December 2003

Knowledge Management in Communities and Networks of Practice: Challenges, Issues and Paradoxes

Bongsug Chae
Kansas State University

Hope Koch
Baylor University

Huy-Vo Van
HoChiMihn City University of Technology

KNOWLEDGE MANAGEMENT IN COMMUNITIES AND NETWORKS OF PRACTICE: CHALLENGES, ISSUES AND PARADOXES

Bongsug Chae
Kansas State University
bchae@ksu.edu

Hope Koch
Baylor University
hope-koch@tamu.edu

Huy Vo Van
The HoChiMinh City University of Technology
vhuysim.hcmut.edu.vn

Abstract

This research-in-progress paper investigates knowledge management activities in communities and networks of practice and the role and use of IT in such knowledge networks. Drawn from the network model including social-practice perspectives (Wenger 1998; Brown and Duguid 2000; Brown and Duguid 2001), social network theory (Granovetter 1973), and actor network theory (Law and Callon 1992; Latour 1996) and by reviewing existing literature, we develop five research questions. A case study with a university IT department is used to answer the five research questions.

Introduction

In this study we draw on "network" study in sociology, anthropology and social studies of technology to understand knowledge management (KM) activities in real-world environments. "Network" orientation assumes social interaction is the basis of social life, and social networks provide the mechanism (interaction) through which individuals learn about, come to understand, and attempt to handle difficulties (Pescosolido 1992)

There are several approaches in the "network" model including: social-practice perspectives (Wenger 1998; Brown and Duguid 2000; Brown and Duguid 2001), social network theory (Granovetter 1973), and actor network theory (Law and Callon 1992; Latour 1996). Reviewing existing literature from these three research streams allows us to develop five research questions:

1. Is there a difference between a community of practice (COP) and a network of practice (NOP)?
2. Does this distinction affect the relationships/types of knowledge exchanged? What is the role of each community in knowledge sharing and knowledge creation?
3. Is "manageability" of CoPs and NoPs possible? Can we manage structural holes and network closure or weak ties/strong ties? Is such management good and necessary?
4. Do CoPs and NoPs enable or constrain human activity in the context of knowledge management? If so, how?
5. What is the role and use of IT for knowledge sharing and creation and learning in CoPs and NoPs?

Case study is the most appropriate way to investigate these questions because data collected from this method provides deep understandings of KM processes. Case study can reveal paradoxical situations in knowledge management contexts including: formal **vs.** informal, technical vs. social, order vs. autonomy, and closure vs. openness. We chose Texas A&M University's information technology (IT) department for our investigation. Currently, we are finishing data analysis.

Our data analysis suggests these paradoxes may be common in any organizational setting and need to be considered together: formal **and** informal, technical and social, order and autonomy, and closure and openness. It appears that lack and/or

overemphasis on one side in sacrifice of the other will result in KM failure and low organizational performance and innovation. In the next section we discuss our study's theoretical basis and then five research questions are drawn. Finally, we briefly present our case study and its status.

Theoretical Basis

A Social-Practice Perspective

Within the social-practice perspective distributed cognition (Boland 1994; Brown and Duguid 2001; Hutchins 1990; Lave and Wenger 1991; Orlikowski 2002; Tsoukas 1996) is important. Cognition has traditionally been viewed as a localized phenomenon best explained in information processing terms at the individual level. Theories of practice maintain cognition is better understood as a situated and distributed phenomenon, further suggesting knowledge and learning are situated and distributed.

Lave (1988, p. 1) notes that "what we call cognition is a complex social phenomenon. The point is not so much that arrangements of knowledge in the head correspond in a complicated way to the social world outside the head, but that they are socially organized in such a fashion as to be indivisible"." She further points out that cognition observed in everyday practice is distributed - stretched over mind, body, activity, and cultural settings. Clancey (1997, p. 1-2) contends "every human thought and action is adapted to the environment, that is, *situated*, because what people *perceive*, how they *conceive of their activity*, and what they *physically do*, develop together".

