

Knowledge Sharing by Entrepreneurs in a Virtual Community-of-Practice (VCoP)

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Abstract

Purpose. This paper examines how entrepreneurs engage in a Virtual Community of Practice (VCoP) to share knowledge. Intensity of engagement is taken as a proxy to measure the strength of knowledge sharing.

Design/methodology/approach. The archival data spanning over a three-year period from ‘Start-up-Nation[®]’ (a VCoP purposefully setup for entrepreneurs) is used for analysis. A set of indices are introduced to measure participants’ intensity of engagement in terms of message *length*, message *frequency* and *reciprocity* in the knowledge sharing process. Content analysis is employed to test a sample of ‘*highly engaged*’, ‘*moderately engaged*’, ‘*low engaged*’ and ‘*not engaged*’ discussion topics as part of the on-line discourse.

Findings. We find that entrepreneurs normally use *short* (fewer than 100 words) or *medium* (fewer than 250 words) message size to contribute to the discussions. In addition, we find that *senior members* and *discussion moderators* play important roles in igniting the ‘reciprocity’ behaviour in stimulating the interest of the community with the topic discussion. We also find that highly engaged topics usually lead to further discussion threads.

Originality/value. This is the first study of its kind to explore how entrepreneurs engage in a VCoP to share their knowledge and experiences. The set of measurement indices tested here provide a tool for the owner, designer and moderator of the VCoP to measure the utility of their website in terms of its members’ participation. In addition, the set of textual and subjective interventions identified here enable the moderator (administrator) of a VCoP to design effective interventions to facilitate on-line discourse and augment the knowledge sharing process amongst its community members.

Key words – Virtual Community of Practice, content analysis, knowledge sharing, engagement, measurement indices, on-line discourse.

1. Introduction

Entrepreneurs acquire resources and knowledge through online communities and virtual social networks (e.g., Divakaran and Nørskov, 2016; Hara and Hew, 2007). Sigfusson and Chetty (2013) examined how software entrepreneurs use online social networking sites to learn, develop and harness their network relationships. Increasingly, academics and professionals are investigating the potential of these online services and networks (Yang and Li, 2016), which enable members to share knowledge in order to facilitate learning, improve people's lifestyle and for professional development (Davenport and Prusak, 1998; Gray, 2004; Shang et al., 2006). An important step forward within the study of social networking is knowledge sharing, which is the notion of exchange of knowledge between people as members of a community or an organisation (Hafeez and Abdelmeguid, 2003; Hung et al., 2005). Researchers have identified a number of issues concerning knowledge sharing in social media (Giannakos et al., 2013) and VCoP (Hung et al., 2015; Lin et al., 2016; Kavoura and Borges, 2016); there is a gap in the literature about knowledge being shared in VCoP for the benefit of entrepreneurs (Liu and Rau, 2014).

Greve and Salaff (2003) posit that for entrepreneurs, networking is a very important resource for learning. Lave and Wenger (1991), the early proponents of the COP concept, have strongly viewed COP as a 'social learning system'. For Wenger, COPs provide organisations with a platform for knowledge sharing and peer-to-peer learning among practitioners (Wenger, 1998; Wenger et al., 2002). COPs enable companies to develop the essential portfolio of competencies to attain competitive advantage (Hafeez et al., 2002a, 2002b).

Some of the commonly used social networking sites such Facebook, Twitter and LinkedIn use different indices to demonstrate an indication of their utility. Some of the common indices include 'number of followers', 'number of re-tweets', 'number of likes', 'number of

connections' or simply 'number of clicks'. Our extant literature review indicates an absence of any measures to evaluate the utility of a VCoP by its members in terms of their active participation in the on-line discourse. This study seeks to validate a set of indicators that are a reflection of the active engagement by its members in a VCoP. Researchers define essential elements of discourse as text (i.e. contents) and pre-text (i.e. context) (see for example, Squire, 2006). To our knowledge this is the first study of its kind that examines the content of the entrepreneurs' discourse in an on-line CoP to assess the strength of their engagement (context) with the process.

2. Literature Review

2.1 Virtual Community of Practice (VCoP): What is in a Name?

According to Wenger et al. (2002), Communities of Practice (CoPs) are defined as “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (p.4). CoP can be viewed as informal networks that support learners in co-creating knowledge (Hara, 2000; Veenswijk and Chisalita, 2007). Since holding face-to-face interactions on a regular basis is costly and time consuming, VCoPs supported by internet technologies are among the few viable alternatives to live conversations and knowledge sharing (Ardichvili, et al., 2003).

However, the literature provides divergent definitions related to CoP, mainly depending on the characteristics and purpose of use of the social network. In that, scholars working on interactions in online settings refer to CoPs as Online CoPs when they are created for discussing a public issue, and these are referred to as Virtual CoPs when they are created for fulfilling a mutual goal (Hagel, 1999; Kozinets, 1999). Brown and Duguid (2000) have referred to these CoPs as Network of Practice (NoP) and Wasko and Faraj (2005) used the

term electronic Network of Practice. More recently researchers have identified the role of enterprise social media (ESM) to engage consumers through electronic Word of Mouth (eWOM) (see for example, Chu and Kim, 2011). Liu and Rau (2014) examine the employee knowledge sharing behaviour through ESM, in terms of reciprocity, sense of community, altruism, self-efficiency and openness. On the other hand, Ang (2011) reports companies are using ESM to first identify opinion leaders, and secondly to nurture them to influence the brand community about their buying patterns. Other CoPs have been developed for the purpose of education, faculty development, peer learning and professional development (Brooks, 2010; Zhang et al., 2016).

However, the main differentiating factor between an On-line CoP or a Virtual CoP and an on-line discussion forum is that the latter can be joined by any member of the public (without any specific set of expertise), and the forum can be of interest to the general public, but it is not designed with a specific goal or purpose (Hagel, 1999). Whereas, VCoP is designed for a group of professionals with a specific aim. For the purpose of this paper, we concur with the definition of Hagel (1999) and Kozinets (1999) that involves VCoPs created with the purpose of sharing knowledge amongst entrepreneurs. Our case VCoP **Start-up-Nation**® is specifically designed with the aim to bring entrepreneurs and aspiring entrepreneurs together to provide a network of support as indicated on its front-end page (See Appendix 1). It is supported by full time moderators and technical experts that ensure the sustaining of the community, another condition that differentiates the CoP from an on-line forum or a social networking site (Wenger, 1998; Wenger et al., 2009).

2.2 Engagement in a VCoP

According to Porter et al. (2011) engagement is a voluntary behaviour that is exhibited by community members to “participate and cooperate with others in a productive way to create further value for all” (p. 31). Engagement as a behavioural view is also supported by Cheung et al. (2011), Giannakos et al. (2013) and Shiau and Luo (2013) who have studied the over indulgence of youths in engaging with Facebook as part of a habit and a tool of enjoyment. We concur with Porter et al. (2011) who define engagement in an inclusive and behavioural way, and would argue that engagement dictates the intensity of knowledge sharing.

Researchers have divergent views about how to define engagement with regards to on-line activity, however, there is a clear understanding that increasing the engagement helps in the learning process (Whitton, 2011). Benyon et al. (2005) define engagement as an inclusive and immersive experience that attracts people to participate. Engagement includes emotions and feelings whilst reading an article or book, or excitement when successfully completing the challenges posed in a computer game, or simply the captivating experience involved in revealing the dramatic plot of a movie (p. 61).

Chu and Kim (2011) have examined the determinants of consumer engagement in product focussed, electronic word-of-mouth (eWOM) in social networking sites (SNSs). Data from commonly used SNSs including Facebook, MySpace and Friendster were analysed to confirm that tie strength, trust, normative and informational influence were correlated with users’ general EWOM behaviour. Soboleva et al. (2017) investigated if the inclusion of interactive symbolic and textual features can be linked with the recurrence of retweeting a brand message. Li et al. (2017) have examined the *TripAdvisor* travel blogging site to investigate if management response to on-line reviews impacts to engage travellers. They

conclude that *length*, *speed* and *frequency* of response significantly increase customer engagement in terms of higher number of reviews, more votes for helpfulness and higher popularity ranking. Kamboj and Rahman (2017) have developed a scale to measure customer social participation in brand communities. Dubé et al. (2005) posit that by making connections and online discourse, a VCoP can create a collective identity between its members.

