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AM (Accepted Manuscript)

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Value Creation through Knowledge Sharing in Virtual Community of Practice

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Introduction

In this paper, we seek to examine the challenges inherent in creating and managing knowledge at the front-end stages of innovation within the context of temporal proximity and value creation. Specifically, we develop new knowledge to understand how the formation and management of Virtual Community of Practice (VCoP) inform the front end of New Product Development (NPD) and the use of uncodified knowledge to achieve Fuzzy Front End (FFE) innovation outcomes. Here, FFE refers to the first stage of the new product development (NPD) process where the original innovative ideas are conceived (Khurana & Rosenthal, 1998; Koen et al., 2001, 2002; Reid & de Brentani, 2004). The 'fuzziness' comes from the fact that this cannot be codified and therefore predicted. This is relevant because many new product failures have been attributed to the lack of management at the Fuzzy Front End of Innovation (FFEI) and the technologies at play in this stage (Barczak, Griffin, & Kahn, 2009; Rubera, & Kirca, 2012). We offer much-needed new knowledge on how temporal proximity through the effective management of VCoP can lead to value creation in the innovation process.

FFE remains the most critical part of the NPD process while the sharing and extraction of knowledge represent the most significant part of the challenge at the FFE (Frishammar et al, 2011; Lingo & O'Mahony, 2010). Knowledge in this context is referred to as tacit and explicit knowledge. Tacit knowledge resides within our abstract mentality and sub-consciousness and is considered difficult to tap into or cultivate within the spheres of organisational knowledge management (Rosenberg, 1982). When individuals are disconnected, the sharing or cultivation of tacit knowledge becomes harder. This is particularly poignant because it has also been established that expenses incurred in the later stages of the innovation process do

not have any significant effect on the profitability of new product innovations (McNally et al., 2011). The 'fuzziness' and intangible nature of the FFE phase of NPD creates and adds to the complexities and challenges experienced in the management of these activities. There are therefore several innovation concepts and theories that could be applied to the transfer of tacit knowledge within an organisation.

The concept of CoP is based on Situated Learning Theory (SLT), which suggests that it is essential to deliver knowledge in an applied professional situation (Lave & Wenger, 1991). The circumstances within which 'legitimate peripheral participation' engages with such knowledge form the basis of SLT (Lave & Wenger, 1991). For SLT, in temporal proximity and value creation; characteristics, beliefs, and behaviours are acquired through social interactions and collaboration (Lave & Wenger, 1991). Therefore, community collaboration in virtual settings becomes an important aspect of this study as teams at the FEI become involved in a community of practice. This research has uncovered recurring themes and concepts in the knowledge management field, observing a positive connection between tacit knowledge, knowledge transfer and Situated Learning Theory (SLT) of Community of Practice (CoP) at the FEI within high technology organisations in the context of temporal proximity and value creation. This is supported by empirical evidence, which states that individuals or groups with more social connections are more likely to be innovative, creative and share knowledge than isolated people or groups (Bjork & Magnusson, 2009). This, in turn, points to the knowledge transmission benefits of a CoP, particularly in relation to temporal proximity and value creation. However, understanding of the challenges of VCoP remains undeveloped theoretically, conceptually and empirically with regards to how a CoP in a physical environment, and in particular within the context of temporal proximity and value creation, can operate effectively to resolve problems at the FFE of the innovation stage. This leads to the next sections where this studies will discuss the theoretical development.

Theoretical Development

Firms face difficulties extracting and sharing knowledge through virtual communities of practice (VCoP). This is particularly the case within high technology organisations at the fuzzy front end (FFE) of the innovation process

(Khurana & Rosenthal, 1998; Koen et al., 2001, 2002; Reid & de Brentani, 2004) because of the difficulties of extracting tacit knowledge in VCoP at the FFE. Here, FFE refers to the first stage of the new product development (NPD) process where the original innovative ideas are conceived (Khurana & Rosenthal, 1998; Koen et al., 2001, 2002; Reid & de Brentani, 2004). In addition, NPD is defined as the early stages of new product ideation during the innovation process and includes the remainder of the NDP cycle until execution or termination of the project (Murphy & Kumar, 1997). The Fuzzy Front End (FFE) is therefore typically characterised as extremely informal, intellectually challenging and full of uncertainties (Frishammar et al, 2011; Lingo & O'Mahony, 2010).

