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Social Shaping of Knowledge Management

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Abstract

With knowledge increasingly regarded as the most important asset for organizational success, knowledge management is gaining wider acceptance by many organizations. This paper takes a community perspective, emphasizing communities of practice (Lave and Wenger, 1991) and networks of practice (Brown and Duguid, 2000). In this paper, we report on a case study with the information technology group at Texas A&M University and discuss how people (learning in the group) and an organization (learning by the group) actually learn. Finally, we discuss ways of utilizing information technology in communities and networks of practice.

Introduction

Knowledge is increasingly regarded as a critical resource for firms and economies (Drucker 1993; Reich 1992). Recently, several management and organizational theorists have argued that knowledge is an important asset for organizational success (Brown and Duguid, 1998; Davenport, et al. 1996; Nonaka and Takeuchi 1995). Thus, knowledge management is gaining wider acceptance by many organizations (Ruggles 1998; Zack 1999).

Many IS researchers (Alavi and Leidner 1999, 2000; Swan et al. 2000) have popularized information systems that support knowledge management. Recent literature suggests three perspectives on the design of knowledge management systems (KMS) to support knowledge creation and sharing: knowledge as objects, knowledge embedded in people, and knowledge embedded in communities (Wasko and Faraj 2000).

Our paper takes the community perspective, emphasizing communities of practice and networks of practice. First we introduce "community of practice" (Lave and Wenger, 1991; Wenger, 1998) as useful in exploring how people (learning *in* an organization) and an organization (learning *by* an organization) actually learn. We also consider "networks of practice" (Brown and Duguid, 2000). In the next section, we report on a case study with the information technology group at Texas A&M University. Finally, this paper discusses ways of utilizing information technology in communities and networks of practice.

The Community Approach

The community perspective suggests that knowledge is both produced and held collectively in social practice (Cook and Yanow, 1993; Brown and Duguid, 1998; Lave and Wenger, 1991). This perspective has stemmed from theories of practice such as Activity theory and Dewey's pragmatic inquiry (Wenger, 1998). We believe the "communities of practice" concept is useful in exploring how people actually learn and how organizations create and share knowledge. We further believe that the communities of practice concept may provide a better understanding of learning and knowledge by offering a practice-oriented view to the area of knowledge management rather than the prevalent "process-oriented" view that is heavily influenced by the business process reengineering paradigm.

Community of Practice

The term "community of practice" was coined by Lave and Wenger (1991) who defined 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 in the Italian construction industry (Gherardi, Nicolini, and Odella, 1998), chief executives (Easterby-Smith and Gherardi, 1998), and research scientists (Brown and Duguid, 2000).

While researchers have used a wide range of definitions to explain communities of practice, generally speaking a community of practice is a human activity system or a relatively tight-knit group of actors who know each other and work together directly. The groups of people are informally bound together by shared experiences and passion for a joint enterprise. Examples would be engineers engaged in deep-water drilling, consultants who specialize in strategic marketing, or managers in charge of check processing at a large commercial bank (Wenger and Snyder, 2000). Communities of practice should not be created in a vacuum and cannot be mandated by managers (Wenger and Snyder, 2000). A community of practice is a self-organizing, complex adaptive system, with members' practices reflecting their understanding of what is important. Outside constraints or directives can influence this understanding, but members develop practices that are their own response to external influences (Wenger, 1998). They demand direct coordination that inevitably limits reach and increases the need for reciprocity (Brown and Duguid, 2000).

Networks of Practice

Management researchers have suggested 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, we argue that organizations should see the value of an inter-organizational aspect of learning and the way communities of practice transcend organizational boundaries. If organizations recognized this value they would be more likely to create wider occupational communities, what Brown and Duguid (2000) call "networks of practice." 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.

Organizational members are likely to belong to several networks of practice, linking communities of practice in an organization to other communities of similar practices in different organizations. Typically the members of the network of practice are dispersed geographically, limiting the amount of knowledge that can be shared. Thus, in order to develop and maintain a close community bond, networks of practice use conferences, conventions, newsletters, journals and other means of keeping members in contact with one another (Pickering and King, 1995).

