The rise of knowledge towards attention management

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Keywords

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Abstract

Knowledge management is the key success factor of today's business leaders. Focuses on the rise of knowledge management. Provides a summary of useful concepts, different project types, supportive organizational structures, effective technologies and points out future knowledge management directions. Shows that currently, within knowledge management, attention management has become the most important success factor. In future the management of attention management is likely to decide which businesses will be among the leaders of the new economy.

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Introduction

Beginning in the mid-1990s, individuals and organizations began to think seriously about managing what they know. This movement came to be known as "knowledge management". By "knowledge" – a term fraught with history and definitional peril – firms generally mean codified information with a high proportion of human value-added, including insight, interpretation, context, experience, wisdom, and so forth. Some knowledge management projects address relatively mundane information such as personnel manuals, corporate procedures, and cafeteria menus, but most also include more knowledgeable content: best practices, lessons learned, and insights about customers, competitors, and business partners.

The "management" in knowledge management has also been the subject of controversy. Some critics argue that knowledge cannot be managed because it is invisible and intangible. But if we take management to mean any concerted attempt to improve how knowledge is created, distributed, or used, then knowledge management hardly seems impossible. Management has previously involved the manipulation of other invisible, intangible phenomena, e.g. motivation, inspiration, and creativity.

Only a few years ago, knowledge management was a fledgling concept in Western businesses. Now it is becoming a mainstream business function. Most large companies in the USA, and many in Europe, have some sort of knowledge management initiative in place, including every major firm in the professional services, automobile, pharmaceutical, and oil industries. Chief knowledge officer (CKO) positions are being established in many companies. Every major consulting company has a knowledge management practice. In a relatively quiet and rapid way, the concept has penetrated into many different functions and processes of business.

Perhaps even more importantly, the idea of managing knowledge has begun to change how business people think and act. When

embarking on a new business venture, they are asking themselves and others: "How can we capture what we learn?". Developers of business strategy are focusing on what a company knows, and what it needs to know, as inputs to strategic goals. Before taking action on a major initiative, business people are consulting repositories of knowledge and best practices to guide their actions. Knowledge management is becoming embedded into ideas about good management in general, which is perhaps the best possible outcome for the phenomenon.

Useful concepts in knowledge management

The practice of knowledge management has benefited from several key concepts, most of which were not created within the knowledge management movement, but have been imported into it. We will describe several concepts below, make reference to their creators, and discuss how they have been applied in organizations.

Tacit vs explicit knowledge
This idea can be traced back to the philosopher Polanyi (1958, 1967), but has been applied to business and knowledge management by the Japanese management scholar, Nonaka. It suggests that there are two types of knowledge: tacit, which is embedded in the human brain and cannot be expressed easily, and explicit knowledge, which can be easily codified (Nonaka, 1991). Both types of knowledge are important, but Western firms have focused largely on managing explicit knowledge.

Codification vs personalization
This distinction is related to the tacit vs explicit concept; it involves an organization's primary approach to knowledge transfer (Hansen *et al.*, 1999). Companies using codification approaches rely primarily on repositories of explicit knowledge; personalization approaches imply that the primary mode of knowledge transfer is direct interaction among people. Both are necessary in most organizations, but an increased focus on one approach or the other at any given time within a specific organization may be appropriate.

Knowledge markets
This concept recognizes the interest that individuals have in holding onto the knowledge they possess; in order to part with it, they need to receive something in exchange (Davenport and Prusak, 1998). Any organization is a knowledge market in which knowledge is exchanged for other things of value – money, respect, promotions, or other knowledge.

Communities of practice
This idea, which developed in the "organizational learning" movement, posits that knowledge flows best through networks of people who may not be in the same part of the organization, but have the same work interests (Brown and Duguid, 1991). Some firms have attempted to formalize these communities; Chrysler, for example, has created more than 100 communities in the new car design area, one for each major component of a car. The concept has been sufficiently successful that it is being extended into the much larger Daimler Benz organization in Europe after the company's merger with Chrysler.

