



UNIVERSITY OF GOTHENBURG

Providing infrastructure for communities of practice using social computing

**Investigating knowledge strategies in multi-national
organizations**

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Abstract

Knowledge Management involves the management of an organization's knowledge assets and includes knowledge creation, sharing, storage and application. Information technology was thought to enable this, but the key challenge is to address all components of knowledge. This can be done by organizing communities of practice. Social computing is a collection of technologies normally sharing collaborative functions, community formation and user defined content. Individual social computing technologies have been suggested to address KM challenges, but indications demonstrate its effects and usage in organizations is limited and depends upon appropriate strategies. The aim of this study is therefore to investigate how organizations support communities of practice and how the portfolio of social computing technologies has been implemented with KM purpose. This would present both obstacles and opportunities. With an ethnographic approach, nine informants from multi-national organizations were interviewed. Competence management, which is part of KM, was found to be conducted in various forms throughout all organizations. This study also highlights the lack of comprehensive knowledge strategies within most organizations and indicates most social computing technologies have been implemented with a technical approach to KM. The findings also suggest a closer co-operation between the HR and IT departments is needed, as more technology is being introduced and used. Additionally, existing social computing technologies with some modifications were concluded to be a suitable infrastructure for communities of practice.

Keywords: communities of practice, knowledge management, knowledge strategy, competence management, learning in organizations, knowledge sharing, social computing, knowledge management system

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1 Introduction

Knowledge is an organizational asset (Alavi & Leidner, 2001) and if captured, shared and developed, can provide competitive advantage (Grant, 1996). This epitomizes knowledge management (KM), which is a conceptual framework that aims to include all activities and perspectives required to gain an overview of, deal with, and benefit from an organization's knowledge assets (Wiig, 1999). KM is a broad field involving knowledge creation, sharing, storage and application (Alavi & Leidner, 2001). However, the KM field has put considerable effort in trying to define itself (Wenger E. , 2004) and has been criticized for focusing on only one component of knowledge, namely information (McDermott, 1999). This study acknowledges that complete KM has not been achieved until knowledge is thought of strategically and organizations can support communities of practice (Wenger E. , 2004). Communities of practice are groups of people bound together by a common interest who learn from each other and share knowledge regarding various topics through interaction (Wenger E. , 1998). They are everywhere and have existed for a long time. Organizations, however, have only recently recognized their importance, in a society where knowledge has become the key to success (Wenger, McDermott, & Snyder, 2002). Communities of practice provide the structure for learning and knowledge development (Davenport & Hall, 2002) and can thus benefit from supporting and developing (Wenger & Snyder, 2000).

1.1 Background

It is essential for members of communities of practice to find knowledge sharing easy and useful (Davenport & Hall, 2002). Especially as communities of practice can be geographically dispersed and exist across organizational borders (Wenger, McDermott, & Snyder, 2002). Providing a suitable technological infrastructure, such as Intranets, is therefore important (Davenport & Hall, 2002). Previous attempts at KM have however failed because they were trying to capture knowledge into digital repertoires. Leveraging knowledge with KM must instead enhance thinking as well as information to succeed (McDermott, 1999; Roberts, 2000). Social computing tools such as blog, wiki and social network services (Parameswaran & Whinston, 2007), were later proposed as the solution to KM related issues due to their inherent networking capabilities (Cayzer, 2004; Wagner, 2004). The term social computing in this study is treated as a collection of technologies. These technologies normally share collaborative functions, community formation and user defined content. It is sometimes referred to as Web 2.0 or social software. Researchers have suggested that social computing can be the key to the Intranets of the future and supported learning (Baird & Fisher, 2005; Tredinnick, 2006). Social computing would consequently enable the managing and developing of business information and knowledge assets (Tredinnick, 2006). Thus, provide the technological infrastructure for communities of

practice. The outcome of progress in that area however, is yet to be known. Indications have revealed that, although not as successful as suggested, it may still have potential (Kosonen & Kianto, 2009; Standing & Kiniti, 2011).

1.2 Aims and objectives

Research has suggested and shown how organizations can benefit and achieve competitive advantage by applying KM. It has also shown how using individual social computing technologies can benefit organizations, focusing on each technology one at a time. Although social computing generally has been suggested to benefit KM by several authors, it has not been tested empirically. Studying how the portfolio of different social computing technologies is used in a KM context may provide insight and a better understanding into possible problematic situations. Through the lens of KM, the aim with this study is therefore to investigate how communities of practice are supported in nine multi-national organizations. It is also to investigate how IT is applied for KM and how social computing as a group of technologies has been implemented with a KM purpose. This may indicate if organizations support and develop communities of practice, how knowledge strategies are implemented and provide insight into obstacles and opportunities, therefore contributing to the body of knowledge. The result may provide organizations with a possible direction for future use of social computing in a KM setting. My main research questions are:

- (1) How are communities of practice supported in multi-national organizations?
- (2) How are social computing tools implemented and used for KM and what knowledge strategies can be identified?
- (3) What obstacles and opportunities are found?