Case Study

We used the case study method (Strauss & Corbin, 1998; Yin, 1994) to examine the characteristics of communities of practice. Our case study consisted of focused interviews (Merton, Lowenthal, & Kendall, 1990) with each of the five full-time members of the IT group at Texas A&M University's Lowry Mays College of Business. A case study method was most appropriate for this research because it provides a deeper understanding of communities of practice within a real-world context; the IT group within the Lowry Mays College was chosen because the small group size would allow investigation of the entire group. Formed in early 1996, the IT group is primarily responsible for maintaining the computing infrastructure within the Lowry Mays College of Business. The group is organized into a flat organizational hierarchy with three full-time employees who report directly to the associate dean and one full-time employee who reports indirectly to the associate dean.

Each interview was approximately ninety minutes in length. To achieve validity, each of the five interviewers prepared and shared interview notes and perceptions with the other interviewers (Kilmann, 1999). Interview data was also corroborated by internal written documentation. Follow-up interviews, electronic communication, and review by members of the IT group helped clarify issues and validate observations (Lawler, Mohrman, Mohrman, Ledford, Cummings, & Associates, 1999).

Findings and Discussion

In this section we discuss the findings from our case study. The findings support our discussions about communities, networks, and theories of practice.

✦ The interviews show that communities of practice do exist.
The responses from five members in the IT group reveal that communities of practice exist within the IT group, across the university, and across the university's boundaries. There is a community of practice within the IT group where they share new problems and answers. The group has a face-to-face meeting every week with the associate dean. With the exception of the associate dean, IT members work very closely and share their daily experiences and information.

There are communities of practice across the university composed of people from IT groups in other colleges and staff from the Computer Information Services (CIS) unit. CIS is responsible for campus-wide computer networking and security. Since CIS is part of the larger university network, members of both groups are required to meet and share information. The two system administrators within the college's IT group believe that IT people in other colleges within the university are their most valuable source of information.

The IT group that we studied also engaged in communities of practice that crossed organizational boundaries. These communities include suppliers (e.g. Dell, Microsoft, Microstrategy) and clients (students, staff, and faculty). Each member of the IT group that we studied had a community of practice with his clients (particular students, staff, and faculty members) and IT vendors. For instance, the associate dean belongs to a community of practice with practitioners, faculty, and people in administrative positions in other universities to stay abreast of new information technologies and market trends.

✦ Each member of the information technology group belongs to more than one community of practice.
For example, the building facilitator forms a community of practice with the information technology staff in other colleges and with the university information technology group. We also noticed that he forms another community of practice with the staff in the fiscal department and policemen for building security issues (the fiscal department is in charge of building security in this university).

✦ Learning is situated.
The interviews show that IT members learn primarily from one another and from their daily activities. Some of their comments include:
• "The primary training is on-the-job. We learn from actually doing"
• "Technology is changing so rapidly that documentation is often not applicable"
• "We are too busy to document work"
• "We can solve almost every problem together. If we cannot, we call suppliers. But this case is rare"
• "Even though I read three to four trade magazines to keep updated with the rapid pace of technological changes, the best way of learning is from contacting my colleagues in academia and industry. I confirm my decisions with them"

✦ Networks of practice do exist.
The interviews show that every IT member relies on his networks of practice. For instance, the system administrators gets information from the Internet Security Forum, a listserv about networking, and technical seminars. The building facilitator reads catalogues and two kinds of magazines every day to stay abreast of market trends and the latest technology. He also gets information by attending trade shows like Infocomm, attending a quarterly meeting for facility managers across the university, and from subscribing to a list serve dedicated to facility issues. The web technician belongs to several networks of practice (e.g., one for structured query language and another for Information server training seminars), trade journals, white papers, mailing lists, newsgroups, and news on the web.

✦ Peer recognition occurs in the communities of practice.
The young system administrator is recognized by other members as the "high achiever" in the group. Peer recognition seems to play a role as part of the incentive system in communities of practice.

Based on this study, we suggest that successful knowledge workers need more than abstract domain knowledge – "know-what" (Ryle, 1949). They also need "know-how" (Ryle, 1949), embracing their ability to put "know-what" into practice. It is dispositional knowledge that is brought out in practice. Know-how is acquired by doing and critical in making knowledge actionable and operational (Brown and Duguid, 1998). The interviews show that IT members are aware of political issues ("not

to tell faculty what software to use"), funding problems, etc. They believe that interpersonal and communication skills and the ability to work with other people are more important than domain knowledge. For example, the building facilitator told us,

The most challenging part in work is establishing the priority between work and family. Also since I have to report to two bosses (associate dean and executive dean), it is difficult to decide which work to give the priority. Because of this, I am reading a couple of magazines about personal management every week to learn work management skills.

