

LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
Department of Business Administration
Knowledge Management

**DIAGNOSING AND DEVELOPING KNOWLEDGE MANAGEMENT
CAPABILITY
-KNOWLEDGE MANAGEMENT CAPABILITY IN UPM-KYMMENE
WOOD OY**

Examiners:

Professor Aino Kianto

Professor Kirsimarja Blomqvist

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Riikka Harju

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ABSTRACT

Author: Riikka Harju

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The purpose of this case study is to clarify how KM (knowledge management) capability is constructed through six different activities and to explore how this capability can be diagnosed and developed in the three case organizations.

The study examines the knowledge management capability of the three factories in UPM-Kymmene Wood Oy, a major Finnish plywood producer. Forest industry is usually considered to be quite hierarchical. The importance of leveraging employee skills and knowledge has been recognized in all types of organizations – including those that mainly deal with tangible resources. However, the largest part of empirical knowledge management literature examines KM in so called knowledge-intensive or knowledge-based organizations. This study extends existing literature by providing an in depth case study into assessment and development of KM activities in these three organizations with little awareness of the KM discourse. This subject is analyzed through literature review, theoretical analysis and empirical research in the case organizations. The study also presents a structured method for evaluating KM activities of a company and for diagnosing the main weaknesses that should be developed in order to achieve KM excellence. The results help in understanding how

knowledge management capability is constructed and provide insight into developing and exploiting it within an organization.

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Tekijä: Riikka Harju

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Asiasanat: Tietojohtaminen, kyvykkyydet, kehittäminen, arviointi, tapaustutkimus

Tämän tapaustutkimuksen tarkoituksesta oli määritellä kuinka tietojohtamiskyvykkyyss muodostuu erilaisista käytännön toimenpiteistä ja kuinka näitä käytäntöjä voidaan yrityksissä tutkia, analysoida ja kehittää. Tässä työssä tutkitaan kolmen UPM-Kymmene Wood Oy:n vaneritehtaan tietojohtamiskyvykkyttä. Tutkimus keskittyy tietojohtamisen käytäntöjen tunnistamiseen, näiden käytäntöjen kehittämiseen ja siihen, kuinka ne hyödyntävät yritystä.

Metsäteollisuus on koettu historiallisesti hyvin hierarkkiseksi ja ei-tieto-intensiiviseksi teollisuuden alaksi. Suurin osa empiirisestä tutkimuksesta tietojohtamisen alalla keskittyy tietojohtamiseen niin sanotuissa tietoperusteisissa organisaatioissa. Aineettoman pääoman johtaminen on kuitenkin tärkeää myös niissä organisaatioissa, jotka tuotannossaan keskittyyt aineelliseen pääomaan.

Tutkimus perustuu kirjallisuuskatsaukseen, teoreettiseen analyysiin sekä laajaan empiiriseen tutkimukseen kolmessa yrityksessä. Tutkimus tarjoaa myös strukturoidun kyselylomakkeen tietojohtamisen käytäntöjen nykytilan arvioimiseen sekä metoden ongelmaohien diagnostoiimiseen, jonka avulla niitä voidaan lähteä kehittämään. Tulokset auttavat yrityksiä

ymmärtämään tietojohtamisen muodostumista erilaisista käytännön toimenpiteistä.

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1 INTRODUCTION

This study aims at diagnosing and developing knowledge management (KM) capability. It examines the KM capability of the three factories in UPM-Kymmene Wood Oy, a major Finnish plywood producer. Also, the KM activities composing this capability are explored. This Master's Thesis is one part of a bigger research project at Technology Business Research Center (TBRC) in Lappeenranta University of Technology. The project is funded by TEKES (National Technology Agency of Finland) and some other Finnish companies. This study focuses on KM activities and organizational benefits of KM.

The data was gathered from three factories of UPM-Kymmene Wood Oy and it represents employees' and managers' experience of managing knowledge in their organizations. The organization is among the leading companies in Finland within the forest industry. The plywood business belongs to wood product industry, which is one of the main businesses of the consolidated corporation. In addition the organization has invested in forestry and energy trade in Finland. Groups sales were over 10 billion and employees about 26 000 in total in the year 2007. Plywood businesses' sales were 580 million and employees 4000 in total. Manufacturing is implemented in 15 different factories, which of 12 is located in Finland. (UPM-Kymmene Wood Oy, 2008.) There were three participating organizational units within the consolidated corporation. These units are discussed as organizations in this study because of their individual management and culture. The data of this study is gathered from the factories located in Lahti, Jyväskylä and Heinola.

Forest industry is usually considered to be quite hierarchical and non-knowledge-intensive by nature. However, the largest part of empirical KM literature examines KM in so called knowledge-intensive or knowledge-

based organizations. The importance of leveraging employee skills and knowledge has so far become a topical issue for all types of organizations – including those that mainly deal with tangible resources. In order to maintain competitive advantage in today's rapidly changing arena, organizations need to manage, use and acquire resources which are difficult to copy (Jordan & Jones, 1997). This way organizations intellectual capital and its knowledge assets have become vital. This study extends existing literature by providing an in depth case study into assessment and development of KM activities in these three case organizations with little awareness of the KM discourse. Also, the current KM activities are explored.

1.1 Background

In considering the globalization of business and the technological advances in today's complex work environment, the growing importance of intangible value drivers is obvious. The role of knowledge as the key productive factor has become one of the truisms of the current managerial discourse. However, competitive advantage does not accrue from intangibles only but from the organizational capabilities to leverage, develop and distribute them (Demarest, 1997). The KM that enables these actions has become an important source of sustainable competitive advantage. (Nonaka & Takeuchi, 1995; Nonaka et al., 2000; Lee & Choi, 2003; Pöyhönen 2005; Robinson et al., 2006). It is essential that the organization is constantly able to renew its knowledge assets to be successful (Pöyhönen, 2005).

The KM literature contains many normative but rather abstract prescriptions for KM, as well as anecdotal pieces of evidence from world-class leading organizations. In spite of this, there are relatively few organizations that are indeed practicing systematic and conscious KM.

One reason for this could be the lack of practical advice and examples of how KM can be implemented in organizations.

An organization operating in a dynamic market environment has to constantly improve its products, services and processes, and rethink its business orientation. Organizations cannot afford to rest on their laurels. They need to acquire new knowledge and competencies which they can convert into innovations. In other words organizations need to renew and learn. KM is though more a matter of facilitating learning than controlling (Filius et al., 2000). Today the focus is on learning, challenge and improving the intangible resources (Marr, 2006, 94).

As noted earlier, knowledge has become the source of competitive advantage and one of the most important resources of an organization (Nonaka & Takeuchi, 1995; Miles et al., 2000; Stähle & Laento, 2000; Hannula & Stähle, 2004; Dalkir, 2005; Pöyhönen, 2005; Marr, 2006). The primary task of management is to maximize the organizations value through optimal deployment of capabilities (Grant, 1996, 110). Organizations need tools to help them understand their resources and capabilities and to convert capabilities into dynamics in order to achieve value and success.

Organizations should ask themselves what are the main sources of competitive advantage in their markets and what are the strategy perspectives and tools still relevant in the new world of business. The emergence of virtual markets opens new sources of innovation that may require a parallel shift in thinking towards more integrative, dynamic, adaptive and efficient business models (Amit & Zott, 2001). KM could offer this new business model to the new business world.

1.2 The objectives and the research problems of the study

The objective of this study is to explore how KM capability can be diagnosed and developed in order to achieve organizational benefits. This subject is first analyzed through literature review and theoretical analysis. The study also clarifies how KM activities can be assessed and developed in organizations with little awareness of the KM discourse. The subject is then analyzed through extensive empirical research in the case organizations. Finally, the study presents a structured method for evaluating KM capability of a company and for diagnosing the main weaknesses that should be developed in order to achieve KM capability excellence. The results help in understanding how KM capability is constructed and provide insight into developing and exploiting it within an organization through different kinds of activities.

In this study the case study approach is utilized to examine the assessment and development of KM capability and its activities in three plywood factories. The current state of KM capability was assessed with a standardized survey method, which addresses the various dimensions of KM, i.e. knowledge acquisition, knowledge transfer, knowledge sharing, knowledge creation, strategic management of intellectual capital and information storage and communication technology (ICT) systems. The standardized survey was improved further by using the Organizational Renewal Capability Inventory (ORCI) -questionnaire established by Aino Kianto (née Pöyhönen) and the analysis was conducted using quantitative research methodology. After the survey diagnosis, focus group interviews were conducted in the case organizations to examine KM activities more in depth and to generate and define development practices for the weaknesses identified through the survey. Conclusions are drawn based on the results from the survey and the viewpoints from the interviews made in the organizations.

The research questions to be answered in this study are:

What elements does KM capability consist of?

How KM capability can be evaluated through a structured method for diagnosing the main weaknesses that should be developed?

What are the most important objectives for development of KM capability in the three case organizations?

The thesis is organized as follows. First, chapter 2 presents the field of KM research and provides a theoretical categorization of KM activities composing finally the KM capability. Chapter 3 provides description of the organizational benefits of KM detected in the previous research. Next, the methodology of the study is explained and case factories introduced in chapter 4. The results are presented in chapter 5 by examining the three factories in the light of the KM activities exhibited in them and by providing an analysis of the main developmental needs identified. Conclusions with implications for understanding KM capability in the case organizations are made in chapter 6 including suggestions for future research. The structure of the study is illustrated in figure 1.

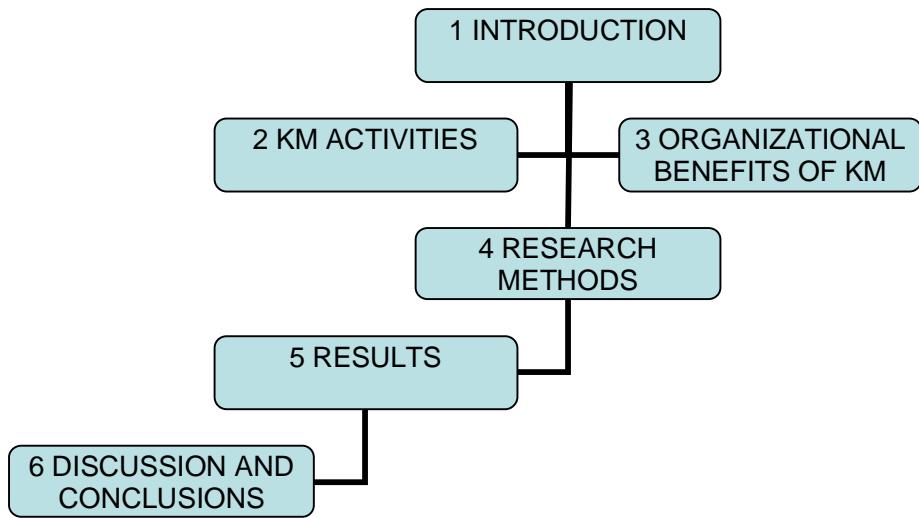


Figure 1: The structure of the study.

1.3 Exclusions and the level of analysis of the study

This study's purpose is to explore how KM capability can be diagnosed and developed and to clarify how specific KM activities can be assessed and developed. An organization in this context is a collective, a factory of plywood. Many concepts of the study are referred as "capability", which refers to an organizational level of skill. Capability has developed over time in interaction between the members of the organization and its partners.

In this study a KM capability model is designed in order to help organizations to understand what it actually is and how it is structured. It also help them in understanding what the concrete activities of KM capability are.

2 KNOWLEDGE MANAGEMENT ACTIVITIES

This chapter presents the activities of KM capability. At first KM is discussed through earlier research. Then the work moves to explore the constructs of KM capability and its activities. They are discussed particularly from the view of which activities organizations should have in order to enable renewal and learning. The aim is also to clarify what kind of KM activities a renewing organization has. The methodology used is a literature review.

2.1. Previous research of knowledge management

A vast number of diverse fields are interested in KM. Organizational science, cognitive science, information technologies, sociology, communication studies and collaborative technologies are just a few to mention. The diversity of KM presents some challenges with respect to boundaries. Some sceptics argue that KM is not a separate discipline with a unique body of knowledge. It is important to be able to describe what set of attributes are necessary and are in themselves sufficient to constitute KM as a discipline that can be distinguished from others. (Dalkir, 2005, 7.)

The role of KM is inevitable in organizations renewal and development. KM means transformation of ideas into knowledge as well as transformation of knowledge into added value. In general, one can say that KM refers to every practice where knowledge is essential and when knowledge is consciously exchanged, created, distributed and stored. The purpose is to bring the right knowledge to the right place when it is needed and useful. The object of KM is to help people and organizations to find, share and use information, enhance knowledge creation and master renewal and innovativeness. (Ståhle, 2003; Pöyhönen, 2004a.)

Previous KM research has addressed to the multidisciplinary nature of KM. The discussion has evolved historically in three phases. The primary focus in the first phase was on information codification and how the information technology (IT) solutions could be a vantage. Knowledge was conceived of as a thing, as something explicit. In the second phase the focus was on the process of knowledge creation. Knowledge was conceived of as embodied in human action, as something tacit. The third phase focuses on the thought of what conditions allow these processes and tacit knowledge to evolve to action. (Senge, 1990; Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Scharmer, 2001.)

There are mainly two types of knowledge in KM theories. The types can be described as to be the opposite ends of a line, in one end is explicit and the other tacit knowledge. Explicit knowledge is easy to share and transfer codified knowledge type. The other end is know how –type of knowledge which is difficult to share or transfer. This is called tacit knowledge. Tacit knowledge is embodied in human action. (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Ståhle et al., 2002.)

Scharmer (2001) defines knowledge even more specifically. There are two types of tacit knowledge in his research. Tacit-embodied knowledge and not-yet-embodied knowledge are the types of tacit knowledge. The last Scharmer calls as self-transcending knowledge. He means by that the kind of knowledge that can be thought of as tacit knowledge prior to its embodiment. This ability to sense and presence the emerging opportunities are usually associated with artists and creativity, not with business managers.

Essential for KM is the functioning of the human networks and cultural change in an organization. KM should fit the real existing organizational culture and not just spoken. Successful KM is often highly dependent on cultural change. The concepts of benchmarking, organizational culture

and knowledge audits should be taken into consideration. (Carpenter & Rudge, 2003.)

In this study knowledge is regarded as a deeper consideration of information; it is a mix of knower's own experience, values and information. Knowledge is something that has influence on the knower's mind. (Davenport & Prusak, 1998; Ståhle & Grönroos, 1999.)

KM has many forms in the earlier research as discussed above. It can be summarized to be the management of knowledge sharing and creating. It also includes creating enabling circumstances for renewal as well as competence and capabilities management. It has also something to do with human relations and people management as well as communication. In this study KM is discussed based on the framework of the categorization of KM capability into six different elements by Pöyhönen (2005). These elements are:

- exploitation of codified explicit knowledge
- exploitation of embedded tacit knowledge
- strategic management of intellectual capital
- collecting information from the environment
- information storage and communication technology (ICT) systems
- knowledge sharing.

2.2 Knowledge management activities

Managing knowledge represents the dynamic and systematic processes and activities and the tools organizations have to store and gather information, as well as knowledge sharing and applying it in the organizations (Adams et al., 2006, Alavi & Leidner, 2001). The literature on KM also boasts several categorizations of KM activities and processes.

For example, Filius et al. (2000) distinguishes the process of KM in its entirety in two parts; a tactical process and a strategical process based on the research of Bukowitz and Williams (1999). Tactical process is the actions that knowledge workers take in their daily work on a continuous basis when strategical process is more a goal of KM with the overall business strategy. Bukowitz and Williams (1999, 2) defines KM also as a process by which the organization generates wealth from its intellectual or knowledge based assets. In addition KM originates and is applied in the minds of knowers, not only in documents or repositories. It is embedded also in organizational routines, processes, practices and norms. (Davenport & Prusak, 1998.)

Filius et al. (2000) found the KM activities to be effective in the context of KM as a process and define what organizational conditions would enable these activities. According to them, the five activities are knowledge acquisition, knowledge documentation, knowledge transfer, knowledge creation and knowledge application. Nonaka and Takeuchi (1995) however divide KM activities into three categories: knowledge creation, knowledge incorporation and knowledge dissemination. Alavi and Leidner (2001) on the other hand discuss knowledge creation, knowledge storage/retrieval, knowledge transfer and knowledge application. Jordan and Jones (1997) divides KM into five different modes: knowledge acquisition, problem-solving, dissemination, ownership and memory (of knowledge). Supyuenyong and Islam (2006) views KM as a wide process including four sub-processes: Knowledge creation and acquisition, knowledge organization and retention, knowledge dissemination and finally knowledge utilization. Their process also includes two enabling elements, IT and corporate culture. Chang Lee et al. (2005) define knowledge circulation process as having five components: knowledge creation, knowledge accumulation, knowledge sharing, knowledge utilization, and knowledge internalization. Demarest (1997) also proposes

different KM activities: knowledge construction, knowledge embodiment, knowledge dissemination and knowledge use.