1.3 Delimitations

This study will investigate how communities of practice are supported regarding strategies, learning, knowledge sharing and the managing of competencies. Organizations acting within a multi-national or global market were chosen. They are affiliated with the IT or manufacturing industry and include consulting businesses. This study will also look at how current social computing and competence systems are used in organizations. It will however not include competence mapping or actual implementation. KM is considered as developing knowledge strategies and supporting communities of practice.

1.4 Outline

This study is organized as follows: Section 2 will present the theoretical background introducing knowledge, learning and competence. Then KM and how IT can be used for it will be explored. Section 3 presents and explains the approach and method of this study. Section 4 contains the results presented in four themes. Section 5 presents an interpretation

of the results based on the aims and main research questions of this study. Section 6 contains the conclusions and recommendations.

2 Theoretical background

This section will firstly present the method used for building the theoretical background. Then introduce the subject of knowledge, learning and competence; KM; and lastly present insights into IT-design for knowledge sharing.

2.1 Literature collection method

Following the directions from Levy and Ellis (2006), systematic keyword searches at several database vendors (ProQuest, Elsevier, IEEE, ACM, JSTOR, Blackwell, EBSCOhost and Emerald Insight) were conducted in order to create a solid theoretical foundation. This is important, especially for research in the information systems field because of the large dispersion of literature. Including the method suggested by Webster and Watson (2002) a backward and forward search was conducted reviewing references of the article found and references to the article. Several searches in library databases in order to finalize a complete literature overview were also made. The KM research field has exploded in the last ten years. To get an overview of the literature a keyword identification method was used to distinguish the most central and recurring key concepts in the literature.

2.2 Introducing knowledge and workplace learning

Historically, learning has mainly been associated with formal learning methods. It is however not until relatively recently that learning has been associated with work (Tynjälä, 2008). Workplace learning can, according to Tynjälä (2008), be described as three metaphors. Firstly, it is the acquisition of knowledge and skills which is typical in formal learning. Formal learning mainly produces explicit knowledge which can be defined as that which can be expressed in words and numbers (Nonaka, 1994; Tynjälä, 2008). However, there have been several categorizations of knowledge as there has been much debate as to what knowledge actually is (Alavi & Leidner, 2001; Stenmark, 2002). Secondly, workplace learning is knowledge creation which can take place in social interaction. This study thus acknowledges learning as something which requires interaction and is a highly social activity. Therefore, informal learning becomes important, producing mainly tacit knowledge (Tynjälä, 2008). Tacit knowledge reflects an individual's know-how and experience, and is thus harder to address (Nonaka, 1994). Lastly, workplace learning can according to Tynjälä (2008) be described as participation in communities of practice. These support the sharing of tacit knowledge and informal learning methods such as storytelling, conversation, coaching and mentoring (Wenger, McDermott, & Snyder, 2002). Workplace learning is thus the interplay of

tacit and explicit knowledge and communities of practice have been identified as the vehicle where this can occur (Davenport & Hall, 2002).

2.3 KM utilized as the strategic organization of communities of practice

Communities of practice have been identified to add value to organizations in several important ways. For example, they can find, explore and solve organizational problems, develop or improve employee networks and assure participation (Ropes, 2010). Further, they can lead to more innovation, faster adaptability to changing conditions, better staff abilities and increase staff efficiency (Plessis, 2008). Communities of practice are considered "...key to an organization's competence and to the evolution of that competence" (Wenger E. , 1998).

Competence can be defined as the "...combination of tacit and explicit knowledge, behavior and skills, that gives someone the potential for effectiveness in task performance" (Draganidis & Mentzas, 2006). Competence is unique and therefore difficult to transfer but is yet one of the most important capabilities of an organization (Hunt, 2000). Indeed, knowledge is a critical asset in organizations and it is therefore important to find a way to describe and represent it in KM (Wiig, 1999). This can be done by managing competence, which is key within KM (Draganidis & Mentzas, 2006).