Several articles suggest that the FFE remains the most critical part of the NPD process and that the sharing and extraction of knowledge are challenging yet significant part of the FFE process (Frishammar et al, 2011; Lingo & O'Mahony, 2010). Knowledge in this context includes both the tacit and explicit dimensions.¹ Tacit knowledge resides within our abstract mentality and sub-consciousness and is considered difficult to tap into or cultivate within the spheres of organisational knowledge management (Rosenberg, 1982).

Explicit knowledge can be explained and retold by the knowledge owner precisely because it can be coded, recorded, communicated and distributed (Griffith et al, 2003). Tacit knowledge cannot be so readily categorised, treated and shared. Although explicit knowledge is required at the FFE, it is not commonly attributed to creativity and idea generation (O'Connor & Rice, 2001). Instead, it is a tacit knowledge that is vital. Therefore, for this type of knowledge to be developed and brought to bear on the FFE of innovation, i.e. where people and their matrices of knowledge (related and unrelated) come together, is a fundamentally important task.

The internationalisation of businesses and commerce and increases in accessible and economical means of Internet mediated inter-communication have amplified the practice of dispersed collaboration throughout all phases of the NPD process at

¹ Tacit knowledge is the unwritten and inferred 'know how' we use and exhibit in everyday life (Polanyi, 1966).

the Front End of Innovation (FEI) (Meyer & Marion, 2013). Dispersed collaboration has numerous advantages for businesses, for example, facilitating teamwork interaction and cooperation among individual professionals with the required expertise, talent, and capabilities for the FEI activities to collaborate regardless of geographical restrictions. In addition, it facilitates innovation due to the proximity of dispersed team members to clients and markets in their local setting (Bertels et al., 2011).

These conditions provide the opportunity to investigate Community of Practice (CoP) and VCoP (the virtual setting for dispersed CoPs) using Internet-mediated tools for communication among virtual communities. CoPs consist of groups of selected members who share information, insight, experiences, and tools about a chosen area of common interest and expertise (McDermott, 2000; Wenger, 1998). However, while a VCoP can be referred to as a type of CoP, but over a virtual network, the use of Internet and or virtual communication tools for CoP can to some degree create further challenges and hamper some of the benefits that face-to-face meetings can produce (Kimble, 2011). Most VCoPs with external links are not sustainable due to the lack of motivation and interest over a prolonged period of time, even where incentives are involved (Dahlander & Piezunka, 2014; Iriberry & Leroy, 2009). Also, some VCoPs lack the ability to sustain a long period of a life cycle and usually degenerate into extinction. This may be partly due to the lack of a communal distinctiveness and feeling of belonging which individuals can usually attain while working as an employed member of an organisation or under the same legal entity in face to face collaboration (Langner & Seidel, 2015).

The concept of CoP is based on situated learning theory (SLT), which suggests that CoP is essential to deliver knowledge in an applied professional situation (Lave & Wenger, 1991). The circumstances within which 'legitimate peripheral participation' engages with such knowledge form the basis of SLT (Lave & Wenger, 1991). Therefore, community collaboration in virtual settings becomes an important aspect of this study as teams at the FEI become involved in a community of practice.

The current increase in the use of modern collaboration tools has created unlimited opportunities in what used to be restricted by time and location (McDermott, 2000; Von Krogh, 2002). As a result, CoPs are progressively moving into the virtual space, termed in this thesis as VCoPs, due to their heavy reliance on information and communication technologies (ICT) tools for communication (Cox, 2007). These and other dynamics such as the global distribution of the workforce and the limited time for traveling makes the use of computer-mediated-communication tools an effective means of communication instead of face-to-face meetings within an organisation or among businesses. With the objective of linking CoPs with VCoPs in mind, in the next section, this research will try to establish a mechanism that can connect dispersed CoPs without the need for groups to physically meet.

VCoP and Knowledge

An examination of academic research into VCoP and FFE revealed some lack of relevant studies considering their importance and the manner in which VCoP might operate to relieve problems encountered at the FFE of innovation. Some of these difficulties are due to the fuzziness of the FEI stages and challenges such as the codification of knowledge, lack of proper management and the complexities of the technologies at the FEI stage. These are partly attributed to commercialisation failures at the NPD stages (Coates, 2009).

