Emergence of Digital Enterprises: A mixed methods research on exploration of transmutation of knowledge into IT innovations by individual innovators?

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INTRODUCTION

The history of information and communication technologies is one of constant change punctuated by technological breakthroughs called technological innovations (Lyytinen and Rose, 2003). As these technological innovations reshape the competitive landscape and create new market opportunities, various perspectives have been proposed to identify the drivers of these innovations (e.g. Chandy and Tellis, 1998; Smith and Tushman, 2005). Among these perspectives, the knowledge based view (Kogut & Zander, 1996; Spender, 1996, Grant, 1996) has specifically gained prominence in recent times (Miller, Fern and Cardinal, 2007; Subramanium and Youndt, 2005; Zhou and Li, 2012; Zhou and Wu, 2010). This knowledge based view stresses on the ability of organizations to create and share knowledge (Obstfeld, 2001) while more micro-level treatments of knowledge highlight the opportunities & challenges in knowledge creation & management (Von Hippel, E, 1994; Dougherty 1992).

Learning and knowledge acquisition processes are central to the explanation of economic change. Recent attempts to provide an analytical foundation of evolutionary economics describe economic evolution as ‘a growth of knowledge process’ (Dopfer & Potts 2004: 21). As Metcalfe and Foster (2004: xi) recognise, knowledge acquired by individual agents and the interaction of agents’ knowledge constitute the basis for evolution and complexity of economic process. Nonaka and Takeuchi’s work of 1995, fills an important gap between macro and micro perspectives of knowledge by providing a framework for how knowledge moves within a firm. This perspective emphasizes the conversion of knowledge between its tacit and explicit forms. Nevertheless, despite the recent attention afforded knowledge transfer and knowledge creation, knowledge creation and knowledge transfer process outside the realms of organizational level of observation remains a largely underdeveloped concept (Spender, 1997; Massey & Montoya-Weiss, 2006).

Evidence from literature suggests that economic performance of individuals, organizations, countries is growing more dependent on knowledge creation and knowledge utilization (Blundell, Dearden, Meghir & Sianesi, 1999; Furman, Porter & Stern, 2002; Phelps et al. 2012; Roberts, 1999). Interest in the relationship between knowledge and economic performance raises a fundamental question: What explains variation in the production and diffusion of knowledge and innovations across individuals and collectives? (Phelps et al., 2012). Knowledge creation has fascinated scholars from different disciplines and varied fields for many years (Grant 1996, Garud and Karnoe, 2001). While, economists have studied the issue of knowledge creation under the broad heading of technical change (Rosenberg, 1982), sociologists have examined the social forces and environments that lead to the creation of new knowledge (Merton 1972).
Empirical research in the area of management has examined the drivers of new knowledge creation (Ahuja and Lampert 2001), while entrepreneurship research has explored when new knowledge is exploited for entrepreneurial ends (Shane 2001). However, the temporal dimension of knowledge and innovation emergence remains relatively unexplored (exceptions include Helfat, 1994 and Katila, 2002). The whole process of conversion of knowledge to innovation (Fleming, 2001; Nelson & Winter, 1982) occurs over time but still the exploration of the temporal fabric of innovation emergence is far away from what past and current research envisage (Massey & Montoya-Weiss, 2006). Prior research provides rich insights into the domain of how firms can tap into distant knowledge domains. But it is particularly surprising that the extant literature offers fairly limited insights on the role of individual innovators in knowledge combination and innovation processes (exceptions include Fleming and Sorenson, 2004; Fleming, Mingo and Chen, 2007).

**RATIONALE FOR PRESENT STUDY**

With the gradual liberalization of the economy and the onset of globalization, it has become essential for individual entrepreneurs, innovators, small businesses, public organization and large private organizations to grow and survive by building their capabilities for technological innovation. Stated below is one of the excerpts from the Science Policy Resolution (No. 131/CF/57) of 1958\(^1\) aimed at promoting development with the help of science and technology -

> “The key to national prosperity, apart from the spirit of the people, lies in the modern age, in the effective combination of three factors, technology, raw materials and capital, of which the first is perhaps the most important, since the creation and adoption of new scientific techniques can, in fact, make up for a deficiency in natural resources and reduce the demand on capital”

The idea of conducting this research was furthered by our curiosity to know more about the following:

- **How does temporally dispersed knowledge, in the form of close and distant nodes, gets converted into innovations?**
- **Are there certain differentiating characteristics between innovators and non-innovators?**

Also, in extant literature there have been several models and frameworks that have explained diffusion of innovations (Rogers, 1962) and utilization of technology and innovations (Van der Ven et al., 1999) but explanations of how knowledge is transmuted into innovations by individual innovators still remain scarce.