Hutchin (1988) states "knowledge may reside in the mind, but minds reside in communities of minds, and the fate of knowledge in a mind is in part shaped by interaction with other minds in the community" (p. 40). Studying a navigation team, Hutchin (1990) shows that on long journeys, the knowledge was held in bits and pieces by many people. Tsoukas (1996) sees organizations as distributed knowledge systems and argues most of their knowledge is tacit and resides not in the heads of individuals, but in teams of individuals sharing common experiences continually (re)constructed through everyday activities.

The social-practice perspective draws attention to active knowing and an epistemology of practice (Schon, 1983, Chapter 2), rather than static knowledge and an epistemology of knowledge (Cook and Brown, 1999). Practice is central to understanding work, and abstractions detached from practice distort or obscure that practice's intricacies (Brown and Duguid, 1991). In this light, learning, working and innovation are interrelated and compatible, and thus potentially complementary, not conflicting forces (Brown, 1998).

Social Network Theory

Social network theory is opposite of neo-classical theory as it emphasizes social processes and social milieu in understanding individual behavior. Firms are embedded in complex networks of social relations such as professional associations, corporate memberships and trade association membership (Granovetter 1985). Granovetter argues most behavior is closely embedded in networks of interpersonal relations. This argument avoids the extremes of under- and oversocialized views of human action.

Granovetter's (1973) theory of strong and weak ties is one of the most important theories in network studies. Granovetter defines a tie's strength as "a combination of the amount of time, the emotional intensity, the intimacy, and the reciprocal services characterizing the tie". The literature is primarily concerned with relationships between two or more social actors, as well as the relationship's effect on their information sharing activities (Granovetter 1973; Granovetter 1985; Hansen 1999; Hansen 2002) Social capital (Burt 1992; Burt 1997) is also explained in this literature. Social capital studies are concerned with the significance of relationships as a resource for social action (Nahapiet and Ghoshal 1998). Social capital's (Nahapiet and Ghoshal 1998) central proposition is "that networks of relationships constitute a valuable resource for the conduct of social affairs, providing their members with collectively-owned capital" (p. 243). Thus, it can encourage knowledge sharing and creation, since it gives individuals access to other people from whom they can acquire knowledge. In most social capital studies, the accumulation of social capital is predominantly viewed as having a positive and proportionate effect on performance (Edelman, Bresnen, Newell, Scarbrough and Swan 2002).

Authors propose two network structures creating social capital (Burt 2001). Structural hole theory describes social capital as a function of network brokerage opportunities (Burt 1997). Coleman, (Coleman 1988) argues closed or dense networks are a source of social capital since they make it easier for people in the network to trust one another.

Actor Network Theory

Actor network theory (Akrich 1992; Akrich 1994; Callon 1986a; Callon 1986b; Callon 1991; Latour 1991) sees the world full of hybrid entities containing both human beings and nonhuman actors such as technological artifacts. Actor network theory assumes "general symmetry" between technical and social entities. Agency in actor network theory includes humans and artifacts with built in human purposes. As such, actor network theory uses heterogeneity to describe a collection of different human and non-human entities.

In this theory, organizations, departments, and groups are actor networks. One of the main differences between actor network theory and other social network theories is that non-human actors can shape actor networks. An actor network may include many other heterogeneous elements including: texts (e.g. documents, reports, and articles), technical artifacts (e.g. machines and technology) (Callon 1992). These elements are intermediaries connected to one another in actor networks.

Research Questions

These three theories share commonalities in understanding knowledge sharing, learning, and human behavior. They are also complementary in developing a full picture of KM in a real-world environment. Based on the three network approaches, in the section below we discuss our five research question and the research in each area.

Is there a difference between a CoPs and NoPs practice?

In the information systems field and particularly in KM research, the most popular term is community of practice. A large number of researchers (e.g., Hara and Kling 2002; Brown and Duguid 2001; Brown 1998; Robey et al. 2001) have studied knowledge sharing and learning using CoPs as the unit of analysis. Others have information technologies' role in building "virtual CoPs". Our first research question deals with whether we can distinguish between communities of practice and the networks of practice.