The reason why, in the past research of KM, there are so many different divides of KM into different kind of activities, is that the researchers would like to cover all activities within distinct organizational types. It is thought difficult to find a unified model which can be used by these activities on every types of organization, also including the non-knowledge intensive organizations. (Supyuenyong & Islam, 2006.)

This study proposes that KM activities can be divided into six well defined main types:

- knowledge acquisition
- knowledge transfer
- knowledge sharing
- knowledge creation
- strategic management of intellectual capital
- ICT systems.

Knowledge acquisition stands here for organizational activities aimed at collecting information from extra-organizational sources (Adams et al., 2006, Cohen & Levinthal, 1990; Darroch, 2005). Explicit knowledge documentation is considered to be a part of knowledge transfer. Tacit knowledge is taking into consideration an activity of knowledge sharing which happens face to face in relations between people. Knowledge creation is considered in this study as an activity which creates new knowledge. This activity has been given far too little emphasis in the literature and earlier research (Adams et al., 2006). Strategic management of intellectual capital and ICT systems discussed for example in the framework by Pöyhönen (2005) are two supporting activities which enable the successful and efficient application of the aforementioned four KM

activities. Knowledge application (a.k.a. utilization or use) on the other hand is a part of each of the six activities because it is a possible consequence of each activity not an isolated activity from the other activities of KM (Filius et al., 2000; Alavi & Leidner, 2001).

These six activities are found common also in earlier research as discussed below. They are considered to be exemplary of good KM activities and also conditions that are supportive of good KM capability. Each of the six KM activities is explained below and possible actions in organizations for each activity are also described.

2.2.1 Knowledge acquisition

Knowledge acquisition stands for organizational activities aimed at collecting information from extra-organizational sources. It can be considered also as an ability to identify and utilize external knowledge. External knowledge is critical to organizations' successful operation. Information flows are important in sparking ideas and allowing the development to take action. (Adams et al., 2006.) For example customer feedback systems and collaboration with different partners are activities of renewing organizations. Also internal communication and capability to transform knowledge into improved products, services, processes and mental models throughout the organization are part of renewing organizations' nature (Cohen & Levinthal, 1990; Darroch, 2005).

Without a systematic routine for acquiring knowledge outside, the organization might not benefit from the best knowledge being captured (Alavi & Leidner, 2001). Knowledge acquisition is considered to be effective when organization is able to expand the individual and collective experiential horizon. Knowledge acquisition activities are for example using experiences of the clients to improve products and services, active participation in external professional network and discourse or association

and active collection of information outside for example about the needs and wishes of clients. (Filius et al., 2000.) The collected information should be disseminated through organization. It should also be remembered that the collected information have to be translated into knowledge and also used in the operations. (Lönnqvist, 2005.)

External networks and collaborative arrangements are important sources of knowledge for all types of organizations. Customers form an especially important group from whom knowledge should be acquired if the organization is to succeed. Customer feedback systems, data mining, business intelligence and collaboration with partners and research institutions characterize also highly developed knowledge acquisition activities. (Filius et al., 2000.)

2.2.2 Knowledge transfer

Knowledge transfer consists of the activities to codify tacit knowledge into explicit form, to store documented knowledge, and to provide up-to-date documented knowledge to others in the organization. In the research of Filius et al. (2000) it was found uncommon to make the methods in use to explicit. Knowledge transfer activities may consist of individuals' performance reviews and assessments, quality systems, manuals, exchanging information at meetings, promoting new services in the market both internally and externally and redesigning of work methods and processes. According to Carpenter and Rudge (2003) and Dalkir (2005) having a knowledge journalist to document projects, best practices, lessons learned and good stories could help in creating a knowledge sharing culture. Also employing video technologies can also enhance knowledge transfer (Alavi & Leidner, 2001).

Ideally, employees are equipped with IT tools and platforms that enable effective codification and storing of explicit knowledge in databases and

manuals, as well as search and transfer of it. Knowledge can increase company's performance only if it is distributed widely enough in the company (Demarest, 1997).

2.2.3 Knowledge sharing

The importance to identify the tacit knowledge and exploit it by sharing and enriching, are crucial for organizations innovativeness and renewal (Nonaka & Takeuchi, 1995; Pöyhönen, 2005). Tacit knowledge is embedded in human experiences and shared in social interaction. Some tacit knowledge may be codified, but some of it will remain tacit and the only way to share it is in face-to-face interaction, thus knowledge sharing (Nonaka & Takeuchi, 1995). Organizations should manage to find the valuable tacit knowledge and bring it available to every member of the organization by sharing it (Lönnqvist, 2005, 37). Therefore the organization should also arrange for possibilities for frequent face-to-face communication and creation of shared learning experiences as well as a knowledge sharing culture (Nonaka & Takeuchi, 1995; Ståhle & Grönroos, 2000; Carpenter & Rudge, 2003; Dalkir, 2005). For example frequent conversations with colleagues about encountered problems at the workplace helps learning from one another and creates an atmosphere where also innovations are feasible to occur. Also the interaction of intra and outside the organization is important to attain a state of smooth flow of information and knowledge. Instituting KM get-togethers, producing newsletters to publicize KM initiatives, launching KM pilot projects (like expertise location systems) for different communities of practice are some other knowledge sharing activities to mention. Also changing performance evaluation criteria, censuring knowledge hoarders and rewarding effective knowledge sharers and giving responsibility to managers to initiate would enable knowledge sharing. Redesigning workplaces to allow gathering together and changing ideas, small teams with different kinds of expertise and teams drawing up core values together would enable creating

knowledge sharing culture. (Carpenter & Rudge, 2003; Dalkir, 2005.) In addition, according to Filius et al. (2000), knowledge sharing activities are also learning from the informal circuit (meeting each other at the coffee machine, visits and telephone calls), informal and formal communication between people, use of brainstorm sessions, or mentoring and coaching one another. Networking is a surplus value to many employees working independently. If organization wants to profit from common knowledge it has to focus on sharing knowledge instead of shielding it and also to adjust its reward systems to this choice.

It is important to share the embedded tacit knowledge with others also in situations where the employee leaves the organization. When a knowledgeable employee leaves the company or moves to another organization a lot of important knowledge usually leaves with him or her. Tacit knowledge should be shared with others in these situations, so that the important know-how does not leave the company. (Lönnqvist, 2005, 71.)

The research of Sáenz et al. (forthcoming, see figure 2 in chapter 2.3) provides empirical evidence about the impact of knowledge sharing on innovation and renewal in organizations and what the most effective mechanisms are for this purpose. It is assumed that new knowledge creation is at the heart of innovation processes and the new knowledge is created dynamically by social interaction processes a.k.a. sharing knowledge in face to face interaction. The researches' aim was to analyze the impact of knowledge sharing on innovation performance. It was found that in knowledge sharing based on IT the most important mechanism is existence of a knowledge vision. In knowledge sharing based on management processes the most important mechanism is organization's culture. And in knowledge sharing based on people the most important mechanism is that the management systems are in place.

2.2.4 Knowledge creation

Creation of new knowledge is a key factor in enabling sustained competitive advantage (Teece et al., 1997; Lee & Choi, 2003). Knowledge creation is an activity where individuals and groups share tacit and explicit knowledge (Nonaka & Takeuchi, 1995). Creating new knowledge is easily mixed with the activity of sharing knowledge. However, creating knowledge is its own activity that needs to be taken into consideration. Knowledge is created when organization and its members learn and collaborate in groups having a mutual trust towards each others (Lee & Choi, 2003). Knowledge creating organizations arrange for the development of potential and self-transcending knowledge in order to cultivate radically new insights (Scharmer, 2001) and promote innovation and idea development on all levels of the organization.

According to Leonard-Barton (1995), the four key activities for new knowledge creation are: shared problem solving, implementing and integrating new methodologies and tools, formal and informal experimentation and pulling in expertise from outside. These activities have in common that they are played out by various actors, equipped with different kinds of skills and have a local context which is not fully understood outside it. Nonaka's (1994) widely discussed SECI-process for knowledge creation has four modes: socialization, externalization, internalization and combination.

The already possessed knowledge should be combined with the new knowledge achieved to benefit and create new possibilities out of it. Suitable circumstances amplify new knowledge creation. This can be achieved for example through using existing know-how in a creative manner for new applications, guided exploration of new themes, varying roles over projects or keeping an "individual development plan" which gives the opportunity to develop employees' expertise and ambitions or

working in innovative projects which fit the employees own personal interests and ambitions (Filius et al., 2000). Also meetings with loose-fitting collaboration partners, for example suppliers, may be an important source of new ideas (Jordan & Jones, 1997). The fundamental choice here is the choice between innovation versus routine. Innovation stimulates creativity at the same time bringing along risks. An organization that wants to lead the market should be more innovative than an organization that just wants to settle itself in the market. (Filius et al., 2000.)

Interesting insights to the research of creating knowledge offers also Ahonen et al. (2000) and Ahonen and Virkkunen (2003) in their research, where people working in kind of change- or competence-laboratories was studied. These laboratories focus on creating new knowledge in shared context by learning from each other. These people work there side by side sharing the embedded knowledge in the shared context with others. New knowledge and innovations are considered to grow in an environment where the whole system is a cultivating environment. Collaboration, rules, structures, management and technology are all parts of building innovations. Or like Senge (1990) calls it: to create new knowledge by building learning laboratories. They offer a place for management teams to learn how to learn together and create new knowledge.

2.2.5 Strategic management of intellectual capital

Strategic management of knowledge is fast becoming an important strategic skill for knowledge-era organizations. The starting point of KM is the recognition of the importance of knowledge and information for the organization, and identification of the strategically significant knowledge within the organization. In other words the organization should assess its stock of intellectual capital and recognize the developmental needs in what it knows and can do (Edvinsson & Malone, 1997; Sveiby, 1997). This

enables successful learning and innovations also in future. According to Claver-Cortés et al. (2007, 46) KM activities can receive support from strategic approach to knowledge and organizational design which also makes interpersonal communication and interaction easier.

According to also Filius et al. (2000, 294) the organization has to keep the balance between innovativeness and routines. The organization has to also choose a strategy between being individuals and being focused on the collective. Sharing or shielding the expertise, within and outside the organization is an important strategy to determine for the organization. Organizations have to make some fundamental choices concerning all their KM activities. There should be a balance between innovation and organizational structure, only then can a KM strategy be effective (Dalkir, 2005, 263). Strategies, core values and visionary goals should not be hard to remember or made of strict rules to be followed. Concept of core values should not include booklets that contain mounds of advices. Organizations should create a long term KM strategy for the organization without it becoming “commandments” and also follow the strategy consistently. (Carpenter & Rudge, 2003; Dalkir, 2005.)

There are two different strategies to pursue KM in the organizations' performance. Codification strategy considers explicit knowledge as an important resource for organization's performance. It includes information capture and codification and achieving advantages from not “reinventing the wheel”. The focus is on mass-solutions instead of unique-situation-solutions. Personalization strategy on the contrary focuses on these and uses IT more a tool of communication than a repository of knowledge. Tacit knowledge has an important role for creating value in personalization strategy. (Hansen at al., 1999, 109; Huotari et al., 2005, 136.)

In the research of Singh et al. (2006) it was found that two main obstacles for implementing KM in the organization are that KM concepts are not well

understood and the lack of top management's commitment. Creating KM strategy requires investment, the concepts have to be popularized and the management have to accept a greater role in the task. Crafting a conscious knowledge vision and strategy for the organization enables innovation and learning through KM (Von Krogh et al., 2001; Robinson et al., 2006).

2.2.6 Information storage and communication technology systems

Explicit knowledge should be efficiently disseminated into organization and combined through ICT systems. ICT systems help employees to design, organize and develop their own work activities and also to communicate knowledge with each other more efficiently. (Nonaka & Konno, 1998.) It is necessary that the required tools are available and the members of the organization are educated and motivated in using these systems. KM can help in effective codification and storing of explicit knowledge in databases and manuals. The ICT systems can also be used to keep the employees under supervision. Renewing organizations should provide their employees with sufficient IT tools and platforms.

According to Claver-Cortés et al. (2007, 46) KM processes can receive support from a technological platform that can collect and disseminate knowledge and from strategic approach to knowledge and organizational design that makes interpersonal communication and interaction easier. Advanced information technologies can be used to enhance and systematize intra- and inter-organization KM activities. The role of IT is to provide a link between sources of knowledge. (Alavi & Leidner, 2001; Chang Lee et al., 2005.) ICT systems work as a supporting structure for the whole KM in organization. Alavi and Leidner (2001) refer to this activity as a capability to reside knowledge in various component forms. These include written documents, diagrams, electronical databases,

codified human knowledge and documented organizational procedures and processes.

The disadvantages of IT and automation should also be taken into account. Software is always just an enabler or enhancer. Turning KM and renewing actions into IT-projects will jeopardize them fundamentally. The foundation lies in the strategic performance management and understanding the core capabilities and competencies of the company. Pure data is just “data”, making sense of it and turning it into actionable knowledge and learning requires more. (Marr, 2006.) On the contrary it is found in the research of Sáenz et al. (forthcoming, see figure 2) that “hard” management elements, like infrastructures, processes and IT, have unexpectedly greater influence on innovation capability and creating knowledge than so called “soft” aspects, like people and culture. In managing innovation projects it is effective to use all types of knowledge sharing. However, in managing new idea generation it is most effective to use IT-based knowledge sharing, because it makes the communication easier between many different people.

2.3 What knowledge management capability is?

According to Marr (2006, 49), the resources of the organization needs to be bundled together to form capabilities and competencies. To deliver value to the organization, resources need to be transformed, mainly into products and services. Because capabilities are embedded in the organization, they do not disappear when an individual leaves the organization. It can be also said that capabilities are potential core competences (Dalkir, 2005). Capability is thus knowledge on how to use competence and create value with it.

Organizations have to have the ability to make knowledge assets act to achieve sustained competitive advantage. In this study the ability is called KM capability. Capability indicates here the ability to use the valuable resources or assets through KM activities.

Nonetheless, according to the discussions before, KM theories have many perspectives headed for these activities. The following figure 2 illustrates how the construct of KM (capability) is operationalized into elements in the research by Sáenz et al. (forthcoming) and how they included also innovation capability in it causing innovation outcomes to occur.

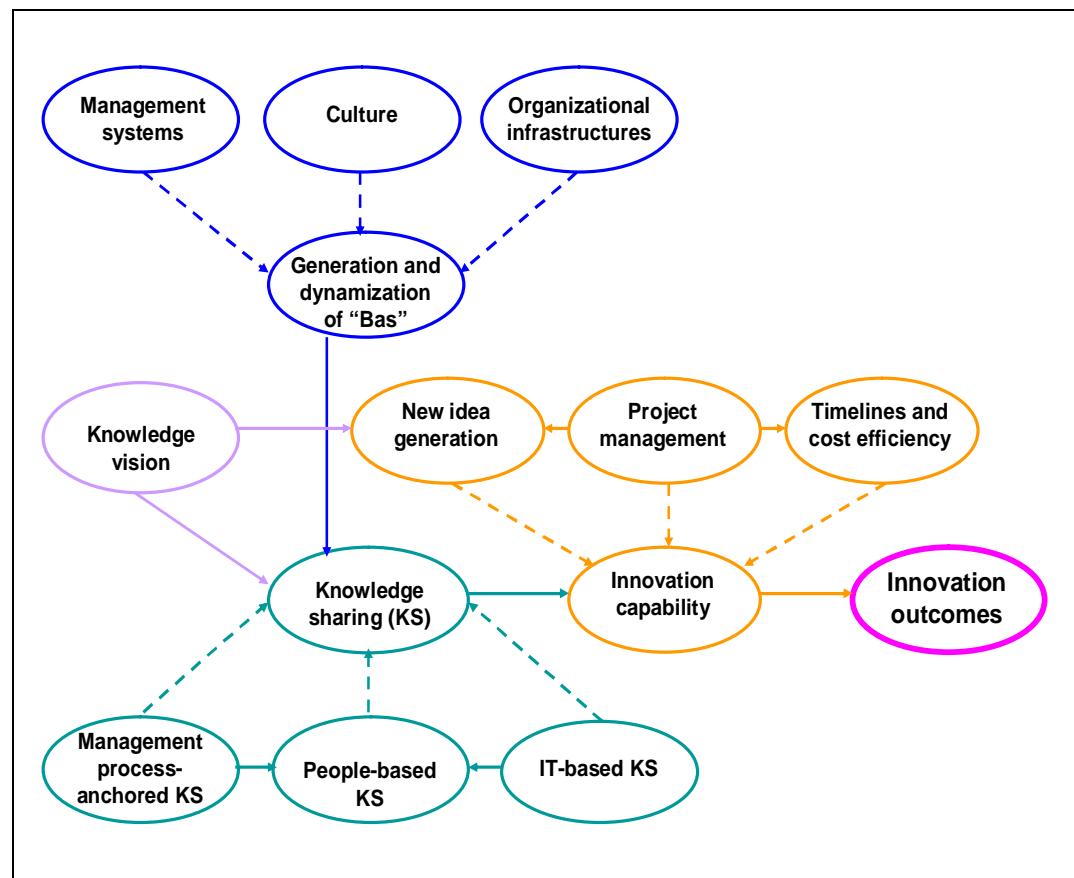


Figure 2: The framework of KM constructs. (Sáenz et al., forthcoming)

It can be seen from the figure that KM is not only an issue of a single IT system or a creative leader but that it needs a great deal of activities to be

successful and concerns an organization as a whole and all the people in and outside of it. In order to get a broader understanding of KM it is distinguished in the model of Sáenz et al. (forthcoming) into elements of knowledge vision, knowledge sharing, generation and dynamization of bas, innovation capability and finally innovation outcomes. Knowledge sharing, generation and dynamization of bas and innovation capability are distinguished also into sub-dimensions of management process-anchored knowledge sharing, people-based knowledge sharing, IT-based knowledge sharing, management systems, culture, organizational infrastructure, new idea generation, project management, timeliness and cost-efficiency. All these elements need different kind of KM activities to succeed.

