

Analyzing Intraorganizational Knowledge Management

Eerikki Mäki

Helsinki University of Technology, Department of Industrial Engineering and Management, P.O. 9500 02015
HUT Finland. Tel +358-9-4512123, Fax +358-9-4513665, email Eerikki.Maki@hut.fi

Eila Järvenpää

Helsinki University of Technology, Department of Industrial Engineering and Management, P.O. 9500 02015
HUT Finland. Tel +358-9-4513653, Fax +358-9-4513665, email Eila.Jarvenpaa@hut.fi

Laura Hämäläinen

Helsinki University of Technology, Department of Industrial Engineering and Management, P.O. 9500 02015
HUT Finland. Tel +358-9-4516056, Fax +358-9-4513665, email Lhama@tuta.hut.fi

Abstract

Managing organizational knowledge is especially important in knowledge intensive work where the inputs and outputs of work are often knowledge. Information and knowledge are raw material for knowledge workers, and their task is to process that knowledge. Availability of relevant information and knowledge is therefore essential for knowledge workers' productivity. An empirical study of obstacles of knowledge flow was conducted in a knowledge intensive organization. This study shows how different obstacles of knowledge flow can impede work in knowledge intensive organization. In addition, some managerial actions are recommended to facilitate knowledge flow in organizations.

Introduction

Knowledge work aims for continuous innovations and learning and requires extended autonomy for knowledge workers. Accordingly, it calls for a new kind of leadership and mindset in managing knowledge intensive organizations. According to Drucker (1999), the most valuable asset of 21st century institutions, whether business or non-business, is their knowledge workers and their productivity. The amount of information and knowledge in organizations is increasing rapidly. Moreover, more demanding functions that organizations are performing require combining of its members skills and knowledge. To utilize its resource pool and benefit from employees' complementary skills, organizations need to have methods to support interaction and knowledge sharing between employees. Since the knowledge is the basis for organizational learning, it is significant to manage organizational knowledge effectively and efficiently.

Typically, knowledge intensive work is non-routine and complex. It requires significant cognitive information processing to guide work as well as to manipulate, produce, and communicate symbols (Järvenpää & Immonen, 1998). In general, knowledge intensive work includes active and independent acquiring, processing, and developing of knowledge. Although knowledge workers may create new knowledge "by accident" or utilize knowledge based on their skills and competencies, improving knowledge acquisition, knowledge storing, and knowledge dissemination, knowledge creation and utilization can be facilitated (see Fig. 1).

Knowledge itself is difficult to manage, but different knowledge processes can be managed. Knowledge management refers to organizations' attempts to introduce tools, technologies, and procedures to utilize available knowledge and intellectual capital in order to learn, create new knowledge, and make the most of the knowledge potential. Knowledge management can be divided into smaller organizational processes, e.g. knowledge collection, storing, dissemination, creation, etc. (Davenport et al. 1996). Different knowledge processes in organizations occur more parallel than sequentially, which makes them difficult to control.

Knowledge processes are highly interrelated, e.g. knowledge storing directives influence on how knowledge can be searched or retrieved, etc. Knowledge management is especially important in knowledge intensive work, where the outcomes of work are knowledge products or knowledge as such. Knowledge intensive work includes active and independent acquiring, processing, and developing of knowledge.

