Teaching 'design thinking' in the context of Innovation Management—from process to a dialogue about principles

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Abstract: *There has been increased interest in design and 'design thinking' in recent times. This has led to the development of a number of interdisciplinary courses where non-designers have the opportunity to learn so-called 'design thinking'. However, 'design thinking' is an ambiguous concept, which is challenging when trying to apply it in non-design learning and teaching contexts: notably, for this study, innovation management. The aim of this study has two aspects: first, a conceptual one, to articulate what 'design thinking' means in context of a design-driven approach to innovation management; and second, a more practical one, to consider how it could be taught in this context. In this paper, a seminar called 'Design Thinking' is analysed along with key texts within the range of design thinking discourses. This paper concludes by identifying the principles underlying 'design thinking' and develops a teaching framework based on these principles, by using the model of action research. This study is therefore the first stage in an on-going action research project.*

Keywords: *Design, design thinking, teaching, innovation, management, action research*

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Introduction

Design and 'design thinking' have proven valuable in engaging with problems that are ill defined or that relate to the 'fuzzy' goals often found in innovation (Lockwood 2010). This has led to an interest in design from those in non-design fields and to the development of crossover courses in both design and business schools. One such course is the MA Innovation Management [MAIM] at Central Saint Martins College of Arts and Design. Its handbook explains:

> This course focuses on the need to develop professionals who have the ability to critically analyse, creatively synthesise and successfully manage innovative opportunities, which benefit from the ability to cross a range of different disciplinary and discursive boundaries. In order to do this you will need to be able to work collaboratively, to identify these opportunities using a number of different methodologies and to communicate them coherently and persuasively. (Brassett 2010b, p. 4)

This course comprised of students from both creative and non-creative backgrounds and offers a *design-driven* approach to innovation and it's management. It is important to highlight that this is not a design course, but has emerged from teaching, research and practice (both pedagogical and subject-specific) within a college of art and design. In this course, collaboration between different practitioners, their ability to engage with the world (intellectually and practically) and their creative response to research are of key importance. Furthermore, MAIM deals with its investigation of innovation, management, design, business and culture autopoetically. 'Design Thinking', among others, is not just a method or methodology that can be adopted, but an integral part of working as an innovation manager.

Such an approach came about through the evaluation of outcomes from one of the constituent projects of this course, the 'Uncertainty Project' (Brassett 2011); a critical reflection that led to a change in the curriculum of the whole course. This evaluation showed that we needed to strengthen the students' understanding of design and thereby the ways in which it could drive a different approach to innovation. To meet this demand a series of seminar-workshops, named 'Design Thinking', was planned. The aim of this series was to give the students a basic introduction to design and the thinking underpinning design. However, planning and defining this seminar series was not straightforward, for a number of reasons. First, the multiple perspectives on what design *is*, such that it has no normative definition (Poggenpohl 2008; Verganti 2009), means that there is a concomitant lack of clarity about what *is* 'design thinking'. 'Design thinking' will change its meaning according to its circumstances (Buchanan 1992) and the contexts in which it is being deployed. As Poggenpohl states (2008, p. 221), the lack of a normative definition of design—and by extension, 'design thinking'—allows for the possibility for design, as a practice, to metamorphose into many different guises over time allowing for as many creative opportunities for the use of design, as there might be ways practicing design itself. She finds this liberating. Other writers (notably Verganti 2009) do not.

Secondly, although there exists extensive research into design and 'design thinking', and even its importance to non-creative sectors (Berger 2009; Martin 2009; Neumeier 2010), *how* this could be taught in a management context is not defined (Kimbell 2011). The teaching of management and design are approached differently and teaching strategies developed in and for creative disciplines are still, to a great extent, driven by an approach that foregrounds the intuitive, both in the delivered content and style of the teaching and learning activities (Wisdom 2006).