The following figure 3 summarizes the six activities of KM capability presented in this study. Organizations can and should exploit these activities to achieve excellence in their KM capability and also conditions that are supporting these in the organization. These activities are knowledge acquisition, knowledge transfer, knowledge sharing, knowledge creation, strategic management of intellectual capital and ICT systems.

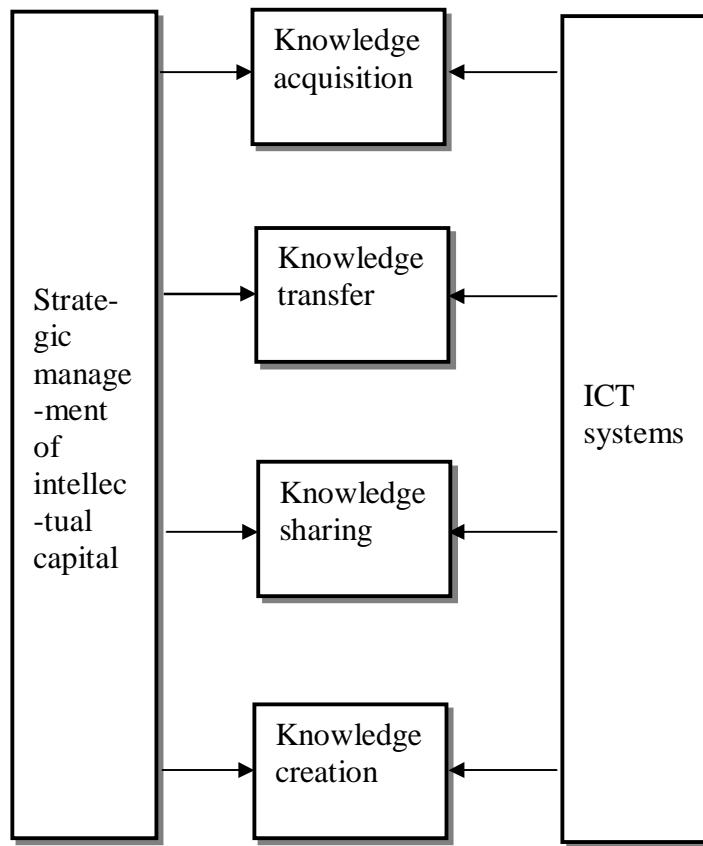


Figure 3: The activities of KM capability.

Similarly to the view of Alavi and Leidner (2001), this study proposes that KM process is not a linear sequence of activities, all though the activities are interdependent and overlapping to some extent, but distinguishable due to their different foci. An individual can, for example, create new knowledge in interaction with others without prior codification of the knowledge. Moreover, the codification of knowledge does not guarantee efficient sharing of it, nor does it necessarily result in more effective creation of knowledge.

KM activities create the foundations of successful performance in an organization. According to Claver-Cortés et al. (2007, 46) KM activities can receive support for example from the following business policies: human resource management focused on attracting and retaining talent, corporate culture which is open to new ideas and fosters learning,

technological platform which can collect and disseminate knowledge, strategic approach to knowledge and organizational design which makes interpersonal communication and interaction easier. KM activities have this way an effect on the whole context of the organization.

The model showed in figure 3 is designed to help organizations to understand what KM capability actually is and how it is structured. It also help them in understanding what the concrete activities of KM are and which of them need to be especially promoted in their particular situation. The model helps organizations to understand what KM has to offer to them in general and which possibilities to open up. This is how the organizations can concentrate in the specific activities of KM that are valuable in their own context where they operate.

3 ORGANIZATIONAL BENEFITS OF KNOWLEDGE MANAGEMENT

This chapter presents the organizational benefits of KM, mainly as an enabler for renewal. Finally, the assessment and measuring of KM capability and the benefits they bring along are discussed.

KM is deliberate and systematic coordination of an organization's people, technology, processes and organizational structure in order to add value through reuse and innovation. The task of KM is to build organizational unity without uniformity (Nemeth, 1997). Organizations which have many possibilities for interaction with many different partners are more often innovative by nature. Widely networked organizations find more easily the relevant information needed and the person who has the suitable tacit knowledge. Strong relationships enhance also trust formulation between partners. (Stähle & Laento, 2000; Pöyhönen, 2005.)

It is important to locate where the knowledge is residing, and how to extract it and make it useful. There is a need for organizations to create a culture where seeking, sharing and creating knowledge is rewarded and encouraged. "The focus is on cultural transformation along with development of infrastructure, supported by IT to improve the capture and use of knowledge." (Singh et al., 2006, 126.)

The desired outcome of KM is renewing. Renewal capability is crucial for surviving in the rapidly changing society for an organization (Stähle & Laento, 2000; Pöyhönen, 2004a; Pöyhönen, 2004b; Lönnqvist et al., 2005; Oikarinen, 2008). According to du Plessis (2007) and Robinson et al. (2006) KM also facilitates collaboration, builds and maintains competitive advantage through utilization of knowledge, facilitates innovation in business processes, enhances stakeholder relationship

management, keep knowledge available to all and integrates internal and external knowledge into organization. Thus, KM has an invaluable role in renewal. It should however be taken into consideration the fact, which Leseure and Brookes (2004, 105) emphasize: if KM is mainly “a program for restoring or sustaining good practices were concerned that the adoption of a technology-driven, formal program may lead to a bureaucracy of knowledge”. There is a risk of over-managing the situation. A collective knowledge base is important in reaching a strategic balance between stability and innovation.

3.1 Knowledge management as a capability to renew

According to Brown and Eisenhardt (1998) managing change is the central challenge for the organizations today. This has three forms: reacting to change, anticipating it, and leading it (create change to which others must react). The best organizations change routinely, relentlessly, and even rhythmically over time. Renewal capability is a dynamic capability (Ståhle et al., 2002; Pöyhönen 2005). It is a capability concerned with change (Winter, 2003). Ordinary capabilities refer to organization's ability to do something with its existing resources whereas dynamic capabilities represent the ability to integrate, build and reconfigure resources in order to create new capabilities. Dynamic capabilities reflect the organizations ability to innovate and create value through achieving new forms of competitive advantage. (Marr, 2006, 147.)

Renewal capability develops a link between knowledge assets and creating sustained competitive advantage also according to Pöyhönen (2005). KM capability, especially its knowledge resource management and exploitation, is this way crucial to organizations success in today's business world (Hannula & Ståhle, 2004, 14). Also according to du Plessis (2007, 23) KM activities (systems) have a distinctive contribution in the

development of sustainable competitive advantage through innovation. KM activities have a major role in the conversion of learning capabilities and core competencies into sustainable advantage. Without effective KM activities organizations could be underutilizing knowledge as an innovation resource.

Renewal capability can be defined as the capacity of the organization to sustain its current success factors (knowledge assets) while at the same time proactively building new strengths for the future (new knowledge). (Pöyhönen, 2004b, 44.) The heart of organizational renewal is embedded and re-created in the knowledge building activities of the organization. To continuously create new knowledge out of existing organization-specific capabilities is the most important dynamic capability (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Nonaka et al., 2000). The following figure 4 illustrates how the interconnections of knowledge assets, renewal capability, innovation, learning and sustained competitive advantage are defined according to Pöyhönen (2005).

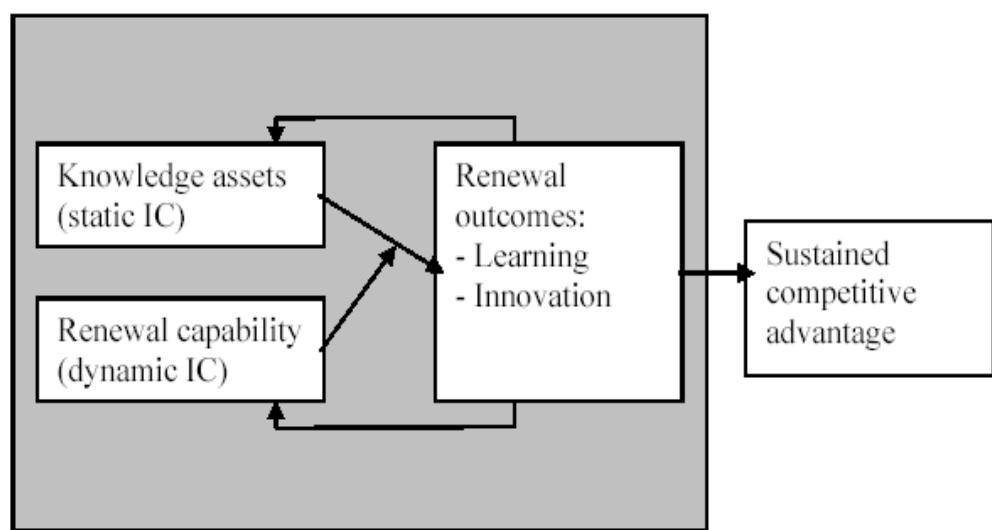


Figure 4: The interconnections of knowledge assets, renewal capability, innovation, learning and sustained competitive advantage. (Pöyhönen, 2005).

Organization should be able to develop its existing knowledge assets and to create new knowledge. Learning and innovation result from the interaction between knowledge assets and renewal capability. The model presents that when an organization is able to renew itself continuously it can create sustained competitive advantage (Leonard-Barton, 1995; Teece et al., 1997; Pöyhönen, 2004a; Pöyhönen, 2005). KM is a capability that can be used to manage this model's static and dynamic knowledge assets. In addition to this model Pöyhönen developed the measuring tool of renewal capability, the ORCI –questionnaire. The renewal capability is therefore a multidimensional subject and has many perspectives also on managing knowledge.

However, the truism of this study is that KM is important for organizations renewal. KM prepares the way for development and renewal of the organization. According to Singh et al. (2006) and Lee and Choi (2003) one of the main reasons for organizations to use KM (activities) is to create new knowledge which will lead to better competitive capability and to improved innovation capability. Successful management of knowledge provides an opportunity to bloom and hit it big time for the organizations. The KM capability with its different activities provides a tool for organizations to improve learning and renewal in their organizations.

3.2 Why and how to assess knowledge management capability?

Why should organizations' performance be measured or assessed in the business world in general? Kennerly and Neely (2002) offer some important reasons and insights for measuring performance in business. Measurement provides a balanced picture of organizations' state to itself and to outside. It points out the most important facts by simplicity and easy logic. Importantly, measurement points out cause and effect.

Measurement should be comprehensive in focusing the critical issues and it should be integrated across functions and through hierarchy. However measurement itself does not improve performance. To be effective, measurement needs to become an action. Also this is how measurement can compel progress. It communicates priorities of the organization. It is often linked in reward and makes explicit how performance will be assessed. (Neely, 1998, 85.)

Measuring makes progress explicit. It is a clear way to check for example whether the required actions have been taken and whether progress has been made (Neely, 1998, 85). Measuring traps are that people can be delivering good measure result without delivering good performance. If they believe that measures are not providing any interesting insights or nothing “ever happens” to the results, they quickly device ways of delivering good results without actually good performance. Also organization should link the indicators to the strategy and not just measure anything that is easy to measure. The indicators should be meaningful in order to be effective for strategic decision-making and learning. (Marr, 2006, 9.)

KM capability measurement techniques and auditing help to assess how well an organization is progressing. As said before, organizations need tools to help them understand their resources' and capabilities' importance and generating a picture of the status quo in the organization. KM capability offers these tools and architectures to organizations so they can better create value and manage their resources. These tools include for example benchmarking, the balanced score card method, and the house of quality matrix (shows the connections between quality characteristics). KM capability auditing is used for example to inventory what knowledge-intensive resources exist within a company. This provides a current state of the organization with respect to KM and helps in measuring progress toward organizational culture change and other KM goals. Two most

encountered KM application goals are reuse and innovation. It is crucial to keep balance with fluidity and institutionalization in a given organization. (Dalkir, 2005.)

Many of the benefits that good KM capability offers are non-quantifiable type, so they cannot be measured in terms of money, time or volume etc. In some cases though, KM projects can be measured using the traditional criteria of return on investment (Singh et al., 2006). The assessment and measurement used in previous KM research are for example postal surveys or structured questionnaires, sharing best knowledge practices, systematic multiple case studies, nominating companies and ranking them against key performance categories, or just as simple as a basic knowledge audit (Chauvel & Despres, 2002; Dalkir, 2005). Also many kinds of interviews are used to assess the capability of KM. Current practices, establishing benchmarks and offering a quantitative/qualitative description of what occurs in reality are important development aspects in surveys to assess the state of KM capability (Chauvel & Despres, 2002).

Intangible resources are hard to measure and the current measurement and auditing tools in organizations do not offer relevant information of the present situation. Organizations can be seen in present-days as systems of knowledge resources, competencies and capabilities. This is why the objective of measurement and assessing for an organization should be learning as an aggregate, not controlling single action of an organization. Measuring and assessment enables proactive perspective and intervening to problem areas. It also enables more effective leadership. Measuring and assessment should be forward-looking and clarify the potential of the future of an organization. (Kianto, 2007.)

4 RESEARCH METHODS

The research methods used in this study are presented in this chapter. In this study the case study approach is used to examine KM activities in three plywood factories. The study also presents the standardized KM capability-survey which was improved through using Organizational Renewal Capability Inventory -questionnaire established by Aino Kianto. Focus group interviews, to examine KM activities more in depth and to generate and define development practices for the weaknesses identified through the survey, are described after the survey diagnosis.

The studied cases are three plywood factories located in Finland. The factory in Lahti functions as a refinement factory, whereas factories in Heinola and Jyväskylä produce staple plywood. Their functioning is not directly comparable to one another, as their fundamental activities differ from each other. The factory in Lahti produces mainly lacquered and painted plywood boards for shipbuilding industry, machined components, building sites and transportation. It has approximately 130 employees. The factory in Jyväskylä produces mainly spruce and birch plywood for construction, cast of cement and parquet- and furniture industry. It has approximately 365 employees. The factory in Heinola produces mainly staple plywood, washers, cast of cement and parquet industry and veneer. It has approximately 280 employees. All factories are parts of a leading forest industry corporation and share the same managing director. The plywood business belongs to wood product industry, which is one of the main businesses of the consolidated corporation. Forest industry is usually considered to be quite hierarchical and non-knowledge-intensive by nature. This is why the three factories represent revelatory cases capable of demonstrating how knowledge is managed also in non-knowledge intensive organizations.

4.1 The methods

The data was gathered from three factories of plywood and it represents employees' and managers' experience of KM capability in their organizations. These units are discussed as organizations in this study because of their individual management and culture. The research on KM capability was a part of a bigger renewal capability survey in these three organizations.