Lave and Wenger (1991) define a community of practice as "a set of relations among persons, activities, and worlds, over time and in relation with other tangential and overlapping communities of practice" (p. 98). The existence of a community of practice is an intrinsic condition for the existence of knowledge. The concept of practice connotes doing in a historical and social context that gives structure and meaning to what members do. Therefore practice is always social practice (Wenger, 1998) and may connote knowledge-in-action (Schon, 1987) and knowing (Blakler, 1993, 1995; Cook and Brown, 1996). Originally the concept was explained by the apprenticeship model, which Lave and Wenger called the theory of Legitimate Peripheral Participation (LPP). The theory explains learning and knowledge sharing enabled by newcomers to a community having access to old-timers and learning from them by gradually moving from peripheral to full participation in practice. The concept of communities of practice has been used to examine Xerox Copier technicians (Brown and Duguid, 1991; Orr, 1996), claim processors (Wenger, 1990; 1998), work groups (George, Iacono, and Kling, 1995), top management (Spender and Grinyer, 1995), construction managers (Gherardi, Nicolini, and Odella, 1998), chief executives (Easterby-Smith and Gherardi, 1998), and research scientists (Brown and Duguid, 2000).

On the other hand, management researchers suggest that interorganizational networks are very important as external sources of information and knowledge for corporate competitiveness and adaptation (e.g., von Hippel, 1988; Teece, 1992; Tsai and Ghoshal, 1998). The nature of knowledge and learning embedded in practice requires organizations to rethink their own boundaries and the notion of "organizational" learning and knowing. The notion of "organizational" learning and knowing is narrow and in need of extension to include inter-firm, inter-organizational, and social learning. For organizations to be successful organizations should see the value of an inter-organizational aspect of learning and the way communities of practice transcend organizational boundaries. If organizations recognize this value they would be more likely to create wider occupational communities. Brown and Duguid (2000, 2001) call these loosely-coupled networks "networks of practice."

Authors (Brown and Duguid 2001; Brown and Duguid 2000; Brown and Duguid 2000a; Faraj and Wasko 2002) presume CoPs and NoPs are different. Brown and Duguid (2001) believe tight networks within the organization are "communities" of practice while loose communities across organizational boundaries are "networks" of practice. Wasko and Faraj's work (2000) uses "electronic" communities of practice; however in their study's context they describe "networks of practice." Faraj and Wasko (2002) and Brown and Duguid's work, assume networks of practice are "electronic" communities but do not indicate whether CoPs are also electronic communities.

Does this distinction affect the relationships/types of knowledge being exchanged? What is the role of each community in knowledge sharing and knowledge creation?

In studying this question, we may be able to see a CoP as a strong tie and a NoP as a weak tie. These terms come from different streams of network research. However, they share some commonalities. People in the same CoP have shared identities and understanding. While researchers explain CoPs with varying definitions, they all agree CoPs are relatively tight-knit groups of actors who know each other and work together directly. In this sense, a CoP represents strong ties in social network theory.

On the other hand, NoPs are loosely-coupled networks. Unlike communities of practice, networks of practice are "occupational communities" (Van Maanen and Barley, 1984) or social worlds that have practice and knowledge in common. Most community members are unknown to one another with more indirect than direct links. Networks of practice have extensive reach, but little reciprocity as network members have minimal interaction with one another. Relations among network members are significantly looser than those within a CoP (Brown and Duguid 2001). In this sense, a NoP represents a weak tie in social network theory.

Recently, using the concepts of weak versus strong ties and the notion of explicit versus tacit knowledge, Hanseth (1999) studied the search-transfer problem and the role of weak and strong ties in sharing knowledge across organizational subunits. His findings show that weak ties help a project team search for useful knowledge in other subunits but impede the transfer of complex knowledge, which tends to require a strong tie between the two parties in a transfer. Having weak ties speeds up projects when knowledge is not complex but slows projects when necessary knowledge is complex.