The aim of this paper is therefore twofold: first, to articulate more clearly what 'design thinking' could mean in the context of innovation management. This will entail examining key texts in the current discourses of 'design thinking'. Secondly, to develop a framework of how 'design thinking' could be taught in this context. In developing this framework we will introduce a more structured approach to teaching through the use of action research as a teaching strategy. This is achieved through reflecting on past seminars and current teaching practice in the 'design thinking' seminar and testing it against both the theoretical critique carried out before as well as some pedagogical theory. This will help us to identify underlying principles and values that constitute our current teaching framework. We hope, therefore, to open a dialogue of what design and design thinking may be in the context of Innovation Management, with the aim of developing an understanding what will be important in this teaching and learning context. These are the first words, we hope, not the last ones.

Design thinking and why it is relevant

'Design thinking' as a concept has been used both to understand what kind of knowledge design consists of (Buchanan 1996) and to 'demystify' the design process by looking into how designers are 'thinking' when working (Lawson 1997). Recently it was reintroduced in the field of design as a concept on its own. The design and innovation company IDEO, uses this term to describe its own human-centred approach to innovation (Brown 2008). The management and branding consultant Marty Neumeier states that business leaders need to think more like designers to gain a more flexible and adaptive approach to business development (Neumeier 2009, 2010). This is a perspective shared by Roger Martin, Dean of the University of Toronto's Rotman School of Management. Martin (2009) forecasts: "the most successful businesses in the years to come will balance analytical mastery and intuitive originality in a dynamic interplay that I call design thinking" (2009, p. 6).

It is not first time that *design* is suggested as an alternative to the linear or analytical approach seen in professional disciplines (Simon 1994 [1969, 1981]), Schön 2011 [1983, 1991]). Martin (2009), Neumeier (2009, 2010) and design and innovation researcher at the University of Cincinnati, Craig M. Vogel (2010), all build their understanding of design thinking on Nobel economics laureate Herbert Simon's understanding of design. Simon presents a solution for professionals who have to deal with 'how things ought to be' in his book *The Sciences of the Artificial* (1994 [1969, 1981], p. 133). He is one of few people to provide a normative definition of design, by suggesting that a designer is anyone involved in actions to change existing situations into preferred ones (1994 [1969, 1981], p. 129)[1]. Furthermore, design is not a process and practice that concerns itself only with analytic reasoning, but rather posits

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[1] Management professor Roberto Verganti (2010) finds Simon's a welcome statement of clarity in an otherwise fuzzy practice, in his book examining design-driven innovation.

materially constructable futures and does so in expansive and connecting ways using 'abductive logic' or 'abductive reasoning'[2]. In this way, design offers a far more qualitative approach than management in general, and innovation management in particular.

Another scholar whose work has been influential across design, management and pedagogic theory is Donald Schön. In his work on the 'reflective practitioner' (Schön 2011 [1983, 1991]), Schön showed how, before even engaging with buildings, architects engaged in a dialogue with themselves and others, wherein they presented their visions, worked through scenarios and encountered trial and error in a virtual world. This process of reflection in action in the name of materialising possible futures resonates well with management practice, providing a way of capturing trials and errors made in practice, reflecting upon the knowledge that is developed, transmitting it through ones organisation and iterating the outcomes back into the original process. It remains to be seen, then, how some of these key, and 'fuzzy' elements of design can impact upon 'design thinking'.

Design thinking an ambiguous concept

Roger Martin was asked in an interview presented in an article in *Academy of Management Learning and Education* (Dunne and Martin 2006) whether 'design thinking' could be seen as a 'fad': a pejorative term for something with even less endurance and depth than fashion. His answer was that *design* in management may be a fad, but that there still was a need for wholesale changes to management practice (2006, p. 516). Nevertheless, the prominence that 'design thinking' has enjoyed in recent years has led to its critique from management and from the design community. A former advocate for 'design thinking', Bruce Nussbaum, argues that it is a failed experiment (Nussbaum 2012): that 'design thinking' promised to deliver creativity but is too often turned 'into a linear, gated, by-the-book methodology that delivered, at best, incremental change and innovation.'