Intangible assets
Many observers have recently pointed out that formal accounting systems do not measure the valuable knowledge, intellectual capital, and other "intangible" assets of a corporation (Sveiby, 1997). This is undeniably true; the market values of knowledge-intensive organizations are often several times their "book" or accounting value. Some analysts have even argued that accounting systems should change to incorporate intangible assets and that knowledge capital should be reflected on the balance sheet. We believe, however, that although it is important to measure and manage intangible assets, assigning a fixed and permanent value to knowledge is impossible, and we will never see knowledge on a balance sheet. While some organizations, specifically the Swedish insurance firm Skandia, are noted for their attention to intangible assets, no firm has yet determined how to translate the value of knowledge into monetary value.

These concepts are useful, and should continue to be applied to the management of knowledge in organizations. However, given the movement toward embedding knowledge management into other aspects of business, the concepts may be incorporated into other, broader approaches to business and management.

Knowledge management project types

Most knowledge management projects in organizations fall into a relatively few categories or types, each of which has a key objective. While it is possible and even desirable to combine multiple objectives in a single project, this was not normally the case in a study conducted of 31 knowledge management projects in 1997 (Davenport *et al*., 1998). Since that time, it is possible that projects have matured and have taken on more ambitious collections of objectives.

Among early adopters of knowledge management, by far the most common objective involves implementing some sort of knowledge repository (Figure 1). The objective of this type of project is to capture knowledge for later and broader access by others within the same organization. The repositories typically contain a specific type of knowledge for a particular business function or process, e.g.:

- "Best practices" knowledge within a quality or business process management function (adopted by such organizations as Texas Instruments, Citibank, and Chevron).
- Knowledge for sales purposes involving products, markets, and customers (Hewlett-Packard and other technology-oriented firms like Siemens[1] have found these especially useful).
- Lessons learned in projects or product development efforts (Bechtel and BASF are two firms that have employed this approach).
- Knowledge around implementation of information systems (the US insurance firm USAA was one of the earliest adopters of this knowledge domain).
- Competitive intelligence for strategy and planning functions (common in many firms).
- "Learning histories" or records of experience with a new corporate direction or approach (Ford has employed these,

for example, to record experiences in designing new cars).

Knowledge in repositories may be "official" – edited and vetted by company management – or unofficial and unapproved. It may be from external or internal sources, and may be textual (most common), numeric, or graphic. Although most knowledge repositories serve a single function, it is increasingly common for companies to construct an internal "portal" so that employees can get access to multiple different repositories and sources from one screen.

It is also possible and increasingly popular for repositories to contain not (or not only) knowledge itself, but also pointers to experts within the organization on key knowledge topics. Called "knowledge Yellow Pages", these systems facilitate contact and knowledge transfer between knowledgeable people and those who seek their knowledge (Dachs *et al*., 2000). It is also feasible to combine stored knowledge with lists of the individuals who contributed the knowledge and could provide more detail or background on it.

A few knowledge management projects focus on knowledge transfer alone, either through technological means (videoconferencing, for example, as at BP's oil exploration sites) or through direct contact between people. One could argue, of course, that the ancient institution called the "meeting" performed this function, although rarely within a conscious knowledge transfer context. Sematech, a semiconductor manufacturing research consortium in Texas, found that meetings were a more successful knowledge transfer mechanism than any technology-based approach.

Several knowledge management projects attempt to better manage knowledge assets, either measuring their level or value within an organization (a notoriously difficult problem) or, more valuably to our mind, attempting to increase their value through more effective harvesting and use. Dow Chemical's successful attempt to increase its patent and licensing revenues and to decrease patent management costs, for example, would fall into this category.

Finally, some firms simply attempt to improve the overall environment for managing knowledge in their projects. They may try to increase awareness of knowledge and its role in business and organizations, or to motivate employees to create, share, or use

Figure 1 Types of knowledge management projects

■ Repositories
■ Asset Mgmt.
□ Transfer
□ Environment
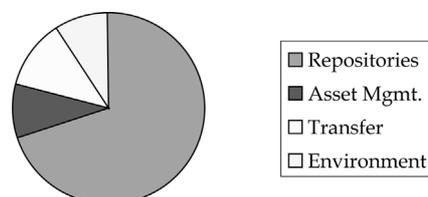
knowledge to a greater degree[2]. This objective may be coupled with a more tangible effort to build a knowledge repository. This approach to knowledge management can be found at the advertising agency Young and Rubicam, for example, where the goal is to integrate knowledge management into everyone's thoughts and actions.

