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Entrepreneurship and networked collaboration; synergetic innovation, knowledge and uncertainty

Abstract

This conceptual paper examines the nature of entrepreneurship in innovation processes in time of crisis. Crisis is a time of heightened uncertainty, manifest as increased ambiguity about what knowledge is available yet necessary for innovation. We argue that the connecting of this diverse knowledge is essential in producing innovation and that this is a key entrepreneurial process. Whilst this point is established in the literature, we sense a gap in our understanding about how such knowledge is entrepreneurially applied. In systems based views of innovation there seems to be an assumption that knowledge synthesis just happens as a natural occurrence. Reviewing and synthesising disparate literatures, we challenge this to argue that stocks of knowledge are not, in themselves, sufficient to produce innovation. Instead, entrepreneurial agency is required to collaborate, connect and to combine these knowledge stocks to produce innovation. We contribute to understanding and theory by demonstrating how and why this "social" connecting is a critical element of the entrepreneurial role and a crucial part of innovation.

Key words; networks, innovation, collaboration, knowledge and entrepreneurial agency

Entrepreneurship and networked collaboration; synergetic innovation, knowledge and uncertainty

Introduction

Economic crisis is characterised by increased levels of uncertainty which causes decisions to be deferred and investments cancelled, thus reinforcing the crisis. Uncertainty is a condition of crisis in which traditional knowledge and routines may no longer deliver. Thus there is a greater temporal need for innovation to foster recovery. But Hayek (1945) offered the seminal observation that uncertainty results from the dispersed, incomplete nature of knowledge. Since economic crisis presents a heightened level of uncertainty, knowledge for innovation in such times may be less complete and more dispersed. Paradoxically, when innovation is most needed, the building blocks of knowledge for innovation are at their most elusive. Entrepreneurship and innovation, according to Drucker (1985) are profoundly entwined and overlap (Simmons et al, 2009), whilst uncertainty constitutes a cornerstone of most entrepreneurial theories (McMullen and Shepherd, 2006). But Drucker (1993; 173) also notes that innovation is "the application of knowledge to produce new knowledge''. Accordingly, uncertainty is the entrepreneurial milieu and the dispersed knowledge may be the feedstock of entrepreneurial action (Dew et al, 2004). Thus understanding how entrepreneurs acquire and use knowledge may provide some understanding of how they contribute to economic recovery.

The purpose of this conceptual paper is to examine how a fuller understanding of entrepreneurship and entrepreneurial network can enhance our existing understanding of the knowledge and innovation. Our argument is that, despite the insights of Schumpeter showing that entrepreneurship is fundamentally about innovation, the literature of entrepreneurship and innovation is characterised in two separate strands (Figure 1). Moreover, recently the entrepreneurship literature has taken what might be best described as a "social" turn (Downing, 2005); what Rehn and Taalas (2004) call the social enactment of entrepreneurship. In essence, entrepreneurial practices are no longer seen as contained by the solitary hero (Anderson and Warren, 2011), but as an agent embedded in a network of relationships (Drakopoulou-Dodd and Anderson, 2007). Furthermore, the explanatory emphasis has shifted to a more processual view that draws on processes over time (Moroz and Hindle, 2012). We see a strong parallel in how the innovation literature has also moved from the solitary eureka moment of invention (Burns and Stalker, 1958) towards a socialised conception of collaborative innovation; what Ylinenpää, (2009) describes as a movement from the individual actor level to a collective agent. This parallel, but separate, conceptualisation seems to offer some theoretical leverage for understanding how synergetic innovation occurs. Aside from this communality in the social turn, we also note a correspondence in terms of knowledge. Knowledge, and importantly its exchange, appears to be a currency and common thread in both entrepreneurship and innovation practices (Hardwick et al, 2013; Zhang et al, 2006). We propose that knowledge, or more accurately diverse knowledge, is an essence of innovation, but that it requires entrepreneurial agency to combine and synthesise knowledge into innovation.

