

EXAMINING THE ANTECEDENTS TO INNOVATION IN ELECTRONIC NETWORKS OF PRACTICE

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The way in which firms innovate ideas and bring them to market is undergoing a fundamental change. Useful knowledge is increasingly dispersed outside the firm's boundaries and the exceptionally fast time to market for many products and services suggest that some very different organising principles for innovation are needed. These developments have led to an increased interest in the electronic network of practice concept to facilitate innovation. This paper argues that innovative behaviour in electronic networks of practice is determined by three interacting systems – individual motivations, network communication structure, and the social context of the network. The theoretical position of the interactive process theory of innovation is used to support this claim.

1 INTRODUCTION

The current environment for organisations is one that is characterised by uncertainty and continuous change. This rapid and dynamic pace of change is forcing organisations that were accustomed to structure and routine to become ones that must improvise solutions quickly and correctly. To respond to this changed environment, organisations are moving away from the structures of the past that are based on hierarchies, discrete groups and teams and moving towards those based on more fluid and emergent organisational forms such as networks and communities. Employees are no longer constrained by the role of formally prescribed relationships in organisations. More work is being done through informal networks and “supporting collaboration and work in these informal networks is increasingly important for organisations competing on knowledge and an ability to innovate and adapt” (Cross and Parker 2004). With the global penetration of internet technologies, individuals may now cross organisational boundaries to exchange their knowledge

with others in various networks of practice regardless of time and space. These developments have led to an increased interest in the electronic network of practice (ENoP) concept to facilitate innovation. ENoPs are computer mediated discussion forums focused on problems of practice that enable individuals to exchange advice and ideas with others based on common interests (Wasko and Faraj 2005). In essence, ENoPs are inter-organisational collaborative knowledge management systems. Tuomi (2002) suggests that the network of relationships that develop in an ENoP, the inner motivation that drives them and the knowledge they produce, lead to the creation of an environment that is rich in creativity and innovation.

Even though ENoPs are becoming an integral facilitator of new knowledge creation, we still have a limited understanding of the antecedents to innovative behaviour. All indications are that any organisation expecting to compete on knowledge and innovation will have to exploit collaborative IT systems. Technologies such as Web 2.0 are dramatically reducing the costs of sourcing external knowledge for the average knowledge worker. In their recent book 'Wikinomics', Tapscott and Williams (2006) argue that we are only beginning to see how the internet can be used for mass collaboration and gathering innovative knowledge. With the internet being so engrained in the everyday lives of today's youth, we will really only see these advances come to fruition when this 'Net generation' moves into industry. Thus, it is vital that we now begin to understand what drives innovation in ICT supported communities. This paper asks the question - What are the antecedents to innovative behaviour in ENoPs? The theoretical positions of the interactive process theory of innovation are used to examine this question. This paper presents a conceptual model which will be tested by gathering data from the R&D labs of three Irish high technology companies.

2 THE ANTECEDENTS TO INNOVATION

To advance innovation we need to understand the antecedents to innovative behaviour. The causes of innovation in organisations have been a major theme in studies of innovation. Three theoretical perspectives as identified by Slappendel (1996) are used to map out this literature on innovation in organisations (Table 1). These are referred to as the individualist perspective, the structuralist perspective, and the interactive process perspective. The earliest innovation studies assumed that single individuals are the main source of innovation in organisations. In this individualist perspective, their actions are not seen to be constrained by external factors; instead, they are understood to be self-directing agents who are guided by the goals they have set. In this view, individuals are rational and make decisions in order to maximise value or utility. This 'trait' approach assumes that some individuals have personal qualities which predispose them to innovative behaviour. Consequently, individual characteristics, such as age, sex, educational level, values, personality, creativity and cognitive style, define the antecedents for innovation. Likewise, concepts such as leader, champion, entrepreneur, innovator and change agent, are of central interest in this perspective.

Table 1 - Main Features of the Three Perspectives (Adapted from Slappendel 1996)

	Individualist	Structuralist	Interactive Process
Basic assumptions	Individuals cause innovation	Innovation Determined by Structural characteristics	Innovation produced by the interaction of structural influences and the actions of individuals
Conceptualisation of an innovation	Static and objectively defined objects and practices	Static and Objectively defined Objects or practices	Innovations are subject to reinvention and reconfiguration. Innovations are perceived.
Conceptualisation of the innovation Process	Simple linear, with Focus on the adoption stage	Simple linear, with focus on the adoption stage	Complex process
Core concepts	Champions Leaders Entrepreneur	Environment Size Complexity Differentiation Formalisation Centralisation Strategic type	Shocks Proliferation Innovative capability Context
Research methodology	Cross-sectional Survey	Cross-sectional survey	Case studies Case histories
Main authors	Rogers March and Simon	Zaltman et al.	Van de Ven et al.