Our findings are similar to what was found in Barley's (1996) five-year ethnographic study on technicians' work. His study shows that technicians valued experience over formal training partly because technologies and techniques changed so quickly. Furthermore, most technicians claimed that a technical education was useful for learning a more disciplined approach to solving problems but believed that the substantive knowledge that proved most critical for unanticipated troubles came from neither courses nor books, but from experience. For unanticipated troubles they had to piece together most of the information necessary for resolution from the situation itself.

Implications for Designing Knowledge Management Systems

Several researchers (McDermott, 1999; Manville and Foote, 1996; Markus and Benjamin, 1997; Malhotra, 2000) have found that despite substantial investment by organizations in advanced technologies such as datamining, groupware, networking, online conferencing, Intranets, etc., most organizations have experienced little return on their investments because they have failed to form and connect communities. Investments in the latest information technology may provide a way of communicating but not a way of forming communities of practice. In the next section, we will discuss some ways of taking advantage of information technology to support communities and networks of practice.

IT Affordance to Identify Communities of Practice

Can IT *afford* (Gibson's, 1979) to identify the existence of communities of practice within an organization? Since communities of practice are self-organizing and informal they cannot be mandated. However, in many cases communities that develop an organization's core competencies already exist. While it is relatively easy to identify communities of practice in small organizations, such is not the case in a large, multinational organization. All organizations must identify critical networks of people and facilitate their coming together as a community of practice (Wenger and Snyder, 2000). Facilitating the development of these communities of practice will facilitate an organization's effort to reach their full potential. .

Communities of practice are as diverse as new situations that give rise to them (Wenger, and Snyder, 2000). People form communities for a variety of reasons, such as new areas of interest, corporate restructuring, and changes in the business environment. For example, the rise of electronic commerce has created new communities in organizations. As organizations struggle with understanding the potential of electronic commerce, they search a variety of channels in order to increase their knowledge; this is a time-consuming process. In many cases, information seekers in one organization are not aware of other members in the same organization with similar interests and information needs. Unfortunately, this lack of awareness of similar knowledge needs and the resulting lack of sharing of new knowledge slows down the speed of organizational learning. This reduced speed of learning may hurt the organization as many believe (DeGeus, 1988; Brown, 1999) the ability to learn faster than competitors is the only remaining source of competitive advantage. In this sense, identifying new areas of interest and facilitating the development of communities of practice are critical to gaining a competitive advantage. There may be a number of ways to deploy information technologies to identify extant communities of practice. For example, management could analyze their corporate databases, intranets, and extranets to gain insight into existing communities of practice. Extant knowledge discovery and datamining methodologies such as classification, clustering, pattern recognition, machine learning, data visualization, text and web mining, and advanced business intelligence applications might be helpful for this purpose.

Web-based interviews or surveys may be a more direct way of collecting information about domains of current interest among organization members. This information can be shared through corporate intranets and can facilitate communication and awareness of those working in similar areas. This practice may increase the number of communities beyond organizational and geographical boundaries within an organization.

However it is suggested that the task of identifying potential communities should not depend solely on technology and engineers but be accompanied with direct interviews with members and close observations of everyday work by managers and, if possible, experts from non-business fields like anthropologists and behavioral scientists. In fact, such a task not only identifies potential

communities but also reveals workplace practices, indicating the ways people actually work, create and share knowledge. Further this provides senior management with a better understanding of how to support theses communities.

Xerox's 1996 launch of Eureka is an example. Eureka is an intranet communication system linked with a corporate database that helps over twenty-five thousand service representatives share repair tips. Eureka was the result of an 18 month study by anthropologists, behavioral scientists, and engineers at the Xerox Palo Alto Research Center. One anthropologist involved in this project published some detailed ethnographic studies of the service technician's work (Orr, 1990, 1996). These studies showed a difference between what service representatives were assumed to do (standard operating procedures) and what they actually did to get the job done. While actual practice is not always clearly shown in an organization's standard operating procedures, it is actual practice that determines the success and failure of an organization (Brown and Duguid, 2000).

