Chapter VII
Organizational Knowledge Sharing Networks

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ABSTRACT
This chapter explores the ways that Knowledge Sharing Networks support the flow of organizational knowledge within a firm. Based on the assumption that tools people need to work with others are different from the ones they need to work alone; it demonstrates how the use of groupware permits “anytime, anywhere” collaboration within the organization. Furthermore, it takes a close look at information technology tools that enable leaders not only to encourage their employees to share knowledge personally, but also to put their knowledge in a form that others can easily access it now or in the future. In doing so, Knowledge Sharing Networks play an important role in preserving organizational memory.

“In the end, the location of the new economy is not in the technology, be it the microchip or the global telecommunications network. It is in the human mind.” Alan Webber (1993, p. 27)

INTRODUCTION

In the course of this book, the term organizational memory is used to describe the preservation of organizational knowledge. The following definition, proposed by the Editor in his call for chapters for this book, has served as a starting point:

Organizational memory is the body of knowledge, past, present, and future, required to achieve the strategic objectives of an organization. Enabled by technology, leadership, and culture, organizational memories include repositories of artefacts, communities of people, and organizational knowledge sharing processes, which focus on achieving the organizational vision.

The key objectives of this chapter are to explore how knowledge repositories, as part of a Knowledge Sharing Network, may best support the flow of organizational knowledge within a
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firm, and to describe ways, through which, in the future, they will best serve for preserving organizational memory. The chapter is organized as following. In the following section we examine two different approaches that are utilized for the flow of information and the organizational knowledge transactions within organizations; namely internal knowledge markets and internal knowledge communities. The section subheaded Supporting Collaboration starts with the assumption that tools people need to work with others are different from the ones they need to work alone. Everyday activities like communication and interaction, or decision making and problem solving are examined under all possible same/different time or same/different place conditions. We demonstrate how the use of groupware permits ‘anytime, anyplace’ collaboration within the organization.

In the following section, under the title Supporting Organizational Memory, we consider organizational knowledge as an intellectual capital asset under the knowledge-based theory of the firm. We take a close look at IT-tools that enable leaders not only to encourage their employees to share knowledge personally, but also to put their knowledge in a form that others can easily access it now or in the future. In the section subheaded Knowledge Sharing Networks, knowledge repositories are presented as the most important element of a Knowledge Sharing Network (KSN) and their contribution in both Integrative and Interactive Knowledge Management (KM) applications is presented. KSNs and their architecture are weighed against codification and personalization strategies, which certain researchers, departing from different perspectives, consider appropriate for a number of organizations. Closing this core section of the chapter, we focus on problems related to the effective use of KSNs, as we consider them the KM and IT-tools that mostly affect organizational performance.

Finally, our conclusions are presented in an effort to assist managers in the difficult task of successfully managing and sharing organizational knowledge.

ORGANIZATIONAL KNOWLEDGE FLOW

For the purpose of our investigation it is important to examine the channels that permit and facilitate organizational knowledge to flow inside and within an organization. Two are the main types of information-handling activities: The procedure-based ones (related to the procedures that employees are involved in their every day practice) and the knowledge-based information-handling activities. We shall focus our interest on the Information Systems (IS) aiming on supporting knowledge-based activities. IS that support employees in performing information-handling activities in order to work together, share expertise and knowledge, and solve problems. As of their nature, these IS must support activities that do not follow the same or similar process every time and that deal with information and knowledge that cannot be easily captured.

There is more than one pattern that allows this flow of information and knowledge in organizations. Cohen (1998), in his well documented Report on the First Annual U.C. Berkeley Forum on Knowledge and the Firm, distinguishes among two different approaches to knowledge transactions in organizations: Internal knowledge markets and internal knowledge communities. It is obvious that the choice of one of the two viewpoints is of significant importance, as it affects action. According to Cohen, the proponents of knowledge markets are mainly talking about knowledge interactions between individuals and may emphasize on incentives as they tend to consider that knowledge is a ‘thing’ that can be transferred. The devotees of knowledge communities focus on the group and give more attention to encouraging connections between people, which may lead to more exploration of the process of knowing.
Supporters of the two approaches can be found in the scientific literature and they also made themselves obvious in the Berkeley Forum. Prusak (1997, and during the Forum) stated that there are knowledge buyers, sellers and brokers in firms, each of whom expects to gain something in a knowledge transaction. The main price mechanism governing the knowledge market is reciprocity, the expectation that one will get valuable knowledge in return for giving it. Or, to put it in another way, one needs to contribute knowledge to become part of the knowledge networks on which his success depends. Gilmour (2003) goes one step further and proposes that organizations should focus on collaboration management based on a brokering model that forces people to share knowledge when there is something in it for them. Let us consider, for example, two managers (i.e. the Manufacturing and Quality managers of a company) evaluating the same vendor; wouldn’t they want to talk to each other and compare their notes and experiences? The brokering model is there to connect people who should be connected. One IT-based solution, proposed by Gilmour (2003), is to continually survey the flood of electronic information that flows through the company in order to find out who is likely to know what. Then, when somebody needs information, those who have it can be asked privately whether they are willing to share.

