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Knowledge management A model for organizational learning

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Abstract

This paper presents a model developed with the help of the Knowledge Management Special Interest Group (KM-SIG) of the Consortium for Advanced Manufacturing-International (CAM-I) with organizational implications for managing knowledge. The KM-SIG model rests on knowledge domains that exist in an organization's environment. Firms engage in knowledge management practices for the purpose of filtering knowledge into its core, stable processes where that knowledge can be used to produce value for the firm. The model presented in this paper identifies the route knowledge takes in this filtering process. The filtration mechanisms that accomplish this process are project teams, knowledge communities, communities of practice and knowledge networks.

Keywords: Knowledge management; Communities of practice; Knowledge communities; Knowledge creation; Innovation; Organizational learning; Tacit knowledge; Explicit knowledge

1. Introduction

Knowledge management, as Hansen et al. (1999, p. 106) pointed out, is nothing new, but instead is newly practiced. As our economy entered the industrial age in the latter part of the nineteenth century, firms required, in varying degrees according to industry and market, shifts to capital intensive technologies. In recent decades, as the developed economies of the world

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have entered an age in which firms rely more on intellectual capital and assert claims to intellectual property, efforts in the management of knowledge have commanded increasing levels of resources.

Knowledge management has captured the attention of firms as one of the most promising ways for organizations to succeed in the information age. At least two challenges present themselves in today's economy causing firms to take an increased interest in knowledge management. First is an aging work force. As the "baby boom" generation makes its way into their 50s and 60s and approaches retirement, the cumulative experience and tacit knowledge of that generation threatens to retire with it. For example, one major defense contractor, that relies heavily on human capital estimates that 90% of its workforce will be eligible for retirement within the next 10 years. Such firms are engaging in strategic initiatives to capture critical tacit knowledge from its workforce with respect to critical processes.

Importance of knowledge residing within the human resources of firms seems to be underscored by perceptions of managers of those firms. Joyce and Stivers (2000) in a survey of U.S. and Canadian executives concluded that those individuals believe the key difference in operating their businesses in 2005 as compared to 1995 will be management of knowledge resources. They further concluded that the surveyed executives "view knowledge resources as critical to their success" (p. 10).

The second challenge is a rapid advance in technology. Information flows within organizations can occur so rapidly that human decision-makers are often left behind. Rapid technological advance, fortunately, presents an opportunity as well. What firms know (to borrow a title phrase from Davenport and Prusack, 2000) seems to be increasing at an increasing rate. First, communication media such as the Internet have enhanced individual capacity to find information pertinent to the performance of daily tasks. Second, the speed with which business is conducted today (and a corresponding number of decisions that have to be made) has increased. Thanks to B2B, B2C, ABC, JIT, CAD, ERP, etc., time to market has decreased, product development life cycles have shortened and consumer demands for new designs and better functionality of products have all contributed to an increased need for information. Fortunately, the same technology boom that has contributed to a more complex environment also offers potential solutions by extending our ability to exchange and archive information. For example, enterprise resource planning (ERP) models are becoming increasingly functional, allowing for more seamless exchange of data across and within organizational boundaries.

Davenport (1999) suggested that in response to challenges such as those above, attempts at knowledge management have, in many cases, become burdensome having become too broad in scope. The purpose of this paper is to present a model of knowledge management that is the result of work conducted over several years by the Knowledge Management Special Interest Group (KM-SIG) of the Consortium for Advanced Manufacturing-International (CAM-I). Members of the KM-SIG who consistently participated in the study of knowledge management and their affiliations, as well as firms, government agencies and universities that presented their ideas on knowledge management to the KM-SIG, are listed in Appendix A.

2. How and where organizations learn: a model for knowledge management

Consistent with their ongoing strategies, firms seek to employ resources in a way that will maximize profits for the firm, and thus maximize shareholder value. Firms invest efficiently in core, stable, mission critical processes (hereafter core processes), designed to carry out their fundamental strategies. Beyond those core processes, project teams feed new ideas, process better ways of doing things, develop new products and technologies, and accomplish all those tasks necessary to make the firm both grow and become better at what they currently do. But where do firms acquire the information that feeds their project teams and core processes? Where do firms acquire the ideas that lead to new and innovative thought, new products, new processes, etc? Also, how might firms facilitate creation and transfer of knowledge within their organizational structures?