Researchers have identified that ‘legitimate member’ of a community maintain an ‘*active participation*’ by contributing to the on-line discourse (Preece and Maloney-Krichmar, 2003). The opposite is called ‘*lurking*’, where members may read the posts but do not contribute in the discussion. Preece et al. (2004) argue that active participation is more valuable as it generates new knowledge, however, members who are lurking still learn by viewing the posts, and therefore, are legitimate participants. Riverin and Stacey (2008) assert that lurking can threaten the sustainability and usefulness of the community, if more people lurk than actively engage (participate) in the on-line discourse. However, Shang et al. (2006) examined the determinants of participants’ engagement and knowledge sharing under brand loyalty, trust and attitude, as an effect of lurking and postings in online settings. Shang et al. (2006) posit that lurking still resulted in brand loyalty. Tedjamulia et al. (2005) examined posting and interpreting *textual messages* in on-line CoPs and assessed how many individuals do contribute, and measured the text thread length. Burnett et al. (2003) investigated how language use both reflects and influences culture in an online community employing methods of cultural hermeneutics and textual analysis.

2.3 Challenges to Knowledge Sharing in a VCOP

A recent survey by Jagasia et al. (2015) states that CoPs are the social tools to connect, engage, and share knowledge in organizations. Previous researchers have addressed the barriers to engaging in knowledge sharing in a VCoP. Ardichvili et al. (2003) report that when employees view knowledge as a public good belonging to the whole society, knowledge flows easily. However, when the same individuals are expected to contribute knowledge to their organizational CoP, they tend to shy away due to fear of criticism, or of misleading the community members, as well as being unsure that their contributions are important, or relevant to a specific discussion.

In other studies, knowledge sharing has been discussed as part of traditional learning, such as mentoring and face-to-face interactions (Loucks-Horsley et al., 2009). However, this approach has been criticized as being removed from the place where knowledge is to be applied (Brown and Duguid, 1996; Robey et al., 2000). In contrast, informal knowledge sharing sessions via CoPs, occurs in the context of the learner's immediate curiosity, needs or desires. This need-to-know approach can transform entrepreneurs into active knowledge builders, possessing substantial autonomy regarding the specific knowledge or skills required (Granger et al., 2002).

Porter et al. (2011) argue that in order to foster and sustain engagement in virtual communities, 'opinion leaders' are required to mobilise 'member leaders'. CoP has a '*moderator*' (or administrator) who is usually a technical expert and facilitates in the on-line discourse (Johnson, 2001). Wasko and Faraj (2001) argue that community members reciprocate more willingly to comments made by domain experts, as they feel that it enhances their professional reputation. In this research we wish to examine the role of moderator and

domain expert in the VCoP to gauge to what extent they enhance on-line interaction and engagement.

3. Methodology

Whereas positivism refers to classic research and interpretivism is about conversational qualitative research, the research philosophy adopted in this study is '*realism*', that is, the combination of 'interpretivism' and 'positivism'. The authors also posit that a '*deductive (data to theory) approach*' was suitable, as the purpose of the study is to gain deeper understanding regarding the motivational aspects of participants in engaging with a VCoP. The deductive qualitative approach is justified as the on-line archival data used for the analysis were found not to conform to any preconceived themes.

This research adopted a case study approach that allows getting a deeper understanding of the research area. Wenger (2004), the current authority in the CoP field, recommends the use of case study methods for CoP research. Following the deductive approach, this study identifies the key themes and factors that relate to people's engagement in CoPs. Once the key issues and themes were investigated, an inductive approach was used, not to generalize, but instead to investigate specific CoPs, with the intention to provide a deeper understanding of the members' engagement in the online CoP.

For the purposes of this study, we were interested in exploring the behaviour (or actions) of the members of the community, how they respond to an online enquiry (questions), whether the topic discourse (content) of the message and size (Li et al., 2017) are more important for encouraging members to engage in the discussion, or the status of the sender (the domain expert or moderator, or the members). Therefore, we study the entrepreneurs' behaviour in

terms of their '*frequency of reciprocity*' to a topic of discussion that we achieved through *coding* each member involved in the discussion. Some previous researchers identify the topic of entrepreneurship, specifically, social entrepreneurship, as a discourse of social identity (Nicholls, 2010). However, in this study, we use 'discourse' in its textual (content) meaning (Widdowson, 2008) without associating it with any social, psychological or institutional theory or paradigm. As well as content analysis of the VCOP, archives were used as the main methodological approach in this study. Weber (1990) posits that content analysis permits for large amounts of text to be classified under a reduced number of categories to group similar underlying meanings.

Hsieh and Shannon (2005) divide content analysis into conventional, directed, and summative approach. With the conventional approach, coding categories are derived directly from the text data. In a directed method, initial codes are directed from a theory or another research finding. However, a summative approach to content analysis is about word counts as well as interpretation of the contents (also referred to as latent content analysis).

In this study we use the summative approach to content analysis. Here we count the 'words' of different messages (queries and their replies) sent by entrepreneurs. The selected archival data were transferred into a word document first that made it easier to colour code the senders messages for the purpose of interpretation, conduct the word count and use the 'find' command to search for key words. Recently Neuendorf (2016, p. 201-236) has developed methods for coding contents acquired from interactive and social media. In addition, Kavoura and Borges (2016) have conducted content analysis of tourists' comments posted on *Tripadvisor* blogging site regarding the top ten restaurants in the Azores and Hawaii. The main purpose of their investigation was to assess if the blogging site (*Tripadvisor*) meets the characteristics of an 'imagined on line community'.

We have selected **Start-up-Nation**[®], a mature website established in 2002 to offer entrepreneurs a resource to help them in starting and growing a company (see Appendix 1) as our case study. The VCoP has many sub forums where entrepreneurs can engage in discussion (see Appendix 2). We trawled through three years' worth of archival data from the site for the purpose of research. At the time of the investigation, the **Start-up-Nation**[®] had 11 sub-forums, where 10460 active threads of discussions were pursued, that had received 97975 replies (see Table 2). This data set allowed us to pick up the required number of topics, where in some cases the thread of discussions lasted for over a month. The topics were chosen using a purposive sampling strategy. In that, we first categorised and coded the discussion topics into relative categories of '*Highly Engaged*', '*Moderately Engaged*', '*Low Engaged*' and '*Not Engaged*', according to the number of reciprocal messages posted by the members in the on-line discourse.

3.1 Developing Engagement Measures

3.1.1 Engagement Indices

We found some principles to assess the degree of engagement of CoP members in an earlier (unpublished) work by Diemert (2002) who has identified '*intensity of engagement*', '*duration of engagement*' and '*degree of centrality*' for this purpose. However, there were few guidelines how to operationalise these measures. For this research, we develop a comprehensive engagement measurement tool as illustrated in Table 1. The indices proposed relate to *membership status* and its impact on the intensity of discussion (e.g. few to many), *duration of engagement* or life cycle of the topic (from short-term to long-term), *stage of engagement* (this relates to membership status - who initiated the topic, who responded first and last, and whether it had a conclusive end) and/or if it led to a new discussion thread.

Specifically, we operationalise ‘engagement intensity’ under the criteria ‘Few–to–Many’ into a “*Topic Engagement Index*”, that is, a ratio of the number of replies received to a query to the total number of ‘views’ (lurkings) of the topic. (A ‘view’ is if a participant (member) has viewed or ‘read’ the query (or the responses by other members), but has not posted any reply to it.

The community page clearly indicates how many members have viewed the post. (*However, we assume that ‘viewed’ means it has been read, rather than a member has clicked on it and moved on without reading it*). We also note that one measure of successful engagement is that the discussion topic leads to generating further sub-topics (discussion threads). We capture this by introducing three measurement indices: (i) “*Forum Activity Index*” that is a ratio of ‘total number of replies’ for the forum to the total number of sub-topics generated (ii) ‘*Sub Forum Activity Index*’ the ratio of ‘total number of replies’ for the sub forum to the total number of replies generated, and ‘*Topic Engagement Index*’ that relates the number of replies to the total number of views of the topic. In addition, another measure of engagement success is how long the topic stayed ‘live’ under discussion. We capture this as ‘*Engagement Duration*’ or ‘*topic life cycle*’ in number of days. We recognise that another useful engagement measurement is ‘*Life Cycle Adjusted Topic Activity Index (LCATAI)*’ that is derived by multiplying the ‘*Topic Engagement Index*’ by the ‘*Life Cycle*’ of the topic; this provides an overall indication of the entrepreneurs’ engagement in the on-line discourse.