INSERT FIGURE 1 ABOUT HERE

Research Method and Approach

Accordingly, our objective is to try to combine these conceptual developments and insights to offer an account which helps to explain the centrality and importance of the entrepreneur

as an innovative agent in collaborative networks. We follow Van Maanen et al (2007; 1147), "theorizing is how we think about the relationships among the elements in the world that occupy our research attention". Thus we interpret and apply what we consider to be important points across a wide range of literature. Our objective and approach is to draw out what we see as relevant points in the innovation and entrepreneurship literature and draw them together to offer a theoretical account of how we might better answer and understand the research problem. Benneworth and Henry (2003) describe this process as 'hermeneutic' theorising whose epistemological position is characterised by an interpretive, reflexive and open-ended mode of inquiry. Our methodology is broadly phenomenological in that we try to interpret meanings in the literature, and to arrive at an understanding that offers a useful conceptualisation based on our interpretation. Our method is a comparative analysis of concepts, rather than comparative analysis of content.

There are limitations to what we do. Our interpretations of the literature's meanings are subjective. Importantly how we synthesise the narratives in the literature is speculative, but then too is most emergent theory. Obviously our "findings" have not been subject to verification, but we see them as offering a very plausible answer to the research questions and we hope the theory is in itself sufficiently interesting and convincing to be useful to warrant further work.

The paper begins by describing the evolution of innovation in the literature and then moves to chart the emergence of the socialised entrepreneur. We note that a feature of recent Chinese literature on innovation, and quite different from the Western literature, is a promotion of what they describe as "synergetic innovation". This concept seems to offer a mechanism for understanding the processes of collaborative innovation. However, in a similar manner to some of the established Western models of open innovation, it lacks an account of who makes these processes happen. Proximity, social or spatial; shared values and attitudes in combination with specialised knowledge spillovers all help to explain the fertile context for innovation. But we need to introduce entrepreneurial agency to explain *how and why* innovation arises. This then is the objective of the paper.

Define Innovation

Porter (1990) defines innovation as the process that uses new knowledge, technologies and generates new products as well as the new or improved products themselves. More recently, Galanakis (2006; 1223) added "by using new or existing scientific or technological knowledge, which provide a degree of novelty either to the developer, the industrial sector, the nation or the world and succeed in the marketplace". Similarly "new learning, such as innovations, are products of a firm's capability to generate new applications from existing knowledge" (Kogut and Zander, 1992; 391).Thus, we see knowledge; knowledge production, dissemination and importantly knowledge application as central to innovation. Nonetheless we may distinguish types of knowledge. Styhre et al (2000; 54) explain that in Greek philosophy knowledge is categorised as *episteme*, *techne*, and *phronesis*. *Episteme* is universal knowledge, knowledge that is generally applicable and valid. *Techne* refers to skills, capabilities and knowhow and is more down to earth, context bound, and practical than *episteme*. *Phronesis* is simply practical wisdom. Knowledge, probably craft knowledge, *techne*, has always played a key role in innovation but we believe the processes involved in knowledge required may have changed. Samarra and Biggerio (2007) explain that from a knowledge perspective, successful innovation does not depend exclusively on technological capabilities or market capabilities, but rather on knowledge integration efforts able to mobilize and combine a broad set of heterogeneous competences. Scarborough (2003; 505)

puts this rather well, “increasingly, innovation is seen as the integration of knowledge with action”.

Importantly for us, it is the combining of knowledge that produces innovation and we see this as the task of entrepreneurial agency. Indeed we define knowledge as systematizing and structuring information for a specific purpose (Johnnessen et al., 1997). This processual view of knowledge differentiates it from “facts” or “information”. Our conceptual point of departure lies in Schumpeter’s contribution in distinguishing invention from innovation. Invention is knowledge led, but innovation is about the application, the use of that knowledge. In other words, a combining *techne* with *phronesis,* the business acumen that allows things to happen. Moreover, application may require a different set of knowledge from that of invention. Without application, an invention cannot ever become an innovation (Chorev and Anderson, 2006). Indeed Schumpeter’s (1935) explanation of Kondratieff economic long waves is based on showing how inventions become innovation (Rostow, 1975) and may be construed as the dissemination and applications of types of knowledge. Moreover, Lindgren and Packendorff (2003) propose that entrepreneurship is not the result of what single individuals do; it is the consequence of collective organising and social interaction. Thus we see innovation as an entrepreneurial socialised process.