'Design thinking' meets critics within the design community as well. Industrial designer Kevin McCullagh (2010) questions whether designers are the best examples of balancing analytic thinking and intuitive originality, referring to one of Martin's definitions of 'design thinking' (Martin 2009, p. 6). From McCullagh's perspective, analytic rigour is neither highly valued in design companies nor an important part of design curriculums (McCullagh 2010). The different attitudes marketers and designers have to research supports this argument. While traditional marketers emphasises an objective, quantitative approach in research, design is far more subjective and qualitative, 'based,' Holm and Johansson explain, "on the designer's skill and an intuitive approach to making decisions". (2005, p. 38)

Furthermore, McCullagh's fear is that to reduce design to a workshop in 'design thinking' for non-designers will lead to the misunderstanding of what design as a practice is and the resultant devaluing of design practitioners (2010). The reduction of design to 'design thinking' thus becomes the training session equivalent of business card machines at railway stations positioning their users as graphic designers. This

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[2] See Neumeier (2009, p. 39-41) and Martin (2010, p. 62-8), who use this concept following Charles Peirce. Philosopher and Social Theorist of Science and Technology, Bruno Latour, adds nuance to this distinction by regarding design today as a "matter of concern" and no longer as just a "matter of fact" (Latour 2008).

parallels a criticism raised of Herbert Simon's account of design, for in positioning all professionals as designers he devalues the singular skills and expertise of designers

Figure 1. *Design thinking DMI 2008. Source: Author1.*

(Edeholt 2003): the championing of their transferrable skills necessitates a denigration of their particular ones. This is an important concern and to deal with it demands not only a rethinking of design as a practice, but a repositioning of 'design thinking' away from the status of a methodology—something that can be taken up or discarded with ease—, towards it being one of a set of principles according to which practice can be expressed—and therefore any engagement with it demands a deeper encounter with the very conditions of its value.

It is not always easy to see what the differences are between design as a practice, 'design thinking' and design process. And when this is the case, we are led to the possibility of questioning the necessity of 'design thinking' as a concept in itself: why not just talk about 'design' or 'designing'? When the Design Management Institute (DMI), a leading professional institution for the design management sector, organised a conference in 2008 to look at 'design thinking', the 100+attendees quickly came up with a range of explanations (see Figure 1). It is significant that this activity also included an examination and outlining of definitions of design. As design focuses less on the nature of its outcomes—as products, images, services and other creative outputs—and more on the principles and processes (Cooper, Junginger and Lockwood 2010), and even about a wider set of issues in which practice and principles are contextualised (Latour 2008), design becomes more important in other areas: for example, in business.

In her analysis of 'design thinking' the design researcher Lucy Kimbell questions the ignorance of 'design thinking' practitioners to the large body of literature and research already existent in design practice (2011). Kimbell (2011) suggests a move away from a generalised 'design thinking' towards design as a set of principles that emerge out of a particular context and can express singular activities in any situation. This is insightful and aligns with our view that any 'design thinking' should not merely instruct in how to

use a set of prescribed techniques or methods, but should be open to both a range and depth of situated intellectual and practical acts. As its advocates champion, 'design thinking' thus articulated could provide an insightful activity for many of us in a multitude of sectors and professions: not least managers.

An action research project

In developing a teaching framework that is less based on an intuitive approach to teaching, the current academic development of teaching towards a professional paradigm is important. A professional paradigm describes a teaching environment where what is taught is in constant and reflective dialogue with institution, self and society (Light, Cox and Calkins 2011). This sense of professional paradigm fits both with how we would like the teaching and learning experience on MAIM to be and how we would like students from MAIM to relate to a professional context.