Organizational structures for knowledge management

A key aspect of the management of knowledge in organizations is the development of an organizational structure to perform knowledge-oriented tasks. While many existing functions are already concerned with aspects of knowledge – including research and development, corporate libraries, market research, and information technology functions – in most companies there has been no group with broad responsibility for knowledge management.

But organizations are beginning to create such groups. They involve the establishment of new roles and responsibilities, new skills, new relationships. Creating an organizational structure to manage knowledge is by no means enough for success at knowledge management, but it is an important ingredient of success.

The capabilities necessary to staff knowledge management functions fall into at least three different levels within a new structure. At the most senior, and visible, level is the CKO or equivalent role (Earl and Scott, 1999). These new positions are appearing in many companies; almost every large professional services firm we work together, for example, has such a role (including Andersen Consulting, Boston Consulting Group, Ernst & Young, Pricewaterhouse Coopers, EDS, KPMG, etc.)[3].

The role is an important one for both operational and symbolic reasons. Operationally, CKOs perform a variety of key roles, including serving as the chief designer of the knowledge architecture, the top of the reporting relationship for knowledge professionals, the head technologist for knowledge technologies, and the primary procurement officer for external knowledge content. Symbolically, the presence of a CKO serves as an important indicator that a firm views knowledge and its management as critical to its success. If the CKO is a member of the senior executive team, it becomes obvious to employees that knowledge is a critical business resource on the level of labor and capital.

But a CKO alone can do little. Since knowledge is typically managed in the form of a project, firms will need a cadre of knowledge project managers – a middle management layer within the knowledge structure. These managers will need to understand knowledge and its uses in various aspects of the business, the motivational and attitudinal factors necessary to get people to create, share, and use knowledge effectively, and the ways to use technology to enhance knowledge activities.

Perhaps the most important aspect of the new knowledge structure is the level of those who do the day-to-day work of knowledge. These roles go by a variety of names, but are most simply described as knowledge managers. On a daily basis, knowledge managers perform a broad collection of tasks, including:

- facilitation of knowledge-sharing networks and communities of practice;
- creation, editing, and pruning of "knowledge objects" in a repository;
- building and maintaining technology-based knowledge applications;
- incorporating knowledge-oriented job descriptions, motivational approaches, and evaluation and reward systems into the human resource management processes of the organization;
- redesigning knowledge work processes, and incorporating knowledge tasks and activities into them.

Some firms already have several hundred such knowledge managers. They are drawn from such backgrounds as researchers, librarians, technologists, journalists, or organizational change experts. In addition to establishing the knowledge manager role, companies that are serious about knowledge management will have to develop rewarding career paths for these individuals.

One last issue in knowledge-oriented organizational structures involves the relationship between new knowledge management groups and existing parts of the organization that address knowledge issues. Despite the absence of centralized knowledge management groups in most companies, there do exist many knowledge-oriented business functions. New knowledge management groups will not replace them, but rather augment their existing efforts. The various

providers of knowledge services in organizations will have to determine how they relate to each other and what the ideal division of labor is for different knowledge management requirements. Research and development groups, for example, may have the primary responsibility for knowledge creation; corporate libraries may be charged with helping employees access internal and external knowledge. It will not serve organizations well to have different internal providers of knowledge services competing with each other and having confusing messages about who does what.

Technologies for knowledge management

Knowledge management technology is not a single technology, but rather a broad collection of technologies that need to be adopted and integrated. Some of the technologies, e.g. those derived from "artificial intelligence" tools, are not new. Some are useful for not only managing knowledge, but also managing data and information – as is true of intranets and the Web. We will describe the several leading types of technologies being used for knowledge management today.