As O'Dell and Grayson (1998, p. 108) suggest, change cannot be left to chance. They argue that in responding to questions such as those proposed above, a firm must establish a "knowledge infrastructure." What, then, does, or should, that infrastructure look like? The answer proposed in this paper attempts to address both the positive and normative dimensions of that question. It lies in the form of a series of more loosely constructed networks whose role it is to probe the environment in a less structured and probabilistic fashion, ferreting out those bits and pieces of knowledge that may at some point add value to the organization. From a positive perspective, the model described here represents, in various configurations, what organizations do, or would like to be able to do, as observed by the CAM-I member firms as well as representatives of companies presenting their knowledge management efforts to CAM-I. Normatively, the model can also serve as a guide for building, in a more structured way, an organizational vehicle designed to capture, process and manage knowledge consistent with the goal of maximizing value for the firm. A graphic representation of the model is depicted in Fig. 1.

The remainder of this paper describes each of the model's components and their role in facilitating knowledge management and learning in an organization. A summary and recommendations for future study are also provided.

2.1. Knowledge domains

Exhaustively underlying the model in Fig. 1 are knowledge domains that exist both internal and external to the organization. Each structure within an organization ultimately draws knowledge, either directly or indirectly, from the various knowledge domains. Simply stated, knowledge domains represent the population of knowledge from which to draw, and knowledge bases acquired by organizations through a knowledge management system are, by definition, subsets of these domains.

Another way of thinking of knowledge domains is that knowledge resides everywhere around the workings of any organization. The critical question is how does that organization filter knowledge from those domains into its core processes?

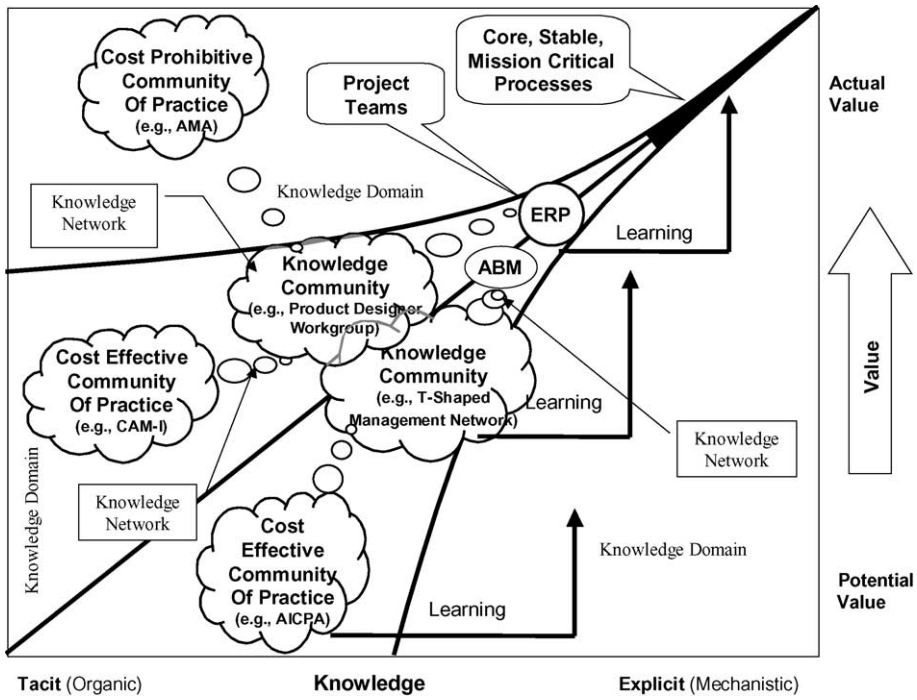

Fig. 1. Conceptual model for knowledge management.

2.2. Knowledge networks

From knowledge domains, a complex and extensive array of knowledge networks seeks to organize and communicate knowledge. Knowledge networks are vehicles through which knowledge may be communicated or conveyed. Perhaps, the most significant advance in knowledge networks facilitating knowledge and information management is development of the Internet. The Internet has provided a network whereby exchange of ideas is much more easily facilitated than was the case prior to its existence. A variety of search engines have further facilitated use of that medium by increasing the efficiency by which a manager may locate relevant sources of knowledge and information.