Throughout our discussion we are mindful of the importance of innovation as a creator of competitive advantage for firms, regions and nations. We are acutely aware of the increasing pace of change and of a need to be ahead in the game and see successful innovation as a primary mechanism to achieve these ends. As Kwong and Thomson (2012) note in the call for papers in this Special Issue, these issues have become highlighted, prioritised and paramount in the economic crisis and its aftermaths.

We see the contribution of the paper as primarily conceptual, but useful theory. In demonstrating the evolution of the literatures, we are able to show a trajectory towards understanding innovation as a collaborative process that has many similarities with the emergent social turn in entrepreneurship theorising. Nonetheless our analysis emphasises that collaboration requires agency and this element may be lacking, and is certainly under emphasised, in accounts of open innovation. However, by synthesising two literatures, the recent developments in the innovation and entrepreneurship literatures, we are able to help explain entrepreneurial innovative practices as agency work to connect and to combine different knowledge.

The Evolution of the Concept of Innovation

Edwards et al (2005) argue that innovation has replaced efficiency as the crucial focus of much theory building and policy analysis. Certainly for policy, “Innovation is now the single most important engine of long-term competitiveness, growth and employment” (European Commission, 2001). Wolfe (1994) acknowledging the importance of innovation, claims that despite the voluminous literature, our understanding of innovation is quite limited. Innovation, pace Schumpeter, is credited with explaining how “entrepreneurial rents” are a return for innovation and these rents create wealth through competitive advantage. But within Schumpeter (1935), we can see a shift from the freewheeling individual entrepreneurship of creative destruction, Mark 1, to the creative accumulation of Schumpeter Mark 2. So rather than a single “innovative event”, Schumpeter’s more mature analysis emphasises process.

Nonetheless, innovation is nowadays praised, prioritised and promoted as a solution to lagging economic development. Chesbrough (2003) sees developments in innovative practices as a response to the increasingly shorter time to market, more knowledgeable customers and more effective competitors that have eroded the effectiveness of the old models. However what has changed significantly is our understanding of how innovation works. First, as noted earlier, we now recognise it as a process. But secondly, we no longer see it as an internal, firm level process. As Doloreux (2002) suggests, innovation cannot be produced in isolation by relying exclusively on internal resources within the firm. Instead as Malbera (2006) usefully argues, the current structure of innovation is a network structure of relationships. For Edwards et al (2005) emphasis is now given to the social shaping of innovation, a favouring of process models and a rejection of the old orthodoxy of 'science-push' or 'market-pull'.

Rothwell (1994) describes these changes as an evolution of innovation process models and recognises five generations of understandings (Figure 1). The first and second generation models (1950-1970) were simple linear models primarily based on technology push and market pull. The third generation model (1970-1980) was about coupling and connections giving more emphasis to the interaction between various elements. Fourth generation model (1980-1990) saw innovation as integrating the company with upstream and downstream actors and the fifth generation model is a systems model that includes networking. Sawhney and Prandelli (2000) go so far as to describe this as *communities of creation* to capture the idea of distributed innovation. Figure 1 summarises this evolution.

Our interpretation of this evolution is that understanding of innovation has moved from closed innovation to open innovation. In figure 1 the first two explanatory modes represent closed innovation, but then move towards more open innovation. Early models described the innovation process as a sequence of distinct stages or functional activities (e.g. design, production and marketing), linked by sequential interactions to make adjustments between the stages or functional activities, and characterized by a relatively weak need for knowledge integration (Sammara and Biggerio, 2008). In later models, innovation is seen as becoming increasingly distributed, as fewer firms are able to 'go it alone' in technological development. Hence the innovative boundaries of the firm become increasingly blurred. Innovations are rarely generated and commercialised in isolation, even by major players (Laursen and Salter, 2006). Given the acceleration and fundamental technology and business changes, maintaining relationships with different types of external contributors seems to be indispensable to staying ahead of the competition (Chesbrough et al., 2006). Evolutionary approaches describe innovation as a social process within the community of producers and users (Anderson, 1991). Samarra and Biggerio (2007) thus argue that a crucial implication of modern conceptualizations of innovation lies in the recognition that multiple functions, actors and resources within and between firms' boundaries, are necessary to transform innovative ideas into economically successful innovations.