According to Baladi (1999) competence management includes several components. It is the identification of core competencies, the specifying of current and future needs, the identification of competence gaps, recruitment and staffing, and individual development through training and coaching. By identifying core competencies, organizations can initiate the process to develop a knowledge strategy which is essential for organizations (Wenger, McDermott, & Snyder, 2002). The next step in the strategy is to associate the core competencies to the relevant people and connect them into communities of practice. It is here that learning and knowledge sharing can take place (Wenger, McDermott, & Snyder, 2002). These communities of practice, then, need developing and supporting. However, "...communities of practice are fundamentally informal and self-organizing" and cannot easily be managed (Wenger & Snyder, 2000). Instead, it is about bringing the right people together and providing the infrastructure where they can thrive (Wenger & Snyder, 2000). Thus, the role of managers is to organize communities of practice rather than directly manage its knowledge (Wenger E. , 2004; Davenport T. H., 2005). This will require a new kind of management which fends off bureaucracy and establishes a knowledge sharing culture among employees (Davenport T. H., 2005) .

There are however barriers when sharing knowledge as identified by Barson et al. (2000). Their findings were reassessed by McLaughlin, Paton & Macbeth (2008) who found eleven barriers to impact knowledge creation and sharing. They can be grouped as technological,

organizational, people or a combination. Although not generic, the barriers described are commonly observed. McLaughlin, Paton & Macbeth (2008) proposed these barriers will have different impacts, as knowledge sharing practices will vary within and between organizations. Thus suggesting relevant solutions to barriers are individual to each organization. This reinforces the need for a comprehensive knowledge strategy where establishing a knowledge sharing culture is key.

A reward system can help motivate employees to share knowledge (Davenport & Hall, 2002) and is an important feature in a knowledge strategy (Yang, 2010). Indeed, it is essential organizations develop a knowledge strategy (Wenger, McDermott, & Snyder, 2002) to help overcome knowledge sharing barriers (Hong, Suh, & Koo, 2011). Choosing an appropriate strategy can improve organizational performance and innovation leading to better products, processes and services (López-Nicolás & Merono-Cerdan, 2011; Yang, 2010).

2.4 Designing IT for KM

While some technologies for KM may be introduced purposefully, others may simply be introduced by employee initiative (i.e. bottom-up). The implementation of IT for KM in organizations can be grouped into two approaches; namely technical and socio-technical (Meso & Smith, 2000). The technical approach to KM, being purely concerned with technology, is used to support KM through a combination of software and hardware infrastructure. Examples are document management, messaging or web browser technologies. The socio-technical approach is however the preferred one (Meso & Smith, 2000; Kosonen & Kianto, 2009; Standing & Kiniti, 2011). This recognizes that KM is more than just technology, being a complex combination of technology, organizational structures, corporate cultures and communities of practice. IT to enable KM should thus be applied with a socio-technical approach and support the process of implementing a knowledge strategy and provide infrastructure for communities of practice.

Competence systems can support competence management (Draganidis & Mentzas, 2006) which is part of a knowledge strategy. One component of a competence system is a knowledge profile (Draganidis & Mentzas, 2006). A knowledge profile is according to Wiig (1999) a useful way of representing knowledge. They are types of diagrams which display an overview of what a person knows. They can also be used to show what knowledge is required to perform a particular job and can be used to identify areas where there is a need for more, or unused, knowledge. Therefore, knowledge profiles are helpful in several ways including recruitment and staffing processes. Furthermore he identifies seven dimensions that can be used to describe knowledge at different levels of detail and its character. Thus, an employee's competence can be described with keywords and diagrams and can be presented in a profile. Research has shown when designing competence systems there are

important aspects to consider. A balanced design is necessary to avoid possible tension between organizational and individual interests. The reporting process needs to be flexible and user-controlled while the right balance between openness and privacy is maintained (Lindgren, Henfridsson, & Schultze, 2004).

When designing IT for knowledge sharing (i.e. IT supporting communities of practice) it is important to acknowledge it is not the access to information and knowledge itself that triggers learning. It is rather the use of both the access, and the knowledge itself for a new purpose that adds value to the organization (Lundin, 2005). Learning is a collaborative and social activity, and designing IT supporting knowledge sharing needs to be integrated as a technology supporting different needs rather than just storing information (Lundin, 2005). According to Wagner (2006) this was not previously recognized, thus creating knowledge acquisition bottlenecks. He suggested the use of collaborative, conversational KM to break these bottlenecks. Social computing technologies have promising features supporting this. For example, collaborative environments support the work of teams, which may not necessarily be at the same place or the same time (Lee & Lan, 2007). They can also interlink informal discussions in communities of practice thus providing competitive advantage (Kosonen & Kianto, 2009). Online communities can help establish, maintain relationships and share knowledge, therefore contributing to employee knowledge access (Ali-Hassan, Nevo, Kim, & Perelgut, 2011). Free contribution in such communities can lead to an enormous amount of content. By letting users tag and rate content, higher quality can be achieved. In this way a sort of ordered chaos is becoming more reliable and is controlled by social interactions (Parameswaran & Whinston, 2007).