In education, Action Research is a method that involves enhancing teaching practice by planning an intervention and reflecting upon the outcome (Smith 2007; Koshy 2010) and was chosen as our approach when considering the role and place of 'design thinking' in the MAIM curriculum. This approach allows us to meet the need for a structured development of our teaching practice, to be open to the many ways in which our curriculum could evolve and to open a dialogue into some key discourses in our subject area itself. Action Research is a style of researching within the social sciences that is not only about application of what is researched within a practical setting, but deals with bringing about change. Norman Blaikie, in his book *Designing Social Research*, defines Action Research as having the "joint purposes of increasing knowledge and changing some aspect of the world at the same time" (Blaikie 2010, p. 73). It is therefore characterised by the role that the researcher takes in this process: as a facilitator helping the group being researched to 'change their own situation from the inside rather than acting as an outside expert forcing change through "external" intervention' (Blaikie 2010, p. 73).

In this paper we will include reflections on the 'design thinking' seminar series during the 2010/11, 2011/12 and the beginning of the 2012/13 academic years. In 2010/11 the action research was not yet defined but will be included as this formed the basis on which the 2011/12 seminar was developed. The action research is still on going and the reflections shared in this paper are presented as the current snapshot of our learning. These seminars will be evaluated based on which paradigms they sit within, which principles and values are identified as of importance when developing the seminars and how the students understood the seminars based on what was presented.

An important part of defining the teaching framework for MAIM was the need for a clearer articulation of 'design thinking', this will make it possible to evaluate the learning with intended teaching in this seminar and be an important step towards teaching informed by pedagogy. In transport and product design fields, the theory of threshold concepts has been a promising framework to identify hidden agendas or underlying assumptions of what the students are supposed to learn in the field (Osmond *et al.* 2008). One of the characteristics of threshold concepts is that they are irreversible, which means that once the students 'get them' they cannot go back to their previous view of the world. In this way they are transformative in nature, to the degree that they change values, attitudes and even self (Barnett 2004 and 2007). Moreover, the integrative nature of threshold concepts means that they must be

related to the context in which they operate, otherwise their abstract nature could be challenging for students to comprehend thus obviating their transformative powers. Further Meyer and Land (2003) show that some threshold concepts might have a bounded nature. This defines their relation to other disciplines, thus identifying passages to new conceptual areas. Threshold concepts are sometimes seen as synonymous with what syllabuses label 'core concepts' although 'core concepts' in a field are not necessarily transformative, therefore not threshold concepts proper (Meyer and Land 2003)[3].

To begin with, not only will we analyse the current structure and execution of the seminar series, but we will also examine through the lens of threshold concept theory five texts selected for analysis during this seminar series (Brown 2008; Martin 2009; Lockwood 2010; Neumeier 2010; Vogel 2010). As stated, the theory of threshold concepts aims to unpack assumptions underlying pedagogic practice and we sought to identify these by asking what might be the core concepts of 'design thinking'. Once we know what assumptions we might be making in our teaching of 'design thinking' and use such knowledge to help us identify those transformational concepts any 'design thinking' seminar might offer for students of innovation management. Based on this we will identify principles that will be implemented in year 2012/2013 and bring new insights into future developments.

Possible threshold concepts from five key texts

Perhaps unsurprisingly given the ambiguity around the term 'design', 'design thinking' is presented in a number of different ways: as a process to be followed, as an approach or way of thinking about a subject (area) (see Table 1). Lockwood presents 'design thinking' as an innovation process that is 'human-centred' (2010). Martin (2009), Neumeier (2009) and Vogel (2010) all present it as a particular design approach, although with different perspectives of what this might be. Martin highlights three components that define this approach: (1) 'deep and holistic user understanding; (2) visualisation of new possibilities, prototyping, and refining; and (3) the creation of a new activity system to bring the nascent idea to reality and profitable operation' (Martin 2009, p. 88). Neumeier's focus is on design and argues that managers need to think like designers; he argues that a design approach is an answer to solving 'wicked problems' (2009) and references Martin (2009) heavily in asserting his argument. Vogel (2010) analyses the ways that both design and 'design thinking' have evolved through time. His emphasis is on 'design thinking' as a practice that demands the integration of multiple perspectives: especially, but not exclusively, it should encompass customer experiences and stakeholder needs. Vogel here presents a systematic and contextually specific design approach. Brown (2008) emphasises the importance of thinking like a designer: this will demand dealing with particular methodologies and methods, in a certain way, as well as engaging in a particular process. Notwithstanding their slight differences of focus, one thing that comes across from all their perspectives on how it is to think as a designer is the importance of a human-centred approach.