Repository and access technology

As noted above, the most common type of knowledge management project involves building repositories of codified knowledge. Not surprisingly, then, the most common technologies are those that allow firms to build repositories, provide broad access, and allow seekers of knowledge to find the knowledge objects that meet their needs. There are three basic "backbones" for knowledge repository and access environments: Lotus Notes, Web-based intranets, and Microsoft's Exchange. Notes was the first tool for this purpose, but intranets and Exchange, e.g. within Andersen Consulting, Boston Consulting Group, KPMG, McKinsey and Siemens, are growing faster at this point.

These backbones are usually supplemented by other basic tools for repository and access management:
- search engines;
- document creation and management tools;
- automated tools for editing and pruning knowledge bases;
- tools for capturing and managing expert biographies.

Repository and search technologies are already quite capable in dealing with textual information and knowledge. Future tools, however, will be able to search and retrieve all kinds of information formats in one query – from summarized data to textual information to audio and video information on a subject. Companies are already beginning to construct Web-based portals that provide access to multiple types of knowledge.

Structured knowledge representation tools

When companies want to use knowledge in real-time, mission-critical applications, they have to structure the knowledge base for rapid, precise access; a Web search yielding hundreds of documents will not suffice when a customer is waiting on the phone for an answer. Representing and structuring knowledge is a requirement that has long been addressed by "artificial intelligence" researchers; now their technologies are being applied in the context of knowledge management. Rule-based systems and, more commonly, case-based systems, are used to capture and provide access to customer service problem resolution, legal knowledge, new product development knowledge, and many other types. While it can be difficult and labor-intensive to "author" a structured knowledge base, the effort can pay off in terms of faster responses to customers, lower cost per knowledge transaction, and lessened requirements for experienced, expert personnel.

Knowledge management e-commerce tools

Thus far, knowledge management has largely focused on internal issues within companies. However, with the strongly increased interest around the world in electronic commerce, companies will begin to require tools that allow them to distribute knowledge over private and public networks. Some vendors (such as Broadvision and Vignette) have already begun to introduce such tools; they provide functionality for customizing the menu of available knowledge to individual customers, allowing sampling of knowledge

before buying, and carrying out sales transactions for knowledge purchases.

Future directions in knowledge management

Thus far, we have primarily described the present state of knowledge management. We will conclude by describing some aspects of knowledge management that may develop in the future. Most importantly, we believe that the management of knowledge will continue to grow in its importance to business success. Although the knowledge management movement has aspects of faddishness (many conferences, many books, many articles in the business press), and it may lose some of its current level of visibility, it must become part of the basic fabric of successful businesses. There are too many knowledge workers dealing with too much knowledge for knowledge management to disappear.

In fact, we believe it will expand. Knowledge management developed first in industries and functions that are basically selling knowledge – professional services, pharmaceuticals, research and development functions. It is already clear that knowledge management is quickly moving into other industries, including manufacturing, financial services, even government and military organizations. In the future, we expect that every industry will view itself as knowledge-intensive and will adopt knowledge management approaches in virtually every business unit and function.

Consistent with the broadening of knowledge management in organizations, we believe that there will be a shift in the organizational focus on the topic. Thus far, the primary emphasis has been on building *professional* capabilities – knowledge management specialists, formal procedures, separate knowledge management skills. To institutionalize knowledge management fully, the focus must shift to the *amateurs* – those whose roles in organizations are not primarily knowledge management, but accomplishing their real organizational missions. We must begin to hire workers for their aptitude and motivation around knowledge, design knowledge activities into everyday roles, and create a culture in which every worker views knowledge management as part of his/her job.

Despite the fact that knowledge is often gathered on the topic of best business practices and processes, most organizations have not taken a conscious process-oriented approach to knowledge management and knowledge work. However, there is an implicit process perspective shared by most organizations that attempt to manage knowledge. The process of knowledge management begins with knowledge creation (Von Krogh *et al.*, 2000a, b) and progresses to knowledge capture and storage, knowledge refinement, knowledge distribution, knowledge use, and monitoring of the entire process, which should then impact the beginning of the process (Figure 2).