Firms routinely maintain internal networks (e.g., an intranet) designed to facilitate communication within the organization. Repositories or databases may be maintained to facilitate exchange of information when there is an asymmetry of needs and expectations. In other words, at one point, an employee may deposit information into a database in order that it may be used elsewhere in the organization when needed.

Knowledge networks also facilitate alternative digital exchanges. Organizations, for example, have the capability to embed digital images of processes into on-line training facilities, such as with the defense contractor that is capturing many of its tacit processes in exactly this way, slowly building a fully functional JIT, on-line training

facility. Such capacity affords interesting and innovative ways of accomplishing knowledge management initiatives.

Of course, a variety of other networks exist that facilitate the exchange of knowledge, including newsletters, interoffice memoranda, white papers, professional publications, office libraries and so on. Even video archives constitute knowledge networks. Essentially, knowledge networks are the media by which knowledge (as well as information and data) are conveyed. Knowledge networks need not dwell exclusively in the technical. As Davenport and Prusack (2000, p. 106) states: "Firms need to shift their attention from documents to discussion." As will be discussed later, knowledge management often is most effectively accomplished through careful and strategic management of human resources.

2.3. Strategic alignment

In Fig. 1, three lines (one straight, two curved) emanate from the top right corner of the figure, flowing down and to the left. The center of these, or the straight line, represents the strategic alignment of the organization. Identification, capture and transfer of knowledge within the firm are expected to be in alignment with the organization's strategic objectives.

In pursuit of new knowledge, however, an organization is required to make probabilistic assessments of the likelihood of a particular activity resulting in the transfer of knowledge up and into the core, stable processes of the organization. As managers make decisions on whether to incur costs in pursuit of the mining of various and different knowledge domains, they must do so in the context of whether that pursuit potentially will produce strategic value. That value may come in the form of better decisions, creation of innovative or creative ideas, improvement of business processes, etc. Ability to predict if a particular knowledge domain will produce strategic value is a function of how far removed it is from the most basic operations of an organization.

The area within the curved lines and emerging from the strategic alignment ray represent a region in which knowledge domains have strategic value. Decisions on whether to engage in searches for new knowledge become probabilistic in nature and require judgment on the part of a manager or employee in assessing the expectation of a net positive return from expending resources in such a search. When an accounting firm, for example, sends a tax employee to a state certified CPE course entitled "Tax Updates," the firm can be fairly confident that the knowledge domain will be closely aligned with the firm's strategic alignment, including the alignment of that particular employee. As a result, there is a higher probability that the firm will realize a positive net value from the knowledge acquired as a result of sending the employee to the training. Alternatively, it may be less certain that sending an audit professional to the same course will yield as high a level of benefit, if any. In that way, and conceptually, an organization begins approaching the curved lines representing decreasing probabilities of a net, positive return from resources consumed in pursuit of strategically valuable knowledge. When an organization determines that costs to acquire new knowledge exceed what they expect to be the resulting benefit, the organization, by definition, has ventured beyond the region described. This brings us to the scales depicted in the margins of the model in Fig. 1.

2.4. Tacit and explicit knowledge

Within the boundaries of information systems, organizations tend to focus their efforts on that which is explicit, or mechanistic, in nature. To be effective in achieving the goals set forth before, knowledge management must enable the conversion of knowledge from the tacit to the explicit. As is feared by the defense contractor mentioned previously, knowledge is lost as personnel retire. Knowledge is also lost as individuals with special and marketable skills leave for other jobs. The loss consists of the combinations and synergies of skills that make up the knowledge of that lost work force. Knowledge management efforts designed to remedy this problem are focused on the capture of tacit knowledge (thus, converting it to explicit). An example of this is an initiative by the aforementioned defense contractor to videotape many of the more complex processes in its manufacturing facilities and to make them available in an on-demand, on-line training environment. Unfortunately, the truth that Polanyi (1966, p. 4) alludes to is that there will always be more knowledge known than documented. As a result, any knowledge management initiative that focused exclusively on the capture of tacit knowledge would always be an incomplete strategy.