The structuralist perspective assumes that innovation is determined by objective organisational characteristics. Of all the potential influences on innovativeness, organisational variables have been the most widely studied, and some authors have pointed to their primary importance as determinants of innovation (Kimberly and Evanisko 1981; Damanpour 1991). Researchers within this perspective have hypothesised on the relationships between innovation and a range of organisation structural variables including size, complexity, differentiation, professionalism, formalisation and centralisation. Slappendel (1996) believes that the advantage of this approach is that it overcomes the narrow concern with the organisation itself by drawing attention to the interrelation of organisation and environment. However, the disadvantage is that this view is too objective - it treats organisational features as objective realities whose factual character is unchallenged. Furthermore, the relationships between organisational variables and innovation are complex and often contradictory.

The individualist and structuralist perspectives (when applied in their purist forms) have major disadvantages in that they place undue emphasis on particular causal factors and so may lead to errors of attribution (Slappendel 1996). These concerns have resulted in the emergence of a third perspective on innovation in organisations, referred to as the interactive process perspective. This perspective views innovation as a dynamic, continuous phenomenon of change over time in

which various factors have a mutual impact on each other. The individualist and the structuralist perspectives have seen innovation as *either* being caused by individual actions *or* by objective structures. In the *interactive process* perspective, the actions of innovative individuals cannot be divorced from either the activities of other individuals or from the organisational structures within which they operate. Thus, innovation is viewed as the result of the continuous *interrelation* of individual actions and structural influences.

3 A CONCEPTUAL MODEL

Theories of innovation generally assume that either financial incentives or need based incentives drive innovative activity. ENoPs are exemplars of a fundamentally different organisational model for innovation. Open source software communities are one example of an ENoP and these communities have been the subject of much scholarly attention in recent times. Open source projects such as Linux, Apache and Gnome have achieved remarkable success and have on occasion, displaced commercially produced software. This model of innovation is based on the open, voluntary, and collaborative efforts of users – a term that describes enthusiast, tinkers, amateurs, everyday people, and even firms that derive benefit from a product or service by using it (Shah 2006). This model extends well beyond the domain of software. ENoPs have been influential in fields as diverse as astronomy (Ferris 2002), law (Wasko and Faraj 2005), IT consultancy (Teigland and Wasko 2003), public health (Vaast 2003) and sports products (Franke and Shah 2005) thus making the study of ENoPs of prime interest for researchers and practitioners.

This research is firmly located within the ‘interactive process’ perspective of innovation which advocates that innovation is produced by the interaction of structural influences and the actions of individuals (Slappendel 1996). By combining the NoP, knowledge management and organisational innovation literatures, this research proposes that innovative behaviour in ENoPs is the outcome of three constructs; individual motivations, network communication structure, and the social context within which the network operates (Figure 1). The arrows between the three constructs indicate that these variables interact together to influence innovative behaviour. It is believed that this research is the first to study ENoPs through the interactive process lens. Future research will involve testing the proposed relationships illustrated in the model.