Alongside this, modern advances in knowledge have facilitated an innovative means for sharing information, identified as computer-mediated-communication or virtual communication (Dietz-Uhler & Clark, 2001). Explicitly, computer-mediated-communication or virtual communication denotes any means of communication that requires the use of the Internet combined with online applications as a means of sharing information (Dietz-Uhler & Clark, 2001).

Computer-mediated-communication brings a lot of benefits to the firm due to the increasingly global nature of activities and the necessity to share knowledge between numerous organisations and across national boundaries. For example, cost savings and a flatter structure in the firm that gives voice to a wide audience

to share information, have both been identified as positive outcomes of utilising computer-mediated-communication (Bergiel et al., 2008). Computer-mediated-communication has also helped many multinational organisations to save up to US\$50 billion (Bergiel et al., 2008), and remains a cost effective way for conducting business across transnational organisations (Baltes et al., 2002; Cascio, 2000; Hill, 2000). However, how effective can computer-mediated-communication be in sharing tacit knowledge for creativity, most especially as an extension of CoP known as VCoP or within the context of temporal proximity? This question remains a central part of this research. Also, the findings from this paper will show how computer-mediated-communication can be better facilitated to support innovative activities at FEI.

Again, FEI, also described in the literature as the FFE, relates to the initial stages of the NPD process where the ideas, concepts, and business cases are defined before the actual implementation phase (Reid & de Brentani, 2004). The amalgamation of several of the early stages of business activities are combined to make up the FFE (Khurana & Rosenthal, 1998). Examples of this would be in areas such as market requirement analysis where the choice of technology and other NPD decisions are to be considered, proposed and evaluated at this stage. Unlike the formal NPD process, the FFE lacks a standardised accepted universal model and as a consequence, the term 'fuzzy' emerged and remains an appropriate descriptor of the nature of the front end aspects of innovating (Coates, 2009).

Making the right choices in the early stages of the business development of the FEI is crucial to the subsequent NPD stages and the eventual commercialisation of the product (Cohen & Levinthal, 1990). According to Henard & Szymanski (2001) a number of factors such as the target market, the corporate strategies deployed, the product in question and the features of the NPD process all influence the success of new product's commercialisation. However, all of these revolve around the activities at the earlier stages of the FEI; in particular, the knowledge that informs those stages.

Due to the challenges established at the FEI and the implications of a VCoP this research has invoked SLT in VCoP as the theoretical lens described in the next section.

Theoretical Lens

This research identified a positive connection between tacit knowledge, knowledge transfer and SLT of CoP at the FEI stage (Wenger et al., 2005; Laine, 2006; Goffin & Koners, 2011; Howells, 2002). This is supported by empirical evidence which states that individuals or groups with more social connections are more likely to be innovative, creative and share knowledge than isolated people or groups (Bjork & Magnusson, 2009). In turn, this points to the knowledge transmission benefits of SLT in CoP, most particularly in relation to the transfer of tacit knowledge at FEI.

This pattern of learning and knowledge sharing through virtual settings becomes an extension of the face-to-face practice in CoP here referred to as VCoP (Collins & Halverson, 2009) and thus creates new challenges precisely because of the virtual nature of the communication process. However, understanding how a CoP, and in particular a VCoP, can operate effectively to resolve problems at the FFE stage of the innovation process remains undeveloped theoretically, conceptually and empirically. This view is supported by the lack of a consistent or coherent set of explanations that address the problem from the review of current literature on the subject.

There, therefore, exists a knowledge deficit within the discipline which this study will seek to correct. Lastly, it aims to provide a series of solutions in respect of some of the challenges which have been identified. In the next section, this paper will describe the research questions, methods and data analysis and outline the contribution to knowledge the research will deliver in the conclusion section.

Research Questions, Methods, and Data analysis

This research raised some research questions which need to be addressed in order to close the gaps found within this topic. During the course of the empirical research more evidence was uncovered to narrow down the problem areas and

challenges posed by the research questions outlined below. The researcher will then be in a position to recommend solutions to these problems at the end of this report.

Research Questions:

- (1) Does a VCoP generate learning advantages meaningful to improve the FFE and if so, how?
- (2) How might a VCoP be organised to contribute to the sharing of knowledge at the FFE?