Along with this study, researchers (Kogut 1988; von Hippel 1994) suggest weak ties are better suited for transferring codified knowledge as opposed to non-codified or tacit knowledge. Granovetter (1973) shows employment opportunities information is more likely to be obtained from weak ties than strong ties. It would be thought that such information tends to be explicit and codifiable rather than tacit.

Von Hippel (1994) proposes information stickiness. Stickiness facilitators include: the nature of the information, the amount of information transferred, and the attributes of information seekers and providers. Tacit knowledge is sticky (von Hippel 1994). Szulanski (1996) analyzes "internal stickiness of knowledge transfer". The study findings show the major internal knowledge transfer barriers as knowledge-related facts such as the recipient's lack of absorptive capacity, causal ambiguity, and arduous relationships between the source and the recipient. The author suggests tacit knowledge transfer to some extent depends on the 'intimacy' of the overall relationship between the source unit and the recipient unit. Similarly Kogut (1988) contends knowledge transfer between firms is difficult. Knowledge tends to be tacit.

Is manageability of CoPs and NoPs possible? Can we manage structural holes and network closure or weak ties/strong ties? Is such management good and necessary?

A general consensus is that CoPs and NoPs play important roles in knowledge sharing, knowledge creation, and learning. Given this, can CoPs and NoPs be managed?

Some studies conceptualize CoPs as spontaneous forms of organizing and forums for learning. Brown and Duguid contend (Brown and Duguid 1991) "communities cannot be created in a top-town fashion, but organizational structures and procedures should aim to preserve the 'healthy autonomy' of communities". Ardichvilli, Page, and Wentling (2002) contend CoPs emerge spontaneously so KM professionals must avoid attempts to manage CoPs.

At the same time Wenger (2000) suggests managers play a critical role in constructing, aligning, and supporting CoP. While noting that communities of practice should not be created in a vacuum and cannot be mandated by managers, Wenger and Snyder (2000) suggest "cultivation" as a strategy. The authors suggest managers can bring the right people together, provide an infrastructure in which communities can thrive, and measure the communities' value in nontraditional ways. According to Wenger and Snyder, management must be prepared to invest time and money in helping such communities reach their full potential. IT systems don't serve them, promotion systems often overlook community contributions, and reward structures may discourage collaboration.

Regarding this issue, Contu and Willmott (2000) note "we encounter an (unacknowledged) shift or slippage from an earlier representation of learning as practice fashioned within a discourse of critique to a formulation of learning as technology conceived within a discourse of regulation and performance" (p. 272-273).

Do CoPs and NoPs enable or constrain human activity in the context of knowledge management? If so, how?

We can view CoPs and NoPs as emergent social structures. Social theories including structuration theory (Giddens 1994), critical realism (Archer 1990) and institutional theory (Scott 1995) propose that social structures or institutions enable and constrain human action. Then, like other social structures such as IT (Orlikowski 1992) and time (Orlikowski and Yates 2002), we presume CoPs and NoPs both enable and constrain knowledge sharing and creation and learning. A natural question is how and in what aspect?

In the social network theory literature, the benefits (or enabling aspects) and weaknesses (or constraining aspects) of weak ties (or structural holes) and strong ties (or cohesive networks) are well accepted (Lazzarini and Zenger 2002). Granovetter (1973) demonstrates the power of weak ties in information diffusion. Weak ties are beneficial because they provide access to nonredundant information and novel knowledge. Weak ties reduce search costs: people obtain information at lower search costs and can therefore dedicate more time and energy to completing the focal project (Hansen 1999). Majchrzak, Neece, and Cooper's (2001) examination of study participants' knowledge bases indicate that they adhered to Granovetter's (1973) weak-tie theory. Granovetter postulates distant and infrequent relationships (weak ties) are more efficient for knowledge sharing as they bridge previously unconnected groups, develop broader access to more organizations, and are less prone to redundant knowledge (Granovetter 1973; Hansen 1999). On the other hand, weak ties are not ideal for complex knowledge sharing (Hansen 1999).