The Network-based View of Innovation

Thus far we have argued that innovation is best understood as a process, and as a process that involves a number of actors in a networked relationship. The paradigm shift from closed to open (Chesbrough, 2003; p. XXIV), "assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology". Clearly the permeability of firms' boundaries where ideas, resources and individuals flow in and out of organizations is emphasised in openness innovation. Doloreux (2002) explains this well, the environment may either be seen as a network of actors, a

general framework for firm action (milieu or cluster), or a reservoir that can be translated into agglomeration economies for firms engaged in interactive learning. But Dahlander and Gann (2010) raise an important point; in spite of rising interest in using the openness construct, systematic studies of openness remain cumbersome because of conceptual ambiguity. In particular, the surrounding debate about whether external or internal resources are more important. We propose that we might summarise this issue simply as "open to what"? One best possible answer lies in another question, "why open"?

The evidence is strong that openness creates innovation possibilities. As Thomas et al, (2009; 393) propose, "innovation is a coupling process". Malbera (2006) describes important elements of the open innovation as outcomes of learning processes, competition and cooperation and knowledge and competencies. Mayer (2005) acknowledges the traditional view of the independent inventor, but proposes a modern approach should take account of social capital. Other studies on networking and networks (Jack, Dodd and Anderson, 2008; Anderson, Park and Jack, 2007; Anderson, Dodd and Jack, 2010; Jack, Anderson, Moult and Dodd, 2010) examines how networks act as forums for resource exchange and sharing. Of these resources, by far the most important is knowledge (Nonaka and Takeuchi, 1995). However, entrepreneurial networking is often informal (Jack et al, 2008) and sometimes arises from happenchance meetings. They may be more or less purposive (Hite, 2005; Jack et al, 2010), but it is very evident that entrepreneurial networking is personally based and hence different from organisational networks. Moreover, there is strong evidence that networks will change and adapt to new circumstances (Jack et al, 2004; Anderson et al, 2010; Slotte-Kock and Coviello, 2011) and that such networks are characterised by a shifting range of strong and weak ties (Dodd et al, 2002; Jack et al, 2004). These personal networks are employed to collect and share information that may develop into knowledge for innovation (Hardwick et al, 2013). Barney (1991) goes so far as to claim that knowledge is the primary resource underlying new value creation and competitive advantage. Indeed, historically Hayek (1945) observed that the creation of business opportunities relies on the effective combination of dispersed pieces of knowledge that exists within individuals and institutions, so too it seems then that innovation demands a coordination of dispersed knowledge. Wittgenstein (1958) makes a similar point, that knowledge is given meaning from how it is used. Tsoukas (1996) reminds us that Hayek (1945; 520) also claimed that the "problem is the utilization of knowledge not given to any individual in its totality".

The question "why open?" can be answered by stating that they are open to knowledge, and that this knowledge is critical for growth, survival and innovation. Specifically in terms of innovation, Hardwick et al (2012) and Anderson et al (2011) demonstrated how small firms can co-create new knowledge for innovation by combining and synthesising tacit and codified knowledge to create new products and services. Moreover, Harbi (2011) and Anderson, Harbi and Amamou (2012) showed that when firms were not able to be open to new knowledge, innovation was very difficult indeed. Frey et al (2011) note that the diverse knowledge held by external actors is a key success factor, but are surprised that the existing body of literature offers fairly limited empirical evidence on this notion. We conclude that open innovation means being open to knowledge. But this implies two important points; first being open to knowledge also means ability to learn, to assimilate the knowledge of others (Cohen and Levinthal, 1990), absorptive capacity. The second point is what sort of knowledge? Indeed Rodan and Galunic (2004) argue that a weakness in the literature of networked innovation is the lack of considering the knowledge held by actors in the network. As Howells (2000:51) notes the linear model of innovation presents scientific knowledge acting as some kind of ephemeral reservoir which scientists would 'dip into' to

help them invent and discover new products " the 'process of knowledge' and how it effected innovation was largely ignored".