Supporters of the knowledge community approach, suggest more emphasis on personal connection and commitment to shared success – but also risks and benefits – and less on knowledge transactions, which von Krogh (1998) associates with ‘low care’ social situations. Collaborators worry about themselves and their partners; buyers and sellers don’t. Trust and good will influence action much more powerfully in a community or collaboration world than they do in the relatively impersonal market environment.

The knowledge market approach driven by pure self-interest and that of the knowledge community characterized by sharing, trust and generosity represent the two extremes, with real-life situations somewhere in between. In practice, many individuals care about their colleagues and knowledge markets do depend on trust and reciprocity, as the value of exchanged knowledge cannot be precisely defined and ‘payment’ for it is usually intangible and delayed. In the same way, knowledge community members are individuals who are better prepared to contribute to the group effort when they expect a share of the benefits of the group success. In their way, they also make a ‘market’ calculation of what they will get in exchange for the knowledge they offer.

**SUPPORTING COLLABORATION**

In a prophetic article Drucker (1988) stated that organizations are becoming information based, and that in the future they will be organized not like manufacturing organizations, but more like a symphony orchestra, a hospital or a university. Each organization will be composed mainly of specialists who direct their own performance through feedback from others: colleagues, customers and headquarters. Three are the factors driving this move, according to Drucker. One, knowledge workers are becoming the dominant portion of labor, and they resist Taylor’s command-and-control form of organization. Two, all companies, even the largest ones, need to find ways to be more innovative and entrepreneurial. Three, information technology is forcing a shift. Once companies use IT to handle information rather than data, their decision processes, management structure and work patterns change.

Both in industrial and business environments, work is done mainly in task-focused teams, where specialists from various departments (i.e. manufacturing, quality and R&D) work together as a team for the duration of a project (i.e. the development of a new product) based on a variety of IT tools for their collaboration. Drucker had long ago foreseen that getting value out of knowledge
sharing requires more than technology, and we were at the beginning of the third evolution in the structure of organizations: the organization of knowledge specialists.

Expecting information and knowledge simply to flow through organizations is unrealistic, because people’s time and energy are limited and they will choose to do what they believe will give them a worthwhile return on those scarce resources. Robert Johansen, in the web site of the Institute for the Future (IFTF), notes that systems that support groups are important because most people spend 60 to 80 percent of their time working with others. At the same time, from informal polls he has taken, people seem to feel they are most productive when they are working alone, or to put it in another way, they are not happy about how they work with others. These findings reveal a need for systems that support groups.

The tools people need to work with others are different from the ones they need to work alone. So groupware (electronic tools that support teams of collaborators) is different from past software. In many organizations groupware represents a fundamental change in the way people think about using computers. Taking full advantage of existing IT platforms (e-mail systems, LANs, departmental systems and public network services such as the telephone or the Internet) groupware is not just another part of corporate information systems. Successful firms have discovered the right mix of people, process, and technology elements in order to use their groupware systems as the backbone of their knowledge sharing infrastructure.

Supporting collaboration has lately been a main effort in organizations as it is commonly accepted that it is conductive to both organizational knowledge generation and sharing. Making available the wealth of knowledge that exists throughout the organization is of real benefit to firms that wish to improve the ability of employees to make decisions. For the past 25 years, Group Decision Support Systems (GDSS) have been used in order to help more than one person work together to reach a decision. McNurlin and Sprague (2004) note that GDSSs traditionally support ‘pooled-interdependent’ decision making (several people to reach a decision jointly by working together simultaneously and interacting) or ‘sequential interdependent’ decision making (one person makes a decision –or part of a decision- and passes it on to another person). As it has been increasingly difficult to tell when decision making starts and when supplementary activities (such as data gathering, communicating and interacting) the ‘D’ has disappeared and we now talk about Group Support Systems (GSS).

The activities of groups can be divided into two generic categories:

- Communication and interaction, where communication is conceived as transmitting information from one person to another or to several others and interaction means back-and-forth communication over time. (Example: Office systems and in particular e-mail.)
- Decision making and problem solving, where members of the groups reach a decision or form a consensus. (Example: The evolution of Group DSSs from the already existing DSSs.)