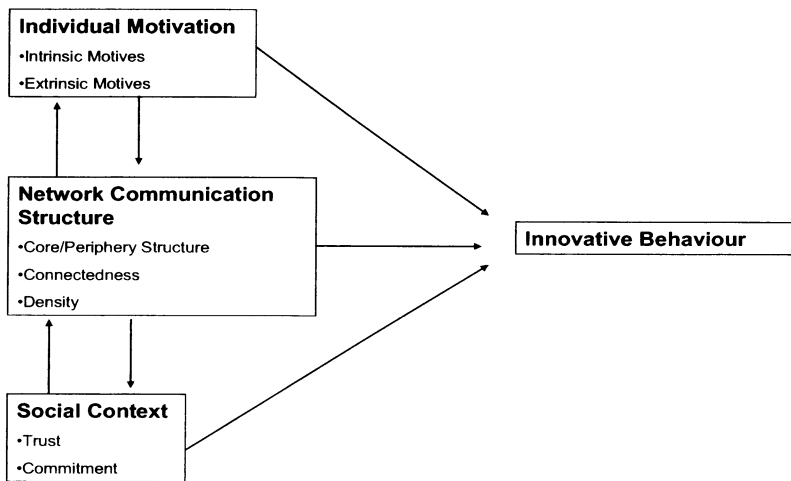


Figure 1 - A Conceptual Model

3.1 Individual Motivations

According to Monge, Cozzens et al. (1992) “The effectiveness of any system for generating innovations depends on many things, one of which is the individuals who find, invent, or propose useful innovations. In a formal organisational setting, intentional innovation requires motivated individuals”. Some organisational positions, such as those in R&D groups, are defined such that individuals in these positions are expected to develop innovations. In these cases, the individuals are presumably motivated by the various rewards and punishments associated with an employees expected performance; for example, job security, wages, promotions etc. What motivates individuals to contribute to voluntary communities? Previous research has found that both intrinsic and extrinsic motivations drive participation in ENoPs.

This research proposes that individual motivations to participate will have a significant relationship with innovative behaviour in ENoPs. Early empirical works have suggested a number of competing and contentious theories. Some argue that participation is driven by users desire to satisfy their own needs, career concerns, learning, status, enjoyment, creativity. Shah (2006) states that there is some evidence to support all of these motives, “However, research has yet to devise a coherent explanation for these findings, connect these motives to the social structure, and understand how differences in social structure affect participation and vice versa.”

3.2 Network Communication Structure

In the field of social psychology, an important tradition of study on networks is that of social network theory. The power of social network theory stems from its difference from traditional sociological studies, which assume that it is the attributes

of individual actors that matter. Social network theory produces an alternate view, where the attributes of individuals are less important than their relationships and ties with other actors within the network. It suggests that at least some properties and outcomes of a social network are a function of its complete structure and are not reducible to either an individual actor or a single link (Degenne and Forse 1999).

The structural properties of the social network help determine the networks usefulness to its individuals. When talking about the structural properties, what is meant is the impact of group communication structure on collective performance outcomes. Structural properties refer to concepts such as density, connectedness, centrality, core/periphery structure, coreness, symmetry, closeness etc. For the purposes of this study, the relationship between three structural properties (i.e. core/periphery structure, connectedness, density) and innovative behaviour will be developed.

3.3 Social Context

Previous research provides a great deal of evidence that individual behaviours are embedded in a social context, and decisions to engage in inter-personal exchange are influenced by perceptions of social relations (Granovetter 1973). Social capital theories propose that people are influenced by their social and organisational context. Whether people engage in interpersonal knowledge exchange not only depends upon the individual, but also depends upon characteristics of the social context (Nahapiet and Ghoshal 1998). Therefore, this research proposes that peoples' innovative behaviour in ENoPs are determined by individual factors, network communication structure, as well as the social context of the network. An example of social capital could be the voluntary participation of the members over the lunch break to discuss various social/organisational aspects which benefits all the participants.

Following the approach of Wasko (2002), social capital is operationalised in this study through two variables; commitment and generalised trust. Mowday, Steers and Porter (1979) define organisational commitment as "the relative strength of an individual's identification with and involvement in a particular organization". Wasko (2002) extends this definition to include on-line organisations including ENoPs. Identification reflects the overlap between an individual's identity and that of the larger collective. Specifically, identification allows a party to understand, appreciate, and feel invested in what others want and need. Identification with a collective enhances concern for the collective processes and outcomes (Kramer and Tyler 1996). In addition, identification enhances the frequency of cooperation and provides a better explanation than self-interest approaches for understanding cooperative behaviour (Lewicki and Bunker 1996). Therefore, people who identify with the collective are more likely to engage in cooperative action in order to sustain the community.

4 CONCLUSION

While traditional face-to-face networks within organisations (i.e. communities of practice) have received increasing attention, we know much less about the dynamics underlying ENoPs and the electronic knowledge exchange supported by these

computer networks (Teigland and Wasko 2003). A review of the literature has shown that little consideration has been paid to the drivers of innovation in electronic communities. This paper argues that innovative behaviour in ENoPs is determined by three interacting systems – individual motivations, network communication structure, and the social context of the network. Future research will involve testing this model by gathering data from the R&D labs of three high technology Irish companies. The ENoPs used to support to work of these labs will be examined. In order to determine the network communication structure of each ENoP, social network analysis (SNA) will first be conducted. SNA is a technique which maps and measures of relationships and flows between people, groups, organisations, computers or other information/knowledge processing entities. The nodes in the network are the people and groups while the links show relationships or flows between the nodes. SNA provides both a visual and a mathematical analysis of complex human systems. Following the SNA, in-depth interviews with a sample of the discussion forum participants will be conducted. The interviews will tease out how the participants' motivations, trust and commitment impact their innovative behaviour.