Strong ties provide timely access to information circulating in the network. Information shared within a dense network tends to be high-quality (Coleman 1988). Coleman emphasizes that network closure facilitates sanctions making it easier for people in the network to trust one another. Strong ties or dense networks enable the transfer of complex or tacit knowledge between people and units (Hansen 1999). CoPs are particularly effective at transmitting hard-to-express tacit knowledge, which describes and defines the routine and expected, (i.e., canonical) aspects of practice (Wenger 1998).

On the other hand, strong ties may constrain flows of new knowledge and inhibit the search for new knowledge outside established channels. Thus, strong ties are likely to lead to redundant information because they tend to occur among a small group of actors in which everyone knows what the others know.

What is the role and use of information technology for knowledge sharing and creation and learning in CoPs and NoPs?

Many studies (Alavi 2000; Alavi and Leidner 2001; Courtney 2001; Holsapple and Joshi 1998; Huber 2001; Majchrzak, Rice, King, Malhotra and Ba 2000; McDermott 1999; Schultze and Leidner 2002; Swan, Newell and Robertson 2000) investigate information technology's use in supporting KM activities. Swan and Newell (2000) offer three perspectives linking knowledge and innovation within an organizational context: the cognitive, the community, and the networking model. Each perspective emphasizes different roles and types of technologies for KM. Similarly, Schultze and Leinder's (2002) **analysis of** IS KM literature finds four discourses: normative, interpretive, critical, and dialogic. Each leads to different roles and types of KM technologies. For example, the normative or the cognitive perspective focuses on supporting knowledge "repository" (Alavi and Leidner 2001; (Zack 1999) development. Interpretive or community perspectives focus on communication-type technologies, such as intranets (Brown and Duguid 1998) or interactive applications (Zack 1999). Thus, taking different perspectives, studies emphasize different IT roles and uses.

A growing number of studies investigate IT's role and use in supporting CoPs and NoPs (Bieber, Segall and Hiltz 2002; Faraj and Wasko 2002; Hara and Kling 2002; Jarvenpaa and Staples 2000; Robey, Khoo and Powers 2000; Staples and Jarvenpaa 2000; Wasko and Faraj 2000). Earlier studies (Sproull and Kiesler 1991) were optimistic about the IT's role and use in electronically connecting people. Even, network perspective researchers, suggest that the new IT has a significant role in forming knowledge communities or networks. For instance, from the activity theory perspective, Kuutti (1996) notes that IT enables the formation of new communities by linking network participants, and making activities possible, and enabling activities to have objects that would otherwise have been impossible to grasp. Dewey's pragmatic view of technology also suggests that information technology can play an effective role in forming community life and communities of inquiry (Hickman, 1999). A number of studies have already explored IT's use in forming CoPs. For example, Goodman and Darr (1998) examines computer-aided systems' role in supporting learning in distributed environments, and find that computer-aided systems facilitate communication across time and space among distributed communities of practice.

By contrast, recent studies (Hara and Kling 2002; Harrison and Dourish 1996; Poitou 1997; Robey et al. 2000) are more cautious about the earlier optimistic view of the role and use of IT. Instead, these studies argue that CoPs cannot be built by IT. Robey et al. (2000) argue that virtual teams, as communities of practice, may be more effective if they are not constrained by technology,

no matter how elegant or powerful it might be" (p. 63). Hara and Kling (2002) argue that "research on CoPs should be built on social theory". Studies take different perspectives on IT's use and role in network formation.

The role and use of IT can be explained by actor network theory. Social practice perspective and social network theory do not take IT or technical artifacts into account in understanding a network. Rather, a network is a collection of people in both approaches. There is a tendency is to neglect the technology in favor of a full exposition of the rich social context in which it is embedded with technology explained as a "black-box" in research (Lea, O'shea and Fung 1995). However, in an actor network, the boundary between social and technical becomes blurred (Davidson and Lamb 2001). This creates opportunities to transcend boundaries between the social and the technical in KM studies. For example, Murphy (2001) shows that digital documents play roles as objects of practice, reifications of practice, and boundary objects. Thus, documents are important parts of learning networks, CoPs, and NoPs for accomplishing, coordinating, and learning in today's complex, knowledge-intensive work. Is the theory useful to explain the IT in CoPs and NoPs? Based on the actor network theory perspective, what is the role and use of IT for CoPs and NoPs?