Hansen et al. (1999) described two basic strategies for knowledge management: personalization and codification. The approach adopted by the defense contractor described above is an example of codification, i.e., one of capturing and archiving knowledge. Efforts designed to solve the problem of employee departures can also take on a personalization strategy, or one whose focus is on maintaining diverse and comprehensive skill sets among their employees. That strategy, rather than focusing on capture of knowledge (i.e., moving from left to right on the bottom axis) would instead focus on facilitating interpersonal communications, improving retention or possibly improving the organization's ability to locate and hire people with specialized knowledge. Maintaining a combination of both strategies may be the only way of maximizing retention of existing tacit knowledge resources and availing the organization of tacit knowledge domains with potential value to the organization.

2.5. Potential and actual value

A critical component for most organizations is the conversion of knowledge into value. The challenge for knowledge management is to identify those knowledge domains possessing potential value for the firm and converting them into actual value.

There are a number of attenuations to this part of the model. First, there exist diminishing marginal returns in the pursuit of new knowledge. Organizations, managers and individuals must make conscious decisions about the proportion of time allocated to knowledge acquisition. At British Petroleum, for example, managers find at times that their calendars are overly consumed with knowledge efforts at the expense of their assigned roles at the firm. While this does not preclude the possibility that certain workers may be more engaged in knowledge acquisition (e.g., think tanks), even those employees must, at some point, engage in knowledge transfer activities to justify their costs.

Second, the region in which firms choose to engage in knowledge acquisition shifts with every change in strategy, including introduction of new business initiatives such as

new products, expansions into new regions, etc. What was judged one day not to be of potential strategic value may the next day present potential for such value. For example, Albertson's grocery chain currently does not engage in retail operations other than in the United States. As a result, endeavors to acquire knowledge in matters of the legal and tax implications of operating in Canada would likely not be undertaken. If Albertson's were to decide to shift strategies and introduce stores into Canada, such knowledge would clearly fall within the region of strategic importance. With the base of the model described, the means by which firms actively engage in knowledge management can now be discussed.

2.6. Core, stable, mission critical processes

At the center of a firm's operations, and thus information gathering efforts, are its core processes. The primary goal of information systems is to support decisions with respect to these processes. At this level, information takes the form of supporting the most fundamental decisions a firm makes: those directly related to its core business and thus directly impacting profitability. Examples of information at this level vary widely, driven largely by the array of decisions this information supports.

Decision-makers play the critical role within core, stable processes as they relate to acquisition and deployment of information and knowledge. For example, a production manager draws information from established models designed to assist their typical decisions (e.g., raw materials requirements). The production manager may also draw information from sources selected (or found) by the manager. For example, subscription to a listserve maintained by a consortium of production managers may result in information the production manager can immediately use in his/her management role. Other participants on the list may in turn contribute production designs, not previously considered by the manager, that prove of value to the manager's organization.

The area of interest here is that part located in the upper right hand corner of Fig. 1 (labeled as core, stable, mission critical processes). Knowledge incorporated into systems, and thus into decision support, tends to be explicit and with ascertainable value.

2.7. Project teams

Within and supported by the organizational structure are project teams. Firms at this level have identified strategic opportunities with a high probability of delivering value and have assigned development of these opportunities to project teams. While these opportunities are not yet captured within the core stable processes of the firm, they do represent those projects management believes to have the greatest potential of delivering value.

Project teams can assume tasks of a wide variety. There may be, for example, project teams established to design next generation products of an established line (e.g., the project team at Boeing charged with designing the 777). Other project teams may take on the task of developing an entirely new product line, such as a new strike fighter to be built for the government. Still other project teams may be charged with the role of taking on less product-

related projects, such as the implementation of a new ERP system or an activity-based management system (both of which are depicted as examples in Fig. 1).

In general, roles of project teams tend to be developmental in nature, but normally with a clear sense of direction and purpose. Innovation that occurs at this level tends to manifest less in the character of the end product (since that is usually well defined at the outset of the project) and more in the processes and substance taken to achieve the product. When Boeing embarked on the 777 project, innovation occurred in many places, particularly in the design process itself; but individuals involved on the project understood that the finished product would be the next generation of long range, wide-body airplane. Further, best practices in process design were quickly filtered up into the core, stable processes of the company.

For organizations to fully avail themselves of opportunities to identify and develop new knowledge domains, they must venture beyond the bounds of their core processes and project teams. Such ventures can be accomplished in either of two ways: either at the behest of an organization, or by communities that form organically among employees of an organization. These two types of communities are referred to as knowledge communities and communities of practice, respectively.