The three organizations were tested, and a standardized KM capability-survey was conducted among the employees of the organizations, consisting of 471 individuals, in the beginning of 2008. One sixth of the respondents answered by web surveys, that were sent to every factory. A paper questionnaire was used by most of the respondents. It was centrally distributed in the factories. It took from two to three weeks to receive the questionnaires back. Respondents were reminded twice by email to answer the survey. All received answers were coded and analyzed with SPSS-software. The analysis was conducted using quantitative research methodology. After the survey diagnosis, focus group interviews with the managers and employees from the case organizations were conducted to examine KM activities more in depth and to define development activities for the weaknesses identified through the survey.

4.1.1 The questionnaire

The KM capability questionnaire (see Appendix 1) applied in this research was improved by using a renewal capability survey, the ORCI – questionnaire, where KM is a significant element of the survey. The ORCI –questionnaire is previously validated and proved to be reliable (Kianto, 2008). In the questionnaire renewal capability is measured through

categorization of the questions into six different elements. These elements are:

- strategic competence
- exploiting time
- learning orientation
- connectivity
- leadership
- managing knowledge.

The first part of the questionnaire included organization-related background questions. This questionnaire was given to one manager per factory. Organizational control variables were for example a task of the organization, number of employees in the organization, the organization's annual budget and the organization's investments in research and development or similar actions.

Background information related to the individual respondent was asked from everybody. The control variables were gender, age, educational level, department and organizational position. At the end of the questionnaire there were also open questions about the issues that emphasize or inhibit learning and innovations in the respondents' organization. Answer clarification was asked on these questions. Open questions give an opportunity to the respondent to tell the situation in their own words which often is more informative than the multiple choice questions with given answers. On the other hand, open questions might produce results that are difficult to interpret. (Hirsjärvi et al., 2004.)

The questionnaire's KM -measures, which have been psychometrically validated in earlier research (Kianto, 2008), consists of 52 items dealing with the respondent's perception of KM activities in his/her work organization, including the aforementioned four open questions (Appendix

1). Questions were also added to develop the ORCI -measurement tool in the area of managing knowledge. These changes are discussed more closely in the chapter 4.2.2. The open questions were on the questionnaire for measuring organizational renewal capability. On the other hand, they gave satisfactory results also for KM and helped in organising an interpretation of the organization in its entirety.

The data gathered from the units was coded and analyzed using SPSS-software (version 14.0) which is designed for analysing quantitative data. The answers were coded to the software and negatively worded items were reverse-coded. Survey results were analyzed to get scores representing the current strengths and weaknesses in KM activities of the factories. After that, the survey results were reported to the top management of the factories, i.e. the director in charge of the factories and the operative heads of the factories. This discussion was tape recorded and transcribed, and yielded valuable information on the general situation of the factories, their history, organizational structure and strategic goals. Factory heads reported the results to their respective development teams and the teams chose the emphases for group interviews from a list of issues made based on the survey results.

4.1.2 The interviews

Focus group interviews formed a second instrument for the study. The interviews were held with a topic list, two to four weeks after completion of the questionnaire. This topic list contained subjects listed in the basis of the results from the questionnaire. The topics were related to the KM activities discussed in the chapter 2. Two group interviews of approximately two hours each were organized in all three factories. In each factory, one group consisted of employees and the other of managers. In Lahti, there were four participants in both groups, representing either employees or managers from all four processes of the

factory, and one person from another factory belonging to the same corporation. In Jyväskylä, both groups included five participants from the factory, one from each process of the factory, and two participants of a similar status from two other studied factories of the corporation. In Heinola, there were five participants in both groups, representing similarly either employees or managers from all five processes of the factory, and one person from another factory belonging to the same corporation studied. Also separate meetings with the top management of the factories were held during the whole process to discuss the practical details of the study. The results were also presented to the top management at the end of the study.

The group interviews were aimed to get deeper explanations and rich descriptions for the issues identified with the survey and to stimulate discussion on action points for future development in specific context of a single factory. These interviews were also recorded and transcribed. The analysis of interview data was conducted in a deductive manner. The topic subjects were also pre-tested in groups in the Lappeenranta University of Technology, School of Business, before the focus group interviews in the organizations. In the beginning of every interview a general introduction was held and some preliminary questions were asked from the interviewees in order to carry on fluent conversation. Illuminating examples and identification of enablers and inhibiting factors were discussed and clarification asked if needed. The aim was not to form consensus about the subject discussed, but to converse with others about their opinions of the subject.

In general, the focus group interviews turned out to be of great value for getting insight into the KM activities employed in the organizations and more profound understanding of the problem areas in the specific organization. Contrary to the hierarchical organizational structure of the factories in Jyväskylä and Heinola, and also in team-based structured

Lahti, the general feeling in a majority of the interviews was relaxed and uninhibited. Perhaps this was because of the interviewer is exterior position towards the corporation. Also the employees were at the same level with the interviewer and did not expose any tension towards her.

4.2 The measures

The research data was collected using a standardized survey. The respondents formed a sample of a population, and the questions were the same to all of them. The advantage of a survey is that the collection of a large amount of data is easy and many questions can be asked. The method is efficient, because it reduces time used by a researcher on collecting data and also the time used by the respondent completing the questionnaire. To be able to measure theoretical constructs they have to be operationalized first. Operationalization is transforming concepts into specific measurable form. When there are many different items in the measurement instrument, the role of one item is not so critical. (Metsämuuronen, 2005, 102.)

The data from the questionnaires can be also efficiently analyzed with computer software so it is an efficient and economic method of collecting data. According to Marr (2006), the disadvantages of the survey method in assessing performance or intangible aspects are as follows. It is hard to form a decent questionnaire so that the questions are clearly worded. It is also difficult and takes time to get the people to complete the survey in time or at all. The results have to be useful and valid so the respondents have to understand the questions right and be familiar with the subject at hand.

To achieve variance and reliability in the research, it is better to use large scales (Metsämuuronen, 2005, 96). In this study the items are measured

on a one to seven point Likert scale. On the contrary, too wide scale can be problematic if the subject of the question is not familiar, and respondents face difficulty to determine opinion. Metsämuuronen (2005), advices to use primarily the kind of measures whose reliability and validity are already examined.

4.2.1 The organizational renewal capability –measures

The standardized KM capability-survey applied in this research was improved through using the ORCI –questionnaire established by Aino Kianto. KM is an important element of the survey. The questionnaire is validated and proved to be reliable in previous researches (Pöyhönen, 2005, Kianto, 2008). In the questionnaire renewal capability is measured through categorization of the questions into six different elements. These elements are strategic competence, exploiting time, learning orientation, connectivity, leadership and managing knowledge. The questions of this study were questions with a given response scale. This kind of scales can be three-point to seven-point and are called Likert –scales (Metsämuuronen, 2005, 94). The questions of renewal capability were multiple choice questions on seven-point Likert -scales.

Development of quantitative measures for organizational renewal capability presents an important challenge for today's research. The measure should treat renewal capability as a pro-active, knowledge-based, dynamic, future-oriented, social, systemic, strategic and multi-dimensional capability. Through these elements it can facilitate organization in continuous change and renewal. (Pöyhönen, 2004b, 68.) Creating a measurement tool for renewal capability is a challenging task and organizations should be able to recognize the critical factors and capabilities that affect organizations renewal capability and innovativeness in our constantly changing environment. The ORCI – measurement tool tries to answer to this challenge.

4.2.2 The knowledge management – measures

In this study the measurement tool of KM capability is developed further on the base of the ORCI- questionnaire. The number of KM capability questions in each activity is presented in the figure 5.

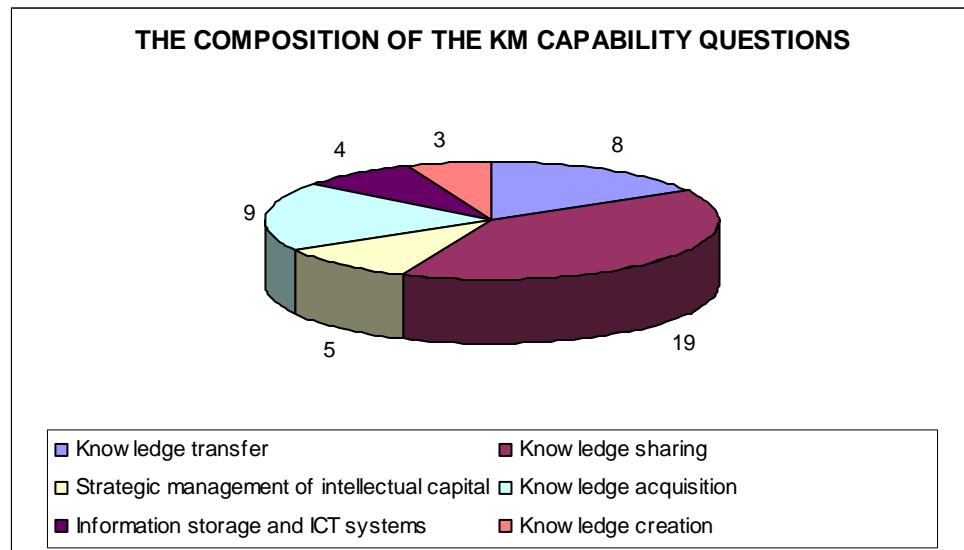


Figure 5: The composition of the KM capability questions.

These questions of this study were also questions with a given response scale. The questions in KM capability are also multiple choice questions on seven-point Likert -scales. On the seven-point Likert scale one meant "I strongly disagree" and seven "I strongly agree". Also the choice eight "I can not tell" was given. According to Hirsjärvi et al., (2004), people tend to answer whether or not they have an opinion about the subject in detail. This is why also an optional choice of not having an opinion about the subject was given in this study. An example of a seven-point Likert scale question in this study is in the table 1 below.

		(1=Strongly disagree, 7=Strongly agree, 8= I can not tell)	1	2	3	4	5	6	7	8
Knowledge transfer										
	1	I easily find the documents and files needed in my work	<input type="checkbox"/>							

Table 1: An example of a seven-point Likert scale question

KM activities are measured with one composite each, though knowledge sharing includes in some of the latter tables two composites, labelled as “tacit knowledge” and “knowledge sharing”. This is because of the importance of the tacit knowledge and wide area of research. All the questions within the KM activities are presented in the Appendix 1. There were some points according to KM theories that were not captured well enough in the questionnaire previously and questions were added to develop the ORCI -measurement tool in the area of managing knowledge. Also some questions from the other sections were removed into this managing knowledge part of the questionnaire.

The structure of activities operationalization into items is based mainly on the research of Filius et al. (2000) who studied the KM activities as knowledge acquisition, knowledge documentation, knowledge transfer, knowledge creation and knowledge application, but other research on the same concept is used also as presented in chapter 2. Most of the items were however already operationalized in the earlier research.

Two new knowledge acquisition measures was derived from Filius et al. (2000) emphasizing the acquiring of external knowledge from the environment and cooperation with external sources of knowledge. One question here was removed from the learning orientation section into this part of the questionnaire. The question concerned following the actions of

competitors as a source of new knowledge. This statement is also supported by Filius et al. (2000).

The research of Filius et al. (2000) was applied also to construct two new questions to knowledge transfer measures. However these were in their research classified as knowledge documentation activity. These items concerned with knowledge updating and information about changes in possessed knowledge.

Three questions in knowledge sharing -measures were removed from the connectivity section into knowledge sharing part of the questionnaire. The questions treated cases as personnel's collaboration with each others and also with customers, suppliers and other partners as well as innovative processes with the customers involved. Creating innovations is considered as a consequence of knowledge sharing activities (Sáenz et al., forthcoming) so this is why the questions were transferred into this section. The new questions in this knowledge sharing section are concerning KM sharing activities related to tacit knowledge as developing better practices instead of the old and unfunctionable ones, mentoring as a part of employees training program (Filius et al., 2000), new knowledge sharing methods (e.g. blogs, chats), middle management-aided knowledge sharing (Nonaka & Takeuchi, 1995) and using team sessions to find new solutions, informal knowledge distribution and having developing groups in the organization (Filius et al., 2000). In the research of Filius et al. (2000) these were classified as knowledge creation, knowledge transfer and knowledge documentation activities. Knowledge can be shared also through new technologies, this of course depends on the availability and ease-of-use of the tools (Nonaka & Konno, 1998; Sáenz et al., forthcoming). This part became the largest, consisting of 19 questions. This was also one reason for composing two composites of this section.

Knowledge creation was measured with questions related to combining diverse fields of expertise and using existing know-how in a creative manner (Filius et al., 2000). These two questions were in their research classified as knowledge application activity. One question in knowledge creating -measures was removed from the learning orientation section into knowledge creation part of the questionnaire. This question treated improvising new work methods. To improve work methods is essential in order to achieve renewal and sustainable advantage (Filius et al., 2000; du Plessis, 2007). The smallest variable knowledge creation consisted of only three questions.

The strategic management of intellectual capital –measures and the ICT systems –measures were adequate and relevant already and no changes were made in these sections.

5 RESULTS

This chapter presents the results of the study. The numeral data of the study was analyzed with SPSS software. First, a descriptive analysis of the respondents and organizational units is provided. The summated scales are formulated mainly already in previous research. Though, some corrective transfers were made between the scales as described in the previous chapter. The final scales and all the items used are in Appendix 1. After that the reliability and validity of the study are explained. Cronbach's alpha was applied to analyze the reliability of the study. Then the general trends and differences between the factories are discussed and the KM activities found in UPM-Kymmene Wood Oy explained. Also, the developmental needs for the factories were identified. As discussed before, items form 7 composites, depicting the six KM activities. Knowledge sharing includes two composites, labelled as "tacit knowledge" and "knowledge sharing".

5.1 Descriptive analysis

Descriptive analysis was conducted in order to gain information about the respondent's characteristics as well as the characteristics of the organizational units of the study. Comparisons were also made between the three factories.

For the analyses, officers with no supervisors were classified to the same group as supervisors. There were few responses that did not include adequate information and therefore they have been filtered out from the analysis. Finally, the effective response rate of the survey was 65,1% in total, which turned out to be excellent. There were some actions in the organizations that had an affect to this high rate of responses. The survey was conducted among the employees and managers simultaneously. The

questionnaire was available both in a paper and online in the internet. The distribution of the questionnaires was also carried out internally by the organization. Table 2 below shows the response rates of the questionnaire.

	Factory			Total
	Jyväskylä	Heinola	Lahti	
Responsive rates				
Of all respondents	45,20 %	33,80 %	21,00 %	65,06 %
Per factory	61,90 %	65,40 %	72,30 %	

Table 2: The response rates of the questionnaire.

In total 137 questionnaires were sent to factory in Lahti, 99 of which were returned, yielding a response rate of 72,3%. In the factory in Jyväskylä, out of the 344 sent questionnaires 213 were returned, resulting in a response rate of 61,9%. 243 questionnaires were sent to factory in Heinola, 159 of which were returned. The response rate resulted in 65,4%.

5.1.1 The respondents

Three units of the organization were tested consisting of 471 responses total. Almost 84,7 % of the respondents were workers. The second biggest group was supervisors, with 9,3 % amount of the answers. The third group was officers with no subordinates, with 4,0 % of the answers. The other employee-groups were smaller than 8 respondents so they were excluded from the results.

Furthermore, intra-factory comparisons between personnel and management are presented in table 3.

		Factory			Total
		Jyväskylä	Heinola	Lahti	
Personnel group	Employee	178	135	86	399
	Supervision	22	13	9	44
	Officer (no subordinates)	9	9		19
Total		213	159	99	471

Table 3: The respondents' formulation.

Individual factories respondents' formulation was as follows. 86 (86,9%) of the respondents in Lahti were employees and nine (9,1%) occupied a supervisory position. In Jyväskylä the respondents consisted of 178 employees (83,6%), 22 supervisors (10,3%) and nine officers with no subordinates (4,2%). In Heinola the respondents consisted of 135 employees (84,9%), 13 supervisors (8,2%) and nine officers with no subordinates (5,7%).

5.1.2 The organizations

There were in total three participating organizational units within UPM-Kymmene Wood Oy. These units are discussed as organizations in this study because of their individual management. The organizational structures in the factories are explained below.

The organizational structure of Lahti is rather interesting: production lines and processes are assigned to teams of employees and there are no supervisors in the traditional sense. The tasks of production line managers include mostly planning of work, resourcing and ordering supplies. The teams have team leaders, who mediate between team members and management. For the last year all functioning has been based on self-managing teams, the transition to team-based functioning was carefully prepared for two years. During this time, the whole personnel went

through intensive training and education. Gradually more and more responsibility and autonomy was given to the teams. Now the teams are empowered to plan their activities and solve problems autonomously, as well as make most of the decisions guiding their work. Both top management and employees are happy with the team-based model and it has also proven to produce effective results. This become apparent in the interviews made in this study.