Both types of group activities are needed in collaboration and, historically, systems supporting group work have originated from one or the other of these two major functions.

Johansen (1991) and his colleagues of the IFTF are categorizing the work of groups using a variation of the DeSantis and Gallupe (1985) matrix, by having time on one dimension (same time/different time) and place on the other (same place/different place). The time/place framework they propose in their search for ways in which technology can be utilized to support ‘anytime, anyplace’ collaboration is shown in Figure 1. The two options (same or different) of the parameters time and place designate the way the group mem-
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Figure 1. Groupware options

Same Time / Same Place Collaboration

Supporting same time/same place collaboration has generally meant supporting meetings. Team members from the groups involved meet face-to-face in order to develop the basic plan and objectives and finally reach a decision. Meetings are part of the daily schedule of any staff member and McNurlin and Sprague (2004) mention the results of a US study that have found that the average executive in a US company spends more than 800 hours a year in meetings. The number alone represents an approximate 30 percent of total work hours, but in addition, the executives reported that they considered about 240 of those hours to have been wasted in useless meetings.

Here is a short list of the main problems with meetings:

- Often there is no agenda, participants do not study the documentation provided before the meeting and expect to be briefed during the meeting.
- Key people arrive late or do not attend at all, time may be spent on briefing attendees or on routine matters, and due to a poor job of the chairperson a few people --very often the same ones-- dominate the discussion and others do not speak up.
- Many meetings are wasteful from a cost standpoint (consider cost per hour in salaries, travel expenses, etc) not to mention the unavailability of the participants at their place of duty.

bers are communicating and interacting over time and/or distance. The ‘same time/same place’ cell, for example, includes electronic meeting support systems. The ‘different time/different place’ cell incorporates such communication-oriented systems as e-mail, computer conferencing and use of Lotus Notes or more modern software.

In the following two subsections we shall further comment on some particular situations where the use of IS in support of collaboration is important. Until recently there has been little integration among the systems in the four cells, even though it is clear to investigators and system developers that supporting collaboration must aim to permit anytime, anyplace group working.
The goals of systems used for improving meetings are to (a) eliminate some meetings, (b) encourage better planning and better preparation for those meetings that must be held, and (c) improve the effectiveness of meetings that are finally held. The following measures can be taken and it is here that information technology can help:

- **Eliminate some meetings.** Use of e-mail or the company intranet can eliminate all meetings that do not call for a group decision or action (i.e. progress report meetings). Electronic and voice mail systems allow meetings to be cancelled at the last moment (when key people can not attend or essential information is not yet available).

- **Better preparation for meetings.** Computer conferencing can play a significant role in improving preparation for meetings. A computer conferencing system is actually a form of enhanced e-mail, allowing participants to log on at their convenience, read all entries made by others since they last logged on, and make their contributions. The chairperson can use the system to obtain reactions to the proposed agenda and even for handling routine actions (like approval of previous meeting minutes and voting on routine issues) as well as for providing a written record of pre- and post- meeting communications.

- **Improve the effectiveness of meetings.** The major benefit of using meeting support systems is improved meeting efficiency and effectiveness. Meetings are more effective when the ideas generated by the group are more creative and the group commitments materialize more quickly.

Another ‘same time/same place’ situation that can benefit from the use of group support systems is the traditional presentation and discussion sessions usually applied in conferences and in business meetings of a certain importance.

### Different Place Collaboration

Collaboration of groups that work in different places and probably at different times is another promising use of information systems, and mainly groupware. In the global economy era multinational companies can use the three main regions of the globe (Asia, Europe and the Americas) to extend their workday to round-the-clock by passing work from groups in one region to the next at the end of each one’s workday.

Imagine the following situation: Two scientists collaborate on writing a report. The one based in Europe, e-mails his thoughts and questions on the topic to his US based colleague at the end of his workday. During his workday—and while his EU partner is sleeping—the US scientist does some thinking and research on the topic, and e-mails his thoughts and findings back to Europe at the end of his day. Now, when the US scientists sleeps, the EU one can work again and this may continue for, let’s say, a week. At the end of the week, they will have accomplished at least two weeks’ worth of work, without either of them having to work long hours. In an extreme case (of a company having a third person involved in the project and working in Asia) the result could have been even three weeks’ worth of work done.

One of the results of using IT to support collaboration is the formation of the so called virtual teams; they exist in a space but not in one place. Some of them never meet face-to-face. They are formed to handle a project and then disband after the project is completed. Virtual teams tend to operate in three cells of the matrix presented in Figure 1:

- **Same time/same place:** The team meets face-to-face probably once, at the beginning, to develop the basic plan and objectives.