Social computing for KM did however not seem to succeed fully. Hong, Suh & Koo (2011) identified a need for improvement. They concluded that KM changed from a conventional approach to a conversational approach. Therefore, in a single case study, Hong, Suh & Koo (2011) developed an online communication tool for knowledge sharing along with appropriate KM strategies. The online tool provides discussion board functionality and includes support for user profiles, rewarding, anonymity, rating, tagging, post privacy control, subscription and post editing (i.e. wiki). The study demonstrated this can effectively overcome many knowledge sharing barriers and provides successful guidelines for efficient and effective knowledge sharing. The design is also according to the three guidelines for KM systems provided by Stenmark and Lindgren (2004). They concluded that KM systems should be integrated within everyday work, include familiar functionality and also contain a reward system to assure participation. Indeed, the most promising way to include knowledge into knowledge work is to embed it into the technology used by its practitioners (Davenport T. H., 2005).

3 Research methodology

This section presents chosen approach for this study and will further describe the method used and its progress.

3.1 Ethnographic approach

Following the aim of this study the topics of learning, knowledge sharing and competence management need to be studied and technologies used in the pursuit of those objectives need to be investigated. Such a task cannot rely on quantitative analyses such as statistical techniques. To construct a questionnaire covering all possible aspects including all important factors does not allow in depth exploration (Cornford & Smithson, 2006). Hence, a qualitative approach was chosen for this study. Although often limited to a small number of cases and thus making it hard to generalize, a qualitative approach has the potential to give considerable insight in a subject. The information systems field is complex and it is acknowledged that information systems are social systems. Thus, the field is closely related to social science. (Cornford & Smithson, 2006). Therefore, an ethnographic approach was chosen as it is a multi-discipline research strategy. It gives the ability to interpret how informants view the world they live in, from their point of view (Murchison, 2010).

3.2 Semi-structured interviews

Semi-structured interviews were chosen as the primary method as they enable the interviewer the chance to ask direct questions to informants and gain access to personal thoughts and experiences while sticking to the topic. In addition, interviews can "...be an extremely important source of data: it may allow one to generate information that it would be very difficult, if not impossible, to obtain otherwise" (Hammersley & Atkinson, 1995).

As to deciding whom and how many to interview, this depends upon the time and resources available, as well as accessing the right people (Hammersley & Atkinson, 1995). Getting to see people can be a hard task to achieve but a compromise is to conduct the interview over the phone. When it is not possible to interview all people in a particular role one can try to select a sample of them that is representative. In an organizational context sampling can be made if clear boundaries exists (Hammersley & Atkinson, 1995). In order to find representative samples the participants of this study were found on the basis of following criteria; geographic location, market, number of employees and line of business. Geographic locations were chosen as criteria to enable in person interviews. Study limitations would not allow 'in person' interviews if a relatively close geographic proximity were not chosen. However, telephonic interviews would overcome this limitation. Participants were to act on a multi-national or global market and employ more than 200 people, preferably more to widen the scope of the study. It was believed there may be a higher probability or need for KM in these types of organizations. Participants needed to be related or affiliated with either the IT

or manufacturing industry. The IT industry was chosen due to the subject of this study and manufacturing industry to widen the scope. Further, consultant businesses were chosen as they were believed to have the highest need or probability to implement KM due to their probable geographical disposition within the employment network. This could possibly enable the results to be generalized and avoid bias.

Following these criteria an online search engine was used to find appropriate organizations. Contacting these organizations to describe the intentions of this study led to a human resource (HR) or IT employee, most commonly a manager. After being informed, the employee would agree upon an interview and date. Depending on geographic location, time and resource limitations a decision could then be taken for the interview to take place in person or by telephone. Nine organizations with a wide range of employment numbers were chosen. This would give a comprehensive a picture as possible, thus limiting bias. Privacy may also be a concern, hence why anonymity was protected (Murchison, 2010). Additionally, the informant from HR2 answered several questions based on the previous role as KM coordinator within a large telecom organization. The HRIT interview was conducted with two informants, the HR and IT managers. Table 1 presents the informants of this study.