Case Study

We use a case study (Emerson, 1983; Emerson, Fretz, & Shaw, 1995; Gubrium & Holstein, 1997; Strauss & Corbin, 1998; Yin, 1994) to investigate these five research questions. Our study consists of focused interviews (Merton, Lowenthal and Kendall 1990) with five full-time members of the IT department at Texas A&M University's Mays Business School. A case study was most appropriate for this research because it provides a deeper understanding of KM activities within a real-world context; allowing us to find communities and networks of practice in the IT department and investigate their knowledge sharing practices. In addition, the IT department's small size allows us to investigate the entire KM activity. Their close proximity allows a long-term relationship helping us study KM over time.

Data Collection and Analysis

We use Holsapple and Joshi's KM framework (2002) to formulate our interview questions. This framework identifies and characterizes the main KM elements and their relationships including knowledge influences, knowledge manipulation activities, and knowledge resources.

Our study used three interview approaches: interview guides, standardized open-ended interviews, and dialogic interviews (Rossman and Rallis 1998). Four researchers interviewed each member of the IT department. Each interview lasted around ninety minutes. After each interview we wrote up our findings. To achieve validity (Yin 1994), we each prepared and shared interview notes and perceptions (Kilmann 1999). We corroborated interview data with internal written documentation. Follow-up interviews, electronic communication, and review by members of the IT department helped clarify issues and validate observations (Lawler, Mohrman, Mohrman, Ledford, Cummings and Associates 1999; Leonard and Anslem 1973). Currently we are adapting Miles and Huberman's (1994) tabular methods to analyze our data. Our data analysis includes charts, tables and time lines.

Organization Overview

Formed in early 1996, the IT department is primarily responsible for maintaining the computing infrastructure within the Mays Business School at Texas A&M University. The department is organized into a flat organizational hierarchy with three full-time employees reporting directly to the associate dean and one full-time employee reporting indirectly to the associate dean. Although the associate dean is responsible for a number of other programs with the Mays School, in his role as the administrative head of the IT department his responsibilities include determining and enabling the overall direction.

In analyzing the duties of each role in the operational IT department, there is a strong interrelationship between and within the four operational roles. For instance, the system analyst II and the network administrator equally share responsibilities for five of the ten major responsibility areas and all but three major responsibility areas have explicit interrelationships or joint responsibilities among the four operational department members.

Presentation at the Conference

We have finished data collection and are currently conducting data analysis. At the conference, we should be able to present major findings from the case study and their implications for KM research and practice.

References

Akrich, M. "The De-scription of Technical Change," in: *Shaping Technology/Building Society,* W. Bijer and J. Law (eds.), MIT Press, London, 1992.

Akrich, M. "The de-scription of technical objects," in: *Shaping technology / building society: studies in sociotechnical change,* W.E. Bijker and J. Law (eds.), The MIT Press, Cambridge Ma, 1994, pp. 205-224.

Alavi, M. "Managing Organizational Knowledge," in: *Framing The Domains of IT Management: Projecting the Future Through the Past,* R. Zumd (ed.), Pinnaflex, New York, 2000.

Alavi, M., and Leidner, D. "Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly* (25:1) 2001.

Ardichvili, A., Page, V., and Wentling, T. "Motivations and Barriers to Participation in Virtual Knowledge-Sharing Communities of Practice," OKLC 2002, Athens, Greece, 2002.

Bieber, M., Segall, R., and Hiltz, S. "Towards Knowledge-Sharing and Learning in Virtual Professional Communities," Proceedings of the 35th Hawaii International Conference on System Sciences, 2002.

Boland, R., Tenkasi, R. and Te'eni, D. "Designing Information Technology to Support Distributed Cognition," *Organization Science* (5:3) 1994, pp 456-475.