- **Different time/different place:** Team members then communicate by e-mail and do data gathering and analysis separately.
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- **Same time/different place:** If the company possesses strong enough technology, team members may have audio or video conferences to discuss developments and progress towards goals.

   It is obvious that there is a spectrum of group working situations and many types of IT-based systems that support collaboration. These systems have been around for at least 30 years, becoming increasingly sophisticated over that time. They permit more discussion, more evenly spread participation, more high-level companywide discussion, and involvement by more people than a traditional planning meeting would allow. Other tools allow real-time collaboration among distributed team members who not only need to hear each other’s voices, but also need to simultaneously see their hand-drawn changes to an engineering drawing in real time. Still other collaboration tools help team members located around the globe ‘converse’, not in real-time but at different times of the day.

   In all these, and many other cases, use of IT-based collaboration tools changes the collaboration process, revolutionize who can participate, how they participate and even the kind of work they do. Collaboration is at the heart of the business world today. Use of collaboration software can change the structure within one enterprise, working relationships between enterprises, and working relationships between people in different parts of the world.

**SUPPORTING ORGANIZATIONAL KNOWLEDGE**

Supporting organizational knowledge, and the information systems used for this purpose, is an issue very closely related to managing knowledge. We have addressed the subject in the previous section of this chapter from a general perspective. Here, we shall do it from a practical point of view, emphasizing on particular IT-based tools and techniques that facilitate the flow of organizational knowledge within the company. In doing so, we bear in mind that organizations create and exchange knowledge to achieve a competitive advantage. Leaders of knowledge creating organizations must create value today and, at the same time, have to take all necessary measures, in real time, in order to ensure that the next generations of organizational leaders know what they knew. That means not only encouraging people to share knowledge personally, but also to put their knowledge in a form that others can easily access it now or in the future. Because knowledge originates from both inside and outside the company, practical issues on knowledge management deal with customer knowledge and researcher knowledge and how to embed this outside knowledge in a real-time system. It is under this umbrella that we are examining knowledge as an intellectual capital asset and in particular the usage and sharing of organizational knowledge. The challenge is to recognize where IT fits in the overall knowledge management and knowledge sharing arena.

**Theoretical Background**

Knowledge management has been an enduring subject in the IT field since the mid 1990s. Many attempts have been made to capture knowledge in computer systems, but soon top management realized that their greatest assets (their employees) walk out the door every evening, taking with them another crucial asset, knowledge. Many researchers in the field (Grant, 1997 and 2000; Sveiby, 2001, and von Krogh, 1998 among them) believe that knowledge is not something that can be captured in a machine; it only exists inside a person’s head. Information can be captured in computers, knowledge cannot. Some of them feel that the term knowledge management creates the wrong impression, as knowledge cannot be controlled or engineered. It can only be leveraged
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through processes and culture. The more people are connected, and the more they exchange ideas, the more their knowledge spreads and can thus be leveraged.

The fundamental problem in traditional management theory is how to align the objectives of workers with those of managers and the stakeholders. Only when executives view knowledge in this light will they manage it for most effective use. Grant (1997, p. 452) affirms that “… if knowledge is the preeminent productive resource, and most knowledge is created by and stored within individuals, then employees are the primary stakeholders”. According to Grant, the knowledge-based theory of the firm is the most adequate framework for these objectives to be fulfilled. Under this perspective, management’s principal challenge is to establish the mechanisms for collaborating individuals and groups to coordinate their activities in order to best integrate their knowledge into productive activity.

Sveiby (2001, p. 346) believes that people can use their competences to create value in two directions: by transferring and converting knowledge externally or internally to the organization they belong to.

• When the managers of an industrial company direct the efforts of their employees internally, they create tangible goods and intangible structures such as better processes and new designs for products.

• When they direct their attention outwards, in addition to delivery of goods and money they also create intangible structures, such as customer relationships, brand awareness, reputation and new experiences for the customers.

In both these above transactions, shared knowledge within an organization becomes a critical factor for its performance and this is exactly the way sharing knowledge is conceptualized in this chapter.

The above view has not been generally accepted. Brewer (1995) researched the topic and tried to answer the question: If we cannot disembody knowledge, how do we better manage the knowledge within people to leverage this asset? He notes that as we move from a service economy to a knowledge economy, companies move towards more effective knowledge management by transferring knowledge between the two states it exists. From tacit knowledge (within a person’s mind and thus private) to explicit knowledge (articulated, codified and thus public) and vise versa. According to Brewer, knowledge is not a physical asset, and as such it is not effectively described in terms of manufacturing analogies such as storing it in inventories.