Furthermore, if we compare the identified potential threshold concepts in this literature with the threshold concepts highlighted in the studies of design in

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[3] Collier and Esteban (1999) highlight many issues that cut across creative, business and pedagogic practices. Their focus on the creative and human benefits of open, dynamic and critically positive feedback on practices, processes and principles seem apposite not only for the innovation management, design and business subject areas, but their pedagogical paradigm too.

automotive and spatial design sectors, we also see the importance of viewing design as a practice in a context. This is also a key consideration for MAIM as a whole. One of the key course learning outcomes is the ability to 'research and analyse the discourses of business, culture and design and translate between them'. Any process and practice of innovation management—especially a design-driven one—must take note, always, of the cultural contexts in which it sits. This seems to be less important in traditional approaches to innovation management.

Table 1. *Unpacking design thinking from five key texts.*

Text and page	What it is	Important key words
Lockwood 2010:xi	A process. A method of innovation.	Human-centred, collaboration, observation, visualisation, rapid concept prototyping, imagination tool.
Vogel, 2010:11-12	Design approach.	Integrating stakeholders needs, connecting.
Neumeier, 2009:18, 22	Design approach. Think like a designer.	Design of processes, systems and organisation, solve 'wicked problems'.
Martin, 2009:6	Interplay between rational and intuitive.	
Martin, 2009:64		Wondering, coming up with something different, user understanding, visualisation and prototyping, creating systems and processes.
Martin, 2009:90		Tools to engage, creative , practical.
Brown, 2008:1-2	Thinking like a designer.	Full spectrum of innovation activities, human-centred design, people needs, sensibility, methods, people needs v technology/strategy.
Brown, 2008:3		Empathy, integrative thinking, optimism, experimentalism, collaboration.

From an intuitive approach to teaching to introducing pedagogy

The first introduction of the 'design thinking' seminar series in the curriculum was in 2010/11. In this we focused first on a range of activities and methods used in design and introduced these to the students in a workshop form. This was driven by an intuitive approach to what should be taught and what the students in an innovation management context could need. This series was planned as a combined lecture and practice workshop where different perspectives on what design is would be presented first, before asking the students to engage in various design-led activities. The tutor who developed and led this series comes from an academic and practical industrial

design background, and theoretical and historical discourses from design studies and her experience of practicing design and strategy in a commercial setting, played an important role in shaping what this seminar series. In a way which deals with the Kimbell's (2011) concerns, mentioned above, it was clear that the experience from design (including historical and theoretical issues) should be brought to bear on this 'design thinking' series. For us, it was also important to emphasise from the beginning the manifold nature of design as a set of practices and theoretical discourses was difficult to homogenise. Not only does this convey the contemporary condition of design, but is a key element of its practice too (Poggenpohl 2009).

The following year (2011/12) this 'design thinking' series was informed more rigorously by teaching pedagogy particularly the notion of 'constructive alignment' (Biggs and Tang 2007). The core idea of constructive alignment is that activities are planned from intended learning outcome and this is aligned with how, and on what, the students are assessed. An important principle in planning the learning experience is that the focus shifts from what the teacher would like to teach, to students' needs in learning. This led to a further streamlining of the series, where less material was included in the workshop and what remained was more aligned to support the learning needs of the students. These seminars were also planned as an action research project that allowed us a structured approach to reflecting upon the seminar.