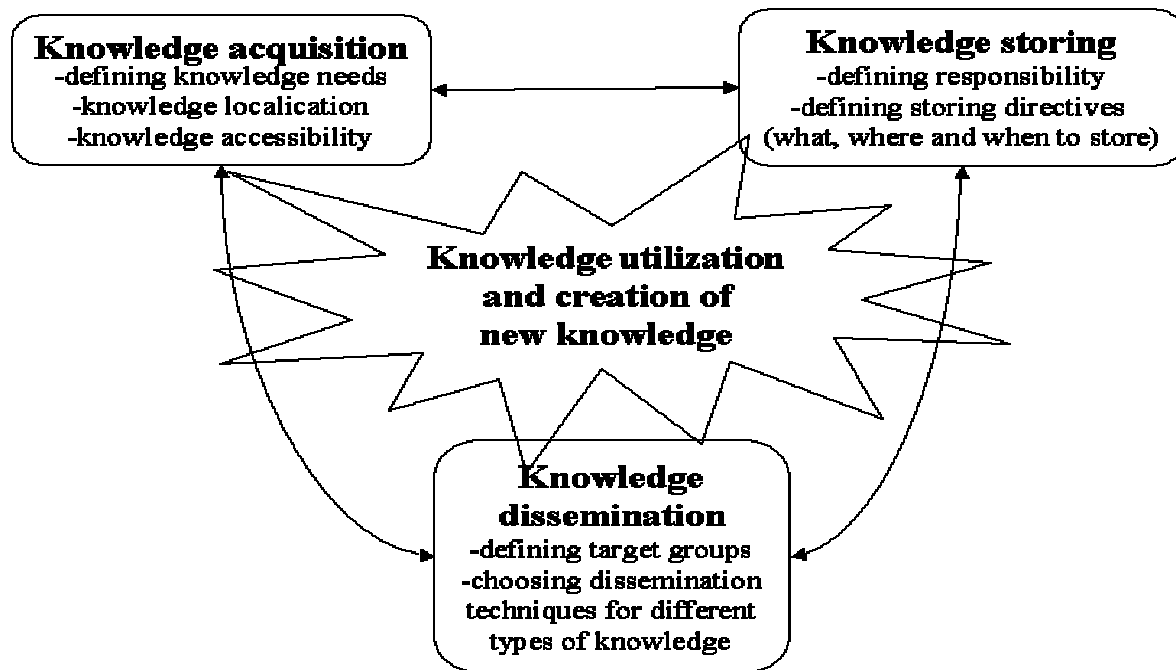


Figure 1 Different knowledge processes and their relationships (Mäki, Järvenpää & Hämmäläinen 2001).

Knowledge consists of a tacit element and an explicit element (Polonyi, 1966). Tacit knowledge is personal, context-specific, and thus hard to formalize and communicate. Explicit knowledge is transmittable in formal, systematic language. Maula (2000) also makes a distinction between highly-structured and less-structured explicit knowledge. The fact that knowledge in organizations is different by nature implies that there must be different methods to manage different kinds of knowledge. Information and communication technologies (ICT) are widely used to manage highly-structured explicit knowledge. ICT is, however, less practical in managing less-structured explicit knowledge and tacit knowledge.

The aim of knowledge intensive organizations is to produce and create new knowledge and utilize available, existing knowledge. Their aim is by connecting different pieces of information and knowledge to create new knowledge and improve existing knowledge. For these purposes individual employees, as well as different groups and units within an organization or even between organizations must have effective methods, tools, or practices to process knowledge. How knowledge is processed is more or less dependent on organizations' members' skills and competencies, but there are also managerial actions that can either improve or impede utilization of organizational knowledge.

Sometimes in knowledge intensive work, it is not clear in advance, what is the goal of the work or what are the knowledge resources needed (e.g. in R&D work). In many cases, however, knowledge workers know what pieces of information and knowledge they need to

have. If this is the case, the knowledge workers need only to acquire that information or knowledge and then process it.

Locating and accessing knowledge resources

If the required information or knowledge is known, knowledge worker needs first to localize it. It usually means finding people or finding documents within an organization or outside the organization. Finding the right people – “knowers” – is influenced by seeker’s social network. The size and diversity of one’s social network is affected by the time spent in an organization, organizational design, social skills, etc. The potential knowledge pool is large, if the seeker of information or knowledge has a large and diverse social network, which in turn helps to locate knowledge sources. Granowetter (1973) and later Hansen (1999) had addressed to the importance and influence of tie strength and type of knowledge on locating, accessing and transferring knowledge.

To have a possibility to find documented explicit knowledge in organizational knowledge repositories, the documents should be stored in such places where the seeker of information has access. Therefore, organizations’ should have well and clearly established directives to store documents. These directives should define what knowledge is stored, where it is stored and when it is stored. In addition, the seeker of information or knowledge must have appropriate methods to search for the desired information and knowledge (e.g. search engines). Beyond question, the praxis to organize knowledge into knowledge repositories must be systematic and user friendly.