The process of transferring tacit knowledge to others is a key part in managing knowledge. Emphasizing on this aspect, some companies have stopped talking about knowledge management and only use the term knowledge sharing. Under this perspective, IT is seen as one enabler, but not the only one. Getting people together face-to-face to explain how they do things, is still very important in organizational knowledge sharing. Talking about what they do and why, barriers fall, knowledge flows, and sharing increases. Unfortunately, free time for sharing knowledge is not yet seen as important by the majority of top and senior management executives.

Manage or ‘Share’ Knowledge

At its first stages, knowledge management focused on sharing knowledge related to industrial world applications. The two dominant and mostly cited examples of the 1990s refer to new product design and development, and industrial innovation. The first one, by Nonaka (1991), relates to the development of new product lines (like Matsushita’s bread making machine, the Honda City car, and Canon’s revolutionary mini-copier) and persuades researchers, product designers, manufacturing and sales personnel to work together across
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departmental boundaries. With these examples Nonaka has made Matsushita's software developer Ikuko Tanaka with her ‘twist dough’ identical to his SECI model, Honda’s project team leader Hiroo Watanabe with his ‘Tall Boy’ concept and Canon’s task-force leader Hiroshi Tanaka with his beer can analogy, identical to terms like ‘metaphor’, ‘analogy’ or ‘model’. The analogy to the knowledge sharing situation that our research is focused on is very strong.

The second example refers to the sharing of what Seely Brown (1991) and the researchers of the Xerox Palo Alto Research Center (PARC) call ‘local innovation’ in the design of usable technology by sharing the knowledge that end-users have of the products under consideration. PARC research is focused on new work practices, in parallel to new products, and recognizes the customer as the research department’s ultimate innovation partner. In both these classic examples, the emphasis is on the way large organizations (namely Matsushita, Honda, Canon and Xerox) used brainstorming methods and software systems for co-designing and cross-leveling the knowledge within the organizations.

Recently, sharing of organizational knowledge emphasizes more on indirect interactions between members of different groups in an organization or members of a community, that are not always working at the same geographic location. Davsenport and Probst (2002), in their Siemens Best Practices case book, refer to a number of organizations devoted on their staff sharing ‘best practices’ using document repositories (such as reports of past successful or failed projects, employee, product and service profiles, known as Yellow Pages) and IT-based tools for inputting and extracting knowledge from the repositories. The range of such knowledge sharing systems includes from simple document management systems that help in the storage, annotation and retrieval of documents (Gibbert et al 2000; Kalpers et al 2002) to Group Support Systems and Expert Systems that help in problem solving and decision making (McNurlin & Sprague 2004), as we have already seen in the previous section.

Classical knowledge sharing models suggest that the knowledge transfer and/or sharing process involves the conversion of tacit knowledge into explicit and vice versa. At the same time, there are processes that help share tacit and explicit knowledge without conversion, despite the fact that for Nonaka and Takeuchi (1995) the conversion of knowledge from tacit to explicit and finally tacit is the basis of knowledge creation. The knowledge conversion process involves close interaction between and complete understanding amongst key employees, the so-called knowledge group of an organization. This team includes employees and staff (from manufacturing, quality, R&D, marketing, supplies and sales) and in most cases the end-users of the products or services created by the organization.

KNOWLEDGE SHARING NETWORKS

For knowledge to be shared effectively between, within and across organizations and persons, those who possess knowledge should make it available in an accessible place and manner and with a focus on its application. Those who seek knowledge should first be aware of the knowledge locus and, second, be capable of interpreting the knowledge within their own context, prior to applying it.

In recent literature, a number of scientists have successfully addressed the topic of inter-organizational networks. Based mainly on the work of von Krogh and Roos (1996), Zack (1999), and Dyer and Nobeoka (2000), we consider Knowledge Sharing Networks (KSN) as those types of networks among individuals, communities, organizations (or even between groups of organizations), which have as main common characteristic the sharing of both tacit and explicit knowledge. Dyer and Nobeoka (2000) consider that a KSN serves as a
locus for facilitating knowledge sharing and effective knowledge work, since it makes knowledge permanent, accessible and portable to those who need it, both inside and outside organizations. Zack (1999) proposes a framework that he calls Knowledge Management Architecture, in order to manage mainly explicit knowledge, based on two KSN elements:

- Repositories of explicit knowledge
- Refineries for accumulating, refining, managing and distributing explicit knowledge

He also recognizes the new organization roles needed in order to execute and manage the refining process, and the importance of IT in supporting the repositories and processes. We shall briefly explain these two KSN elements, building mainly upon Zack (1999) and Ruggles (1998).