Table 1

Name/Dept.	Type	Related industry	Employees
HR1	In person	IT, Revision, Consultancy	100 000+
HR2	Telephonic	IT, Consultancy	4000+
HR3	Telephonic	Manufacture	400+
HR4	Telephonic	IT, Consultancy	700+
HR5	Telephonic	Manufacture	1000+
IT1	In person	Manufacture, IT, Consultancy	5000+
IT2	Telephonic	Manufacture and IT affiliated	200+
IT3	In person	IT, Manufacture	2000+
HRIT	In person	Manufacture	100 000+

Interviews can suffer from critical problems. Keeping interviews to the topic is very important and the researcher needs to carefully plan the questions and take control (Cornford & Smithson, 2006). However, “ethnographers do not usually decide beforehand the exact questions they want to ask, and do not ask each interviewee exactly the same questions (...) they adopt a more flexible approach, allowing the discussion to flow in a way that seems natural” (Hammersley & Atkinson, 1995). The interview questions were designed to follow the main research questions but to also allow investigation of perceived problems, hence

allowing flexibility. 'How' and 'why' questions were constructed and used as they are crucial to the entire research project (Murchison, 2010). They were designed to be as neutral as possible without losing context. Appendix A presents the interview questions of this study.

The location of interviews can affect the outcome. The best strategy is to allow the informants to choose the setting in order for them to feel more relaxed. Also, some informants may feel unfamiliar with being interviewed while others regard it as part of their life (Hammersley & Atkinson, 1995). Therefore, location was always chosen by the informant in all interviews conducted face-to-face. An audio recorder was used in order to document as much detail as possible. It was an invaluable aid but does however suffer from certain limitations such as the inability to record body language or physical interaction. In addition, a recorder can make an informant nervous or change the way they respond (Murchison, 2010). In order to overcome the limitations of an audio recorder, observations during the interview were described in field notes where necessary or possible. Also, the audio recorder used was small and put outside the immediate line of sight of the informant. Permission to record was obtained from the informants.

The initial few minutes of an interview can have a great impact in establishing its nature and tone (Hammersley & Atkinson, 1995). Generally it was first asked what role the interviewee had in the organization in order to make them feel more comfortable. As it is the informant whom possesses the knowledge and information sought after, the roles of a student and teacher were adopted (Murchison, 2010). All interviews lasted on average 30 minutes and resulted in audio-files that were transcribed using a word-processor. This was done shortly after the conducted interview in order to preserve as much information as possible. It would also allow the ability to recall information as the research developed.

3.3 Data analyses

Transcribed material was analyzed using the thematic coding technique which matches semi-structured interviews (Flick, 1995; Cornford & Smithson, 2006). This was achieved by using a spreadsheet matrix identifying common themes in each interview. Four main themes were found and compared across all interviews and the research topic. In addition, the transcribed material was revisited several times as engaging in ethnography involves continually writing and rewriting while research questions change (Murchison, 2010).

All interview material has been translated by the author of this study.

4 Results

This section presents the result from the interviews according to the four themes found in the data analyses; namely methods for learning, tools to document competence, ways of sharing knowledge and social network services.

4.1 Methods for learning

How does an employee learn at work?

Let us start with formal learning. All interviews indicated formal learning to take place. For a newcomer, an introduction is always used as the first step. The purpose of the introduction varies throughout the organizations and they have different names and lengths. However, the common goal is to learn the basics - how to find things and how to use relevant systems including security routines. Typically the HR department is responsible for formal learning in organizations (HR1, HR2, HR3, HR4, HR5). However, HRIT has a separate training department. Additionally, there were indications of boundaries between the IT and HR department, where one was responsible for technology and the other for training (IT1, IT3, HRIT, HR2, HR3, HR5).

“Our HR department is responsible for the introduction package where new employees learn our security routines and day to day work.” (IT3)

While some organizations prefer one to the other for various reasons, internal and external training is the most common formal training given at a company. Five of the informants also reported e-learning systems were in use (IT1, IT3, HR4, HR5, HRIT). Most were only in the starting up phase without particular experience and most systems had limited learning material. In addition, IT1 has a newly introduced self-study portal where a lot can be learned, especially for new employees.

“The younger generation probably thinks e-learning is pretty good, while the older generation appreciates interaction face-to-face.” (HRIT)

E-learning systems have been introduced in both lines of businesses. There may however be doubts to its introduction or usefulness (HR4, HRIT).

“Our company produces e-learning material for customers. It is however only partially used internally.” (HR4)

Getting an employee motivated to learn and grow was reported to be a problem and it is up to the individual to participate when training is given (IT1, HR4, HR5). Failure to achieve this

can result in inefficient, costly training (HR4). HR5 regarded this mainly as a management problem, not as a problem regarding individuals' motivation to learn.