Orr's study shows that most of the knowledge within work groups comes from their "war stories". The war stories are what allowed service representatives to teach one another to diagnose and fix machines. Drawing on Orr's findings, Eureka is people-driven not technology-driven, and facilitates Xerox's service reputation in sharing their war stories in the form of electronic tips. Eureka is a self-organizing system; there is no dedicated staff to collect information and write up stories or scripts. Eureka is also self-sustaining; service representatives understand the purpose of Eureka and maintain the system's knowledge base by contributing and renewing tips to the system. Because fellow service representatives recognize the importance of Eureka they are motivated to continually contribute their tips. This peer recognition was the source of Eureka's self-sustainability (Wah, 1999). Eureka's knowledge base is different from the traditional knowledge base that contains an expert's knowledge only and is aimed at transferring the expert's knowledge base into peripheral members. Eureka's knowledge base is applied to new situations, examined, and renewed everyday by members.

Information Technology Affordance to Form and Connect Communities of Practice

Today many organizations have thousands of geographically dispersed members. It is important to provide an information technology infrastructure that can integrate organizational members in dispersed locations and facilitate the development of communities of practice. Can communities of practice be scaled up through information technology? Or can communities of practice be virtual? Can IT *afford* a way of "forming" communities of practice?

With the popular concept of "virtual communities, virtual spaces, or distributed learning", some work has been undertaken to explore the use of information technology in forming communities of practice. Some studies have focused on replacing the physical world with the virtual world. In many cases the medium is multimedia communications (e.g. MUDs, MOOs, and virtual reality). While these mediums were originally used for entertainment, these mediums may provide people with *spaces* for collaboration and communication. Harrison and Dourish (1996) found that collaborative systems that mimic the spatial organization of the real world can support the emergent patterns of human behavior and interaction which our everyday actions in the physical world exhibit.

However the spatial model's application in business environments is limited because knowledge sharing and creation in the real world is much more complex than described in theory. The spatial model fails to recognize that communities of practice exist not in spaces but in places that require not only content, reach, and formality but also context, reciprocity, and informality – social periphery - residing in being with other people and their everyday activities in the physical world. A place is generally a space with social meaning, convention, cultural understanding about role, function and nature (Harrison and Dourish, 1996) and thus should be understood in its social sense (Poitou, 1997). The sense of place cannot be inherent in the system itself but must be forged by the members of communities (Harrison and Dourish, 1996). Thus the media of virtual communities of practice should be shared practice, identity, and common purpose based on social interaction, not the computer system itself.

While advanced information technologies like the Internet enable virtual social interaction to some degree, face-to-face interaction is necessary for effective social interaction which needs geographic, social, cultural, and emotional "proximity" among members. The proximity is not readily replaced by the computer system. An interview-based study (Robey, Khoo, and Powers, 2000) of virtual cross-functional teams as communities of practice reports that team members mentioned the value of face-to-face interaction with their remote counter-parts through business travel and quarterly business meetings and they used this knowledge to greater advantage when communicating remotely. The authors 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).

It is suggested that instead of trying to replace communities of practice with technology, decision makers should use information technology to extend and complement communities of practice. Easy-to-use corporate intranets may be suitable for extending

the local scope of communities of practice into global levels. In the intranet environment, members of communities of practice understand different worldviews through circulating different boundary objects like cognitive maps. Well-designed corporate Intranets support both extensive reach and reciprocity, which can be defined as a mutual understanding through complex, multi-directional, implicit negotiation (Brown, 1998). Also various advanced information visualization techniques can be used to create yellow pages for communities of practice and "who knows what" within an organization.

Summary

Knowledge management implies a shifting paradigm from the computer system itself and process to people and practice. In this paper, we were interested in the community perspective; particularly using the concept "communities of practice" to explain how people learn and share ideas and knowledge. We argue that organizational members learn and share knowledge through participating in varying communities of practice which are often invisible in the formal organizational chart. Drawing on another work-related group, "networks of practice", we argue that there is an imperative need for shifting the whole notion of knowledge management from "protecting" and "killing competitors" to "flowing" and "co-evolution."

This paper explored ways of deploying information technology to support communities and networks of practice. We have found information technology limited in readily replacing context, informality, and reciprocity; however, our existing technologies can extend and complement them. We propose internet-based systems as facilitators of communities and networks of practice, promoting organizational and interorganizational learning and knowledge sharing!

Acknowledgement

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