**Knowledge Repositories**

Knowledge repositories capture explicit, codified information wrapped in varying levels of context. They are used to store and make accessible ‘what the organization knows’. They include data warehouses, which are useful in knowledge management when the mining and interpretation of their content allows employees to become better informed. More sophisticated repository approaches attempt to enfold more context around information as it is captured.

According to Zack (1999) the basic structural element of a repository is the Knowledge Unit, a formally defined atomic package of knowledge content (labeled, indexed, stored, retrieved and manipulated). The repository structure also includes schemes for linking and cross-referencing the different knowledge units. A Knowledge Platform may consist of several repositories, each one with a structure appropriate to a particular type of knowledge or content.

The most common types of knowledge repositories are those accumulating:

- Structured internal knowledge or knowledge embodied in documents such as memos, reports, product oriented material, etc.
- Informal internal knowledge, a less structured form of accumulated knowledge, such as discussion databases containing know-how, usually referred to as ‘best practices’ or ‘lessons learned’.
- External knowledge, such as competitive intelligence knowledge encompassing analyst reports, trade journal articles and external market research on competitors.

Repositories may be linked to form a ‘virtual’ repository (i.e. product literature, best-sales practices and competitor intelligence might be stored separately but viewed as though contained in one repository).

**Knowledge Refineries**

The refinery represents the process for creating and distributing the knowledge contained in a repository. This process includes five stages:

- **Acquisition**: Firms either create or acquire knowledge.
- **Refinement**: A value-adding process, including cleansing, labeling, indexing, sorting, abstracting, standardizing, integrating and recategorizing.
- **Storage and retrieval**: Bridges upstream repository creation and downstream knowledge distribution.
- **Distribution**: The mechanisms used to make repository content accessible.
- **Presentation**: Firms develop capabilities in selecting, arranging, and integrating knowledge content.

Acquisition, refinement and storage create and update the knowledge platform, whereas retrieval, distribution, and presentation generate various views of that knowledge.
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For KSNs—and knowledge projects in general—to succeed, organizations must create a set of roles and skills to do the work of capturing, distributing and using knowledge. The majority of researchers (Earl & Scott 1999; Zack 1999; Davenport & Prusak 2000, among others) coincide with the need of a Chief Knowledge Officer (CKO), responsible for the overall organization’s knowledge management. As Davenport and Prusak (2000) point out, many firms in the United States and a few in Europe have already appointed CKOs, although in some of them the title may vary. It may be Chief Learning Officer (CLO), Director of Intellectual Capital, or Director of Knowledge Transfer, just to mention a few.

We have already emphasized on the role of IT in section 3. The IT infrastructure provides a ‘pipeline’ for the flow of explicit knowledge through the five stages of the refinery process. Using IT (i.e. the World Wide Web and Groupware) a firm can build a multimedia repository with knowledge units indexed and linked by categories. In this way, the organization’s explicit knowledge will be displayed as flexible subsets via dynamically customizable views. Effective use of IT allows knowledge communication via electronically mediated channels. Explicit, factual knowledge may be disseminated by means of an electronic repository. When the exchanged knowledge is less explicit, e-mail or discussion databases are more appropriate and when knowledge is primarily tacit, most interactive modes, such as videoconferencing or face-to-face conversation are the best answers.

Knowledge Repositories and Knowledge Processes

According to Zack (1999) and under the concept of his Knowledge Management Architecture, knowledge processing is segmented into two broad classes: integrative and interactive. These two approaches support well-structured knowledge repositories, for managing explicit knowledge, while enabling interaction to integrate tacit knowledge.

Integrative applications exhibit a sequential flow of explicit knowledge into and out of a repository. Producers and consumers of knowledge interact with the repository rather than with each other directly. The focal point tends to be the repository and the explicit knowledge it contains, rather than the contributors, users and the tacit knowledge they may possess. Zack (1999) distinguishes two extreme situations, based on the extent to which knowledge producers and consumers come from the same or different knowledge communities.

- At one extreme, which the author names Electronic Publishing, the consumers (readers) neither directly engage into the same work nor belong to the same community as the producers (authors). For example: The organization produces newsletters, or its Human Resources department publishes its policies or a directory of employee skills.
- At the other extreme, producers and consumers are members of the same practice community or organizational unit, and the repository provides a means to integrate and build their collective knowledge. Zack names this an Integrated Knowledge Base and he provides the following example: A best-practices database, where practices are collected integrated and shared among people confronting similar problems.