The informal way of learning-by-doing or on-the-job training is shared among all companies. Some indicated this as a method for learning at the workplace (HR1, HR2, HR4, HR5), whilst others merely recognized this is how one learns (IT1, IT2, IT3, HR3, HRIT). For example, HR1 stated a three-step global plan for learning is in use (training, coaching and experience). HR4 stated on-the-job-training is recognized as the fastest way of learning and HR2 recognized it as a way to achieve cost efficiency for learning in the workplace.

“The fastest way of learning is on-the-job. However, sometimes formal training is necessary.” (HR4)

Others merely indicated learning from fellow co-workers and team work to commonly take place (IT1, IT2). Although not recognized by the informants in the interviews, HRIT, HR3 and IT3 did show indications of team work taking place.

Coaching and mentoring is another informal learning method. Interviews indicated it is used in all organizations. It was seen as a good way of sharing experience (IT2, IT3) and according to IT3 necessary as formal learning does not teach logical thinking and to see connections.

4.2 Tools to document competence

How to know when more or better competence is needed and how is an employee's knowledge documented?

According to HR2 a review of competencies can be done on several levels. In an organization a group of managers can have a subjective discussion where it is believed there are too few or too many competencies. This is the case of HRIT and IT3. Observations indicated this is conducted differently in each department at HRIT and IT3. Further, according to HR2 a competence review can also take place on an individual level. An employee and the manager register competence in a knowledge profile and a learning strategy is formed. This is conducted in HR1, HR2, HR3, HR4, HR5, IT3 and HRIT. Some interviews also revealed competence is registered individually as a CV (IT1, IT2, HR3) and skill list where employees receive reminders to update their profile (IT1, IT2).

There is a difference in the level of sophistication of the documentation tool used for competence and the integration of other systems. Observations indicated they range from: most developed (HR1, HR2), less developed (IT1, IT2, HR3, HR4, HR5) and least developed (HRIT, IT3). Managers construct a competence matrix in a spreadsheet in HRIT and IT3. Each department in HRIT and IT3 do this differently. Thus, it is up to each manager

to register competence. While other systems support CV-registration and graded skill-lists, the highest level of sophistication and integration was found in HR1. Their system support skill-matching from incoming assignments and will soon support integration of the learner-system. Most competence systems in the interviews (IT1, IT2, HR2, HR5) gives the organization an overview of what competence is lacking, what competence is available and also indicate a plan for employee growth. The level of integration was from the interviews unclear in most cases, although there were indications the systems and their functionality were run as a separate instance.

According to HR2 there is a third approach to conduct a review of competencies. Key players of an organization can be reviewed professionally with certificates of external standards. Additionally the informant claims an effective way of succeeding with KM is to include KM practices in these standards.

4.3 Ways of sharing knowledge

How do employees communicate, find solutions to problems or share their knowledge?

The everyday interaction within the workplace was identified as the most important and common way of sharing knowledge by all interviewees. Several types of knowledge sharing meetings were indicated in this study. Mostly they take place among co-workers and work groups but they can also take place whilst networking. Meetings differ in formality, agenda and regularity (HR1). Interacting face-to-face is the preferred and most important way of communication according to all interviews and is closely associated with learning-by-doing. For example, HR1 stated that they are trying to arrange more in person meetings as it is now recognized as the best way of interacting. HR3 stated that ninety percent of all interaction is face-to-face and if any knowledge sharing is taking place apart from that it is by writing reports and attending meetings.

When face-to-face interaction is not possible for various reasons, technology-mediated interaction is taking place. The telephone can almost certainly be said to be taken for granted in today's organizations. Another common way of technology-mediated interaction is video meetings (HR1, HR4, HR5, IT1, IT3, HRIT). Modern video meeting technology is indicated to normally have what it takes for flawless communication. Older equipment is however not good enough (IT3, HR5). Additionally, IT3 expressed a need for an 'easy to use' video solution for spontaneous calls.

Generally telephone and video meetings are indicated to be beneficial in several ways. For example, they can be efficient when time and travel costs limit face-to-face interaction (IT3). They can be the preferred way of communicating from geographically dispersed locations (HR1, IT1), especially when working in teams (IT1). In addition, smaller offices in larger

enterprises may sometimes suffer when substantial amounts of information is exchanged face-to-face within the larger offices. Although not ideal, this problem can be solved with telephone and video meetings according to HR1.

As to the documentation of meetings it is indicated protocols are used by all interviews.

“A lot of documenting is being done. If there was a problem it is required to be documented along with how the problem was solved. This way one can reuse solutions to frequently occurring problems”.
(HR1)

Some also systematically document problems and their solutions (HR1, IT1, IT2), recognizing documenting can be useful when shared. While this information is freely available among employees in certain companies (HR1, IT1, IT2), the manufacturing industry tends to limit the availability of documentations from meetings to whoever is believed to be in need of it (HR3, HR5). IT3 expresses lack of documentation as a problem caused by motivational issues. This phenomenon is confirmed by IT1 but is however not experienced as a major problem.