2.8. Knowledge communities

Xerox is one such company that actively engages knowledge communities in their business. Their practice of establishing knowledge communities as a means of connecting individuals with common strategic interests provided the KM-SIG the foundation for its distinction of knowledge communities and communities of practice. There are two principal qualities that distinguish knowledge communities from communities of practice in their role of filtering knowledge up and into the firm's core processes. The first is that the firm takes responsibility for identifying likely areas of interest and establishing these communities (as compared to simply allowing them to form organically). The second quality is that while the organization actively establishes and supports these communities, they typically do not have well-defined goals, other than to expand thinking along common areas of interest.

As implied in Fig. 1 by the cloud, direction and objectives of knowledge communities tend to be less well defined. They are, instead, formed because management of the organization believes that there are specific knowledge domains that bear potential value for the firm, and that there are common interests across the organization that might facilitate a synergy through sharing of best practices, common problems and their solutions, expertise, etc.

Hansen et al. (1999) provide an interesting perspective on a form of knowledge community (although they do not identify them as such) in their description of their "personalization strategy." As discussed earlier, this strategy emphasizes interpersonal communication of knowledge, rather than relying on a knowledge repository for facilitating knowledge sharing. Databases within the organization point to experts in subject areas rather than providing actual knowledge. In this way, a community is formed that supports specific subject needs within an organization. Transfer of knowledge is accomplished by interpersonal communications within a knowledge community, rather than reliance on archived knowledge.

Hansen and von Oetinger (2001) also describe communities among managers at British Petroleum (BP) that qualify as knowledge communities. Labeled "T-shaped management," BP organizes division managers in a network of "collaboration and networking" (p. 109) that seeks to make available best practices and access to expertise of units horizontally across the company. If, for example, a geologist working at Prudhoe Bay encounters a problem related to working in the Arctic region, there is a high probability, with the expansiveness of BP's operations, that another geologist has encountered the same problem. The principle behind BP's efforts is that instead of re-solving the problem, the geologist should have a network available to him or her that will more efficiently lead them to a solution to the problem.

2.9. Communities of practice

Referring again to Fig. 1, note that beyond the structured environs of knowledge communities are communities of practice (CoP). Like knowledge communities, CoP can (and are more likely to) extend beyond the boundaries of the firm. They include such communities as professional organizations and their special interest groups (e.g., CAM-I and the KM-SIG).

Unlike knowledge communities, however, which are organized by the firm for the purpose of filtering knowledge for potential value, CoP are organic in nature; that is, they form spontaneously in response to professional interests that lie within the firm. Wenger and Snyder (2000, p. 139) define CoPs as "...groups of people informally bound together by shared expertise and passion for a joint enterprise..." Brown and Gray (1995) more elaborately draw out the boundaries of CoPs in the following way:

> At the simplest level, they are a small group of people who've worked together over a period of time... not a team, not a task force, not necessarily an authorized or identified group... [who] perform the same tasks... or collaborate on a shared task... or work together on a product... They are peers in the execution of "real work." What holds them together is a common sense of purpose and a real need to know what the other knows. (p. 45)

CAM-I is a very good example of a sophisticated and focused community of practice. CAM-I members pay an annual fee to belong. In turn, meetings are held quarterly in which approximately a day and a half are dedicated to special interest groups (such as activity based management, activity based budgeting, project management, etc.). Another day is dedicated to a series of three or four focused presentations. During the meeting, there is ample time programmed in which members may interact on a less formal basis. In this way, CAM-I serves as a fertile medium in which "peers in the execution of 'real work'" (Brown and Gray, 1995, p. 45) may share knowledge.

Focusing more broadly, Nonaka (1991) identifies the organization as less like a machine than an organism. One might argue that it is the organic nature of CoPs that most comprehensively brings that quality to organizations. CoPs are self-selecting as well as self-sustaining. They do not rely on the organization to sanction them and, in fact, may even exist contrary to expectations of the organization. And while the organization *may* foster such communities (e.g., allowing time away from work to participate in meetings of CoPs,

recognizing and/or rewarding involvement in CoPs, paying dues, travel costs, etc.), members therein must have an interest, even a passion, for what they are doing, and thus cause the community to sustain itself.