The factory in Jyväskylä was formed through merging two previously separate factories, joining two different organizational cultures raised negative feelings in the employees. The organizational structure of the factory is hierarchical. Decision making is centralized at the top level of the organizational hierarchy, which tends to emphasise differences and lead to conflicts between employees and their superiors. Historically, the management style of the factory has been highly authoritarian, causing the employees to feel controlled and repressed. Recently, there have been attempts to change the organization by bringing managers closer to the employees and by hiring younger managers with more modern views on leadership.

The organizational structure of Heinola is closer to Jyväskylä than Lahti. Though, there has been a pilot project of team working on one process for almost a year now. The aim was to give more responsibility and autonomy to the employees. The transition was aided by “weekly projects”, each team working only one week together in a project. The aim for the team was to solve a specific problem on a specific area during this week. These project-based teams had also team leaders. The results were encouraging but also problems aroused. Each project resulted in solutions and development proposals. The problem was to screen out the relevant suggestions from the large amount. The factory has started to train and educate more team leaders also in Heinola.

5.2 The measurement scales, reliability and validity

Summated scale is a method of combining several variables that measures the same concept into a single variable in an attempt to decrease the variable amount and to increase the reliability of the measurement (Metsämuuronen, 2005, 507). Measuring different activities of KM, seven original summated scales (later also named as composites) formed previously were also used in this study. The separate variables are summed and their average score is used in the analysis, though it is also possible to use the total score. According to Metsämuuronen (2005, 530), the objective of the average score used, is to avoid missing of a whole respondent from the analysis because of a single missed variable.

The reliability of each summated scale was evaluated with Cronbach's alpha. It is a measure of reliability of the research and it ranges from zero to one. Value of 0,6 is generally deemed the lower limit of acceptability. Cronbach's alpha measures the consistency of the different variables, so that they all measure the same thing to be measured. (Metsämuuronen, 2005, 464.)

In this study the reliability of the items in managing knowledge is excellent. The items form 7 composites, depicting the six KM activities as discussed before. All the Cronbach's alphas in these scales have values over 0,7 demonstrating internal reliability of the summated scales. High values of reliability indicate good suitability of the selected items representing a specific summated variable (Metsämuuronen, 2005). The Cronbach's alphas for summated scales is presented in the table 4 below. The overall Cronbach's alpha of the study was 0,92, which can be considered excellent.

CRONBACH'S ALPHA	KNOWLEDGE ACQUISITION	0,898
	KNOWLEDGE TRANSFER	0,903
	TACIT KNOWLEDGE	0,763
	KNOWLEDGE SHARING	0,875
	KNOWLEDGE CREATION	0,842
	STRATEGIC KM	0,869
	ICT SYSTEMS	0,883

Table 4: The values of Cronbach's alphas for summated scales

The reliability of the summated scales in managing knowledge is also excellent in this study. The lowest value for Cronbach's Alpha in summated scales is within the tacit knowledge. It is 0,76, which is also good (when lowest value of acceptance is 0,6). Either are there any specific items to be removed from the scales, because the lowest value of the items in the summated scales is 0,7 (see Appendix 2). Specific items do not need to be removed from analyses because alpha would not rise significantly as a result.

The inter-item correlation matrixes were also made within the KM activities in all variables. They describe that the variables within the summated scales correlate between each other. According to Metsämuuronen (2005,

345) correlation coefficient varies between -1 and 1. Zero correlation means that there is no connection between the variables. The closer to +/- 1 the stronger the correlation is. A high correlation varies between 0,80-1,00, good is 0,60–0,80 and 0,40-0,60 is moderate. The correlations between the items in summated scales were mostly good or moderate. The range was in knowledge acquisition between 0,272 and 0,736. In knowledge transfer the lowest value was 0,370 and the highest 0,783. The range in tacit knowledge was 0,270-0,505. In knowledge sharing the lowest value was 0,211 and the highest 0,720. The range was in knowledge creation between 0,573 and 0,686. In strategic KM the lowest value was 0,500 and the highest 0,665. In ICT systems the range was 0,529-0,774. Also std. deviations (table 5) with the items are significant, so the items separate the respondents from each other well. (Metsämuuronen, 2005, 515.)

The Kruskal-Wallis one-way analysis of variance (ANOVA) by ranks test was used to determine whether three independent groups (the factories in Lahti, Jyväskylä and Heinola), were the same on variables of interest (different KM activities) (Metsämuuronen, 2005, 1051). The purpose of this test was to determine whether there was a significant difference at an alpha level of 0.05 in the answers of the three factories in KM activities. The question asked was: Are the three factories (samples) different, or are the differences found reflecting the variations to be expected from random sampling. The differences were statistically significant concerning knowledge transfer, knowledge sharing, knowledge acquisition, and ICT systems at an alpha level of 0.05 (see Appendix 3).

Reliability is the degree to which the measurement can produce the same results twice. Reliability can be indicated if two different measurements give the same results or an object is examined twice ending up in the same results. Validity on the other hand is the degree to which a research measures the object that it was intended to measure. If respondents

misunderstand the questions of a questionnaire, the measurement is not valid, because it measures something else than, what it was meant to measure. (Metsämuuronen, 2005, 64.)

Validity on the other hand, is the degree to which the variables measure the subject that wanted to be measured. The meter does not always indicate the specific subjects studied. The construction of the meter is important. The meter that is not valid is neither reliable. Theory beyond the meter determines the content validity of the research. It is crucial that the theory is explored widely for a research (Metsämuuronen, 2005). In this study the validity is controlled by using two different methods; a survey and the group interviews. This way the validity improves (Hirsjärvi et al., 2004). Denzin (1970) refers also to the same statement by the term triangulation. Mixing methods is emphasized also by Brannen (1992). Janesick (2000) on the other hand refers to it by the term crystallization, which means examining subjects through different perspectives. In this study validity was also controlled by leaning on previously validated meter. The questions were also previously tested. Misunderstandings by the respondents may show up, if the respondents are not familiar with the subject (Hirsjärvi et al., 2004).

A weakness of a survey study is considered according to Hirsjärvi et al. (2004) when they state that the questionnaire can be difficult to fill in. The main reason for this is the ambiguity and out of focus of the questions. It is not always necessarily clear that the respondents have understood the questions. On the other hand, group interviews are an effective method for gaining a deeper insight of the subject studied from many respondents at the same time. The group can help an individual to remember, correcting possible misunderstandings straightaway. However, the group's control can also be a negative matter for the reliability and validity of the research. Group can prevent negative and harmful subjects to come up, if they

would harm the group by some means. There can also be dominating individuals who control the dialogue. (Hirsjärvi, 2004.)

All though the concept used in this study is tested to be valid and reliable in previous research (Kianto, 2008), there is a need for further testing, because the changes made in the measurement tool. The ORCI – measurement tool approaches organizations KM capability quite widely and from many perspectives. It covers all the important activities in managing knowledge. The questionnaire is divided into well-defined sub-dimensions and there are not overlapping questions or missing areas. The questionnaire is very easy to fill in and there is no doubt about the respondents' capability to fill it in. The main reason for this is the intelligibility and concreteness of the questions. The 7-point Likert scale used is adequate as a measurement tool and can be achieved sufficient range of variance in the results with it. Assessing the results is easier and more objective this way to the researcher. On the other hand, great divides in the respondents' results are quite discomforting because the cause and effect relations are hard to detect. This problem is however unimportant if the sampling is big and statistically significant as in this study. The reliability of the research is guaranteed.

5.3 The knowledge management capability in UPM-Kymmene Wood Oy

In this section the results related to each of the three researched organizations and the differences between the organizations are presented. Also the objectives for development are presented in this chapter.

Findings in this study are based on the survey data, the group interviews and top management reflection. There are rather large differences

between the factories mostly in the KM activities of Lahti and Jyväskylä. All KM activities are in general best level in Lahti.

In Lahti the experiences and views of personnel and management were fairly similar and there were no statistically significant differences between these two groups. However, in Jyväskylä staff and management perceptions differed considerably from one another (see table 9). The differences were statistically significant also concerning all KM activities except knowledge creation in Jyväskylä. Also in Heinola the experiences and views of personnel and management differed from one another apparently.

Knowledge acquisition from outside of factory sources was the weakest KM activity in all factories. As this issue is similar in all factories, it is discussed before going to the factory-specific results. Employees are scarcely encouraged to search for information from external sources and few opportunities for doing so are provided. The customer interface is centralized and goes through the marketing department of the corporation, so the factories are not in direct contact with customers. All external knowledge is acquired in a centralized manner and then distributed from the marketing department to the factories as seen fit. Based on the management interviews, new customer knowledge is not distributed to the factories as reliably as it could be. On the other hand, top management of the factories is quite happy with the centralized nature of extra-organizational communication and thinks that acquiring knowledge from external sources is not relevant for the employees in none of the factories. Also knowledge acquisition from other factories was scarce. This, however, was something that the top management wished to change. They expressed a strong wish for improving inter-factory learning and sharing of knowledge and best practices with each other. However, there are many obstacles before this can be achieved. The consolidated corporation has a long history of internal rivalry between the factories. The

performance between the factories is being compared with each other as well as the other factories of the corporation. As a whole, inter-factory cooperation within the corporation has not gained ground as required and there seems to be a strong tradition of competition and a sense of unspoken limits and jealousy towards other factories.

The mean scores, std. deviations and variances for summated scales of the three factories are presented in the table 5. Also the graphs of KM capability in comparison between the three factories are presented in table 6 below. The questionnaire was received from most of the respondents (471 out of 724). All received answers were coded and analyzed with SPSS-software. All the respondents did not fill all the statements given which lead to changes in quantities (N). After the survey diagnosis, focus group interviews were conducted in the case organizations. Focus group interviews are also discussed in this chapter in the light of generating more in depth picture of the status quo of KM capability in the organizations.

	KM ACTIVITY	Knowledge acquisition	Knowled-ge transfer	Knowled-ge sharing	Tacit knowled-ge	Knowled-ge creation	Strategic management of intellectual capital	ICT systems
Jyväskylä	Mean	3,2093	4,0227	3,8675	4,0990	4,1685	4,2847	3,6566
	N	202	209	208	207	184	195	199
	Std. Deviation	1,3628	1,2908	1,1217	0,9972	1,3686	1,2933	1,5572
	Variance	1,8574	1,6661	1,2581	0,9945	1,8731	1,6725	2,4249
Heinola	Mean	3,4619	4,3867	4,0567	4,3455	4,5208	4,5153	3,7639
	N	150	156	158	156	136	146	144
	Std. Deviation	1,3875	1,2755	1,0493	1,1405	1,3692	1,2213	1,6908
	Variance	1,9251	1,6268	1,1011	1,3008	1,8747	1,4917	2,8587
Lahti	Mean	3,7403	4,7098	4,2971	4,2978	4,4655	4,5839	4,7604
	N	96	98	99	98	87	92	96
	Std. Deviation	1,4380	1,1607	1,0968	1,1437	1,4039	1,3098	1,3595
	Variance	2,0678	1,3472	1,2030	1,3081	1,9710	1,7155	1,8481
Total	Mean	3,4077	4,2908	4,0233	4,2247	4,3497	4,4260	3,9332
	N	448	463	465	461	407	433	439
	Std. Deviation	1,3996	1,2852	1,1024	1,0829	1,3830	1,2768	1,6200
	Variance	1,9589	1,6516	1,2152	1,1727	1,9127	1,6302	2,6245

Table 5: The Mean scores, std. deviations and variances for summated scales in all three factories.

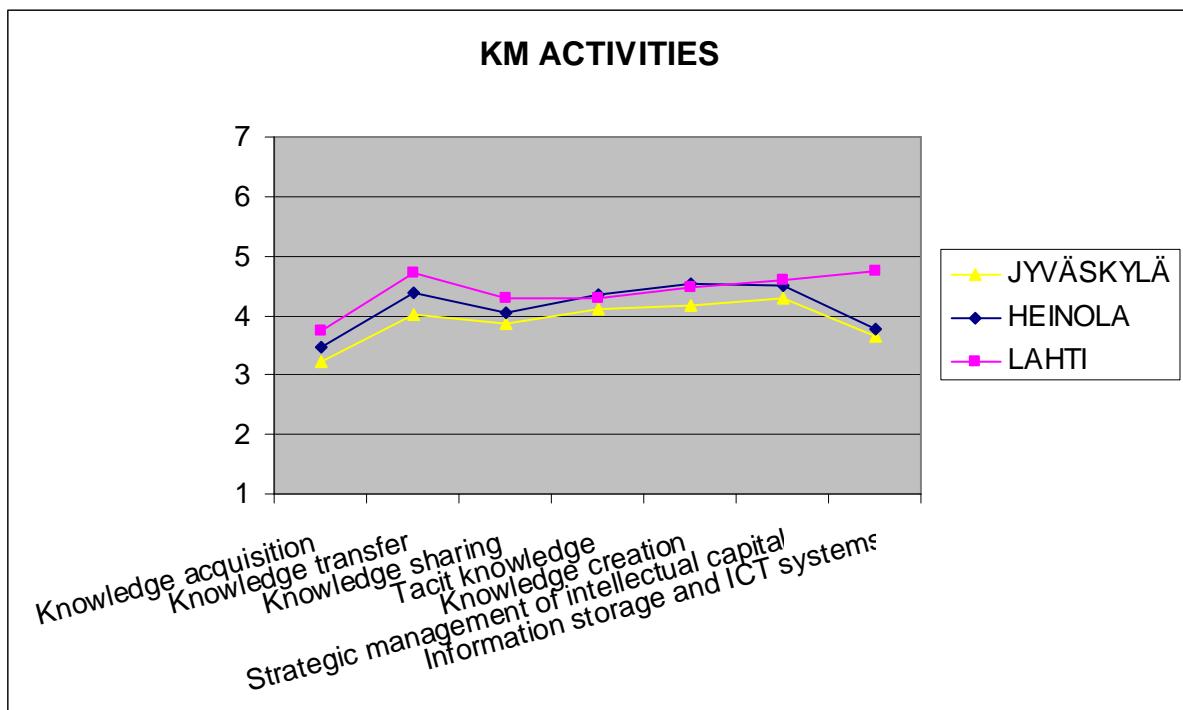


Table 6: The graphs of KM capability in comparison between the three factories.

5.3.1 Factory in Lahti

Next the factory-specific results are presented. In the factory of Lahti, all KM activities are on a better level than neither of the two other factories. First, the results of the questionnaire (table 7) are discussed and then the results from the group interviews are viewed in order to get a deeper insight of the problems raised by the survey.

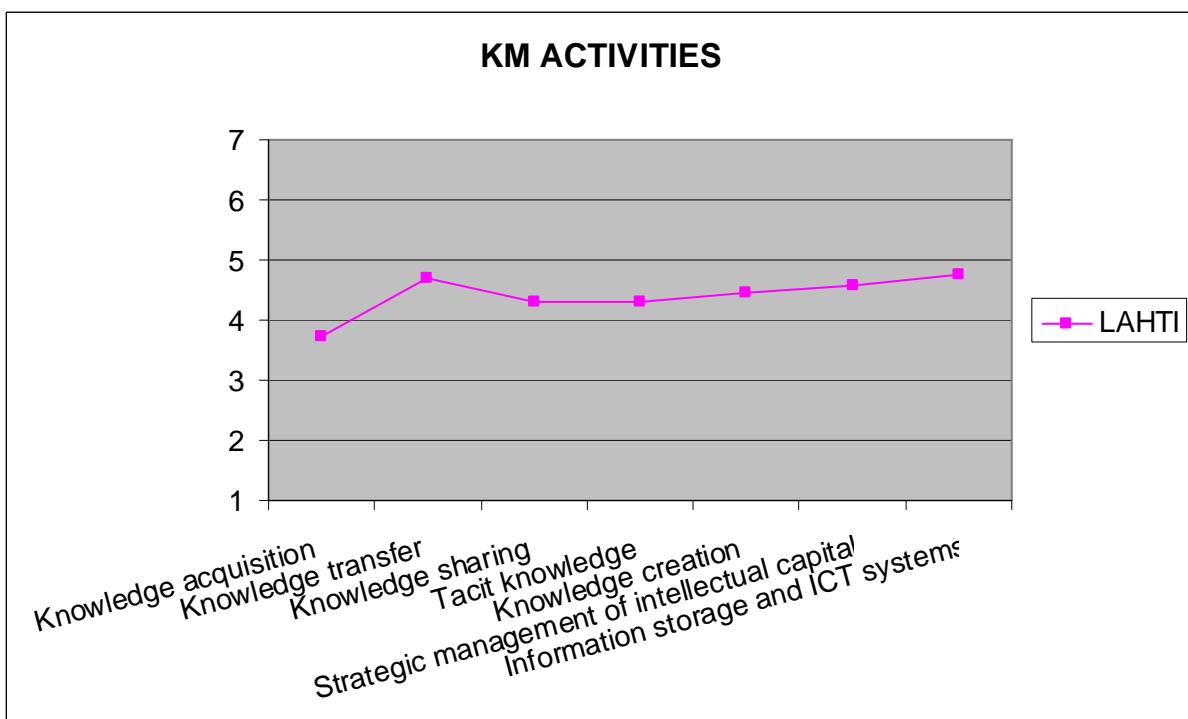


Table 7: The results of KM capability in Lahti.