“INSERT TABLE 1 HERE”

3.1.2 Membership Status

In regard to members' status, the common levels and terms that are used in most virtual communities are: *Junior Member* (for newly joined members) or someone contributing very little in discussions; *Senior Member* (who makes substantial contributions in the discussion, responding to a number of participants); *Moderator* (who can oversee general or specific discussions in forums); *Administrator* (who oversees the web site, generally has the ability to edit and delete posts, move threads, and perform other actions); and *Domain Expert* (someone who is respected in the community due to his/her knowledge or professional status) regarded as the 'Guru'. Becoming a moderator for a specific forum is usually a reward to users who are particularly helpful and knowledgeable in the subject of the forum they are moderating. Administrators are the people who have overall control of everything that happens on the forum. They oversee how the forum is styled, what sub-forums to be created and how to organize them, what information to require from members and who to appoint as moderators. For the purpose of this research, we identify 'domain expert' through measuring their activity across a number of forums in the **Start-up-Nation**[®] VCoP. We validated the domain expert status by checking their on-line profiles showing their message frequency and total number of topics in which they have participated.

We operationalise membership status with the 'stage of engagement' into three sub categories as in Table 1. That is, the 'Topic-initiator' to identify who posted the topic; i.e. if the community 'moderator', or 'member' or 'domain expert' posts it. This aims to identify if the engagement intensity has any relevance to the membership status. Similarly, the 'initial-engagement' index measures if the involvement of the domain expert or the moderator has an impact on the engagement intensity. The 'terminal-engagement' is to record who posted the last reply, or who had a final say. In addition, we assess if the topic ended in a successful

conclusion, or remained open ended, where community members could not arrive at a consensus or a final verdict. As mentioned earlier, another measure of a successful engagement is that a topic leads to further discussion under a different ‘thread’ in a sub-forum. In addition, we measure the degree of centrality by counting how many times a member (entrepreneur in this case) has engaged in the discussion and what is his/her total ‘word’ contribution in the discussion in a pie-chart format.

3.1.3 Size of the Message

In this research, we aimed to investigate if there is a pattern of message *length* that could explain why participants engage in the discussion. We also wanted to identify if the size of the message is significant in high intensity engagement topics, compared to that in low-intensity or unsuccessful topics. Therefore, we have classified the length (size) of message (reply) based on the word count (Woods and Keeler, 2001; Masters and Oberprieler, 2004). From our reading of over 10,000 messages in different CoPs, we classified the message length using number of words as follows: 1-50 ‘*Very Short*’ message; 51-100 words as ‘*Short*’; 101- 250 words ‘*Medium*’; 251-500 words ‘*Long*’; 501- 1000 words ‘*Very Long*’; +1000 words ‘*extended contribution*’.

4. Case Study of Start-up-Nation[®] VCoP

4.1 Case Study Background

Jeff and Rich Sloan formed **Start-up-Nation[®]** network in 2002 to offer entrepreneurs a resource to help them in starting and growing a company. This high-profile web site has been featured in the news media such as The New York Times, Wall Street Journal, Fortune Small Business, Entrepreneur Magazine, CNN, CNBC, MSNBC and FOX News. Through **Start-up-Nation[®]** broadcast, online, print, and event channels, entrepreneurs can access advice

from a variety of experts and peers. The **Start-up-Nation**® VCoP went live on 6th April 2006, and has grown to become a valuable resource for the entrepreneurial community. **Start-up-Nation**® provides collective knowledge and experience that allows entrepreneurs (members) to gain information, learn from and mentor others.

At **Start-up-Nation**® CoP, members can network with others through the community pages by posting their profile, searching for and connecting with other entrepreneurs. We observe that members of this VCoP are those who aspire to starting their own business, part-time/full-time entrepreneurs, employees of a start-up, college students, inventors, creative people who are looking for an idea, those in transition and looking for work in all types of industries, freelancers, mentors/coaches, potential investors, and those who want a flexible work schedule. An example of the discussion forum top page is illustrated in Appendix 2.

4.2 Case Statistics

Start-up-Nation® CoP interface has a list of categories and forums (see Table 2), with basic statistics for each, including the number of topics and posts, and which member posted the most recent message. In other words, the VCoP as a whole (at the time of investigation) contained eleven categories (broad subject areas), which themselves contain forums (more specific subject areas) and these contain topics (conversations on a topic) that are made up of individual posts (a message sent by the member). In Table 2, we provide a sub-forum activity index illustrating, for example, that topic 10 ‘Inspired Sharing Wisdom’ was the most engaged topic scoring the highest engagement (22.2) by the community entrepreneurs.

“INSERT TABLE 2 HERE”

4.3 Analysis of Selected Topics

A total of twelve topics are selected for further analysis as illustrated in Table 3. The analysis is based on ‘high’, ‘medium’ and ‘low’ number of ‘replies’, to understand the textual context (word length) and assess if the message length has any repercussions on the engagement intensity. In addition, topics with ‘no replies’ are identified to assess whether any meaningful conclusions can be drawn about the query (first posting) towards initiating an on-line dialogue.

“INSERT TABLE 3 HERE”

Highly Engaged Topics

Topic 1: How do I hire people?

The topic initiator *Chordail* is not an active member of this CoP (see Table 4). However, he claims that he is a very successful business person. *Chordail* seeks advice on his financial difficulties due to lack of cash flow to pay his employees’ salaries. He posted:

‘My new consulting business consists of myself and a partner. Our (currently one and only) customer is asking us to hire more talent so they can utilize us more. This sounds great, but we do not have the cash in the bank to afford the temporary cash outflow to hire and pay salaries. Once we can invoice and be paid for their work, we will be fine, but there is about a 2- month gap we need to cover’.

The topic had generated a lot of interest, attracting over 5620 views (lurks). This topic has attracted 21 entrepreneurs to actively participate and share their experiences in the community. Based on the responses to the above topic, a detailed analysis has been carried out and is shown in Table 4.

“INSERT TABLE 4 HERE”

Table 4 illustrates that *Brand Alchemy* (Code H) was the main contributor in the discussion, who offered his/her expertise to *Chordail* (the inquirer) to solve his short term cash flow problem using a number of theoretical examples. Most of the ‘interventions’ (messages) he generated were ‘medium’ and ‘large’ sized. Overall, the message length used in this discourse was predominantly medium (M). The topic originator, *Chordail*, did not respond to any of the participants’ comments during the discussion.

Appendix 3 illustrates the ‘*life cycle*’ of the topic with 35 days ‘duration’ (the number of days the topic stayed alive) with two peak days of discussion, involving an exchange of nine messages on the 3rd of January and eight messages on the 17th of January. Appendix 4 gives the percentage contribution (*degree of centrality*) of different members during the discourse. Member H (*Brand Alchemy*) was the main contributor with overall 17% of input in the discussion, making six interventions (see Table 4). Another three members (Q, V and R) contributed 9% each in the discourse.

Topic 2: How do I prove market demand for a new product?

This topic was initiated by a member *biznesman* who was setting up a business in the technology sector and was in the process of writing a business plan to attract investors to financing the development of a software product. His below topic brief gives a picture of his desperation to get an expert advice on this issue. His original message was about two pages in length. However, we reproduce an excerpt of the message as shown below:

“I am starting a business in technology sector and am writing a business plan to find investors (or bankers) to fund development of a software product. According to my findings from business plan writing books and online resources, developing a new product/service, as part of my marketing analysis, I need to provide proof of strong market demand and customer acceptance for the product in question to address the concerns of the investors or bankers about this important matter. Being a Start-up and dealing with tight budget before getting the

loan, I need to come up with an effective and affordable method to gather opinion from my target market regarding my product.....”

This topic actively attracted 11 members with overall 29 messages posted, while 2894 members have viewed the topic. Most of the replies came from one domain expert who summarized the available methods to answer the query (e.g. survey, advertising, etc.). The debate led to three related *sub-topics*, initiated by the same member. We also observed that all three topics led to a successful conclusion (in that the responses satisfactorily met the raised query). Full discussion profile, discourse analysis of the topic, and authors’ relative contributions are shown, respectively, in Table 5, Appendix 5 and Appendix 6.