Simultaneously, organizations must also consider the probabilities that costs of involvement in CoPs will add strategic value in the long run. Because benefits of involvement in CoPs are probabilistic in nature, a manager must make a subjective evaluation of whether to support such activities. For example, at one time, there were two individuals working with the KM-SIG at CAM-I, but working for two different supervisors. One supervisor continued to perceive benefit to having their employee attend the quarterly meetings, while the other supervisor came to the opposite conclusion and discontinued their support for that individual. The first manager, by our definition, is judging the CAM-I activity to fall in the cost-effective region of strategic alignment while the second manager believes the activity to fall outside that region.

Williams and Cothrel (2000) investigated the characteristics of 15 on-line communities. They identified on-line communities as those that engaged in many-to-many interactions on-line. That is an effective way of thinking about the ways in which CoP operates. In a CoP, the essential element is the sharing of ideas among individuals with a common interest. In this way, Williams and Cothrel argue, CoPs are the "true seat of collaboration, learning and innovation in organizations."

Ultimately, the value added by CoPs depends on a manager's ability to convert information and knowledge acquired from CoPs into their organization's core processes in a way that is economically beneficial. As discussed above, this depends on an employee identifying and then capturing, either tacitly or explicitly, knowledge that is then used to make decisions within the organization that produce value.

2.10. The learning process

Nonaka (1991), rather than focusing on learning, focuses on knowledge creation. Here, knowledge creation is posited as a subset of learning. Nonaka identifies knowledge creation as serendipitous and learning would qualify for that descriptor as well. At a core, stable level, knowledge flows within an organization are expected to be highly functional—that is, their contribution to value is readily identifiable. But for firms to survive in an information age, they must engage more organic and probabilistic means of pursuing new sources of knowledge.

Simultaneously, however, Amidon (1997, p. 31) points out that knowledge management, if the organization is to take any interest in it, must extend beyond merely the serendipitous. If organizations are to build a structural means by which to take advantage of organizational knowledge, that effort must extend beyond chance interaction among the agents of the organization.

A combination of these views most closely describes the ways that organizations learn. Tyre and von Hippel (1997) investigated adaptive learning in organizations by examining the processes engineers went through en route to solving complex manufacturing problems. In the settings examined, engineers certainly had a structured way of going about solving their

problems, but much of the process involved going to the factory floor and observing the problem environment. As one engineer commented, "...I just don't know what is going on until *I see* the problem."

The learning process, therefore, begins at the organic level, which previously has been identified as the CoPs in which members of an organization participate. Dominating at that level is tacit knowledge that has yet to present itself as possessing actual value. Learning takes place when that knowledge can be filtered, codified and otherwise processed into a form usable by the firm.

As CoPs cast a wide net, gather in knowledge, and begin to filter it down toward the core areas of the firm's information system (represented by the three arrows in Fig. 1), vehicles that stand in place to assist in that process are the firm's knowledge communities. As noted above, the role of these communities are to take knowledge both from general knowledge domains on which the firm resides, as well as from the CoPs in which members of the knowledge communities participate and solicit ideas, in a less organic and serendipitous way.

As knowledge is filtered along through this network, it gradually becomes increasingly codified and documented, thus evolving from the tacit to the explicit. As knowledge is captured and processed through knowledge communities, project teams begin to use that information as they see appropriate (i.e., assessment of knowledge value is still a probabilistic mechanism, but those probabilities are increasing). The net that has been cast, then, gradually becomes narrower and more focused. Finally, as project teams bring those projects online, the knowledge that has been captured and made part of those projects is incorporated into the core stable processes of the firm.

3. Summary and recommendations for future study

Firms are organized around the purpose of maximizing value, whether it is shareholder value in the case of for-profit corporations, or service value in the case of not-for-profit entities. To produce value, firms make decisions about the deployment of resources, which are in turn supported by the information systems of the firm. Individuals, however, in making their decisions apply a tacit process of evaluating information they are provided. That process can generally be described as the knowledge that resides within an organization. Knowledge management refers to the ways firms capture and disseminate those tacit processes.

The model proposed by the KM-SIG and forwarded in this paper relies on an organizational structure that facilitates the progressive filtration of ideas via knowledge networks, communities of practice, knowledge communities and project teams into its core, stable processes, where it has, through discriminatory power, the capacity to produce value.