Locating the needed information and knowledge is usually not enough. The seeker must also have an access to the knowledge that is located. Several aspects may impede the accessibility of knowledge. These include competition between organizations or units, confidentiality of located knowledge, trust between the seeker and the holder of knowledge. Also physical proximity or time may restrain accessibility of knowledge. The latter restrains are especially related to the type of knowledge that should be transmitted between these two parties e.g. the difficulty to transfer tacit knowledge without face-to-face interaction.

Transferring knowledge

The difference between codified explicit knowledge and personalized tacit knowledge plays a crucial role in transferring knowledge between the seeker and the holder. Knowledge can be transferred via different kinds of medias e.g. email, Intranets, conversations, workshops, etc. More and more frequently ICT are applied to transfer knowledge between different parties. Transferring explicit knowledge via ICT is cheap and easy. However, using ICT for knowledge sharing may cause problems in externalizing knowledge (knowledge owner/sender) and in internalizing knowledge (knowledge receiver) (Hendriks 1999). Although IT tools may be useful for organizations, some organizational (Doherty & King 1998) and institutional forces (Olesen & Myers 1999) and knowledge itself (Hansen 1999, Hansen, Nohria & Tierney 1999) put limitations to employ technology for managing organizational knowledge. Successful methods in consulting companies to manage tacit knowledge include interpersonal knowledge networks, mentoring, and knowledge maps (pointing to people as well as to documents) (Apostolou & Mentzas 1999a and 1999b). So, management of tacit knowledge can be facilitated by ICT, even though it requires close interpersonal interaction.

Utilizing knowledge

How knowledge is utilized is both a strategic and operational question. Organizations should know how they transform their knowledge into products and services that can be sold in the markets. Operational level of utilizing knowledge is linked to organization's employees' skills and competencies. Educational background and work experience are the most important tools to operate with knowledge. Organizations' and their employees' ability to utilize knowledge is crucial for organizations. However, it goes beyond the scope of this paper.

Research questions

In general, one objective of knowledge management is to eliminate the obstacles of knowledge flow. At the same time, information overload should be avoided, too. Poor knowledge flow and incomplete use of knowledge resources are probably known and recognized in all kinds of organizations. Nevertheless, not too many attempts have been done to analyze systematically how different variables affect on knowledge flow and utilization of knowledge within a knowledge intensive organization. This paper aims to systematically analyze intraorganizational knowledge management and find the crucial obstacles of knowledge flow.

Three main research questions were placed: 1) What are the current methods and that are applied to manage knowledge practices in the case company? 2) What are the obstacles and facilitators of knowledge flow in the selected operational process? 3) What kind of actions could be taken to improve knowledge flow within the organization?

Material and methods

Case description

Company Alfa, which participated on this study, is a large engineering company operating on traditional industry sector. The products they produce are very knowledge intensive and a lot of resources are allocated to product development. Company sells its products worldwide. Its operations are separated on different business units that operate quite independently. There are several thousands of employees in the whole company, but only some tens employees participated in the operational process that was studied.

Knowledge flow in one operational business process was selected to be analyzed thoroughly. Work processes under investigation include acquisition, storage, dissemination, and utilization of knowledge. Compared to R&D work there are lots of similarities, although company employees do not call it with that name. The selected process (and knowledge flow) crossed several different units in the organization and included collaborative actions with customers.

The purpose was to identify 1) how information and knowledge was collected and acquired in the operational process, 2) how that knowledge was processed (stored, shared, converted, etc.) and 3) what kind of obstacles and facilitators of knowledge flow there were. In addition, the aim was to find out what managerial actions could be taken to improve knowledge flow in the selected operational business process.