“INSERT TABLE 5 HERE”

It is worth noting that unlike topic 1, the message initiator *biznesman* was the main contributor to this discourse. He made 12 interventions (mainly, ‘S’ to ‘M’ sized) acknowledging various inputs and creating further inquiries that generated three sub topics. Overall most of messages were ‘Very Short’ to ‘Short’ in length. Appendix 5 shows that there were four active periods, which lasted 5, 3, 2 and 2 days where most of these discussion actively took place. There were 23 days of inactive period with no responses. The Appendix 6 shows the author’s relative contribution to the discourse, where it can be seen that the topic initiator *businessman* (coded as B) contributed 46% of the discussion mainly using medium and small sized text messages. Another two members (A and C) contributed 11% each in the discussion.

Topic 3: Business name

The topic initiator here is looking for help in developing brand name for his/her business to create maximum impact in the market and to achieve high brand awareness in a short span of time. The topic generator has given a detailed description of his situation to make his appeal to the community members. An excerpt of the message as follows:

“I am stuck on naming my business... .. Do I hire a patent attorney? How do I protect myself and cover my tracks? I've got a name that checks out as unused in my state and on the web. What is my next step?)”

The topic initiator *John* (coded B) received several positive feedbacks from the members of the community suggesting some apposite names in order to capture a big market share for his services through online selling. It is interesting to note that *John* himself participated five times in the discussion using a range of text sizes ranging from S to L. The total life cycle of the discussion was short, lasting only 11 days. It is observed that the engagement activity peaked towards the last day of the discussion when 11 entrepreneurs responded to the discussion, then it tailed-off abruptly. The degree of centrality coding analyses revealed that four members contributed 17%, 17%, 14% and 14% of the discussion respectively.

Moderately Engaged Topics

*Topic 1: Learning from other **Start-up-Nation**[®] entrepreneurs*

The topic initiator wanted to share his experience about how he benefitted from using this CoP. The topic seems to be perplexing if anybody reads it without reading the brief of the initiator. The brief below explains why the topic initiator wanted to show his gratitude towards this CoP and his analysis of how **Start-up-Nation**[®] VCoP had benefited others.

“I met my web designer here, I've met customers here both wholesale and retail, I've gotten great advice and inspiration, I've purchased great products from new friends (still lovin that Jerky of the Month Janie!) and I have a place in SuN where I can come to for answers that

nobody in my everyday "real" life would know. Thanks SuN for being there from "idea" to now in 13 stores in 5 states, 2 online sites and 1 catalog..."

Through the content analysis, we note that the topic initiator, *HouseJerky* (Code C), has been actively engaged in the discussion through one further intervention. However, the main stimulator of the topic discussion was *CraigL* (Code A) who made three contributions using VS and M sized messages. From text size coding analyses, we observe that M and VS sized text messages were frequently used during the discussion. In addition, the total life cycle of the discussion was short, lasting only 6 days, with two active periods, which lasted 3 and 2 days, there was an inactive period of one day when no response was registered. However, the responses peaked on the final day of the life cycle. Interestingly, where the topic initiator (C) contributed twice, his overall contribution was only 10%. The main thrust of the discussion rested with *CraigL* (A) the resident domain expert who contributed 30% of the total, followed by entrepreneurs D and F, contributing 20% of the discussion each.

Topic 2: How to use text messaging to reach customers

The above topic is self-explanatory and engenders curiosity among the members to be engaged in such a discussion. In this topic the initiator tries to engage members by asking a question: *Do people like having their private communications invaded by adverts?* His question stimulated 10 member-entrepreneurs to participate, predominantly using short to medium size messages. Nobody engaged second time in the discourse. The life cycle analyses (not shown) indicated that although the topic stayed alive for 33 days, it attracted very little activity during the period, and the maximum number of responses received on a single day were two. There were multiple long spells of inactivity during the life cycle, and the discussion attracted three replies during the last 3 days of the life cycle. We also note that

the topic initiator (*Cigaman*) did not engage himself with the discussion, or respond to any message posted by other entrepreneurs.

Topic 3: How to increase your sales overnight?

This topic is another distinctive example of the altruistic nature of this CoP. A member (*DaleKing*) who seems to have some knowledge of online marketing tools initiates this topic to share his knowledge how to increase the online sales by utilising different online marketing tools. There was a high degree of lurking, however, only seven members responded with a single reply each. Many responses were limited to a thank you note or acknowledgement. We noted that the message lengths (text) in this discourse were short (S). We also observed that the total duration of the life cycle was 30 days; however, only 10 of these were active days. From the degree of centrality point of view the topic initiator (*DaleKing*) was instrumental in keep the discussion going by responding to five comments with an overall total contribution 46%.

Low Engaged Topics

Topic1: Risks of a car rental business

This topic is a typical example of the message posted in this CoP, where the topic initiators requested specific support from the members. The topic was worded as,

“Hi, I am 18 yrs old and interested in opening a car rental company. I was wondering if anyone has any experience in this area, and if you could share your difficulties and successes in the business.”

The topic attracted sufficient degree of lurking (425 views); however, it generated only four responses. Only one member responded to the request with long and medium replies. The topic lasted only for 2 days, and the two participants made equal contributions in the

discussion. In addition, we learn that there was only one active period, which lasted for 2 days. From the degree of centrality perspective, we noted that the four responses came from two authors and each of them contributed two responses.

Topic 2: Is receiving/stocking/shipping inventory a difficult task?

The above is another example of a low engagement topic. The brief of the topic is, “*I'm looking to inventory various products, but all of it seems so intimidating to me (especially in regard to owning/leasing warehouse space.) Just how hard is it to set up an inventory network? Should I look into 3rd party services such as Amazon's fulfilment services? (in which they receive, stock, and ship your inventory for you) Any thoughts would be appreciated, especially your own personal Experientials. Thanks everyone*”.

There was a high degree of lurking (with 678 views). Reminiscent of the previous topic, there were few responses probably for similar reasons, that the topic requires certain specialised knowledge in the specific field. Consequently, this topic could generate only two responses (with a short and long response) and stayed active only for 4 days; the two participants made equal contributions in the discussion.

Topic 3: Who shops at Amazon.com?

A member (WAUHVGR) who is trying to increase internet traffic flow to a new program called **5% Blue** generated this topic. Again, this topic seems atypical in this CoP as it is requesting help and suggestions to solve a specific problem. As with the previous two topics, despite a high degree of lurking (556 views) this topic could generate three responses with two short and one medium response. The topic life cycle lasted effectively for one day. In this case, the topic initiator (WAUHVGR) did respond to one member's comment. The last reply was posted by **CraigL** who we would regard as the **domain expert** and who was very active in the community (see Tables 4 and 5 membership codes V & A, respectively). **CraigL**

actually made a substantial contribution (46%) in one of the *highly discussed* topics as identified earlier.

Not Engaged Topics

Three topics with no replies were selected for further analysis. These are representative of topics that did not receive any responses. We note that topics under this category are either very specific or of “general knowledge” type.

5. Key Findings

One key area of our interest with this research is to shed light on how knowledge sharing takes place in a VCoP populated by entrepreneurs. In order to do this, we provide an overall summary of the key results as illustrated in Table 6. As explained earlier, we have included detailed analysis of the twelve topics to summarise the results for generalisation.

5.1 Size of the Message

Table 6 gives a comparison of message length for all 12 topics, classified under ‘Very Long’; ‘Long’; ‘Medium’; ‘Short’; and ‘Very Short’. The table also list the number of responses along with the percentage contribution for each message against its size. The ‘Average’ column at the right-hand-side of the table illustrates the overall percentage contribution for each size message.

Overall, a majority of the entrepreneurs’ messages (38% of the total) were of ‘Short’ length (51 to 100 words) (see Table 6). This was particularly true for the ‘Highly Engaged’ and ‘Moderately Engaged’ topics. This was followed by ‘Medium’ sized messages where 31.7% of the total contribution fell into this category. The majority of messages in this category

were posted for the highly engaged topics. The third most liked text message length was ‘Very Short’ scoring 15.8% of the total contribution. However, the entrepreneurs avoided making ‘Large’ message text contributions (2.22%) and no one contributed using ‘Very Large’ text messages (501 to 1000 words). This can perhaps be attributed to the entrepreneurial characteristic of contributing in constructive discussions and avoiding fruitless long debates.