Towards the Synergistic View of Innovation

Felin and Hesterley (2007) consider that collective knowledge is the most important kind of strategic knowledge. But the nature and processes of this "collective" knowledge is not always clear. For example, Simon (1991) argued that all organizational learning takes place inside human heads so an organisation can only acquire knowledge (learn) through the learning of its members or by "ingesting" new members with different knowledge. Yet, Nelson and Winter (1982) stated that the possession of technical "knowledge" is an attribute of the firm as a whole, rather than an individual. Nonetheless, by stepping outside this debate about where knowledge resides, we can readily see that different types of knowledge may contribute in different ways to innovation. For example, Sammara and Biggerio (2008) distinguish between technological, market and managerial knowledge. These types of knowledge reside in specific organizational functions, such as production and R&D for technological knowledge and sales and marketing for market knowledge. But this point seems too closely related to the functional mode of the 1980s in Rothwell's (1994) categories of innovation understandings.

Although Rodan and Galunic (2004) seem to make a similar point, their comments focus more on the heterogeneity of knowledge itself; the variety of knowledge, know-how, and expertise that may exist in a network. Thus rather than the functional specialisms of knowledge silos, they bring out importance of different forms of knowledge. As Dosi et al (2000) pointed out long ago, firms are characterised by heterogeneous knowledge bases. But if firms are characterised by different knowledge bases, different institutions must similarly distinguished. Asheim et al. (2007) usefully describe this as differentiated knowledge. For example, Gordon and Jack (2010) explain how universities can offer particular benefits when engaging with industry as they can serve as knowledge hubs. Indeed, it has been argued that the next mode of the evolution described by Rothwell (1994) earlier, is the Triple Helix Model (Leydesdorff, 2000). Conceptually, the Triple Helix Model, the engagement of three different groups of stakeholders for innovation; universities, industry and government, is premised on the assumptions of different, and potentially complementary, sets of knowledge. Each triple helix partner "takes the role of the other" and learns to "take the view of the other". Universities develop some business capacities even as firms increase their academic capabilities, including the ability to share knowledge with each other. Thus perhaps the most important aspect for understanding innovation is the *collecting* process rather than the collective knowledge itself. Indeed Sammara and Biggerio (2008) comment on the importance of bringing together and recombining diverse knowledge. Significantly, Anderson et al. (2012) propose that a key element in the entrepreneurial function is connecting.

A largely Chinese language literature tackles this problem from a somewhat different perspective, the idea of synergistic innovation. Examples include Chen and Wang (2006); Youxia et al., (2010) and Chen et al. (2006). Whilst this literature is not well cited in the West, the principles and components are similar to the Triple Helix model, but emphasise synergy between elements. The components; firms, universities and research institutes, governments and agency interact with each other to promote innovation using the largely codified knowledge by adding to the value of accessing unique, often local, mostly tacit, knowledge-based assets residing in different national innovation systems. Like much of the Chinese literature the general style is normative, reflecting the different method and

approaches employed in China (Peng et al., 2001). Nonetheless this literature usefully draws out the benefits of synergy in complementary knowledges.

What is a particularly interesting is that the system is claimed to be self organizing. This seems true of both the Chinese and western modern models of open innovation. Although the open innovation literature does not make such a strong claim about self organisation, in this Chinese literature our attention is drawn to the conspicuous absence of specific drivers and organisers. It seems almost that proximity, the milieu, the network itself, somehow generates the energy to connect the disparate partners and to persuade them to share knowledge. To us this seems counter intuitive; networks cannot act, only people can! Casson (1982) insists that only individuals can take judgmental (i.e. entrepreneurial) decisions about the coordination of scarce resource of which knowledge is a paramount innovative resource.

Conclusions: The Roles of Entrepreneurs in Collective, Synergistic Innovation

This void, the missing link in the conceptualisation of collaborative innovation practices forces us to recognise the importance of agency. In broad terms agency is "the temporally constructed engagement by actors of different structural environments – the temporal-relational contexts of action – which, through the interplay of habit, imagination, and judgment, both reproduces and transforms those structures in interactive response to the problems posed by changing historical situations" (Emirbayer and Mische 1998: 970). In narrower entrepreneurial terms, an agent as an individual with "transformative capacity" (Giddens, 2004; 15); or entrepreneurs simply "make it happen" (Sarasvathy, 2004).