The aspects of the process most commonly focused on by firms practicing knowledge management are certainly knowledge capture and storage, and knowledge distribution. These subprocesses involve building repositories and enabling access to them; they are relatively easy to address using information technologies, and are relatively tangible. Knowledge creation, according to one survey of knowledge managers in the USA, is the least likely subprocess to be addressed formally. The refinement of knowledge is viewed as labor-intensive and difficult. Knowledge use, one of the most important subprocesses in any firm, is seldom addressed in any formal or structured way. It seems that the more invisible the subprocess, the less likely it is to be addressed as part of a knowledge management initiative.

Companies and organizations could also take a process-oriented view of knowledge work itself (Dachler and Hosking, 1995; Dachler and Rüegg-Stürm, 1999), and the incorporation of knowledge management activities into it. Knowledge work processes refer to the inputs, tasks, and outputs of knowledge workers. Examples of knowledge work processes include planning, marketing, consulting, managing, and aspects of sales, customer service, and manufacturing processes. While knowledge workers may

Figure 2 The knowledge management process
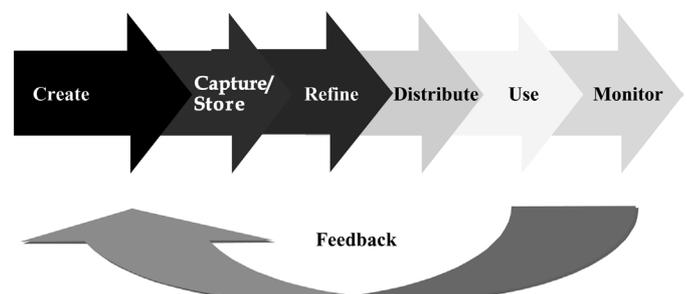
view their work in unstructured terms, it is possible to view knowledge work as involving a somewhat structured process that can be designed and improved (Davenport *et al.*, 1996). In US and European firms, knowledge work processes were not commonly addressed in business process reengineering or quality programs; administrative or operational processes were the primary focus of those movements.

A key goal of knowledge managers should be to understand knowledge work processes and to incorporate key knowledge management activities – creation, distribution, use, and so forth – into those processes. At each step, managers should attempt to identify how knowledge can better be imported and used, or exported and stored for later access by the broader firm. Knowledge work process designers should also focus on eliminating non-value-adding activity; otherwise, knowledge workers will not have time to perform desired knowledge management activities. Simply adding knowledge management tasks on top of existing knowledge work processes will fail in most cases.

If there is a limit to the success of knowledge management, it lies in the area of human attention. There is only so much employee and managerial attention to go around, and even the highest-value knowledge is of little use unless someone can attend to it. One of the key battlegrounds in the future knowledge war will be the management of attention: understanding how it is allocated by individuals and organizations, knowing how to capture it more effectively for important information and knowledge, using technology to get, keep, and protect it. Attention is the currency of future business, and is already the scarcest resource in many organizations. In addition to knowledge and knowledge management, in the future all organizations will need to focus their attention on attention.

Attention management is one aspect of the broader key to success in knowledge management: people and their effective management. In the future, organizations will realize that the most valuable aspect of their organizations is the knowledge they possess, and that knowledge is created and applied only in the minds of human beings. Technology can provide assistance in knowledge management, but it pales in comparison to developing knowledge-oriented cultures, motivating individuals to share and use knowledge, and encouraging every person to view their jobs in terms of effective knowledge management. Managing knowledge is managing people; managing people is managing knowledge.

Case studies of knowledge management

Hewlett-Packard
Knowledge management projects began to surface at Hewlett-Packard (HP), a large, diversified maker of computers, printers, and electronic instruments, in the early 1990s. One of the first applications involved transmitting knowledge on HP computer system sales and service issues to the dealer channel. Other early knowledge management applications involved capturing and using knowledge about information technology project management, about education offerings for HP's training community, about new product development, and about where expertise is located within HP laboratories. By 1999 HP had undertaken more than 100 knowledge management projects in almost all areas of the business. Most of these have been viewed as successful by their creators.