**RESEARCH GAP**

In spite of developments in the understanding and modeling of innovation processes, there is still lack of clarity regarding how ideas emerge and evolve into innovations (particularly from knowledge). The definition and use of the term ‘innovation’ seems to accord the developmental intent of the process while presupposing the existence of the idea and knowledge. Behavioural and economic actions of individuals are conditioned by their desired

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and pursued goals (which vary greatly and are submitted to change over time). These differences in intentions, goals and patterns, that lead to a differential ability of economic transformations (such as innovation), have not been clearly studied and conceptualized in literature and need further research (Cañibano, C., Encinar, M. I., & Muñoz, F. F., 2006).

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Prior research provides rich insights into the domain of how firms can tap into distant knowledge domains. But it is particularly surprising that the extant literature offers fairly limited insights on the role of individual innovators in knowledge combination and innovation processes (exceptions include Fleming and Sorenson 2004; Fleming, Mingo and Chen 2007). Although the field of entrepreneurship abounds in studies attempting to explain the creation of new ventures from an array of theoretical perspectives, the answer to the critical question regarding “how” the process unfolds over time remains unexplored. Most of the studies about industrial clusters and innovation stress the importance of firm’s geographical proximity and their embeddedness in local business networks, as the factors that positively affect their learning and innovation processes. There is paucity of research on how heterogeneous and asymmetric distributions of individual innovators’ knowledge-bases in industrial clusters, influence the way knowledge flows and innovation emerges (Giuliani, 2007).

RESEARCH QUESTION AND RESEARCH OBJECTIVES

This research study envisages the investigation of the following research question:

*How does knowledge ‘dispersed in time’ gets converted into an innovation, by an individual innovator?*

Following research objectives will help me in answering the aforementioned research question:

- To explore the temporal evolution of knowledge combination in case of individual centric technological innovations
- To study and analyze the dynamics and patterns of combination of temporally dispersed knowledge
- To study how evolution and dynamics of knowledge combination lead to emergence of innovation
- To study the characteristics that differentiate innovators and non-innovators
- And finally, on the basis of aforementioned four objectives, to refine and extend comprehension of the knowledge – innovation link in individually driven innovations.
RESEARCH METHODOLOGY

The research question given in the previous section provides the direction to the appropriate methodological design for this research. The research involves revealing temporal dynamics through which knowledge is converted into innovation. Such research is broadly called process research, as Ferlie and McNulty (1997:368) have defined, “it is a dynamic study, focusing on context, sequence of incidents, activities and actions, which unfold over time”.

The use of any single research paradigm is likely to produce too narrow a view to reflect multi faceted nature of reality of emergence of innovation. Also, it is difficult for researchers to personally hold on to a single perspective without moving to and fro between others. In this regard, this research, although intended for being carried out in the interpretative philosophy, gained much by borrowing a few principles from positivistic approach that enabled building of rigor while keeping intact the core approach to the methodology. A plural approach (sequential multi method) was drawn from the strategies of sense making from process data as described by Langley (1999).

During the course of this research, distinct dimensions of knowledge conversion that map the complete process of conversion of temporally dispersed knowledge into innovation, were identified and conceptualized with Herbert A. Simon’s decision making model (Simon, 1960) as the theoretical base and using systematic literature review as the starting point. Beyond this starting systematic literature review, the research design of this study consists of broadly three phases. Phase one consisted of use of patent data to see how explicit knowledge spread across time is converted into innovation by individual innovators using network analysis and qualitative comparative analysis. Phase two consisted of use of multiple case study method (Eisenhardt, 1989) to build a process theory of emergence of innovation. Phase three involved a hypothetico-deductive knowledge construction approach (Dubin, 1969) via which the final theory of emergence of innovation will be proposed.

CONTRIBUTIONS OF THE STUDY

The agents of knowledge creation and emergence of digital enterprises are people, and it is through their endowments that knowledge components get combined and potentially path-breaking innovations and enterprises come to life. The exploration and the explanation of the dynamics and patterns of knowledge combination and innovation emergence of individual innovators can be of relevance for a number of reasons.

- Conceptual – Building a new process theory of emergence of innovation and a novel insight as to how analysis of patent data (secondary proxies) can be done qualitatively using network analysis.

- Methodological - A new insight into the process of emergence of innovation particularly in terms of unit of analysis (individual), pluralist research methodology, and a rich description of how temporal analysis of existing knowledge can lead to emergence of innovation.

- For practitioners, this research would suggest not only way a of improving knowledge management systems and practices but also structuring of knowledge access strategies to enable innovation.
REFERENCES