Future direction in the study of knowledge management should focus on at least three areas. First, studies of best practices among firms are needed to provide a baseline from which to study market implications of capital and labor shifts by firms designed to promote better capture and exchange of "knowledge." As mentioned above, knowledge management practices today often take on the form of knowledge repositories. Are there

alternative practices that better illustrate the principles discussed above? (Of course, models that others have proposed that are comparably broad in scope should also be considered, such as those of Davenport and Prusack, 2000; Amidon, 1997; Nonaka and Takeuchi, 1995.)

Second, with a baseline established, positive theory studies need to provide insight into the relative effectiveness of various practices and their correlates. Knowledge management can be described, in part, as an organization's ability to capture tacit processes that, in many instances, provide individuals with a competitive advantage in labor markets. As Davenport and Prusack (2000, p. 43) point out, individuals who possess unique knowledge hold a monopolistic power and are reluctant to relinquish that power. How an organization induces sharing of those knowledge assets and the factors that are associated with success in doing so is critical to obtaining a workable solution to knowledge management that can be generalized across firms and industries.

Finally, knowledge management impacts and is impacted by numerous other organizational constructs. For example, whether systems functions are centralized or decentralized may have an impact on the ability of a firm to incorporate knowledge management strategies of various kinds. Or, as firms adopt new technologies that enhance intra- and interorganizational communication (such as ERP), do those technologies foster a knowledge management culture? A research question that presents itself in this context is whether knowledge management dimensions are associated with labor versus capital-intensive firms. The ways that knowledge management interacts with these organizational characteristics are of interest to firms and need to be explored.

Knowledge management is an area of study of increasing interest to organizations. With this increased attention comes an opportunity for academics to participate in examining and refining new practices as they emerge. This paper offers a model that can serve as a useful context within which to frame such efforts.

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Appendix A. Members of the KM-SIG of the CAM-I and other participating firms

Frank Reynolds, Chair	Eastman Kodak
Ben Balzer	Boeing
David Malone	Texas Tech University
Ken McIntyre	Honeywell
George Millush	Daimler Chrysler

ABC Technologies
Armstrong Laing
Army Management College
Bell South
Center for Naval Analysis
Cisco Systems
Department of Defense
GATX Capital
Immigration and Naturalization Service
MEVATEC
Microsoft
Peoplesoft
Saint Edwards University
San Jose State University
The Saint Paul Companies
Xerox

References

Amidon DM. Innovation strategy for the knowledge economy: the Ken awakening. Boston: Butterworth-Heinemann, 1997.

Brown JS, Gray ES. After re-engineering: the people are the company, *FAST Company* 1(1) 78–82, quoted in Amidon DM, 1997. *Innovation strategy for the knowledge economy: the Ken awakening*. Boston: Butterworth-Heinemann, 1995.

Davenport T. Knowledge management, round two. CIO Mag 1999;30–3 (November).

Davenport TH, Prusack L. Working knowledge: how organizations manage what they know. Boston, MA: Harvard Business School Press, 2000.

Hansen MT, von Oetinger B. Introducing T-shaped managers: knowledge management's next generation. Harv Bus Rev 2001;107–16 (March).

Hansen MT, Nohria N, Tierney T. What's your strategy for managing knowledge? Harv Bus Rev 1999;106–16 (March–April).

Joyce T, Stivers BP. Leveraging knowledge in small firms. J Cost Manage 2000;6–10 (May/June).

Nonaka I. The knowledge-creating company. Harv Bus Rev 1991;96–104 (November–December).

Nonaka I, Takeuchi H. The knowledge-creating company: how Japanese companies create the dynamics of innovation. New York: Oxford Univ. Press, 1995.

O'Dell C, Grayson CJ. If we only knew what we know: the transfer of internal knowledge and best practice. New York: Free Press, 1998.

Polanyi M. Personal knowledge. Chicago: University of Chicago Press, 1966.

Tyre MJ, von Hippel E. The situated nature of adaptive learning in organizations. Organ Sci 1997;71–81 (January–February).

Wenger EC, Snyder WM. Communities of practice: the organizational frontier. Harv Bus Rev 2000;139–45 (January–February).

Williams RL, Cothrel J. Four smart ways to run online communities. Sloan Manage Rev 2000;81–91 (Summer).