HP's knowledge management efforts were largely bottom-up, with little involvement by senior management. The company's corporate information technology function did attempt to educate knowledge managers about some of the issues involved and to connect them with each other, but knowledge management was not connected with any specific corporate strategy. HP has a tradition of divisional autonomy, and most knowledge management projects have stayed within divisional boundaries. HP's biggest challenge in knowledge management is probably the sharing of knowledge across the entire organization.

Chrysler and Daimler Chrysler
Chrysler began seriously to address knowledge management in the mid-1990s. The primary motivation for the effort came when the new vehicle engineering department noticed that quality problems in vehicle design that had previously been solved were re-appearing in Chrysler cars and trucks. Managers concluded that engineering experts were no longer able to pass along lessons learned and problems solved to each other, since they spent most of their time on cross-functional "platform teams" with people from other business functions.

In order to address this problem, Chrysler formed a collection of "Tech Clubs", or knowledge-based communities, for technical specialists in over 100 different areas. Experts in car bumper technology, for example, now can get together in both face-to-face and electronic contexts to share their knowledge. Each club is supported by a facilitator and by a Lotus Notes "Book of knowledge". The clubs have enjoyed high levels of participation, and quality problems have decreased since their initiation.

After Daimler Benz and Chrysler merged in 1998, Daimler Chrysler managers in the company's corporate university, newly responsible for knowledge management, decided to adopt the "Tech club" approach throughout the company, expanding both the number and average size of the clubs. It is still too early to tell whether these communities will function as well across geography and previously diverse corporate cultures as they did within Chrysler alone.

Sematech

Sematech, a research and development consortium of US semiconductor companies, was formed in 1987, to counter a perceived threat from Japanese firms. Based in Austin, Texas, like another high-tech R&D consortium (Microelectronics and Computer Corporation, or MCC), Sematech attributes most of its success in transferring knowledge to human factors. Because none of its sponsors (AT&T, IBM, Intel, Texas Instruments and ten other firms) are based in Austin, knowledge management and transfer cannot be based on casual contact.

Sematech believed that knowledge or technology transfer to sponsors was important from the beginning, in part because it had observed difficulties in that area in MCC's history. Sematech founders created a senior management role to be in charge of knowledge transfer, and undertook many different mechanisms to achieve the goal. One of the key approaches involved the presence of "assignees" from the sponsoring firms who would spend time in Austin, participate in the research, and then take ideas back with them. Sematech also had frequent meetings of managers and professionals from the sponsor firms at its headquarters location. As one manager of technology transfer put it: "We have documents, document databases, an intranet Web, groupware, you name it. But the assignees and the face-to-face meetings

are by far the most important channels for transferring knowledge to the member firms."

MCC, which relied primarily on documents and technical means of knowledge transfer, is now largely defunct. Sematech was so successful that it turned down the possibility of continued US Government support and became fully supported by its sponsoring firms. It has also formed Sematech International, a consortium of firms from the USA, Europe, and Asia.

Siemens

The movement towards knowledge management by Siemens over the last three years has been an extraordinary transformation. With 153 years of history, it is one of the world's oldest, largest, and historically most successful corporations. Between 60 percent and 80 percent – and the proportion is growing – of *value-added* Siemens generates is *linked directly to knowledge*. It has become an organization that is highly dependent on knowledge. Siemens, once noted for its bureaucracy and its deliberation, has embraced a new business concept in a brief period of time.

There are several reasons *why knowledge management is important for Siemens*. First of all, the company is *global*. If employees are to share knowledge, they must do so through means other than (or in addition to) informal face-to-face communications. The aspects of knowledge management that involve technology-enabled repositories and sharing networks – that is, the parts that help to overcome geography – were well suited to an organization dispersed around the world.

Second, the firm is *built on technology*. Since knowledge management is greatly enhanced through the effective use of very rapidly changing information technology, it is not surprisingly that Siemens is an relatively early and enthusiastic up-to-date adopter of knowledge management.

Third, the corporation is a *highly diverse organization* that participates in a wide variety of businesses. If knowledge can be shared across business units, then one Siemens business unit can take advantage of the learning and expertise from another. Another rational moving towards knowledge management is the *shift from* a product or "*box selling*" manufacturing-oriented firm *to* a "*total solutions*" *provider* including services that meet a customer need. Most of these services are

knowledge-based, and benefit from activities to capture, distribute, and use knowledge.