“Our IT technicians enjoy solving problems - not writing about them.” (IT3)

E-mail is widely used and is indicated as a common message-orientated interaction among all companies. It is regarded as well suited for one-to-one conversations (HR2) but is often used for one-to-many conversations (HR1, HR4, HR5, IT1, IT3, HRIT). However, there may be a limit to its usefulness. E-mailing is sometimes experienced as a bad thing. A large amount of e-mails was identified to be a main reason (IT3, HR5).

“People have forgotten to speak with each other - too many e-mails are sent.” (HR5)

“E-mail is a hassle for most people” (IT3)

HR1 and HRIT are using instant messaging for internal conversations in addition to e-mail. It is regarded as quick, perhaps spontaneous, and conversations are easier over geographically dispersed locations. IT2 stated they have successfully implemented instant messaging as a great alternative for communication with other units.

“Mailing lists and instant messaging can be used by co-workers to interact. This is especially useful for smaller offices” (HR1)

According to HR2 blogs can effectively be used as a replacement for e-mail with one-to-many conversations. The informant claims using a blog is not harder than using e-mail and

can be beneficial as the knowledge created is kept at the source instead of in each employee's mailbox. The problem is, according to the informant, that it is a new way of working and many people are not used to using it. HR4 stated blogs are used both internally and externally and are a good way of sharing knowledge. It is however not used by everyone in HR4 and HR2 stated there are attempts of introduction being made.

Generally, Intranets contain databases including information such as business processes, responsibilities and job descriptions, procedures and instructions (HR1, HR5, IT1, IT2, IT3, HRIT). HR1 and HRIT use a global business system with a range of features. However, it was observed HRIT only used these features to a limited extent. The interviews also indicated intranet portals differ greatly in sophistication. For example, IT1 has integrated a self-study portal for their employees. Additionally, they have successfully introduced video instructions. The instructions work as a guide on how to solve certain problems. They are, according to the informant, easy to produce and the IT-department experience a reduction in telephone calls. The sophistication of Intranets in the manufacturing industry was indicated to have less functionality. However, HR informants, especially in the manufacturing industry, indicated feature unawareness to different extents. For example, specific intranet functions or features, apart from news-feed, were unknown to the informant of HR3.

Generally, discussion board usage is limited. HR1, HR2 and IT1 stated internal discussion boards were used to some extent, however not by everyone and the informants did not indicate a frequent use. Although not used by the informants in HR1, HR3 and IT2, external discussion boards were also indicated to be used by employees every now and then in all companies with an exception to HR3. For example, the informant of HR5 stated external discussion boards were used when faced with certain problems.

Work related knowledge sharing with the support of an employee's network (i.e. individuals or organizations in an employee's social life) was not specified by HR3 and IT2. In addition, only the consultant businesses clearly regarded networking as a strategic asset (HR1, HR2 and HR4, IT1).

“One of the purposes of our yearly training sessions is to create a network and exchange information”. (HR1)

IT1, IT2, IT3 and HR2 stated that their Intranet contains frequently asked questions (FAQ). A way of using a FAQ is to publish recurring questions (IT1, IT2) or specific problems (IT1, IT2, IT3). Which questions to be published is up to the IT-department (IT1, IT2) or individual employees (IT3). It is according to IT1 a good way for instructions to be published, if the right information is provided.

The informant of HR2 provided information of an alternative way how a FAQ can be used. Discussion boards can become online communities. These communities are assigned leaders. The leaders can direct discussions and publish recurring themes within a FAQ. The informant also expressed the importance of understanding how such a community leader can become an incredibly strong informal leader. These discussion boards are a good way of addressing tacit knowledge according to HR2. To assure quality the community leader should try to direct the course of content. Another way of assuring quality is by introducing a rating functionality, but perhaps most importantly a critical amount of people is necessary (HR2).

“It is relatively easy to start sharing knowledge with the use of wikis and blogs. But in order to leverage the investment one has to address tacit knowledge.” (HR2)

Two organizations (IT1, IT2) stated they are actively using wikis to share knowledge. While the informant from HR2 has positive previous experience of wikis, HRIT has all the technology in place but not experienced usage success. The main purpose of wikis in organizations has been identified as to share knowledge regarding routines and instructions (IT1, IT2). However, HR2 states in order to get a good return of investment in KM, introducing a wiki in itself is not enough. Tacit knowledge needs to be addressed by capturing it in interaction. This can be done according to the sample above (HR2).