“INSERT TABLE 6 HERE”

5.2 Topic Engagement Indices

We observe that the *Topic Engagement Index* (TEI) is not necessarily higher for the ‘Highly Engaged Topics’ (topic 5 has relatively higher TEI with a value of 0.027 (see Table 6)). We further introduce an improved measure ‘*Life Cycle Adjusted TEI*’. In addition we observe from Table 6 that topic 5 also scored the highest (0.89) on the *Life Cycle Adjusted TEI* highlighting that the topic had kept the participants engaged over a longer period. This is an interesting find indicating that moderately engaged topic (Topic 5) was more effective in ‘active’ knowledge sharing. However, if we use the no. of views (lurking) as a measure, then the topic 12 that attracted no response had attracted 2410 views trailing fourth to the three highly engaged topics. This is an important find as in line with Preece et al. (2004) whilst knowledge sharing has not taken place, but there is still a high degree of leaning taken place even in low engaged topics.

5.3 Degree of Centrality: Does the Size and Initiator of the Initial Message lead to Higher Frequency of Engagement and a Successful Outcome?

Table 7 gives an overview of the twelve topics for each category ('Highly Engaged', 'Moderately Engaged', 'Low Engaged' and topic with 'No Engagement') along with the mentorship status of '*Topic Initiator*' who posted the first message (who started it) and the status of the member who posted the last message (who concluded it).

“INSERT TABLE 7 HERE”

There is also nothing conclusive about the size (length) of the *Inquiry* (first message), similarly the *first reply* and *last reply*, to indicate if the length of the message has any influence on the engagement indices. There is no conclusive evidence for this factor, as for the 'Highly Engaged' topics there is no pattern, as the length of the messages varied from VS (Very Short) to VL (Very Long).

We note that the word length of the first '*Inquiry*' for highly and moderately engaged topics varies from VS to L (see Table 7). The fact that there was no pattern in inquiry text size was deduced with regards to highly engaged topics that comprised S, L and M sized messages. This suggests that there were instances where the topic initiator included sufficient factors to excite and stimulate other entrepreneurs' imaginations to take an interest in his/her debate. On the other hand, on occasions the member resorted to asking a direct and concise question of his/her peers in 'moderately engaged' 'low engaged;' and 'not engaged' topics. However, we seek to discover if the size of the first reply can influence a successful discussion by the community. We note that the first reply has been a Short (S) to Very Short (VS) message.

However, one important observation we have made is that the discussion did not necessarily follow the thread of discourse. That is, irrespective of the first reply, on most occasions, members of the community responded by answering the initial message. This indicates that the respondents have focussed on the original question while responding to the message, without being lost in the essence of the overall debate. Similarly, we found that the size of the final reply (message) for each topic did not predict if the message length was a decisive factor in concluding the discussion. From Table 7, we observe that the length of the final message ranged from Very Short (VS) to Very Long (VL).

We also set out to find out *to what extent the community was influenced by the standing of the topic initiator*. We could identify that for two of the ‘Highly Engaged Topics’ the discussion was initiated by a Senior Member (SM) of the VCoP. It would be interesting to find out if the members of the community participated because of the knowledge and authority of the SM or were motivated to respond because they found the topic more interesting. However, we observe that a Junior Member (JM) of the community started most of the other topics. Similarly, we notice that there is some impact on the engagement of ‘who responded first to the message’. We observe that for all four ‘Highly Engaged Topics’ a SM responded first to the query that initiated further debate. We can infer that the presence of a SM of the community attracted other members to be drawn into the on-line discussion. It seems to have little impact on the successful engagement with the topic. Where clearly the community administrator (Mod) responded to all ‘Moderately Engaged Topics’, there was no pattern that could be deduced concerning ‘Highly Engaged or ‘Low Engaged’ topics.

We were also interested to know who sent the last reply because that perhaps led to concluding or killing the discussion. We note that for the ‘Highly Engaged Topics’ there is a

pattern that the community Senior Member (SM) or the Domain Expert posted the final message. However, for two of the three ‘Moderately Engaged Topics’ the community moderator (Mod) posted the final message. For the ‘Low discussed Topics’ the final message came from a junior member (JM). A possible reason for this could be that, on the one hand, the junior members could be more active in the discussion forum, on the other hand, it may signify that the senior members did not wish to engage with the junior member’s response to further the discussions.

We also wanted to find if the outcome of the discussion (Topic Conclusion) has any bearing on the life cycle of the topic. Is it when the members see a successful outcome of the discussion that they stop engaging with the topic? We observe that five out of twelve discussions had a successful conclusion (Table 7). However, one interesting observation was that for all three ‘Highly Engaged Topics’ the discussion led to either an ‘unsuccessful’ or an ‘open ended conclusion’. This could be one reason why entrepreneurs engage in the discussion as much as possible to seek a solution to the inquiry, therefore increasing the duration of the topic life cycle. As and when the community found that an appropriate solution has been posted, they stopped responding further. Therefore, topics for this category belonged to medium and low discussed categories. What this signifies is that when people are attracted to a topic, they keep engaged in it until an appropriate solution is found. We also note from earlier discussions that when there was no commitment from the topic initiator to remain engaged with the on-line discourse, the topic died away quickly.

The last column, ‘Does it (inquiry) lead to another topic?’ gives a very different result. We find that all three ‘Highly Engaged Topics’ led to the start of another discussion thread (sub-topic) and two out of three ‘Moderately Engaged Topics’ led to at least one other sub-topic,

whereas ‘Low Engaged Topics’ did not lead to any sub-topic. Also, we observe that all of the ‘Highly Engaged Topics’ and two of the ‘Moderately Engaged Topics’ led to further topic threads (sub-forum) irrespective of whether the discussion led to a successful conclusion, remained open-ended, or led to an unsuccessful conclusion. Therefore, it appears that what is important in this context is to attract and engage many members of the community in the topic and this leads to further engagement and therefore, knowledge sharing. We have found that all three ‘High Engaged Topics’ and two of the ‘Moderately Engaged Topics’ led to starting one or two further threads or sub-forums. This seems to be a key characteristic of highly engaged topics. This is irrespective of the end-result of the topic discussion, whether successful, or unsuccessful or it remained open-ended.

6. Discussions and implications

This research make a number of contributions in the fields of information and knowledge management, entrepreneurship and behaviour sciences. The study has added to the developing body of literature regarding VCoPs and their importance in knowledge sharing during this era of digital transformation. An important contribution of this study is how to manage information sharing more effectively in an VCoP. The engagement indices validated here have proven their utility to measure the intensity of engagement through the *forum activity index*, *sub-forum activity index* and *topic engagement index* by giving an accurate engagement ratio between community ‘active’ members and those who are lurking. The *topic life cycle* provides an additional measure to evaluate the active time during which the on-line discourse has taken place (Preece and Maloney-Krichmar, 2003). This provides the community moderator an in-depth understanding relevant to the utility of the topic and members’ engagement during the on-line discourse and helps to ensure the sustainability and usefulness of the VCoP for its members (Shang et al, 2006; Riverin and Stacey, 2008). We

also posit that if lurking is reckoned a useful phenomenon with regards to individual learning (Preece et al, 2004) then ‘active’ participation and ‘lurking’ both should be utilised as measures of engagement.

The study makes useful contribution in the field of behaviour sciences in that it illustrates how knowledge sharing by entrepreneurs may be intensified in a VCoP (Hara and Hew, 2007). The behaviour of *reciprocity* (Liu and Rau, 2014) is measured through ‘stage of engagement’ (see Table 6). Here we have tested how a membership role (junior member, member, senior member (domain expert), and moderator can influence re-enforcing more *frequent* on-line debate in the VCoP (Li et al., 2017). In particular we have ascertained to what extent the ‘*degree of reciprocity*’ and the related ‘*degree of centrality*’ intensify in relations with the membership status and how ‘senior members’ have played a key role in stimulating the on-line discourse over a longer period of time.

Finally, the research make contribution in the field of on-line discourse analysis. In particular the research shows a way how on-line discourse can be analysed by categorising the ‘size of the message’ and assimilating the impact of each contribution over time undertaking a life cycle analysis. In addition, the research investigates if the size of the text (message) has any bearing to intensity the on-line debate and the successful conclusion of the debate and leading to new aspect of knowledge creation and sharing.