Over time, Siemens business units will become even more knowledge-based. This transformation is already beginning, and will probably characterize Siemens' direction for the next several decades.

The *uniqueness of Siemens' approach* is, that in the past, it was known for its *strong hierarchy*, but its *approach to knowledge* management has not been hierarchical at all. Instead, the approach was relatively grass-roots and "*bottom up*". Without any suggestion or provocation from above, mid-level employees and managers in Siemens business units began to create repositories, communities of practice, and informal sharing approaches for knowledge. After these business units began to develop knowledge initiatives, they looked around and noticed that others were doing the same thing. After a period of informal communication, the employees and managers who were managing knowledge began to form a semi-official community of practice themselves. Ultimately they began to feel that they need a corporate group to facilitate the firm's broad efforts, and they were successful in convincing senior executives to create the corporate knowledge management function. Most of the knowledge management efforts are taking place in the business units, but the corporate group plays a coordinating role. There is no organization in the world, other than consulting firms, with such a lot of knowledge workers.

Siemens' approach to knowledge management is also unusual for the *diversity of initiatives and applications* that are underway within the company. The breadth of approaches and tools being employed across Siemens is a good fit to the diversity and complexity of the organization itself.

Siemens' approach to knowledge management is also notable for the *extant of its relationship with external entities*, particularly universities. The firm's openness to external experts and sharing of ideas among a broad network will eventually lead to a more successful and advanced state of knowledge management.

Siemens' *external marketing focus* is another distinctive attribute of its overall knowledge management focus. In today's economy, a firm must not only do good knowledge management, but also be known for doing it. To that end, Siemens has undertaken several initiatives to tell the world about its

knowledge management initiatives, including books, videos, a large corporate exhibition at EXPO 2000, and various conferences to which the public – and knowledge management opinion leaders – have been invited.

There are several *challenges to knowledge management* Siemens has to overcome. First of all, Siemens' executives have begun to guarantee to shareholders that they will achieve a better-than-market rate of return from the capital they invest in the company. The firm also plans to be listed on equity markets in the USA – a set of capital markets requiring high levels of profitability, growth, and financial return. This is therefore a relatively *difficult* time for Siemens to make *substantial investments in intangible capabilities* such as knowledge management. But even at a time when investments are given a higher level of scrutiny, Siemens business units and the corporate knowledge management functions have found the *resources* to give *knowledge management* a strong start.

Another challenge for Siemens in knowledge management is setting a course between local and global knowledge initiatives. While earlier we argued that the global nature of the company provides a strong rational for knowledge management, it also creates difficulties. Siemens business units have knowledge initiatives that cut across countries and continents, and other programs that work only within a particular country. Employees must choose to allocate their attention and energies to either a global system or a local one. Many participants in knowledge initiatives may realize the value of a global system, but may also be more comfortable with the language of their home country[4]. The *balance between local and global knowledge management* will be struck every day, and it is important to keep them in balance.

Another tension in Siemens will be between knowledge initiatives that support the *entire firm*, versus those that advance a *particular business unit* or even a smaller group within it. Firmwide initiatives help to exploit the scale of Siemens business and promise the "knowledge synergy" described above. More specialized, focused initiatives will be more easily measured, and may be better supported by managers who are responsible for a unit's financial performance. Like the local vs global distinction mentioned, this is a creative tension that will play out over time[5].

Notes

1 How a knowledge management network leverages sales performance within Siemens can be seen in: Gibbert *et al.* (2000).
2 One possibility for incentive systems are shares for contributing to ShareNet, a knowledge management system within Siemens. For further information see: Gibbert *et al.* (2000).
3 Also based on semi-structured interviews conducted by Sven Völpel at Harvard Business School, Massachusetts Institute of Technology, Cambridge and Boston, Massachusetts, USA, in May and June 2000.
4 For the discussion of this knowledge – and specifically attention management problem – see Davenport and Beck (2000).
5 For detailed case studies of the variety of knowledge management initiatives and applications within Siemens, see: Davenport and Probst (2000).

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