As knowledge is embedded and circulates in networks, in firms and in regions but to become innovation, it requires to be synthesised and activated. This, we argue, is the entrepreneurial role. Rodan and Galunic (2004) emphasise that innovation depends on the ability of bringing together and recombining diverse knowledge. Entrepreneurs engage with these knowledges, they connect, they synthesise, they combine to form new applications in what we describe as innovation. There is some evidence to support this in the literature. For example, Felin and Hesterley (2007) point out that innovation is not reducible to what any single individual knows, or even to any simple aggregation of competencies and capabilities. Lundvall and Borrás (1998) suggest that the process of knowledge exploration and exploitation requires a dynamic interplay between, and transformation of, tacit and codified forms of knowledge as well as a strong interaction of people within organisations and between them. Thus this literature draws out the necessity of agency. For us it seems obvious that this agent is entrepreneurial. The entrepreneurship literature (Drucker, 1985), although using a different lens, clearly identifies this combining and change agency as the entrepreneurial role (Anderson and Starnawska, 2009).

Interestingly this entrepreneurial role is itself embedded and shaped by particular social and economic frameworks (Jack and Anderson, 2002; Harbi and Anderson, 2010). Indeed, Emirbayer and Miche (1998) and Emribayer (1997) describe a relational sociology of agency characterised by social ties and cultural discourse. Although they are not discussing entrepreneurs, but agency more generally, they describe (1998; 998) the "imaginative generation by actors of possible future trajectories of action, in which received structures of thought and action may be creatively reconfigured".

Thorpe et al (2005) provide explanation for such processes, pointing to the socially embedded nature of entrepreneurial learning. Similarly Zhang et al (2006; 313-314) have shown that the mode and scope of learning interactions with alters, as well as specific

"unique social and business contexts", shape the extent to which an entrepreneurial firm can create product and process innovations). Nonetheless, Tushman and Scanlan (1981) suggest that successful boundary spanning individuals are often regarded as technically competent; achieved by their superior ability to seek out and utilize external information. However, Styhre et al (2000) point out that knowledge does not only reside in routines, processes, and communication, but is also mediated through emotional, cognitive, and perceptual processes and interactions. Knowledge does not evolve from parallel skills and capabilities, but from the totality, what they describe as the texture, of human relations. Such individuals develop the specialist social and translation skills necessary to communicate with external organizations, decoding internal technical and organizational jargon into language that can be understood by the outside world and vice versa. Boland and Tenkasi (1995) describe how these individuals have the ability to make strong perspectives within a community, as well as being able to take the perspective of others (e.g. outsiders) into account. This suggests innovative entrepreneurs are not only adept communicators but also have highly developed social skills.

In sum then, from our synthesis of the literature we have shown how knowledge is a critical resource in innovation, but we have also highlighted how this knowledge is likely to be dispersed. We have argued that the converging argumentation in the different literatures indicates that the enactment of innovation is increasingly recognised as a social process. We see this social enactment as a key point that is underdeveloped in the literature. Nonetheless, enactment is an entrepreneurial action, largely about synthesising, combining and aplying knowledge. In these ways the entrepreneur and their agency produces innovation. Entrepreneurs produce innovation by combining diverse knowledge and innovation will contribute to economic recovery.

Further research

In drawing together these literatures we have made a strong theoretical case for understanding how entrepreneurship creates innovation by a socialised practice of combining diverse knowledge. Although well grounded in the different literatures, our theory is speculative. In that sense it is abductive, but ready for application and testing. We see two routes. The first is detailed case studies looking carefully at what actually occurs in practice. We suspect that this route could lead to refining our theory. The second approach might be to operationalise the theory as constructs of connections. These constructs could form a questionnaire for a survey which would offer some validity or refute our explanations, but would establish the scope and scale of the phenomena we hypothesise.

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Fig.1 The evolution of explanatory modes of innovation