In 2011/12 the 'design thinking' seminar series was structured to take place over three, three-hour long sessions (see Table 2). The first of these was itself broken into three parts: 1-1 presented an introduction to the practice of 'design thinking', by investigating some of the core definitions of design itself and was structured to follow a simplified version of the product/industrial design process. In part 1-2, the design process was still used but the focus here was on developing a concept into a brand. In part 1-3 the focus was on how to launch this new brand they had developed. Through this first seminar the students was first introduced to the concept around design thinking and also explored how this could be used to develop a concept for a brand and a plan for launching this to the market. The second seminar (Table 2: 2-1, 2-2 and 2-3) was constructed to provide support to a particular project that the students were engaged in, called the 'Uncertainty Project' (Brassett 2011). In this the students explored more in depth key stages in the design process: mapping of information, prototyping as a tool to ideate and importance of identify a vision in the process. The third seminar (Table 2: 3-1, 3-2 and 3-2) is focused on unpacking the concept 'design thinking.' In this last session the students engaged more with the literature on 'design thinking' and worked on defining their own position in relationship to this field.

Table 2. *Unpacking core principles in 'Design Thinking' seminar 2011/12*

Title of seminar	Key words describing the activities
Seminar 1-1: Design	*Group collaboration, tools, visualisation, integrating stakeholders view, empathy, analytical and intuitive reasoning.*
Seminar 1-2: Branding	*Wondering/imagination, group collaboration, tools, visualisation, integrating stakeholders view.*

Seminar 1-3: Launching	*Wondering/imagination, group collaboration, tools, visualisation, integrating stakeholders view.*
Seminar 2-1: Visual mapping	Group collaboration, tools, visualisation, *analytical* and intuitive reasoning.
Seminar 2-2: Prototyping	*Prototyping, Group collaboration, tools, visualisation, analytical and intuitive reasoning, experimentation.*
Seminar 2-3:Visions and values	*Wondering/imagination, tools visualisation, analytical and intuitive reasoning.*
Seminar 3-1: Design thinking part one	*Wondering/imagination, tools visualisation, analytical and intuitive reasoning.*
Seminar 3-2: Design thinking part 2	*Group collaboration, tools visualisation, analytical and intuitive reasoning.*

The 2011/12 was in general perceived by the staff team as an improvement upon the 2010/11 seminar and one-step further to engage with 'design thinking' both for designers and non-designers. However, our critical analysis of the design of this whole seminar series shows that the focus in these seminars was still on the specific processes and the tools introduced in the seminar. This could make it challenging to transfer the learning to other areas as the tools are introduced for a specific purpose. This reflection was supported by students' feedback showed as they saw 'design thinking' *as* an innovation process and as a 'toolkit'.

When evaluating current teaching framework, it became clear how the activities, structure and the content delivered drove the students' perspective on 'design thinking'. This was particularly evident the last seminar. The first day (Table 2: Seminar 3-1) the focus was on each of the students' individual understanding of 'design thinking': their descriptions of 'design thinking' positioned themselves as 'design thinkers' in its discursive and practice context. The second day (Table 2: Seminar 3-2) all of the activities were group-related. These activities changed the students' perspectives on 'design thinking' from being an isolated, personal creative activity to a collaborative, group one. This transition from an individual to collaborative activity highlights a threshold concept we identified in MAIM and thus helped drive the approach to 'design thinking' that would be taken in the future.

Overall, our reflection on the seminar was that the underlying principles that led the teacher in designing the teaching activities—identified by teasing out the threshold concepts—, are key in articulating 'design thinking' and therefore should become the focus of the *point* of doing 'design thinking' in an innovation management context. To insist that certain activities, processes or even methodological approaches are necessary in 'design thinking', we concluded, would be too dictatorial. Furthermore, to create greater transparency in what is taught, there is also a need to deal with the underlying values and assumptions more openly. We were able to tackle both a subject-specific and a pedagogical issue in the same act. Our conclusion that a defining of these principles when engaging in these activities is when 'design thinking' will

happen. The reflective activities that are demanded throughout the whole process may request change and be adapted differently than previously imagined. So what we even offer as "principles" are not written in stone: how could they be? Surely 'design thinking' acting in "fuzzy", uncertain, complex areas needs the opportunity to adapt dynamically to these.