Data

The data consisted of documents, questionnaire survey, interviews, and workshops. Company documents were used to get an understanding of the knowledge intensive process that was

studied. Survey included questions on company's IT tools and their practicality. Interviews were used to collect data on employees' experiences of knowledge flow. Interviews were taped and transcribed. Then the events that were related to fluency of knowledge flow were categorized and analyzed using content analysis (Weber 1985). Workshops with company's representatives were arranged to check the reliability and validity of the results.

Results

Results showed several defects on managing both explicit and tacit knowledge. Surprisingly, management of tacit knowledge was superior compared to management of explicit knowledge. Being an engineering company, the emphasis on personalization strategy on managing intraorganizational knowledge was somewhat unexpected. Knowledge was stored as personal skills and expertise, and within an organization knowledge was often transferred using person-to-person channels. Not much attention had been paid to manage knowledge more efficiently, but company had adopted routines that enabled employees manage knowledge sufficiently.

Obstacles of knowledge flow were classified into three categories (root causes). These were 1) incomplete directives to store explicit knowledge 2) tacit knowledge was not converted into explicit form, and 3) lack of regular or organized forums to share both explicit and tacit knowledge. Obstacles of knowledge flow and their consequences are depicted on table 1.

First, there were no clear instructions or directives for storing explicit knowledge that had been created within an organization. Explicit knowledge was usually stored on personal computers or folders and it was therefore not accessible by other employees. If knowledge was stored on public knowledge repositories, there were no uniform directives *what* knowledge should have been stored, *how* it should have been documented, explicitly *where* it should have been stored, *when* it should have been stored, or *who* was the responsible person for storing and updating the knowledge. Altogether, knowledge was not documented systematically or regularly. As a consequence of deficits of knowledge storing, employees found it very difficult to locate stored knowledge within an organization, and the reusability of stored knowledge was low. In some occasion, employees used incomplete knowledge to carry out their tasks, even though they knew that more complete knowledge would have been somewhere in the organization.

Second, since the knowledge appeared to be personalized tacit knowledge, it was difficult to localize or transfer required knowledge within an organization. ICT was applied only modestly to support localization of knowledge embodied to experts. Naturally, localization of knowledge resources was most difficult for those employees that had the shortest tenure since they did not have large social network. Although company employees were willing to share their knowledge with others it was often difficult to locate those employees that had the required knowledge. Again, the most experienced employees that were the most knowledgeable were usually the busiest ones, so they had only limited time resources to share their knowledge with other employees. Furthermore, tacit (not explicated) knowledge was difficult to communicate with customers or employees from other departments.

Third, knowledge transfer between, and even within, projects was poorly organized. ICT was poorly utilized for knowledge sharing and transfer. Knowledge sharing based on voluntariness and it happened on informal forums. Moreover, employees had only limited access to public knowledge repositories, and they could not find or access knowledge that was created by other projects or units.

To conclude, obstacles to manage both explicit and tacit knowledge were found. Some of these obstacles are rather easy to eliminate, whilst some of them probably need more time or even totally new kind of leadership and mindset in managing knowledge. Managerial implications to remove obstacles of knowledge flow are discussed later on this paper.

Despite the large number of obstacles on knowledge flow, there were a lot of enablers that facilitated knowledge flow and sharing of tacit knowledge, especially. Employees worked physically near to each other, which gave them opportunities to visit their colleagues' rooms if needed. They also had a long working history together, so they had developed similar knowledge base and understanding, and they knew easily what were meant in conversations. They also felt that they had enough time and opportunities to face-to-face collaboration. There was a strong organizational culture encouraging employees to share their knowledge even with organization's members they didn't know before. This happened even though no managerial actions were taken to encourage knowledge sharing across project or unit boundaries.