Brown, J.S., and Duguid, C.P. "Organizational Learning and Communities-of-practice: Toward a unified view of working, learning, and innovation," *Organization Science* (2) 1991, pp 40-57.

Brown, J.S., and Duguid, C.P. "Knowledge and Organization: A Social-Practice Perspective," *Organization Science* (12:2) 2001, pp 198-213.

Brown, J.S., and Duguid, P. *The Social Life of Information* Harvard Business School Press, Boston, 2000, p. 320.

Brown, J.S., and Duguid, P. *The Social Life of Information* Harvard Business School Press, Boston, MA, 2000a.

Burt, R. *Structural Holes* Harvard University Press, Cambridge, MA, 1992.

Burt, R. "The Contingent Value of Social Capital," *Administrative Science Quarterly* (42) 1997, pp 339-365.

Burt, R. "Structural Holes Versus Network Closure as Social Capital," in: *Social Capital: Theory and Research,* R. Burt (ed.), Aldine de Gruyter, 2001.

Callon, M. "The Sociology of an Actor Network: The Case of the Electric Vehicle," in: *Mapping the Dynamics of Science and Technology: Sociology of Science in the Real World,* M. Callon, J. Law and A. Rip (eds.), Macmillan, Basingstoke, 1986a, pp. 19-34.

Callon, M. "Some elements of a sociology of translation: Domestication of the scallops and fishermen of St. Brieuc Bay," in: *Power, action and belief: a new sociology of knowledge?* J. Law (ed.), Routledge, London, 1986b, pp. 196-233.

Callon, M. "Techno-economic networks and irreversibility," in: *A Sociology of Monsters: Essays on Power, technology and domination,* J. Law (ed.), Routledge, London, 1991, pp. 132-161.

Coleman, J.S. "Social Capital in the Creation of Human Capital," *American Journal of Sociology* (94) 1988, pp S95-S120.

Contu, A., and Willmott, H. "Comment on Wenger and Yanow. Knowing in Practice: A 'Delicate Flower' in the Organizational Learning Field," *Organization* (7:2) 2000, pp 269-276.

Courtney, J.F. "Decision Making and Knowledge Management in Inquiring Organizations: A New Decision-Making Paradigm for DSS," *Decision Support Systems*) 2001.

Edelman, L.F., Bresnen, M., Newell, S., Scarbrough, H., and Swan, J. "The Darker Side of Social Capital," 3rd European Conference on Organizational Knowledge, Learning and Capabilities, Athens, Greece, 2002.

Faraj, S., and Wasko, M. "The Web of Knowledge: An Investigation of Knowledge Exchange in Networks of Practice," *Working Paper*) 2002.

Granovetter, M. "The Strength of Weak Ties," *American Journal of Sociology* (78:6) 1973, pp 1360-1380.

Granovetter, M. "Economic Action and Social Structure: The Problem of Embeddedness," *American Journal of Sociology* (91:3) 1985, pp 481-510.

Hansen, M. "The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits," *Administrative Science Quarterly* (44) 1999, pp 82-111.

Hansen, M. "Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Compaines," *Organization Science* (13:3) 2002, pp 232-248.

Hara, N., and Kling, R. "IT Support for Communities of Practice: An Empirically-based Framework," WP-02-02, Center for Social Informatics, Indiana University.

Harrison, S., and Dourish, P. "Re-Place-ing Space: The Roles of Place and Space in Collaborative Systems," CSCW, ACM, 1996.

Holsapple, C.W., and Joshi, K.D. "In Search of a Descriptive Framework for Knowledge Management: Preliminary Delphi Results," *Kentucky Initiative for Knowledge Management*: Paper No. 118) 1998, pp 1-27.

Huber, G.P. "Transfer of Knowledge in Knowledge Management Systems: Unexplored Issues and Suggested Studies," *European Conference on Information Systems* (10) 2001, pp 72-79.

Hutchins, E. "The Technology of Team Navigation," in: *Intellectual Teamwork: Social and Technological Foundations of Co-Operative Work,* J. Galegher, R.E. Kraut and L. Egido (eds.), Lawrence Erlbaum Associates, 1990.