In all, factory in Lahti received relatively good scores in the survey. Only knowledge acquisition, discussed in the previous paragraph, was assessed to be lower than the arithmetic average (4). ICT systems were evaluated to be quite workable and also employees felt that the ICT systems were of help. This subject might have had an effect on knowledge transfer also. Recording and codifying information was judged to be handled quite well. In Lahti the most important subjects for further discussion were: use of development suggestions, improving the company in general, learning more from previous experiences and from others, knowledge acquisition and creation, sharing tacit knowledge and improving cooperation with the other factories. Some comments to open questions (Appendix 1) of the things that inhibit learning and innovations in organization were mentioned to be poor familiarization of new employees i.e. mentoring, too remote job rotation and the overlapping of information systems.

The group interviews focused mostly on knowledge transfer, ICT systems and knowledge sharing. Knowledge acquisition was problematic in areas of applying customer knowledge in intra-factory operations and access to knowledge about customer needs, especially in the employees' point of view.

Knowledge transfer was judged on the other hand to be handled quite well in Lahti. Generally, recording and codifying information was seen as a positive thing, as there is not always time or possibility to share knowledge face-to-face. Especially for dealing with unexpected problem situations arising during the night shift, it would be useful to have more knowledge recorded in the form of manuals and guidelines. Recording existing knowledge into databases and manuals can also increase efficiency of knowledge utilization: "If many handy shortcuts have been developed in some line or post, it really does take a very long time to transfer them through observing and learning. But if there are clear systems where we have directions for conduct or instructions or such, there is no need for teaching, simply for applying them."

Intensive and successful knowledge sharing is a necessary precondition for Lahti's team-based functioning. Much knowledge is shared in teams, which tend to work together for a long time and possess a safe and trustful atmosphere. An important nod in Lahti's internal knowledge system is the team leader, who is an employee and works as a mediator between other team members and managers. Intensity of knowledge sharing and appreciation of tacit knowledge of organizational members on all levels is reflected also in the many meetings. For example, the team leader meets with the team's manager once a week to inform him/her on how the team is doing, and managers then discuss this information in weekly managerial meetings. Two shifts participate in the weekly meeting at a time and the agenda is open for discussion on any acute issue. Knowledge sharing is much encouraged, but it was also brought up that

even though long-time employees had much knowledge to share, they may not be willing to share it. For example, one interviewee (manager) said that rather than explain their reasoning and basis for making informed decisions to others, the “old masters” “rather go and do it themselves. Then I go later a little bit behind and ask [from other team members] “what did you do”. They just say “well the master came here to give us instructions”. Sharing the tacit skill of identifying problems and selecting right ways of conduct in complex and acute problem situations is not easy. In Lahti, careful familiarization of new employees, job rotation and mentoring were seen as fruitful methods for sharing tacit knowledge. Though they were seen as complicated to implement well. Concerning mentoring activities, it was brought up that the selection of mentors should be based more on the long-term practical expertise on a particular work post than what is currently done. As new technologies and machines are adopted periodically, also the senior employees need to learn new working methods once in a while. Teaching others is demanding also because there are no instructions on how to do it or even a list of the most important things that should be taught to a novice: “there always are things that one just does not remember to say. And if one does not know enough to ask, then the other surely does not remember to tell.” Systematizing learning, familiarization and teaching would improve this situation in Lahti.

Knowledge creation had problems in empowering employees to develop new solutions and learning from other factories and also through different kinds of trainings in the company. In Lahti mentoring, in depth familiarization of new employees and job rotation were seen as fruitful methods to share tacit knowledge and to create new ideas. The employees felt that it was not so much a matter of resources but more about possibilities to connect with colleagues to develop new solutions to problems.

Strategic management of intellectual capital did not have big problem areas in Lahti, although, rewarding methods were discussed in the interviews. It would be important, according to the organizational members, to reward maintaining collaborative problem-solving even better. Also recognising the value of knowledge based on experiences was seemed to be important.

There are several overlapping information systems in use in Lahti. This frustrated the organizational members. For example one employee complained that “at the moment we record the same information to four different places, because we don’t really know how and where the directors want it”. Organizational members wished that there would be “only one place where they [all information] are, unified knowledge bank, which is not changed, where knowledge is collected and then it stays there in the memory”. In addition, several operational improvements were called for, for example building a databank where e.g. previous meeting memos would be stored and searched with keywords. In Lahti (unlike in Jyväskylä and Heinola), every post has a computer, possibility to connect to the internet, to search for information and to study. Every employee has a personal e-mail address and widespread usage of e-mail ensures that information reaches all wanted individuals efficiently. The aim has been to get rid of unnecessary paper documents, and e.g. directions and precepts are mainly circulated in the electronic form. Managers, however, criticized this and argued that it would be more useful to have “comprehensive situational reviews, where issues would be clearly talked about instead of machine-drawn curve presentations”. Thus it is not surprising that ICT systems received a high rating from workers but only a mediocre one from managers also in the survey.

In all, employees and managers experienced their work environment to be quite pleasant and no major objectives for development were detected in Lahti. Team based work was described to be a workable method in Lahti's

factory. Co-operation inside the factory was coming easy to both the workers and managers. Also co-operation with the other factories was perceived better than in the other two factories. Ways to improve learning from other factories was mentioned e.g. visits to other factories and different trainings with the other factories personnel. Rewards for maintaining collaborative problem-solving in the factory was also mentioned as an effective activity.

However, also critique was expressed. The flow of information and knowledge between employees and managers was seen as ineffective and slow. Also familiarization was felt to be quite poor in some cases. Longer periods of familiarization was hoped for and more in depth guidance to the product process. On the other hand, also specific knowledge about equipment and illustration of solutions to different kinds of problems were longed for. Clear instructions for knowledge codification and codified instructions for problem situations were also wanted. Also guidelines for job familiarization and mentoring would help the process of knowledge sharing when new employee arrives in the company. Improving access for the employees to intra-factory knowledge would be an efficient way to advance knowledge acquisition. Reducing overlap of information systems was important to the managers and would clarify their knowledge acquisition also.

5.3.2 Factory in Jyväskylä

The factory-specific results in the factory of Jyväskylä turned out to be a subject of apprehension. First the results from the questionnaire (table 8) are discussed and second the results from the group interviews.

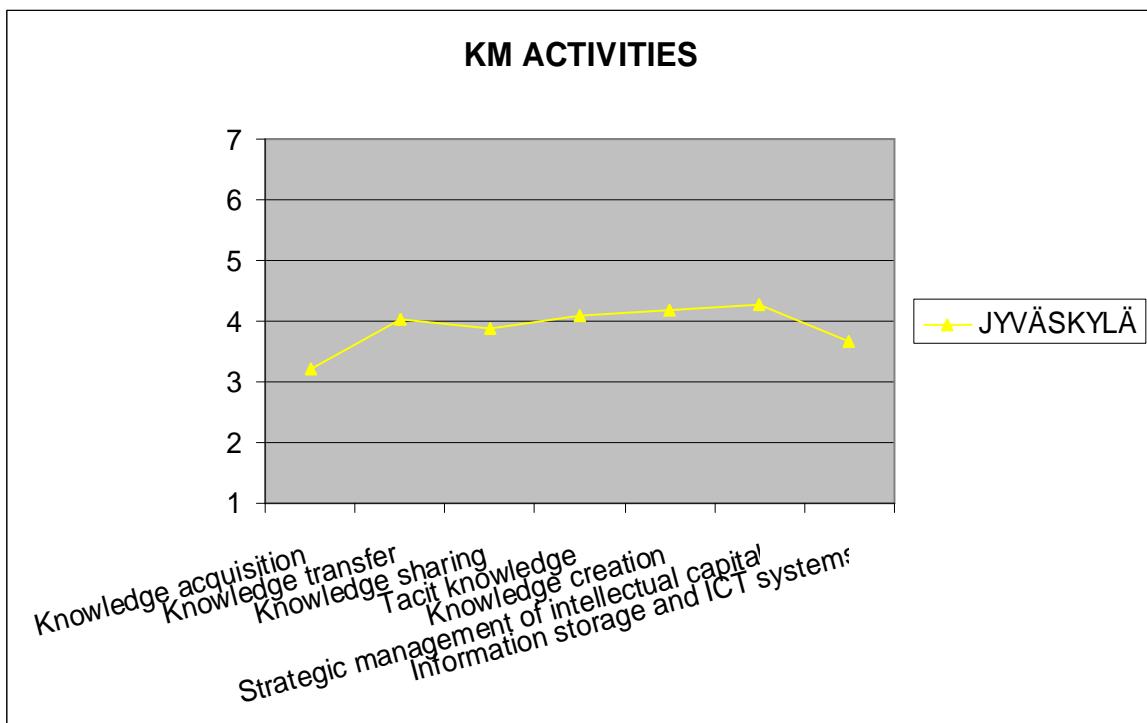


Table 8: The results of KM capability in Jyväskylä.

The survey scores of the factory in Jyväskylä were lower than those of Lahti or Heinola concerning all KM activities. The most striking feature of the survey results in Jyväskylä was however the large differences between employee and management perceptions (table 9). Similarly to Lahti, also in Jyväskylä knowledge acquisition, discussed previously, had the lowest scores. Only managers have access to computers and this was also reflected in the low survey score that employees gave when evaluating ICT systems. In Jyväskylä the most important subjects for further discussions were improving the company in general, knowledge acquisition from the customers, sharing tacit knowledge, improving cooperation with the other factories, acquiring ICT systems to employees, empowering employees and obviously the large differences between employee and management perceptions. Some comments to open questions (Appendix 1) of the things that inhibit learning and innovations in organizations were: the lack of internet connections, “hiding” useful knowledge from others, poor familiarization and mentoring and general resistance towards anything new.

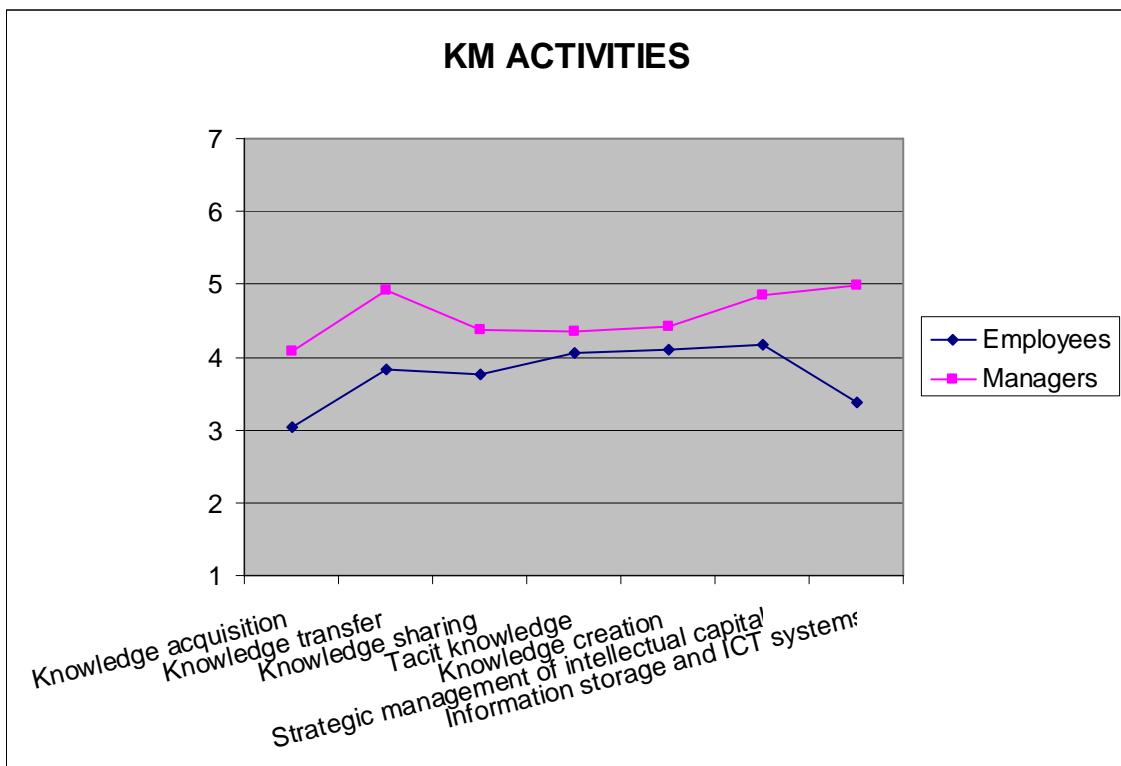


Table 9: The differences between employees and management perceptions in Jyväskylä.

The discrepancies between workers and managers were also evident in the opinions expressed in group interviews conducted at Jyväskylä: it was almost as if staff and management were describing two different work environments rather than the same factory. There is a lack of managerial understanding on how employees experience the working environment. One interviewee (manager) put it bluntly: "One could give such feedback up there that they should come and get acquainted with it, so that they would not have to always bad mouth guys accidentally and without purpose. They would see the problems, there really are problems." This may be connected with the hierarchical operational model of the factory. Employee attitude toward the organization as a whole and managers especially seemed to be hostile and negative. Management attitude, on the other hand, apart from few exceptions, seemed to reject from the responsibilities that come with a managerial position. Managers feel like they do not have a proper place in the organization, that they are just

juggled from one place and change to another. Like one of them expressed when reflecting the position of management in Jyväskylä, “All maliciousness is poured to this lot, and these are the worst of people that one can find in the world, and this lot is being educated and always taken to some punishment camp – to courses.” Also in the management group interview, surprisingly the managers tended to approach discussion topics from the perspective of what should be changed to make them (managers) as individuals happier about their jobs. They found it hard to consider developmental needs from the perspective of how to improve their processes, or from the perspective of the whole factory. Perhaps the authoritarian past of the factory is still demonstrated in the inability of the managers to see themselves as responsible for the work of a group of people within a production process, aiming to reach the goals of the factory.

In Jyväskylä focus group interviews addressed also the history of the corporation. The old and strict culture of the company was widely discussed and the work practices that do not favour the employees to operate by themselves. Instead, it is expected that the management briefs the employees in every occasion. The managers felt that they were left alone on top management’s behalf and without the empowerment to practice as a manager.

The group interviews in Jyväskylä focused also on knowledge sharing, ICT systems and knowledge creation. Knowledge acquisition however was seen similarly to as in Lahti, i.e. applying the customer knowledge in intra-factory operations. Access to knowledge about customer needs and enabling information search from external sources were seen as difficulties.

Knowledge transfer on the other hand has difficulties in the area of knowledge codification and transfer to employees. Managers feel that it

would be useful to codify solutions of different kinds of problems in the ICT systems (databases), so the required knowledge would not be just behind one person. Access to internal knowledge was seen as almost impossible because of the lack of computers. Internal communication in general is seen as inefficient and difficult especially between shifts. Employees feel that they have little possibilities in general for getting their ideas heard in the factory of Jyväskylä.

In Jyväskylä managers are not trained in any way for the supervisory position. Like one of them put it, "I have not received any kind of initiation or familiarization... one day you stay to work overtime, next day you are the foreman of the department". Many managers themselves realize this shortcoming and that training for how to be a supervisor is seriously lacking and should be organized. In addition to lacking a formal managerial training, there is very little communication concerning managerial skills and responsibilities, since the novice manager does not necessarily even meet his/her predecessor. This is fatal for sharing tacit knowledge: "tacit knowledge cannot be passed on, because there is no one to transfer it to you". Employees felt that tacit knowledge is highly valuable and important and that especially older employees have much of it. However, just like managers, also employees have very limited opportunities for sharing tacit knowledge. Familiarization is judged to be too short and haphazard. Since some years, Jyväskylä has organized department meetings which are aimed to be communication forums where both managers and employees participate to tackle acute problems and come up with solutions. However, the meetings have recently diminished, they are being held irregularly and are open for part of the organizational members only. Especially employees feel that these meetings are not fulfilling their goals and that they are not expected to take part in these meetings.