5 REFERENCES

1. Cross, R. and A. Parker. *The Hidden Power of Social Networks. Understanding How Work Really Gets Done in Organizations*. Boston, Harvard Business School Publishing. 2004.
2. Cummings, J. and R. Cross. "Structural Properties of Work Groups and their Consequences for Performance." *Social Networks* 25. 2003. 197-210.
3. Damanpour, F. "Organisational innovation: A meta-analysis of effects of determinants and moderators." *Academy of Management Journal* 34(3). 1991. 555-590.
4. Degenn, A. and M. Forse. *Introducing social networks*. California, Sage Publications. 1999.
5. Ferris, T. *Secing in the dark: How backyard stargazers are probing deep space and guarding earth from interplanetary Peril*. New York, Simon & Schuster. 2002.
6. Franke, N. and S. Shah. "How communities support innovative activities: an exploration of assistance and sharing among end users." *Research Policy* 32. 2005. 157-178.
7. Granovetter, M. "The Strength of Weak Tics." *American Journal of Sociology* 78. 1973.
8. Kimberly, J. and M. Evanisko. "Oranizational innovation: The influence of individual, organisational, and contextual factors on hospital adoption of technological and administrative innovations." *Academy of Management Journal* 24(4). 1981. 689-713.
9. Kramer, R. M. and T. R. Tyler. *Trust in Organizations*. Thousand Oaks, CA, Sage Publications. 1996.
10. Lewicki, R. J. and B. B. Bunker. *Developing and maintaining trust in work relationships. Trust in Organizations*. R. M. Kramer and T. R. Tyloer. London, Sage Publications. 1996.
11. Monge, P., M. Cozzens, et al. "Communication and motivational predictors of the dynamics of organizational innovation." *Organization Science* 3(2). 1992. 250-274.
12. Mowday, R. T., R. M. Steers, et al. "The measurement of organizational commitment." *Journal of Vocational Behavior* 14. 1979. 224-247.
13. Nahapiet, J. and S. Ghoshal. "Social capital, intellectual capital, and the organizational advantage." *Academy of Management Review* 23(2). 1998. 242-266.
14. Roberts, J., I.-H. Hann, et al. "Understanding the motivations, participation, an performance of open source software developers: A longitudinal study of apache projects." *Management Science* 52(7). 2006. 984-999.
15. Schenkel, A., R. Teigland, et al. *Theorizing Structural Properties of Communities of Practice: A Social Network Approach*. Academy of Management Conference, Washington DC, Organisation and Management Division. 2001.

16. Shah, S. "Motivations, governance, and the viability of hybrid forms in open source software development." *Management Science* 52(7). 2006. 1000-1014.
17. Slappendel, C. "Perspectives on Innovation in Organizations." *Organization Studies* 17(1). 1996. 107-129.
18. Tapscott, D., and A. Williams. 2006. "Wikinomics: How Mass Collaboration Changes Everything." Portfolio Hardcover. New York.
19. Teigland, R and Wasko M. Integrating Knowledge Through Information Trading: Examining the Relationship between Boundary Spanning Communication and Individual Performance. *Decision Science*, 32(2). 2003. 261-287.
20. Tuomi, I. *Networks of Innovation*. Oxford, Oxford University Press. 2002.
21. Vaast, E. The use of intranets: The missing link between communities of practice and networks of practice. *Knowledge networks; Innovation through communities of practice*. P. Hildreth and C. Kimble. London, Idea Group Publishing. 2003. 216-229.
22. Wasko, M. M. Why should I share? Examining knowledge contribution in networks of practice. Faculty of the Graduate School, University of Maryland. 2002. 150.
23. Wasko, M. M. and S. Faraj. "Why should I share? Examining social capital and knowledge contribution in electronic networks of practice." *MIS Quarterly* 29(1). 2005. 35-57.