Table 1 Obstacles of knowledge flow

Root cause	Obstacle of knowledge flow	Consequence
Incomplete or impractical directives to store explicit knowledge (what, where, when)	Knowledge is stored on personal computers or folders.	Knowledge is not accessible to others.
	Only portion of knowledge is stored on common databases.	Only portion of knowledge is accessible to others => knowledge is not searched from company knowledge repositories.
	Knowledge is not collected systematically.	Reusability of knowledge for others is low. Causes extra work or solutions based on incomplete knowledge.
	Knowledge is not documented systematically.	The reusability of knowledge will decrease. Causes extra work or solutions based on incomplete knowledge.
	Only “finished” documents or end results from projects are available.	Projects in organization do not necessarily know what knowledge is concurrently produced in other parts of an organization.
	Several places to store explicit knowledge.	Difficulties to find organizational knowledge.
	Knowledge repositories contain too much knowledge and it is poorly organized.	Even important knowledge is not found from knowledge repositories.
	Basis for important decisions are poorly documented.	It is difficult to know afterwards why certain decisions were made.
Tacit knowledge is not converted into explicit form	Organizational or individual areas of expertise are poorly listed and available.	Time is wasted when trying to locate or find experts. Required experts are not found.
	Expertise is embodied to individuals.	Knowledge transfer to less experienced individuals is slow. The availability of knowledge (experts) is limited.
	Different working methods within an organization in different countries.	Impedes knowledge flow within an organization.
	Difficult to catch experts because they are usually the busiest ones.	Knowledge must be acquired from somewhere else. This knowledge is often less complete.
Lack of regular or organized forums to share explicit or tacit knowledge.	Time is not spent into apprentice actions.	Knowledge from most experienced employees is not transferred to the less experienced.
	Not enough formal or informal opportunities to share knowledge with other projects or organizational units.	Knowledge does not flow between projects or units.
	People do not attend project meetings regularly.	Employees in projects do not have same knowledge base.
	Formal project meeting are not arranged regularly.	Employees do not know how their project is proceeding.
	Limited access to databases.	Employees do not even know that knowledge they need exist somewhere in the organization.

Discussion

This study aimed to find out current knowledge management practices in a certain business process, and to develop more efficient methods to utilize case company's organizational knowledge. Over the years the company had adopted routines that enabled employees to manage knowledge satisfactorily. However, these routines seem not to be proper anymore because of the increased volume of available knowledge and accelerating demands of planning and production. A lot of knowledge resources remained unutilized because they were not available at the time of request. Many obstacles for effective knowledge flow and utilization of knowledge were found. These obstacles are not unique and they are reported earlier in literature. However, obstacles of knowledge flow, and their influence on business performance are different in different organizations due to their unique operational contexts. The contribution for the companies for analyzing organizational knowledge management is that they become aware of how knowledge flows and how knowledge resources are utilized. This gives them opportunity to organize their knowledge management practices more effectively. Most of the managerial actions to be taken may be actually quite small. This is not to say that focusing on improved knowledge management is always easy. Sometimes implementation of knowledge management practices needs changes in strategic direction or organizational culture.

This study was limited to a single operational process in one organization. Results seem to be reliable and valid in this context, but it is difficult to assess if the results can be generalized in different kinds of working environments. Although the obstacles of knowledge flow may be similar in different organizations, the solutions to remove these obstacles may vary depending on the culture, structure, size, etc. of the organization in case.

Managerial implications

All organizations consist both tacit and explicit knowledge. Since organizations should choose whether they emphasize personalization or codification strategy (Hansen et al. 1999), this would be the first task for the case organizations. Some of the tacit knowledge is convertible into explicit form. Yet, organizational tacit knowledge can also be a competitive advantage because competitors will not easily imitate or copy knowledge that is only in tacit form. Converting a lot of tacit knowledge into explicit form will also need a lot of resources. Zack (1999) concludes that organizations should determine what knowledge they make explicit and what they leave tacit. Schulz & Jobe (2001) also suggest that knowledge codification should be considered carefully to have positive results. Not all knowledge is convertible into explicit form and the codification directives should be focused on special form (e.g. numbers or words, but not both). Also Johannessen, Olaisen & Olsen (2001) discuss about the importance of both explicit and tacit knowledge for sustainable competitive advantage. Derived from the operational context of the case company, more emphasis on codification strategy might be an alternative to be considered. This would probably have positive impacts on availability of relevant knowledge and reduce time spent on localizing and accessing knowledge. However, this study does not bring much empirical evidence which strategy should be chosen in this particular case company.