Zack (1999) gives a detailed scheme of the organizational roles required for successfully managing integrative applications that includes knowledge creators, finders, collectors, and others such as organizational ‘reporters’, analysts, classifiers and integrators. Finally, he proposes that a librarian or ‘knowledge curator’ should manage the repository.

Interactive applications focus primarily on supporting interaction among those people who
possess tacit knowledge. Here the repository is a by-product of interaction and collaboration, rather than the primary focus of the application. According to Zack (1999) they also vary regarding the expertise level of producers and consumers and the degree of structure imposed on the interaction:

- When formal training or knowledge transfer is the objective, (interaction between instructor and student) Zack refers to these applications as Distributed Learning.
- Interaction among those performing common practices or tasks tends to be more ad hoc or emergent. These applications are referred by Zack as Forums. Highly interactive forums, support ongoing, collaborative discussions among producers and consumers as one group.

Interactive Applications play a major role in supporting Integrative Applications. For example, a forum may be linked to an electronic publishing application so that editors discuss directly with readers. Best-practices databases typically require some degree of forum interaction, so that adopters can discuss reapplication with the creators.

Zack (1999) gives a detailed scheme of the organizational roles required for successfully managing interactive applications that includes recruiters and facilitators to encourage and manage participation in forums; communicators, who often refine, structure and index the content. Finally, a Conference Moderator who shall manage the conference repository throughout its life cycle may also be needed, as well as Quality Assurance personnel, in order to assure the quality of the knowledge stored in the repository.

KSNs and Knowledge Management

Despite the fact that many companies today consider knowledge as an asset (Drucker 1988 and 2002; Davenport & Prusak 2000), it is treated differently from the traditional assets of land, labor and capital. Knowledge is a resource locked in the human mind, consequently creating and sharing knowledge are intangible activities that can neither be supervised nor forced out of people. Active cooperation of the individual possessing the knowledge is absolutely necessary for knowledge to be shared. A common language among all the participants—not just English, French or Spanish, but also ‘industrial engineering’ or ‘field sales’—is a major factor in the success of any knowledge transfer. Individuals who do not share a common language will neither understand nor trust one another. When they are brought together to collaborate, they will spar or simply not connect.

Over the same perspective Nonaka and Takeuchi (1995) emphasize on ‘redundancy’ when people from overlapping areas of expertise are working together, while other researchers simply refer to ‘cultural mismatch’ as a barrier to knowledge or technology transfers.

We are summarizing here below some reasons that make sharing knowledge a complicated task:

- Knowledge is not simple and should not be simplified to be made to fit into a KSN, because doing so lessens sharing and exchange.
- People do not easily share knowledge, even if its value grows as it is shared.
- Culture often blocks sharing, especially in highly competitive environments. A sharing culture is a prerequisite for the existing disincentives not to prevent the use of the KSN.
- Technical solutions do not address the sharing issue, or to put it in another way, technology does not change the culture.
- Sharing is not cure-all; neither it is good in all cases. Unlimited knowledge sharing does not work, either. Managers (and especially the CKO, wherever one exists) must be aware of that and take the necessary measures.
• Even hiring and promotion practices may affect knowledge sharing. If not rewarded, sharing may be seen as an anathema.

Barriers to generating and sharing knowledge do exist even in cases where management has taken all necessary steps to encourage it. Most of those barriers have to do with either the stimulation of divergent thinking among the knowledge workers, or the distribution of that thinking among the collaborating group members. We shall briefly present some of the most typical ones:

• Individuals who possess knowledge – especially tacit knowledge – may be actively discouraged from participating, or even worse, could sensor themselves. In order to avoid this, companies must first reward knowledge sharing, mentoring and assisting others, and second, provide the required time for personal contacts.

• Inequality in status among group members is also a strong inhibitor to sharing knowledge, especially when worsen by differences in accessing information. Technicians often hesitate to propose solutions, not only because engineers have higher status, but because technicians base their recommendations on different knowledge bases.

• Distance –both physical and time– makes sharing of knowledge, and especially its tacit dimension, difficult. Technology may offer a partial solution, despite the fact that much knowledge is generated and transferred through body language, physical skill demonstration, and very often requires the use of three-dimensional prototypes.