Jarvenpaa, S., and Staples, D. "The Use of Collaborative Electronic Media for Information Sharing: An Exploratory Study of Determinants," *Journal of Strategic Information Systems*) 2000.

Latour, B. "Technology is society made durable," in: *A Sociology of Monsters: Essays on Power, Technology and Domination,* J. Law (ed.), Routledge, London, 1991, pp. 103-131.

Lave, J., and Wenger, E. *Situated Learning: Legitimate Peripheral Participation* Cambridge University Press, Cambridge, 1991.

Lazzarini, S., and Zenger, T. "The Strength of Churning Ties: A Dynamic Theory of Interorganizational Relationships," *Working Paper*) 2002.

Majchrzak, A., Neece, O., and Cooper, L. "Knowledge Reuse for Innovation," *Working Paper,* University of Southern California, 2001.

Majchrzak, A., Rice, R.E., King, N., Malhotra, A., and Ba, S. "Computer-Mediated Inter-Organizational Knowledge-Sharing: Insights from a Virtual Team Innovating Using a Collaborative Tool*," *Information Resources Management Journal* (13:1) 2000, pp 44-53.

McDermott, R. "Why Information Technology Inspired but Cannot Deliver Knowledge Management," *California Management Review* (41:4) 1999, pp 103-117.

Nahapiet, J., and Ghoshal, S. "Social Capital, Intellectual Capital, and The Organizational Advantage," *Academy of Management Review* (23:2) 1998, pp 242-266.

Orlikowski, W. "The Duality of Technology: Rethinking the Concept of Technology in Organization," *Organization Science* (3:2) 1992, pp 398-427.

Orlikowski, W. "Knowing in Practice: Enacting a Collective Capability in Distributed Organizing," *Organization Science*) 2002.

Orlikowski, W., and Yates, J. "IT's About Time: Temporal Structuring in Organizations," *Organization Science* (13:6) 2002, pp 684-700.

Poitou, J. "Building a collective knowledge management system: knowledge-editing versus knwoeldge-eliciting techniques," in: *Social science, technical systems, and cooperative work,* G. Bowker, S. Star, W. Turner and L. Gasser (eds.), Lawarence Erlbaum Associates, 1997, pp. 235-256.

Robey, D., Khoo, H.M., and Powers, C. "Situated Learning in Cross-functional Virtual Teams," *IEEE Transactions on Professional Communication*: (February/March) 2000, pp 51-66.

Schultze, U., and Leidner, D. "Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions," *MIS Quarterly* (26:3) 2002.

Sproull, L., and Kiesler, S. *Connections: New Ways of Working in the Networked Organization* The MIT Press, London, 1991.

Staples, D., and Jarvenpaa, S. "Using Electronic Media for Information Sharing Activities: A Replication and Extension," International Conference on Information Systems, 2000.

Swan, J., Newell, S., and Robertson, M. "Limits of IT-Driven Knowledge Management Initiatives for Interactive Innovation Processes: Towards a Community-Based Approach," Proceedings of the 33rd Hawaii International Conference on System Sciences (HICSS-33), Maui, Hawaii, 2000.

Szulanski, G. "Exploring Internal Stickiness: Impediments to the Transfer of Best Practice within the Firm," *Strategic Management Journal* (17) 1996, pp 27-43.

Tsoukas, H. "The Firm as a Distributed Knowledge System: A Constructionist Approach," *Strategic Management Journal* (17) 1996, pp 11-25.

Von Hippel, E. "Sticky Information and the Locus of Problem Solving: Implications for Innovation," *Management Science* (40:4) 1994, pp 429-439.

Wasko, M., and Faraj, S. "It is What One Does": Why People Participate and Help Others in Electronic Communities of Practice," *Journal of Strategic Information Systems* (9) 2000, pp 155-173.

Wenger, E. "Communities of Practice and Social Learning Systems," *Organization* (7:2) 2000, pp 225-246.

Zack, M. "Managing Codified Knowledge," *Sloan Management Review,* Summer 1999, pp 45-58.