Principles informing the teaching framework

The reflection upon the former 'design thinking' seminar series, along with discussions with colleagues and the analysis of current texts within the 'design thinking' field, have led to a better awareness of how 'design thinking' could be taught in the context of MAIM. For 2012/13 academic year, 'design thinking' on MAIM has been introduced, in the way we state above, as a *design approach* to innovation that is driven by key principles, rather than as an *innovation process.* This is to shift expectations from learning a process, to learning how to adapt an approach (and an adaptive approach at that). The design process will be introduced, as it proved valuable to engage with the 'design thinking'. However, the emphasis in the discussion will be on the principles and not on the process or specific tools. We will also stress that the context of the challenge will set the terms of the action needed; so that given the set of principles, their expression in action at a particular time may determine how 'design thinking' may operate and these, of course, could change. A teaching framework based on action research allows the creation of a dynamic learning context. (See Figure 2) In this the principles will need to be defined in order to plan the activities for the seminar. However, in the teaching space we open up for a dialogue around current understanding and how the activities are intended to engage with the principles. An important part of the teaching will be reflection upon the principles, both in the teaching space and after seminars. The reflection will be an important part of defining future seminars.
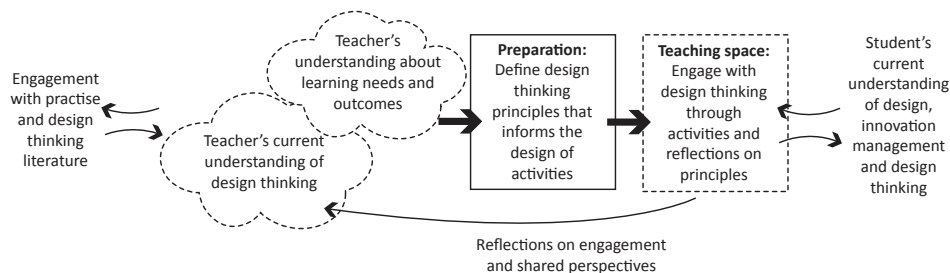

Figure 2. Action research as a teaching framework for the Design thinking seminars

The principles that we will focus upon in 2012/13 will be as following:

- Group collaboration
- Emphasise both analytic and intuitive approach
- 'Zooming in' on details and 'zooming out' on the bigger picture
- Have empathy for people in the context

- Integrate multiple stakeholder views
- Driven by wondering and imagination, by experimentation and prototyping
- Use multiple tools for opening up challenges
- Reducing to core idea and continuous iterations
- Assessment towards criteria that are defined by the context

These principles will be displayed continually from the beginning of the first session of 2012/13 and they will be presented as open for discussion and revision (See Table 3 – Seminar 1-1). We hope that this will be relevant not only for the 'design thinking' seminar series, as we have outlined here, but for the whole masters course too. Not only do we see this exercise refining how 'design thinking' may be of use to innovation management (its practice and teaching), but also how we see innovation management being expressed in an art and design higher education context. We envisage, then, that in moving the discussion

Table 3. *Outline of 'Design Thinking' seminar 2012/13*

Support to student learning	Title of seminar	Description
Introduction to design thinking.	Seminar 1-1: Immerse Seminar 1-2: Ideation &Concept development Seminar 1-3: Prototype & Presentation	Key principles introduced, reflections on these through out the process and after the students have been through the design process.
Supporting Uncertainty project.	Seminar 2-1: Visual mapping Seminar 2-2: Research Seminar 2-3: Prototyping	Mapping information, group collaboration From research to ideas. Exploring experimental research. Prototype as ideation technique and to create a shared vision.
Examination of design thinking literature	Seminar 3-1: Design thinking, 1 Seminar 3-2: Design thinking, 2	Critical engagement with key texts, reflection. Reflection upon principles in relation to seminar and other projects. Group collaboration, positioning