Increasing productivity is one of the challenges for KSNs in a manufacturing environment. Product and manufacturing process life cycles are becoming shorter as we move from traditional to more high-technology based engineering. As a consequence, the available time for recovering the expenses related with developing and manufacturing new products, is also compressed. This places a reward on the ability of KSNs to capture knowledge created during the process and re-use it in the next generation of products, thus reducing the development and manufacturing time. This “capture-reuse” cycle is a key enabler for performance improvements. The fact that the challenges associated with capturing and reusing knowledge, are basically knowledge management challenges is underlining KM’s key role.

KM responses to this challenge may range from the above presented Knowledge Management Architecture, as proposed by Zack (1999), to the alternatives of a Knowledge Codification Strategy (a people-to-document approach to codify, store and reuse knowledge) or a Knowledge Personalization Strategy (based on networks of people and dialogue between individuals) as clearly distinguished by Hansen et al (1999). Companies using codification strategies or approaches rely primarily on repositories of explicit knowledge. Personalization strategies or approaches imply that the primary mode of knowledge transfer is direct interaction among people.

Based on a study of KM practices of companies in several industrial sectors (Consulting Firms, Health Care and High Tech Industry) Hansen et al (1999) note that although in every sector managers had chosen a distinct knowledge management strategy, there is a common pattern among them. “Those that pursued an assemble-to-order product or service strategy emphasized the codification and reuse of knowledge. Those that pursued highly customized service offerings, or a product innovation strategy, invested mainly in person-to-person knowledge sharing.” (p. 112). They also note that many companies that use knowledge effectively have chosen one strategy predominantly and use the second one to support the first, on an 80-20 split: 80% of their knowledge sharing follows the predominant strategy and 20% the supporting one. They advise managers not to straddle as they may find themselves with an unmanageable mix
of people and expertise. Grover and Davenport (2001) seem to be in complete agreement, when they state: “Both [codification and personalization approaches] 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” (p. 8). It is noteworthy that they add ‘time’, as a new parameter affecting the company’s decision.

It has already been noted that effective knowledge sharing strongly affects the organization’s performance. It is for this reason that we shall close this section by taking a closer look into the issue.

**KSNs and Performance**

Some organizations believe that they have internal customers; manufacturing is marketing’s customer, for example. By doing so they lose sight of what they are trying to accomplish as an organization. Others are organized around multifunctional processes that are directly focused on serving the end user. They form ‘product business teams’ that behave completely differently to the way departments behaved in the past over relevant functions. In this way a lot of dumb decisions in manufacturing –made only for the sake of manufacturing– can be avoided. The ‘product business teams’ are meant to divert the focus from the function to the customer.

There are particular aspects in the manufacturing process that create difficult situations for both the Knowledge Sharing Networks (KSNs), and the knowledge management system in use. We are listing here below some of the most common:

- Lack of shared understanding, mainly due to the fact that they do not all use a common language.
- Discrepancies among the various versions of information stored in different locations of the KSN.
- Extensive use of personal (or group) information stores and the absence of easy-to-use indexing systems.
- Over-dependence upon sharing explicit knowledge and information, as the tacit one is more difficult to flow.
- Loss of skills developed due to collaboration, as they are not transferable through the KSN.
- Over-dependence on the KSN, and thus minimization of face-to-face contacts.

In industrial environments where these situations are not overcome, they may result in inefficiencies in the manufacturing process, which may, in their turn, produce a negative influence on the performance of the organization. Thus the effort is to make available infrastructures supporting knowledge management applications and introduce management initiatives promoting knowledge sharing activities throughout the entire manufacturing environment.

**CONCLUSION**

It has been made clear, in this chapter, that getting value out of knowledge sharing requires more than technology. Knowledge is inherently hard to control as it is ever expanding and unpredictable. Only when executives view organizational knowledge under this light will they manage it for most effective use. Starting on the assumption that tools people need to work with others are different from the ones they need to work alone, we demonstrated how the use of groupware permits ‘anytime, anyplace’ collaboration within the organization and for the benefit of the organization.

Further on in this chapter, we examined organizational knowledge as an intellectual capital asset and focused on the effect that IT has on its management. We also recognized where IT –and particular groupware and knowledge
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repositories—fit in the usage and sharing of organizational knowledge. Under this perspective, we demonstrated that management’s principal challenge is to establish the mechanisms for collaborating individuals and groups to coordinate their activities in order to best support the flow of organizational knowledge within a firm, and to define ways, through which, the same mechanisms will preserve organizational memory in the future. That means not only to encourage their employees to share knowledge personally, but also to store their knowledge in a form that others can easily access it now or in the future.

Thus, we may conclude that successful management or sharing of organizational knowledge provides a competitive advantage by adopting a knowledge management perspective assisted by information technology, leadership and culture, while, at the same time, it preserves organizational memory.

REFERENCES