These findings have implications for the development and design of a VCoP. The set of engagement measurement tools validated here would allow practitioners to understand the effectiveness of a social networking site beyond VCoP. By reviewing the topic engagement index, the moderators of VCoPs can develop strategies to encourage members to share their

knowledge and experiences. The key is to make timely interventions to intensify members' engagement for longer periods. In addition, by utilising *Forum Activity Index* and *Forum Sub-Activity Index*, the moderator can identify active or fading forums and sub-forums, and can invest his/her attention either to re-ignite the community interest in those forums by starting another more relevant thread of discussion, or divert the energies of the engaged members into a related topic (Soboleva et al., 2017).

If collectivism (Tiessen, 1997) and reciprocity (Zimmer, 1986) are the most common combination of motivators reported in the *Start-up-Nation*® VCoP then, logically this combination should be fostered and facilitated perhaps by the CoP moderator, or by some of the frequent knowledge sharers like a Senior Member of Domain Expert. As mentioned previously, people typically act out of collectivist motives because they commit to or value the group's or the profession's welfare (Batson et al., 2002). The moderator of the VCoP can discuss with the senior members and domain experts for each forum the importance of their engagement in prolonging the life cycle of the discussion by making appropriate interventions in timely manner (Zarella, 2013; Li et al., 2017). Also, the moderator can advise the members of the VCoP about the type of queries that will attract better engagement from its members, and guidelines for the maximum size of the text that facilitates more frequent response from the community members.

7. Study Limitations and Future Work

The virtual CoPs discussed in this study was created through the efforts of a number of interested members. As such, the findings of this study have more relevance for bottom-up emerged virtual communities of practice for professional purposes, rather than for top-down management, or organisation-mandated ones. As such, the findings reported in the study,

should be viewed with caution in terms of the completeness of the whole picture. Nonetheless, the findings reported here would still be valid in providing the practitioners with useful guidelines of the types of activities that members in each VCoP engage in, as well as the types of knowledge that they share. Future studies should consider analysing more than one VCoP, and designing experimentation by the moderator or domain expert by posting messages using particular text size as described above, to observe the engagement pattern of the members, the duration of the life cycle and the outcome of the on-line discourse. In addition, the present study did not investigate the quality of the on-line discourse (Hafeez and Alghatas, 2007) that can shed further light on the process of engagement by the members of VCoP.

We anticipate that one of the major impact of this increased knowledge sharing would result in enhancing entrepreneurs' personal knowledge and competencies (Hafeez and Essmail, 2007), the organisational and functional core competences (Hafeez et al., 2007 & 2010), and the marketing competences (Foroudi et al., 2018) of their business ventures leading to financial and non-financial sustainability. On the other hand, the enhanced knowledge can facilitate entrepreneurs to make decision for developing strategic partnership (Salamat, et al., 2018) and knowledge networks to grow their business or attain operational efficiencies (Hafeez, et al., 2018). Therefore, future studies could be specifically designed to measure the personal, financial, and operational benefits of the enhanced knowledge sharing by entrepreneurs in an VCoP.

8. Conclusions

Research on VCoP related to entrepreneurs is still in its infant stage. This study contributes to the current body of knowledge with novel insights into use of VCoP by entrepreneurs for knowledge sharing. Although this research is conducted for entrepreneurs, the results of this study have significance for managers looking forward to creating VCoPs or social networking sites in other professions. Our findings inform the research literature in three ways: (i) how entrepreneurs engage in an online discussion? (ii) what role do members of VCoP, in particular, senior members and moderators play to keep online discussion alive and (iii) using different text message sizes how to develop a ‘right intervention’ to maintain and stimulate participants engagement in VCoP. We have found that the text (size of the message) and context (who is sender) plays a major role in attracting entrepreneurs to join and reciprocate in online discourse. The indices validated here will allow the moderator of a VCoP to measure the engagement in the discussion forums, and therefore, would lead to superior sharing of knowledge by entrepreneurs.

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Table 1: Engagement Indices

Measures	Measuring points		Explanation
Intensity of Engagement	Few-to-Many	Sub Forum activity index	Total number of replies / number of topics discussed
		Forum activity index	Total number of replies in the forum / total number of topics generated
		Topic engagement index	Number of replies / number of views (lurking)
Duration of Engagement	Short-term, Long term	Topic life cycle	Total discussion period for each topic (in days)
Stage of Engagement (Reciprocity)	Topic initiator Initial-engagement Terminal-engagement Outcome	- Who posted the topic? - Who posted the first reply? - Who posted the last reply? - Conclusive; inconclusive (and did it lead to open a new discussion topic)	
Degree of Centrality (Reciprocity and Frequency)	Re-engaging (The extent to which members are involved with the 'Community')	- How many times each person contributed to the discussion? - How much an entrepreneur contributed as proportion of total discussion (in number of words). This also identifies which member has been more active, and if this member was the moderator or domain expert to keep the discussion alive.	

Table 2: A summary of the Start-up-Nation© VCoP sub-forums and their activity index

Sub forum	Description	Topics	Replies	Sub Forum Activity Index
Start-up Nation.com Scoop	Questions regarding the whole CoP can be sent into this sub-forum. The latest news & updates are found here.	229	1792	7.8
Start-up Business Basics	Members can select a Business, choose a business model (home-based, e-commerce, etc), learn what works, and get opinions.	1965	15725	8
Money	Finding sources of money & how to get it. Members can also practice their pitches and submit them for critique.	744	6196	8.3
Marketing, Sales & Public Relations	Public Relations ideas & marketing campaigns to promote members' businesses, (online, direct, and advertising).	1862	16787	9
Doing Business on the Web	Members learn tools & tactics to make their website shine, and search engine optimization & advertising. Members can also submit their websites for critique.	1828	17458	9.5
Inventing & Intellectual Property	Members wishing to protect their ideas, patents, trademarks, copyrights, trade secrets, developing their Invention designers, prototypes.	460	3276	7.1
Running Your Business	Members discuss businesses and discuss strategies for record keeping.	1256	8635	6.8
Like-Minded People	This sub-forum is for those who are 50+ and starting it up, and discussing green business issues.	404	3360	8.3
Getting told	Members share lessons learned in their business.	570	8142	1.4
Inspired, Sharing Wisdom	Members share their entrepreneurial journey and their achievements, learning about books that help entrepreneurs succeed.	320	7123	22.2
New Member Welcome	New Member Welcome New to the SuN community? Introduce yourself and get tips on finding your way around. Everything we missed with the other categories	822	8881	10.8
Overall Forum Activity Index		10460	97975	9.36

Key: Overall Forum Activity Index = Total replies of the forum/ total topics generated by the forum.

Table 3: A list of selected topics from Start-up-Nation© VCoP
Key: **Topic Engagement Index**= No. of replies / No. of views (lurking)

	Topics	No. of Views	No. of Replies	Topic Generator	Topic Life Cycle (Discussion period)	Topic Engagement Index
*High Engaged Topics						
1	How do I hire people?	5620	35	Chordial	35 Days	0.0062
2	How do I prove market demand for a new product?	2894	29	biznessman	39 Days	0.01
3	Business Name	3123	28	Joan	11 Days	0.0089
*Moderately Engaged Topics						
5	Learning from other Sun entrepreneurs	376	10	housejerkey	6 Days	0.026
6	How to Use Text Messaging to Reach Customer	358	10	Cigarman	33 Days	0.027
7	How to Increase Your Sales Overnight	679	11	DaleKing	30 Days	0.016
8	*Low Engaged Topics					
1	Risks of a Car Rental Business	425	4	desisun	2 days	0.0094
2	Is receiving/stocking /shipping inventory a difficult task?	678	2	bronco	7 days	0.0029
3	Who Shops at Amazon.com?	556	3	WAVHUGR	1 day	0.0053
* Topics with no Engagement						
1	Did Virgin Mobile steal the idea??	903	0	matthew		0
2	How can I keep a growing e-publishing company growing??	1840	0	Nolan Media	-	0
3	How does the member search work?	2410	0	Joal	-	0
Overall Topic Engagement Index						0.012

Table 4: Content analysis of Topic ‘How do I hire people’?