Inflow of new ideas is small, as external communication is minimized, there are no meetings where participants from several departments would be allowed, and personnel working a particular shift changes very rarely. Thus learning and knowledge creation only take place on a minor scale. Even when employees do have new ideas, they do not know where to go with them and good ideas that may be useful for the whole factory are dropped before they are even properly addressed. It would be useful to empower employees to question established practices and to develop new solutions.

Strategic management of intellectual capital in Jyväskylä has problems in recognizing the importance of external knowledge. It is not seen important to share knowledge with other factories, although discussing the subject many useful consequence of acquiring external knowledge was mentioned in the focus group interviews. Reducing hierarchy and empowering supervisors to make decisions is also vital to create coherence between workers and management in the factory of Jyväskylä.

In Jyväskylä, only managers have access to computers and to the internet. This was also reflected in the low survey score that employees gave when evaluating ICT systems. On the other hand information systems at use in managerial level were felt to be complicated, unclear and difficult to use. Managers hoped that experiential knowledge of experienced employees could be codified into databases and manuals, so that earlier solutions could be referred to in problem situations.

In all, co-operation with other factories did not exist almost at all. Activities to improve this were mentioned as visits to other factories and also different kind of training with the other factories personnel. It would be essential to offer more support to the managers in their work, reduce hierarchy and empower supervisors to make decisions. Also more careful familiarization to new managers would be useful in sharing tacit

knowledge. In certain terms, also introducing team-based structure to the factory of Jyväskylä might be useful. What should be taken into account according to personnel are geographical distances between the process lines and also the channels by which supervisors could give instructions to employees in problematic situations. On the other hand, there was a fear that inequality between the factories might increase in the case where the teams would function only partially in the factory of Jyväskylä, while in Lahti they are fully functioning. The most important subject for development would be creating open conversation and coherence inside the personnel and effective internal communication. Also, understanding the whole operational process of the factory would be useful for the employees in improving their work performance.

5.3.3 Factory in Heinola

Finally, the factory-specific results in the factory of Heinola are presented. First the results from the questionnaire (table 10) are discussed and then the results from the group interviews.

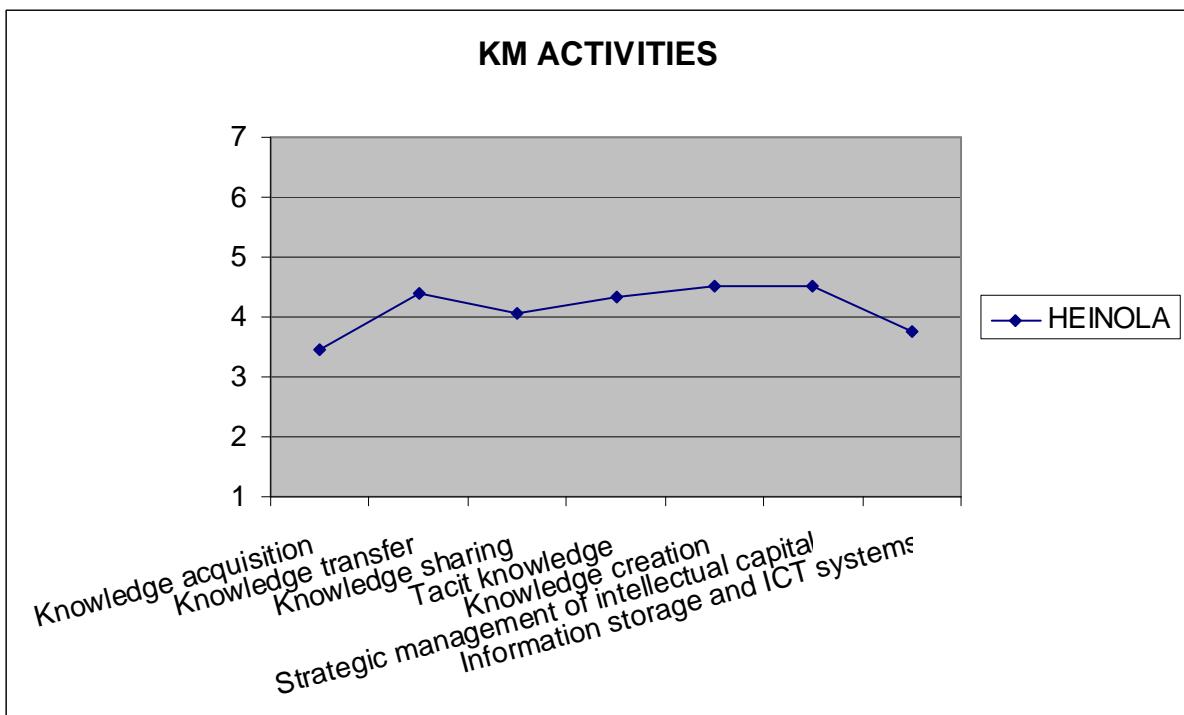


Table 10: The results of KM capability in Heinola.

The survey results showed that also in Heinola knowledge acquisition had the lowest scores. Similarly to Jyväskylä, only managers have access to computers and ICT systems was assessed to be lower than the arithmetic average (4). Also knowledge sharing received mediocre scores in the survey. There exists some inter-shift communication in the factory of Heinola, but more formal knowledge sharing mechanisms are craved for. In Heinola the most important objects of KM activities for further discussions were questioning established practices, improving the business in general, learning from previous experiences and from others, knowledge acquisition, tacit knowledge and sharing it and improving cooperation with the other factories and acquiring ICT systems. Some comments to open questions (see Appendix 1) of the things that inhibit learning and innovations in organizations were: The lack of internet connections, ineffective internal communication, and also similarly to Jyväskylä, “hiding” the useful knowledge from others.

The group interviews in Heinola focused mostly on knowledge sharing, knowledge creation and ICT systems. Knowledge acquisition was seemed to be difficult from external sources. Similarly to other factories, also Heinola had difficulties in applying customer knowledge in intra-factory operations.

Knowledge transfer was judged to be difficult to employees and increased emphasis on the codification of knowledge was wished for. Managers hoped especially better traceability to different working shifts. This would give managers an opportunity to comparative measuring between processes and shifts.

In knowledge sharing it seemed to be important that face-to-face tacit knowledge sharing would be possible in everyday work practice. An example of this tacit knowledge sharing was mentioned to be job rotation. Also visits to other factories were important to those who had had experience of it. More formal mechanisms for sharing knowledge and instructions for example in familiarization and mentoring were craved for. Managers felt it inflexible that they did not have any possibilities to discuss with the managers from other shifts face-to-face. Also there were blackouts between the workers and the managers in sharing knowledge. Workers did not necessarily meet their manager at all during the shift. Similarly to Lahti, also in Heinola careful familiarization of new employees, and mentoring were seen as fruitful methods for sharing tacit knowledge.

Learning from other factories is also mentioned in Heinola as an activity to create new knowledge. It would also be important to empower employees to question established practices and to develop new solutions in their everyday work practice. Inflow of new ideas is small and personnel working a particular shift changes very rarely. Similarly to Jyväskylä, even when employees do have new ideas, they do not know where to go with

them and good ideas that may be useful for the whole factory are wasted before they are even properly addressed.

Strategic management of intellectual capital did not have outstanding problems neither in Heinola. However the introduction of more teamwork, cross-functional and concurrent working was welcomed by both, workers and managers. Also recognizing the importance of experiential knowledge by employees would be useful. Managers however needed more support in their work and empowerment to make decisions.

In Heinola, only managers have access to computers and to the internet similarly to Jyväskylä. This was also reflected in the low survey score that employees gave when evaluating ICT systems. Employees wished to have possibilities to access IT also. On the other hand information systems at use in managerial level were felt to be problematic: more systematic storage of knowledge through the use of databases was hoped for. Also overlapping of the systems seems to be a problem in Heinola. Like an employee put it, "Here we start to build a new system of our own instead of acquiring one from the corporation that is already ready to use."

In all, as well as the other factories, also Heinola had problems in empowering employees to develop new solutions and learning from other factories. Job rotation was seen as successful method for sharing tacit knowledge. Ways to improve learning from other factories, co-operation and developing external contacts, e.g. visits to other factories and participating in different trainings with the other factories personnel were mentioned. Knowledge "hiding" seemed to be an acute problem. One way to improve this would be recognizing the importance of experiential knowledge and increased emphasis on sharing it and the codifying it. Also in Heinola, supervisors felt that they did not receive enough support from the top management or their colleagues in their every-day work, nor were they empowered to make decisions. The introduction of a more team-

based, cross-functional and concurrent working practices might improve the factory's performance. The personnel felt that the team-based structure would be enforced by top management only without asking anything from the personnel. Important subjects, before the transition would occur, thought to be the thorough guidance in the implementation and also profound familiarization to factory-specific exigencies of the situation. In Heinola it was also discussed by the managers that they do not feel empowered to make decisions. The introduction of more teamwork, cross-functional and concurrent working was also supported by both, employees and managers.

5.4 Specific KM activities found in the factories of industrial production

The results (table 11) present that many specific KM activities were found even in the factories of industrial production with little awareness of the KM discourse. In the survey results the factory in Lahti received the best scores almost in all KM activities measured. Only in tacit knowledge and knowledge creation Heinola received slightly better scores. Jyväskylä's scores were lower than those of Lahti and Heinola concerning all KM activities. It can be seen also from the table 11 that Lahti has quite many KM activities in use while the other two factories does not have that many of them.

THE SPECIFIC KM ACTIVITIES FOUND IN THE FACTORIES OF INDUSTRIAL PRODUCTION						
	KNOWLEDGE ACQUISITION	KNOWLEDGE TRANSFER	KNOWLEDGE SHARING	KNOWLEDGE CREATION	STRATEGIC KM	ICT SYSTEMS
LAHTI	N/A	Recording and codifying information was judged to be handled quite well. Widespread usage of e-mail ensures that information reaches all wanted individuals.	Team based work. A safe and trustful atmosphere to share knowledge. Team leaders work as a mediator between other team members and managers. Intensity of knowledge sharing is reflected also in the many meetings. There is also co-operation inside the factory, e.g. two shifts participating in the weekly meeting. Job rotation.	Small inflow of new ideas.	Appreciation of tacit knowledge of organizational members on all levels. Rewarding collaborative problem-solving.	Every post has a computer, possibility to connect to the internet, to search for information and to study. Every employee has a personal e-mail address. Directions and precepts are mainly circulated in the electronic form.
JYVÄSKYLÄ	N/A	Few codification of knowledge into databases by managers.	Department meetings which are aimed to be communication forums where both managers and employees participate in. Familiarization exists.	Learning and knowledge creation only take place on a minor scale.	Employees recognize that tacit knowledge is highly valuable and important and that especially older employees have much of it.	Only managers have access to computers and to the internet.
HEINOLA	N/A	Some codification of knowledge into databases by managers.	Familiarization of new employees. Some informal knowledge sharing mechanisms. Job rotation.	Small inflow of new ideas. Some inter-shift communication. Learning from other factories through visits.	N/A	Managers have access to computers and to the internet. Some storage of knowledge through the use of databases.

Table 11: The specific KM activities found in the factories of industrial production.

In Lahti co-operation with the other factories and inside the factory was perceived better than in the other two factories. It was easy to reach all wanted individuals through e-mail. ICT systems received a high rating from workers but only a mediocre one from managers in the survey. Appreciation of tacit knowledge of organizational members on all levels was high as well as rewarding collaborative problem-solving used. In Jyväskylä, learning and knowledge creation only take place on a minor scale. Employees recognize that tacit knowledge is highly valuable and important and that especially older employees have much of it, but there are no workable mechanisms to share knowledge with others. In Heinola there were some storage of knowledge through the use of ICT systems, but similarly to Jyväskylä, also here only managers have access to

databases and computers. The inflow of new ideas were small and it was difficult to the employees to get their ideas heard.

Many KM activities were found in the factories through the focus group interviews, especially in the categories of knowledge sharing and ICT systems. Regular discussion on methods and problems in the work place was important to both managers and employees. Interestingly, while there were many KM activities especially in the factory in Lahti, the concept of KM was not used in any of the interviews by the interviewees. Many KM activities were seen to be linked with “organizational development”, “continuous improvement” and “team working”, but not perceived to form an activity system of their own. Arguably this could be the best way to manage for KM, at least in an organization with little awareness of the KM discourse, where it might be difficult to justify the existence of KM as an independent and centralized function. Even though the three plywood factories cannot by any means be described as knowledge-based in the sense that their value creation would happen through intangible assets, KM still is an important issue for them, and can at best yield important productivity improvements. None of the organizations has a consciously created KM strategy and relatively few KM activities to document, but the results demonstrate that there is much management of knowledge going on in these organizations, regardless of whether it is labelled as such by the actors themselves.

6 DISCUSSION AND CONCLUSIONS: HOW KNOWLEDGE MANAGEMENT CAN ENABLE ORGANIZATIONAL RENEWAL

This chapter presents the conclusions made by the study. This study extends existing literature by providing an in depth case study into assessment and development of KM activities in three case organizations. The survey was answered in total by 471 respondents of three organizational units which were plywood factories of Finnish multinational corporation. Conclusions are drawn based on the results from the survey and the viewpoints from the group interviews made in the organizations.

Chapter 2 concentrated on the field of KM research and provided a theoretical categorization of the KM activities composing KM capability. It provided insight in understanding how KM capability is constructed. Chapter 3 provided description of the organizational benefits of KM detected in the previous research. Chapter 4 concentrated on the research methods and data collection explanations. Finally, the results of this study were presented in chapter 5 to examine the three factories in the light of the KM activities exhibited in them, also an analysis of the main developmental needs identified was provided. Conclusions are made in this chapter.

First it is worth discussing the theoretical conclusions of the research and the KM capability searched. Next the methodological conclusions are discussed. After that managerial conclusions are discussed and the objectives for development within the KM activities are presented as a summary in table 12. Also some suggestions for future research are discussed based on the results of this study.

6.1 Theoretical conclusions

As pointed out in the previous chapters KM capability can be diagnosed and developed to enable organizational renewal. The role of knowledge as the key productive factor has become one of the truisms of the current managerial discourse. The KM literature contains many normative but rather abstract prescriptions for KM, as well as anecdotal pieces of evidence from world-class leading organizations. In spite of this, there are relatively few organizations that are indeed practicing systematic and conscious KM and the great majority of companies rather reside on the start-up level of the KM maturity ladder (Robinson et al., 2006). One reason for this could be the lack of practical advice and examples of how KM can actually be implemented in organizations. Furthermore, the largest part of empirical KM literature examines KM in so called knowledge-intensive or knowledge-based organizations (Starbuck, 1992; Winch & Schneider, 1993). However, the importance of leveraging employee skills and knowledge has become a topical issue for all types of organizations – including those that mainly deal with tangible resources.

The results were in line with the earlier research which assumes that KM - capability and KM activities as its components are tools that can be used to modify and create knowledge assets. One of the main reasons for organizations to use KM (activities) is to create new knowledge which will lead to better competitive capability (Singh et al., 2006; Lee & Choi, 2003). Organization should be able to develop the existing knowledge assets to create new knowledge. Organizations that perceive themselves highly capable in managing knowledge and being innovative in relation to others and consciously attempt to compete with and differ from others are likely to exhibit more proficiency and efficiency in achieving competitive advantage as well as both adopting and creating innovations. (Pöyhönen, 2005.)

Stable knowledge assets alone do not bring any value to an organization. Instead, organizations have to have the ability to make knowledge assets operate to achieve renewal and competitive advantage. This ability can be called KM capability, including its components: knowledge acquisition, knowledge transfer, knowledge sharing, knowledge creation, strategic management of intellectual capital and ICT systems. Based on this study KM capability can be grouped into aforementioned six KM activities which comprehensively cover it. Similarly according to Robinson et al. (2006, 798): "If knowledge assets are the roots of the organization, the knowledge management [capability] is about nurturing or strengthening those roots". This study's model is designed in order to help organizations in understanding what KM capability actually is and how it is structured. Similarly to Jordan and Jones (1997) research: "By understanding the activities needed for successful knowledge management, and recognising and exploiting their own unique sources of competitive advantage makes [it] possible to gain a deeper insight into the organization's capabilities and find their own unique sources of advantage." The model in the figure 6 suggests that when an organization is able to renew itself continuously it can create sustained competitive advantage (Leonard-Barton, 1995; Teece et al., 1997; Pöyhönen, 2004a; Pöyhönen, 2005). This study also helps organizations to understand what the elements of KM capability affecting on renewal are and which of them need to be especially supported. These interconnections of knowledge assets, KM capability, renewal capability and sustained competitive advantage are illustrated in the following figure 6.