Due to the nature of this inquiry, qualitative research interviews and the analysis of respondents' stories were the main research methodologies applied in this research. This is because interviews seek to understand the meaning of central themes in the life world of the subjects. The main objective in interviewing is to interpret the context of the interviewees' story and journey (Kvale, 1996). Data was generated from fieldwork through scheduling interviews with relevant stakeholders within the high technology industries who are interested in finding a resolution to the current problems associated with virtual teams at the FEI. These people worked in different sectors of the pre-selected organisations and high technology innovative industries such as; Telecommunication, Health Care, Chemical, Aerospace, Mechanical & Robotics as well as automotive industries respectively. The selection of respondents was based on their position in relation to the innovative activities of the high technology company in question. For example, most of the 46 Interviewees selected for this research are managers and leaders of innovation at their respective organisations.

The reason for choosing qualitative research as the methodology for this research is based on the reasoning that to precisely understand the complexities of the social interactions involved in a virtual team within a high technology organisation in their temporal proximity, it is important to have close interactions with practitioners in the subject area. We thus used semi-structured and unstructured questions, face-to-face interviews and virtual, online, meetings with videos.

Interviews were transcribed and interpreted hermeneutically using NVivo software. Processing field data involved transcribing audio recordings, coding transcripts, and building themes that formed the empirical analysis that leads to the research findings. Table 1 below illustrates the four approaches to the research design.

Table 1: Research design - illustrate four approaches to the research design

Epistemology - The research philosophy	Social constructionism: all knowledge is linked to our social constructions (Alvesson & Skoldberg, 2009).	This was applied to phenomenon of data gathering and how it analysed and used
Qualitative inquiry - Theoretical Perspective	Qualitative Interviews (Ott & Mendenhall, 1995), supported with storytelling methods (Gabriel, 2000).	This is associated to the theoretical lens in which the data was collected and managed.
Methodology - Empirical data collection strategy	Explorative research approach - Qualitative research approach (Bryman, 2004)	This is related to the empirical data collection strategy of this studies.
Method - The means for extracting empirical data	Through the lens of Content Analysis (Cavanagh, 1997) and Narrative Analysis (Riessman, 2005).	This is particularly associated with how this research data was analysed.

Even though Lave & Wenger (1991) state that knowledge and creativity can be extracted through CoP, and potentially VCoPs, there remain very few studies into VCoP. CoPs benefit from face-to-face formal and informal interactions whereas the inability to use physical meetings in VCoPs places them at a significant disadvantage. Therefore, what is needed is the development of a similar or parallel environment in VCoPs. To date then, it has not been at all clear to what extent SLT can be applied to a VCoP. This point is particularly relevant to

innovation activities at the FFE where we anticipate the major benefits of this activity can be seen.

Theoretical Contribution & Conclusions

This research explored the possibility of a connection between the Situated Learning in CoP and another term, which the first author of this paper coined as 'Situated Learning in VCoP', and represents the virtual settings of the latter. We also investigated the implications of Situated Learning of CoP among VCoPs and concluded as follows; firstly, that knowledge can still be extracted among VCoPs using online or virtual communication tools as a means of communication. Secondly, VCoPs do not necessarily have to be managed nor conform to CoP characteristics in order to achieve successful knowledge sharing outcomes. These insights demonstrate different mechanisms and theoretical expectations about VCoP in the innovation process and assert their value over and above CoP. The major benefit of VCoP to an organisation is that it can capitalise on communities of common interest across the organisation as a whole, regardless of its boundaries and borders, and therefore increases the potential for new CoPs (in virtual form) or within temporal proximity and value creation to emerge - opportunities far greater than if the firm relied solely on physical CoPs.

Findings from this research also suggest that VCoP's should not be structured and that businesses need to build an enabling environment to sustain the VCoP within temporal proximity and value creation. In order to develop and manage VCoP at the FFI, this research recommends a sustainable, flexible and adaptable innovation process. This may be understood as creating a vehicle for the innovation process filtered through several gates where all experiences and the innovation journey itself is properly scrutinised. It is further proposed that this approach can also assist in the mitigation of risk. This also substantiates the evidence from the literature according to Poetz & Schreier (2012), the methods by which organisations meet these challenges remain a vital gap in the area and organisations can utilise the

strength of VCoPs to facilitate their FEI activities for generating both internal and external ideas.

For managers, the use of virtual communication tools such as emails, online repository, virtual workspace and video conferencing for VCoP activities has become standard working practice for many businesses. Organisations who pay close attention to finding better ways to utilise, adapt and apply these tools to specific VCoP projects will be more likely to achieve positive results within the context of temporal proximity and value creation.

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