Number of participants	Community Members	Membership Code	No. of Messages	Message Length (in words)
-	Chordail	-	-	S
1	Raise Capital	A	1	VS
2	Chordial	B	1	VS
3	Laura Glynn	C	1	VS
4	Smoots	D	1	VS
5	Stuart Calgary	E	1	S
6	Money Lady	F	1	S
7	Letutor	G	2	M, M
8	Brand Alchemy	H	6	L, M, L, M, M, VL
9	Sheby	I	1	VS
10	Ihead	J	1	S
11	enlightDan	K	2	M, S
12	The Doc Diva	L	1	VS
13	Small Business	M	1	S
14	Mister blubs	N	1	M
15	Star pointe	O	1	S
16	Pokie	P	1	S
17	S Entrepreneur	Q	3	M, M, M
18	Prof. Pete	R	3	L, M, M
19	Bfleming	S	1	VS
20	Toobizlady	T	1	M
21	Background	U	1	VL
22	CraigL	V	3	M, M, VL
Key: Message Length (in words). 1-50 Very Short (VS); 51-100 Short (S); 101-250 Medium (M); 251-500 Long(L); 501- 1000 Very Long (VL); +1000 extended contribution (EC)				

Table 5: Content analysis of the Topic ‘How do I prove market demand for a new product?’

Number of participants	Community Members	Membership Code	No. of Messages	Message Length (in words)
-	John	-	-	M
1	CraigL	A	5	L first reply, M, M, S, L
2	John	B	5	M, S, L, S, M
3	Keycon	C	1	L
4	MNGrillGuy	D	1	S
5	Frndchip	E	1	S
6	IDEAJohn	F	4	S, VS, M, M
7	Jennifer	G	1	M
8	Steve	H	2	L, S
9	tmSmall	I	4	VL, M, M, M
10	KenR	J	2	VS, S
11	GotMail	K	1	S
12	Onlineater	L	1	S last reply
Key: Message Length (in words). 1-50 Very Short (VS); 51-100 Short (S); 101- 250 Medium (M); 251-500 Long(L); 501- 1000 Very Long (VL); +1000 extended contribution (EC)				

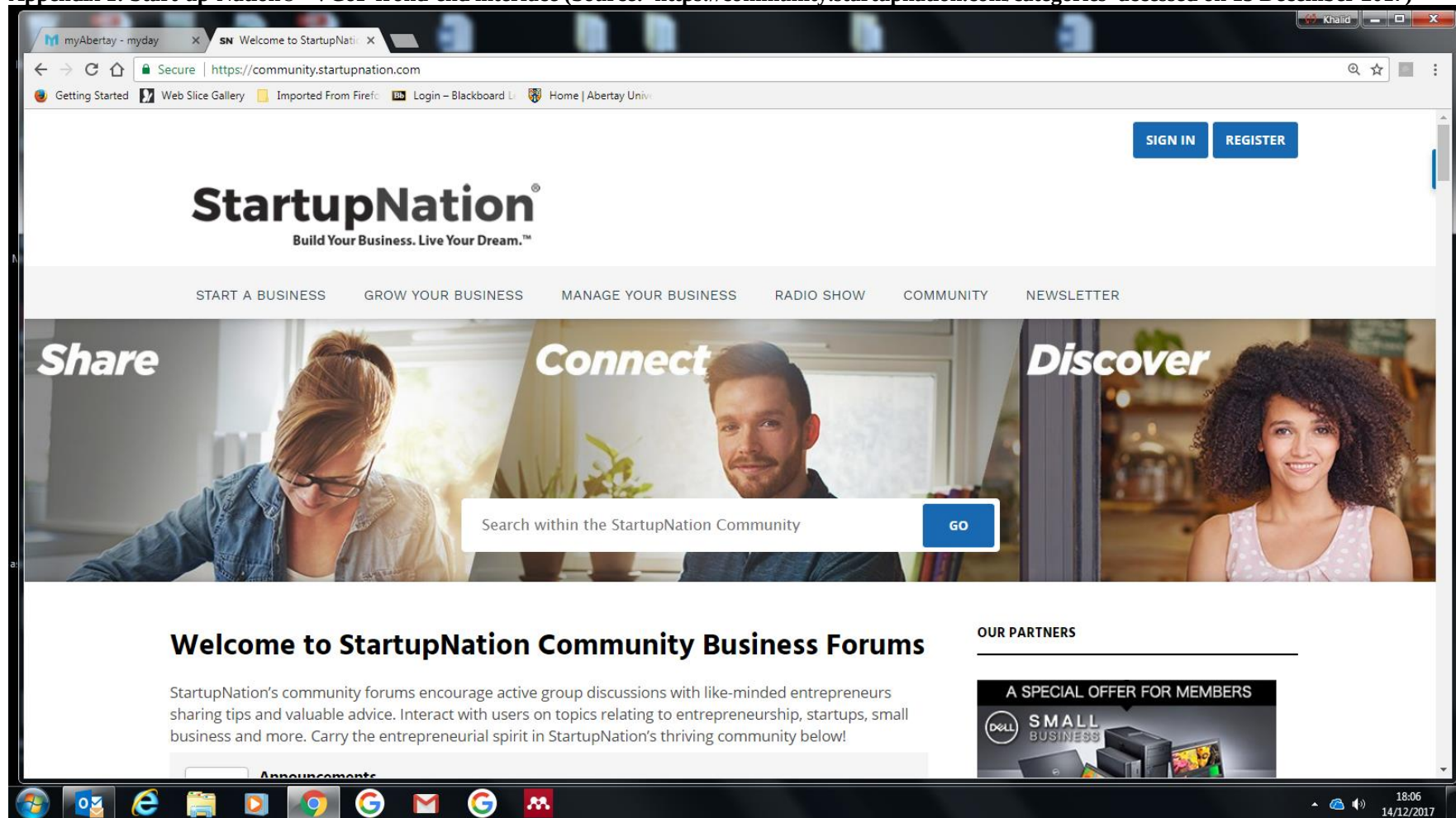
		Highly Engaged Topics						Moderately Engaged Topics						Low Engaged Topics						Topics with no Engagement						Average
		Topic 1		Topic 2		Topic 3		Topic 4		Topic 5		Topic 6		Topic 7		Topic 8		Topic 9		Topic 10		Topic 11		Topic 12		
			%		%		%		%		%		%		%		%		%		%		%		%	%
Message Size	Very short	7	20	4	14	2	7	4	40	1	10	2	19	0	0	0	0	1	33	0	0	0	0	0	0	15.8
	Short	7	20	10	34	10	36	3	30	7	70	8	72	0	0	1	50	1	33	0	0	0	0	0	0	38.3
	Medium	15	42	9	31	10	36	3	30	2	20	1	9	3	75	0	0	1	34	0	0	0	0	0	0	31.7
	Long	3	9	4	14	5	17	0	0	0	0	0	0	1	25	1	50	0	0	0	0	0	0	0	0	12.7
	Very long	3	9	2	7	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.22
	Extended contribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of replies		35		29		28		10		10		11		4		2		3		0		0		0		
No. of views (lurks)		5620		2894		3123		376		358		679		425		678		556		930		1840		2410		
Topic Engagement Index (TEI)		0.0006		0.01		0.00097		0.026		0.027		0.016		0.00094		0.00072		0.00054		0		0		0		
Topic Life Cycle (Total No. of days topic remain active)		35		39		11		6		33		30		2		7		1		0		0		0		
Life cycle adjusted Topic Activity index (LCATEI)		0.021		0.39		0.01		0.156		0.89		0.48		0.00188		0.00050		0.00054		0		0		0		

Table 6: A Summary of the engagement indices for the selected topics from Start-up-Nation© VCoP