about 'design thinking' away from a focus on how designers 'think' and how this thinking can be installed in other contexts, we can focus upon the principles key to the practice of innovation management irrespective of the background of the practitioners. Consequently, as this is happening also within the context of a reflective teaching practice—which necessitates constant dialogue with our students, our colleagues and the practice of innovation management outside of the college and the myriad changes in concepts and theories of many related subjects—it is likely that we are still a little way away from the finished article. If it is possible ever to reach such a thing. As it is, we are treating this seminar series (as it is currently and might be in the future) as part of an action research exercise: which in itself encompasses some of the key principles of dynamism, reflection, prototyping, experimentation, dialogue and collaboration that we find in the value of 'design thinking' to innovation management (See Figure 2). Furthermore, one might see in Schön's process an account not only of the perfect action researcher, but also the perfect 'design thinker' and, we might add, the perfect innovation manager: for in the act of reflecting, we can see operating the drive to

improve the future, advance knowledge and improve (teaching) practice by considering present and past actions.

The beginning of the journey

The aim of this paper was to bring clarity to the concept and practice of 'design thinking' especially in the context of innovation management and to construct a teaching framework for a seminar series relevant to this.

An important part in crafting this framework has been to engage with some teaching as research and using pedagogical theories to identify underlying values and principles in our teaching approach. An outcome of this activity has been to clarify for us the underlying values of our course and the elements that make it up. We have found that the use of the theory of 'threshold concepts' has made it possible to develop this seminar series in a systematic manner. It also made more transparent, to the students and us, what was taught in the seminar series and how the different activities it contained made it possible to engage with the seminar. The threshold concepts we encountered have helped us to focus on the key learning outcomes of the series on 'design thinking' in particular and of MAIM as a whole, as well as the positioning of 'design thinking' within this course and the subject at large. In the follow-up discussion on MAIM we will need to look at all components of the degree together. By identifying the principles in this one area, it has also opened-up the question whether this seminar series is the best way of strengthening the design-driven approach to innovation management, or whether we need to take a different approach entirely and to embed 'design thinking' in other projects.

However, as we have intimated, the threshold concepts of 'design thinking' will always need to change because the context in which they are, or can be, used is always changing; and even in one particular context, in our case innovation management, this too is a complex and constantly mutating area. It is therefore no surprise that we have implemented action research as our approach to developing a teaching strategy: the teaching framework is developed by the same core principles as what is taught. A teaching strategy based on action research is therefore important combination with the defining of the threshold concepts. This allows us to introduce activities in the seminar with clarity and the underlying values and principles that emerge are always open to reflect upon, to discuss and to change. It seems that it should not be a vain hope for the innovation of our teaching to follow the same principles that we were teaching. Teaching and learning are as ripe for an innovative engagement with their management as any other subject of course.

In the light of the current critique of 'design thinking' (McCullagh 2010, Nussbaum 2012) and still regarding that there is a need for 'design thinking' (Kimbell 2011, Dunne and Martin 2006), this current study has made us more aware of the pedagogical benefit in focusing on 'design thinking'—rather than 'design'—for our group of students. Notwithstanding the possible philosophical problems in the term (Brassett 2010a), 'design thinking' does distinguish itself from the questions of style that may still abound in the discourses related to the design disciplines, especially as they coalesce around material object or other visual (re)presentations. We should also beware of 'design thinking' being used to replace designers designing (McCullagh 2010). We hope to have shown that even though it is generated from thinking about design, 'design thinking' is not a replacement for designing. It should be used as a way in which non-designers and designers can share the discourses (theoretical, practical, conceptual,

intuitive) of design, both in order for non-designers to connect better with designers, and to allow everyone to design systems that are able to adapt to changes. To focus on 'design thinking' and not on 'design' emphasises for our students that we are not training them to become designers, but rather immersing them in the multiplicitous discourses of design by focussing on some of their key principles. Albeit principles which are dynamic and under constant change. It may be that we end up just talking about innovation management—or something else entirely.

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