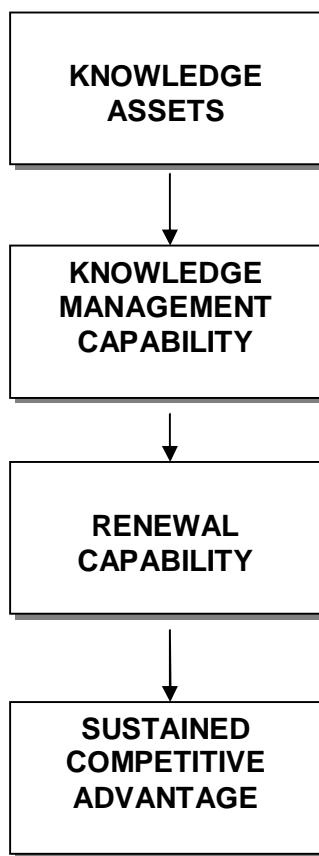


Figure 6: The interconnections of knowledge assets, KM capability, renewal capability and sustained competitive advantage. (Adapted from Pöyhönen, 2005).

6.2 Methodological conclusions

KM capability can be evaluated through a structured method for diagnosing the main weaknesses that should be developed. This study presents a structured method for evaluating KM capability of the organizations for diagnosing the main weaknesses that should be developed in order to achieve KM capability excellence.

Often the measures proposed in the literature are abstract or with little consideration given to the use of measures as a management tool

(Adams et al., 2006). The complex nature of KM capability has resulted in a need to develop a new metric for assessing KM performance (Chang Lee et al., 2005, 479). Organizations need tools to help them create value and a better understanding towards their intangible value drivers. KM capability and its activities can offer these tools. It is also noteworthy that especially when regarding innovations and renewal, measurement does not appear to take place routinely within management practices. Often output measures are the indicators for management to control the situation in the organization. There is a need for a balanced set of areas that need to be measured. There is also a need for multidimensional approaches for measurement to capture both short and long term aspects of value creation in the organization. Resorting to financial measures only can be fatal for organizations resulting only in ad hoc and partial metrics. (Adams et al., 2006.) It should be taken into consideration in the organizations that their measurement tools should be also reassessed every once in a while. When updating the business plan it is important also to update the measurement tool used. When the business objectives are being changed, also the measuring requires new measures. All unnecessary measures should be extracted because they just waste resources.

It is possible to use the ORCI- measurement tool also exclusively as a KM capability -questionnaire. The KM capability questionnaire used in this study is quite extensive and takes into consideration different aspects of managing knowledge. The questionnaire is divided into well-defined dimensions and there are not overlapping questions or missing areas. Also the sub dimensions (KM activities) seem to be appropriate based on this study. The received and completed questionnaires, in addition the viewpoints from the interviews, gave adequate results of the KM capability of the three factories. From this basis it was possible to examine the assessment and development of KM capability in the three plywood factories examined. The questionnaire seems to be suitable both for

scientific research and practical performance measurement in organizational development purposes. The intelligibility and concreteness of the questions are the strengths of the questionnaire. The used 7-point Likert scale is adequate for the measurement tool and with it a sufficient range of variance in the results can be achieved. The results from the questionnaire are also in line with the results from the interviews so there are no doubts about the validity of the research.

6.3 Managerial conclusions

KM capability activities can be assessed and developed in organizations with little awareness of the KM discourse. This study shows that KM capability is important also in non-knowledge-intensive organizations and it is also possible to assess and develop KM capability in them. However, much theory exists on KM, while quite a little empirical work has been undertaken. There are large gaps at the process of KM in this area in the previous research (Alavi & Leidner, 2001). The main purpose of this study was to examine current KM activities in the factories and to generate and define development activities for the weaknesses identified through the survey. None of the organizations has consciously created KM strategy, but the results of this study demonstrate that there is much management of knowledge going on in these organizations. The main developmental needs of the factories are summarized in table 12.

THE OBJECTIVES FOR DEVELOPMENT WITHIN THE KM ACTIVITIES						
	KNOWLEDGE ACQUISITION	KNOWLEDGE TRANSFER	KNOWLEDGE SHARING	KNOWLEDGE CREATION	STRATEGIC KM	ICT SYSTEMS
LAHTI	Improving access to knowledge about customer needs. Application of customer knowledge in intra-factory operations.	Improving access to internal knowledge. Clear instructions for knowledge codification. Codified instructions for problem situations. Guidelines for job familiarization and mentoring.	Team leader communication. Sharing tacit knowledge through familiarization and mentoring. Face-to-face reviews and discussions about factory's performance and situation.	Empowering employees to develop new solutions. Learning from other factories.	Recognizing the value of experiential knowledge of employees even better by fair rewarding to maintain collaborative problem-solving.	Reducing overlap of information systems.
JYVÄSKYLÄ	Encouraging and enabling information search from external sources. Access to knowledge about customer needs. Application of customer knowledge in intra-factory operations.	Knowledge codification and transfer of employees. Access to internal knowledge. Effective internal communication.	Sharing tacit knowledge through familiarization and mentoring. Enabling face-to-face knowledge sharing in everyday work practice, also between shifts. Effective and regular department meetings.	Empowering employees to question established practices and to develop new solutions. Increasing inter-shift communication. Consciously utilizing internal knowledge to find solutions to new situations. Learning from other factories.	Recognizing the importance of external knowledge and employee knowledge. Reducing hierarchy and empowering supervisors to make decisions. Creating open conversation and coherence between workers and management.	Acquiring ICT systems Improving usability of the few existing solutions.
HEINOLA	Encouraging and enabling information search from external sources. Application of customer knowledge in intra-factory operations.	Knowledge transfer of employees. Increased emphasis on the codification of knowledge.	Enabling face-to-face tacit knowledge sharing in everyday work practice, e.g. job rotation. Also the introduction of more formal mechanisms for sharing knowledge and developing external contacts, e.g. through visits to other factories.	Empowering employees to develop new solutions. Learning from other factories. Increasing inter-shift communication.	Recognizing the importance of external knowledge and experiential knowledge. The introduction of more team, cross-functional and concurrent working. Empowering supervisors to make decisions.	Acquiring ICT systems to employees. More systematic storage of knowledge through the use of databases. Reducing overlap of existing systems.

Table 12: The objectives for development within the KM activities.

Often it is expected that the employees just adjust to new technology and way of actions. However then the possibilities for a worker to develop and innovate by themselves are left unexploited (Oikarinen, 2008). Supportive leadership and empowerment of the employees' guarantees that employers also feel more responsibility to their job, believe in their capabilities and are in all more committed and motivated towards their tasks. (Weick & Sutcliffe, 2001; Pöyhönen, 2005.) Most of the knowledge

in the organizations are embedded in human experiences and shared in social interaction. Some tacit knowledge may be codified, but some of it will remain tacit and the only way to share it is in face-to-face interaction. Tacit knowledge is possessed by every member of the organization. This is why the whole personnel should be empowered and capable of finding the valuable tacit knowledge and bring it available to all members of the organization by sharing it. (Nonaka & Takeuchi, 1995; Tsoukas, 1996.)

In Jyväskylä the most important object for development was inevitably reducing hierarchy and empowering supervisors to make decisions. The task for management is to provide suitable circumstances for employees to develop their own work practices and offer the needed information and knowledge. In Lahti empowerment of the teams is important, so that they are capable of operating independently. In Heinola it was vital that the employees are provided possibilities for face-to-face tacit knowledge sharing in everyday work practice. In all, it is important that the flow of information and knowledge is easy and fluent. Also conversation in groups about the problems faced in the work place should be addressed.

The ICT systems should be rooted in and guided by an understanding of the nature and types of organizational knowledge. ICT systems can enhance knowledge assimilation and application by facilitating the capture and accessibility as well as updating the documented information of organizational directives. ICT systems can also help the application of knowledge by codifying and automating organizational routines. (Alavi & Leidner, 2001.) Making ICT systems available also to employees is vital to improving on flow of information in the organizations.

However, ICT is not capable of capturing tacit knowledge without losing its context. It is important to have reward systems for knowledge sharing. Also non-financial systems are important such as peer acclaim. (Robinson et al., 2006.) It seems that the factory in Lahti has succeeded in here

better than the other factories, because of a change in management culture to encourage a positive attitude to knowledge sharing inside teams. An important application is also the creation of corporate directories to map the internal expertise in the organization. It is crucial to assess and understand the knowledge position the organization is in and what are the intellectual resources it has. (Alavi & Leidner, 2001.) Organizations need to codify also some tacit knowledge onto “lessons learned” databases, in order to provide particular solutions to problems. Learning from other factories and increasing intra-factory communication would also provide useful knowledge.

Better familiarization was most often mentioned as an activity to improve performance and make work environment more pleasant. Mentoring activities seemed to work well in Lahti and it was also mentioned in both Jyväskylä and Heinola as a way to share tacit knowledge. Also job rotation was mentioned and some respondents hoped to have expansion of it in the factories. In addition it was seen important that learning from colleagues is vital in knowledge sharing, also between shifts.

This study contributes to the literature by providing an account of how KM capability can be assessed and developed even in the factories of industrial production with little awareness of the KM discourse. It also presents a structured method for evaluating KM capability of a company and for diagnosing the main weaknesses that should be developed in order to achieve KM capability excellence. As a practical deliverable, this study aims to be helpful for general managers hoping to develop KM capability in their own organizations.

6.4 Limitations and suggestions for follow-up research

In this study the objectivity was mainly achieved because of the researcher's external position towards the organization, but like in every research there is always some relationships toward the researched area and its implications should be taken into consideration especially when auditing qualitative opinions like interviews. However, the quantitative research method offered quite an objective way to analyze the results and compare them to the results from the interviews.

In order to increase the clarity of the summated scales, it would have been useful to analyze further whether combination of tacit knowledge and knowledge sharing could have been merged maintaining at the same time the reliability, validity and statistical significance of the differences between the factories in knowledge sharing.

The survey included items that were not analyzed in this study. The concept renewal capability was analyzed solely on managing knowledge dimension. The data collected for the purpose of this study is worth applying to further studies on renewal capability. The data could be also further enlarged by increasing the number of participating factories and thus increasing the meaning and contribution on the study of KM capability.

There are still theoretical and practical inefficiencies in the KM literature. A lack of empirical studies within the literature is a problem. Most of research has centred in large companies, as in this study, and little in small or medium-sized ones. New research is needed on how diverse organizations are actually managing knowledge in practice and how this would enable organizations renewal.

This case study has its limitations, because the organizations are explored through individual observations. However, this study contributes to research by constructing of the model of KM capability. It also emphasizes the importance of KM capability in organizations with little awareness of the KM discourse and that it is possible to assess and develop KM activities in these organizations also. In addition this study presents a structured method for evaluating KM capability of organizations and for diagnosing the main weaknesses that should be developed in order to achieve KM capability excellence.

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APPENDIXES

Appendix 1: Managing knowledge – questionnaire in English

Appendix 2: Cronbach's Alpha if Item Deleted: The items within the summated scales

Appendix 3: The statistical test of significance of the KM activities in the three factories at level $p = 0.05$ of significance

Appendix 1: Managing knowledge – questionnaire in English:

Knowledge creation

46 In our projects, we use teams consisting of people with skills and expertise from diverse fields

47 We use existing know-how in a creative manner for new applications

48 If we cannot solve a problem using traditional methods, we improvise a new method

Open questions

49 Name one thing that emphasizes learning and innovations in your organization:

50 Why that one?

51 Name one thing that inhibites learning and innovations in your organization:

52 Why that one?

Appendix 2: Cronbach's Alpha if Item Deleted: The items within the summated scales

KNOWLEDGE ACQUISITION		KNOWLEDGE TRANSFER		TACIT KNOWLEDGE		KNOWLEDGE SHARING		KNOWLEDGE CREATION		STRATEGIC KM		ICT SYSTEMS	
The number of the item	Cronbach's Alpha if Item Deleted	The number of the item	Cronbach's Alpha if Item Deleted	The number of the item	Cronbach's Alpha if Item Deleted	The number of the item	Cronbach's Alpha if Item Deleted	The number of the item	Cronbach's Alpha if Item Deleted	The number of the item	Cronbach's Alpha if Item Deleted	The number of the item	Cronbach's Alpha if Item Deleted
33	0,888	1	0,895	9	0,734	16	0,857	46	0,813	28	0,849	42	0,891
34	0,881	2	0,896	10	0,808	17	0,862	47	0,729	29	0,838	43	0,826
35	0,885	3	0,887	11	0,723	18	0,887	48	0,797	30	0,838	44	0,853
36	0,896	4	0,885	12	0,696	19	0,898			31	0,833	45	0,832
37	0,890	5	0,884	13	0,727	20	0,866			32	0,851		
38	0,887	6	0,894	14	0,730	21	0,856						
39	0,882	7	0,892	15	0,706	22	0,863						
40	0,882	8	0,894			23	0,857						
41	0,886					24	0,855						
						25	0,858						
						26	0,873						
						27	0,862						

Appendix 3: The statistical test of significance of the KM activities in the three factories at level p = 0.05 of significance (Chan & Walmsley, 2008; Kruskal-Wallis H-test, 2008.)

Common variables for all three factories are:

Degree-of-freedom = df = 2

Alpha = $\alpha = 0,05$

Criterion H = 5,9915

Knowledge transfer	
Chi-Square	16,445
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 1. K-W statistics of Knowledge transfer

Computed H = Kruskal-Wallis approximates Chi-Square

H0= There is no difference in scores of the three factories at p = 0.05 level of significance

Computed H (16,445) > Criterion H (5,9915)

Therefore, the null hypothesis is rejected and it can be claimed that there is difference in the responses of the three separate factories (Lahti, Jyväskylä and Heinola) concerning knowledge transfer.

The result can be attained also by viewing asymptotic significance of the three factories' responses:

Computed p = 0,00 (Asymptotic Significance)

Declared p = $\alpha = 0,05$

Computed p (0.00) < Declared p (0.05)

Therefore, there is difference in scores of the three factories at this level of significance ($p = 0.05$).

The results for other KM activities briefly:

Knowledge sharing	
Chi-Square	8,174
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 2. K-W statistics of Knowledge sharing

Computed H (8,174) > Criterion H (5,9915)

Therefore, the null hypothesis is rejected and it can be claimed that there is difference in the responses of the three separate factories (Lahti, Jyväskylä and Heinola) concerning knowledge sharing.

Knowledge acquisition	
Chi-Square	7,457
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 3. K-W statistics of Knowledge acquisition

Computed H (7,457) > Criterion H (5,9915)

Therefore, the null hypothesis is rejected and it can be claimed that there is difference in the responses of the three separate factories (Lahti, Jyväskylä and Heinola) concerning knowledge acquisition.

ICT systems	
Chi-Square	29,457
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 4. K-W statistics of ICT systems

Computed H (29,457) > Criterion H (5,9915)

Therefore, the null hypothesis is rejected and it can be claimed that there is difference in the responses of the three separate factories (Lahti, Jyväskylä and Heinola) concerning ICT systems.

Tacit knowledge	
Chi-Square	4,756
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 5. K-W statistics of Tacit knowledge

Computed H = Kruskal-Wallis approximates Chi-Square

Computed H (4,756) < Criterion H (5,9915)

Therefore, the null hypothesis is accepted and it can be claimed that there is no difference in the responses of three separate plants (Jyväskylä, Heinola, Lahti) concerning tacit knowledge.

Strategic management of intellectual capital	
Chi-Square	3,287
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 6. K-W statistics of Strategic management of intellectual capital

Computed H = Kruskal-Wallis approximates Chi-Square

Computed H (3,287) < Criterion H (5,9915)

Therefore, the null hypothesis is accepted and it can be claimed that there is no difference in the responses of three separate plants (Jyväskylä, Heinola, Lahti) concerning strategic management of intellectual capital.

Knowledge creation	
Chi-Square	5,947
Degree-of-freedom	2
Asymptotic Significance	0,000

Table 7. K-W statistics of Knowledge creation

Computed H = Kruskal-Wallis approximates Chi-Square

Computed H (5,947) < Criterion H (5,9915)

Therefore, the null hypothesis is accepted and it can be claimed that there is no difference in the responses of three separate plants (Jyväskylä, Heinola, Lahti) concerning knowledge creation.