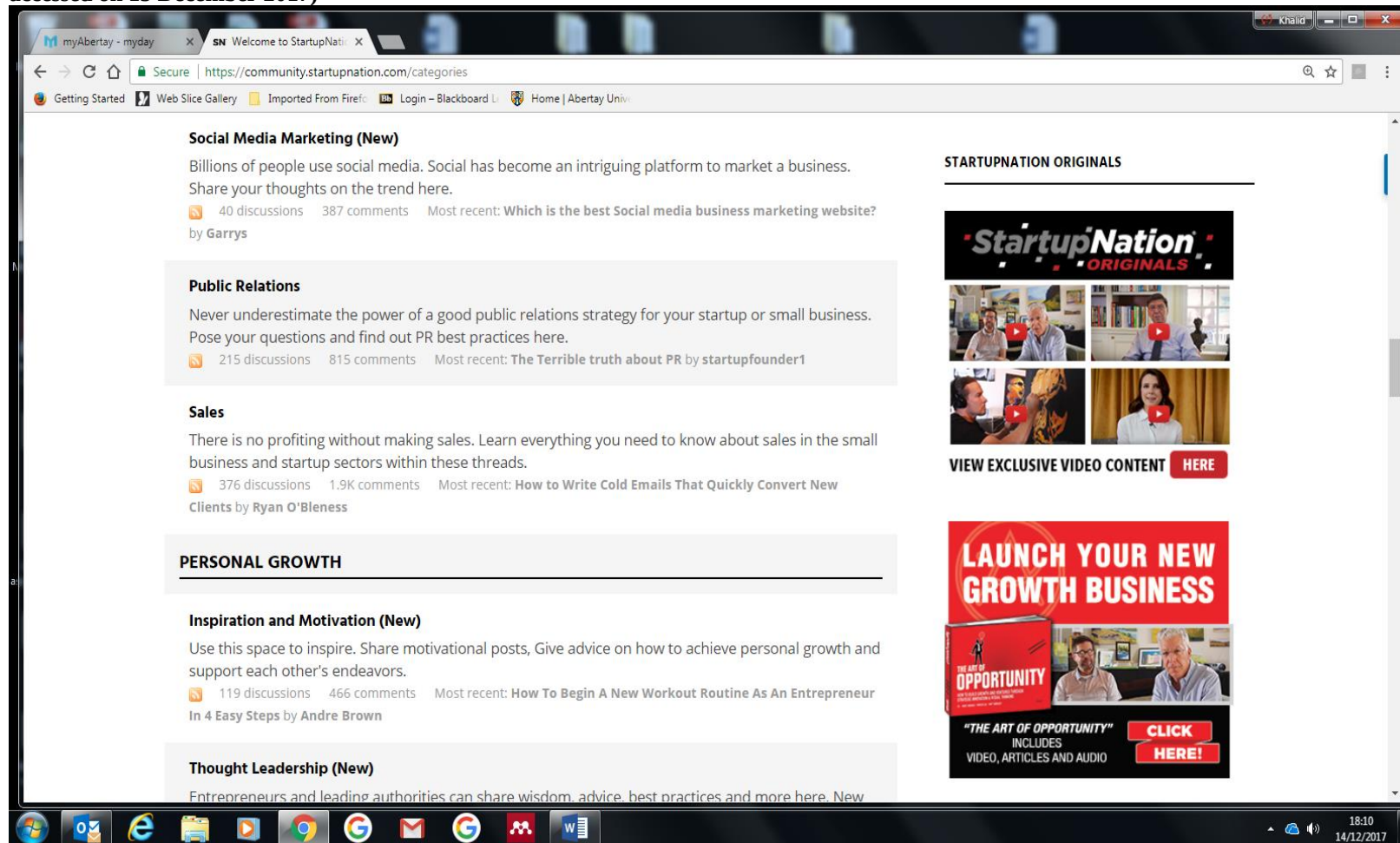
Table 7: A Summary of the intervention analysis for the selected topics from Start-up-Nation© VCoP

		Message length			Member status			Topic Conclusion	Does Topic lead to another discussion thread? If yes, How many?	
		Inquiry length	First reply	Last reply	Topic initiator status	Who started it? (first reply)	Who finished it? (last reply)			
Highly Engaged Topics	Topic 1	S	VS	VL	SM	SM	SM	Open-end conclusion	Yes	1
	Topic 2	L	VS	VS	SM	SM	SM	Unsuccessful	Yes	2
	Topic 3	M	L	S	Admin	SM	SM	Open-end conclusion	Yes	1
Moderately Engaged Topics	Topic 1	VS	VS	S	JM	SM	JM	Successful	Yes	1
	Topic 2	VS	M	S	JM	JM	Mod	Successful	Yes	1
	Topic 3	S	S	S	JM	JM	Mod	Successful	No	-
Low Engaged Topics	Topic 1	S	L	M	JM	SM	JM	Successful	No	-
	Topic 2	S	S	L	JM	JM	JM	Successful	No	-
	Topic 3	S	M	VS	JM	JM	JM	Open-end conclusion	No	-
Topics with No Engagement	Topic 1	M	-	-	JM	-	-	Unsuccessful	No	
	Topic 2	VS	-	-	JM	-	-	Unsuccessful	No	-
	Topic 3	S	-	-	M	-	-	Unsuccessful	No	-
Respond rate: High (H), Medium (M), Low (L), None (0) Message length: Very short (VS), Short (S), Medium (M), Long (L), Very long (VL), Extended Contribution (EC) Member Status: Member (M), Junior Member (JM), Senior Member (SM), Moderator (Mod.), Administrator (Admin) Conclusion: Successful, Open Conclusion, Unsuccessful										

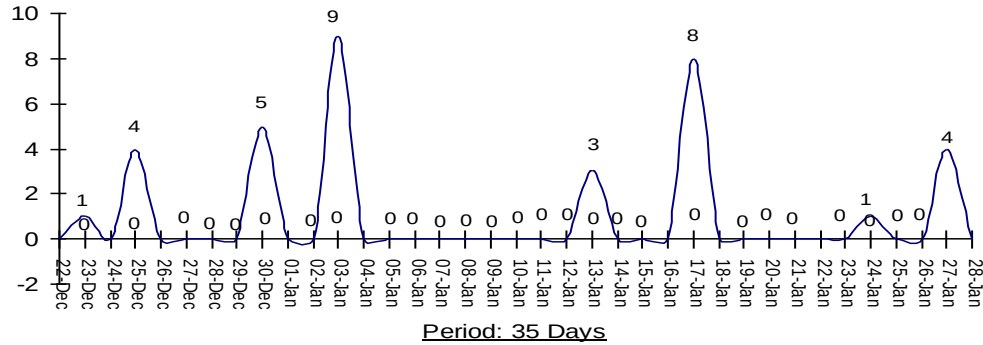
Appendix 1: Start-up-Nation© VCoP frond-end interface (Source: <https://community.startupnation.com/categories> accessed on 15 December 2017)



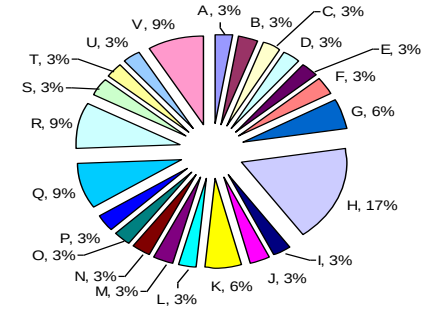
Appendix 2: Start Start-up-Nation© VCoP frond- end indicating different discussion forums (Source: <https://community.startupnation.com/categories> accessed on 15 December 2017)



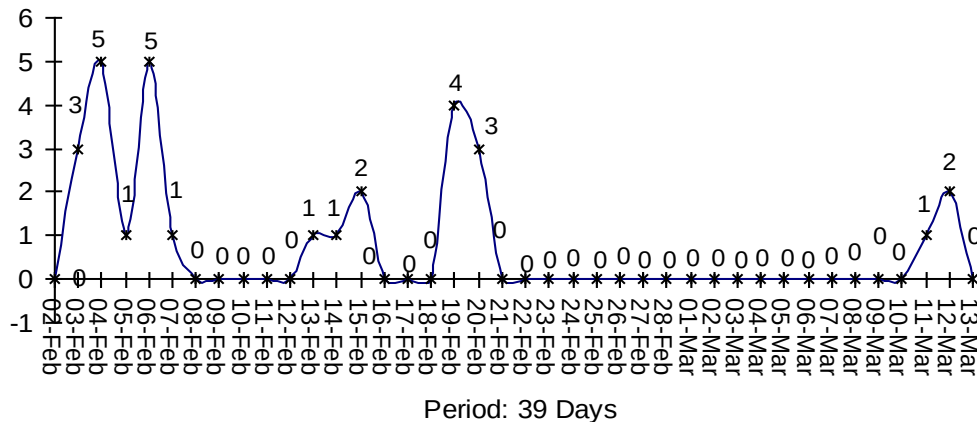
Appendix 3: Discussion profile for the Topic: ‘How do I hire people?’



Appendix 4: Degree of Centrality: Members’ relative contribution in the discussion topic ‘How do I hire people?’



Appendix 5: Discussion profile for the Topic: ‘How do I prove market demand for a new product?’



Appendix 6: Degree of Centrality: Members’ relative contribution in the discussion topic: ‘How do I prove market demand for a new product?’