Managerial actions in this case study should address to remove the root causes that have strong negative effects on finding relevant knowledge within an organization, accessing that knowledge, and reusing knowledge that is created within an organization. First, different tasks that include to the operational process should be explicitly described as well as the knowledge that is required to carry out these activities. Knowledge that is required for different tasks should be systematically collected, documented and stored into repositories

where employees can easily access. Knowledge storing should be done using templates that have sections for all relevant knowledge. Projects and employees should also have their own sites on Intranet or Internet and there should be search engines for knowledge searching. Updating the sites should be easy, so that too much time is not wasted on updating the sites. Second, organized actions to convert tacit knowledge into explicit form should be taken. This would decrease organization's and its employees' dependence on individual experts and these experts could also spend their time more productively than helping other employees. Third, organization should organize forums where explicit and tacit knowledge could be shared. Even though knowledge within organizations will flow without any managerial actions, there is a huge potential to increase knowledge flow if appropriate forums are organized for employees to establish social networks, communities of practice, and so on.

Proposal to improve knowledge management in the case company was given. Implementation is still unfinished, as well as the results of the proposed model for new knowledge management solutions.

References

- Apostolou D., Mentzas G. (1999) Managing Corporate Knowledge: A Comparative Analysis of Experiences in Consulting Firms. Part 1. Knowledge and Process Management, vol. 6 (3), 129-138.
- Apostolou D., Mentzas G. (1999) Managing Corporate Knowledge: A Comparative Analysis of Experiences in Consulting Firms. Part 2. Knowledge and Process Management, vol. 6 (4), 238-254.
- Davenport T., Jarvenpaa S. & Beers M. (1996) Improving Knowledge Work Process. Sloan Management Review, Summer, 53-65.
- Doherty N. & King M. (1998) The Importance of Organizational Issues in Systems Development. Information Technology & People, vol. 11 (2), 104-123.
- Drucker P (1999) Management challenges for the 21st century. Oxford: Butterworth-Heinemann.
- Granowetter M. (1973) The Strength of Weak Ties. American Journal of Sociology, 78 (6), 1360-1380.
- Hansen M. (1999) The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge Across Organizational Subunits. Administrative Science Quarterly, 44 (1), 82-111.
- Hansen M., Nohria N. & Tierney T. (1999) What's Your Strategy for Managing Knowledge? Harvard Business Review, vol. 77 (2), 106-116.
- Hendriks P. (1999) Why Share Knowledge? The Influence of ICT on the Motivation for Knowledge Sharing. Knowledge and Process Management, vol. 6 (2), 91-100.
- Johannessen J., Olaisen J., Olsen B. (2001) Mismanagement of Tacit Knowledge: the Importance of tacit Knowledge, the Danger of Information Technology, and what to Do about It. International Journal of Information Management, vol. 21, 3-20.
- Järvenpää, E. and Immonen, S. (1998) Quality of working life in knowledge and information work: Implications for information society. In P. Vink, E.A. P. Koningsveld and S. Dhondt (Eds.) Human factors in organizational design and management – VI. Amsterdam: Elsevier, pp. 195-200.
- Maula M. (2000) Three Parallel Knowledge Processes. Knowledge and Process Management, vol. 7 (1), 55-59.
- Mäki, E., Järvenpää, E. & Hämäläinen, L. (2001) Managing Knowledge Processes in Knowledge Intensive Work. The 2nd European Conference on Knowledge Management. Bled School of Management, 8-9 November 2001, Slovenia
- Olesen K. & Myers M. (1999) Trying to Improve Communication and Collaboration with Information Technology. Information Technology & People, vol. 12 (4), 317-332.
- Polanyi, M. (1966) The tacit dimension. Garden City: Doubleday & Company.

Schulz M. & Jobe L. (2001) Codification and Tacitness as Knowledge Management Strategies: an Empirical Exploration. *The Journal of High Technology Management Research*, vol. 12 (1), 139-165.

Weber R. (1985) *Basic content analysis*. Sage Publications, Newbury Park.

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