One manufacturing company had chosen not to use social computing supporting common bodies of knowledge as it was believed it may cover too many aspects risking superficiality (HR5).

HR1 stated they have created a culture where employees should ask questions in order to support and increase knowledge sharing. According to HR2, this is regarded as key for a knowledge sharing culture. A knowledge sharing culture is achieved by embedding it in an organizations structure. It can be done by defining clear roles and responsibilities while being supported by a budget. This means KM needs to be included in the strategic planning of an organization where one can define how to measure its success. When these structural components are in place, KM has been institutionalized. A challenge for this to happen is according to HR2 the hierarchical systems, mainly occurring in the manufacturing industry, and the fact that managers are generally older and thus not used to modern technology.

4.4 Social network services

How are social network services such as facebook and LinkedIn used?

Three purposes for using social network services in an organization were identified in the interviews; marketing, recruitment and private networking. Although companies are aware of social network service usage for private networking, none of them had an official strategy in place.

Eight out of nine companies stated facebook was used for marketing purposes. It was later found out the ninth company (HR3) also uses facebook to some degree for this purpose. According to the interview results LinkedIn is used for marketing in seven out of nine organizations. It was later found out HR3 also uses LinkedIn to some degree for this purpose.

HR2 identified social networks as a powerful marketing tool and stated they were aware of risks such as brand exposure. HR1, HR2, HR4 and HR5 find social network services supporting in recruitment processes. Generally, LinkedIn is used by individual employees for private networking (HR1, HR2, HR4, HR5, IT1, IT3, HRIT).

HR1 and HR4 recognized facebook and LinkedIn as a good tool for communication while IT3 had a policy of no such tool to be used at work.

5 Discussion

This section presents an analyses and interpretation of the results based on earlier chapters. It is divided into five themes reflecting the aims of this study; namely current support for communities of practice, determining approach to KM, the lack of knowledge strategies, why social network services are the future for KM, and a future KM system.

5.1 Current support for communities of practice

Learning is taking place within every organization, mainly through interaction (Lundin, 2005). With or without a strategy, organizations have identified this and are actively working to support learning in person. According to many, learning-by-doing and teamwork is the most common way of workplace learning. This is recognized by the HR informants in a clear way (HR1, HR2, HR3, HR4, HR5). The IT informants merely indicated team work to take place. This shows that organizations are recognizing the importance of interaction and that they have a relatively well developed plan for learning-by-doing. In addition, this also indicates a difference in awareness between the HR and IT informants. Team work alone is however not to be confused with communities of practice (Wenger & Snyder, 2000). The results show that only the consultant businesses are currently supporting communities of practice in some form or another. However, most organizations do use coaching and mentoring programs to

guide and share experience with co-workers. This study therefore demonstrates organizations have taken the community of practice way of learning and working onboard, but it also indicates they may not be aware of using it. Thus, indicating there may be a lack of a comprehensive knowledge strategy. HR1, HR2 and HR4 demonstrate a more complete strategy where a knowledge sharing culture has been established in A, a good awareness is expressed by HR2, and HR4 demonstrates learning-by-doing is an efficient way of learning the workplace. This indicates consultant businesses have come further and are working more actively with these types of questions.

Organizations also provide formal training in the form of introductions, internal and external training (including e-learning). This is taking place to fulfill knowledge needs. One way of knowing when there is a need to improve existing knowledge is to manage competence within an organization. This is commonplace but the results of this study have demonstrated it can be utilized in a variety of ways. Competence is usually registered in a performance review within the presence of a manager. One explanation for this may simply be to make sure it is being done, while another may be to assure quality.

In addition, CV-registration services are run separately to the competence system in IT1, IT2 and HR3, perhaps in more organizations, and they tend to be the responsibility of the individual. One can question why a persons CV need to be registered in each individual organization? Alternative solutions may be needed as this could result in having to manage several CV versions on separate locations.

In some organizations there are also indications departments may be “running in silos” from a competence management perspective (HRIT, IT3), thus not benefiting from competence management.

When looking at how Baladi (1999) defined competence management, it can be concluded that all above issues fall under this term. With an exception to consulting businesses, it can thus be said organizations are currently brushing the surface of KM, working solely with competence management. This is the first step of a knowledge strategy and the responsibility of the HR department. Given the trend for higher levels of IT in competence management (i.e. CM-systems, e-learning, social networks) one can argue that also a higher level of knowledge and understanding for these technologies is required. This may suggest a closer co-operation between IT and HR departments is necessary and employees with a high level of understanding about learning as well as technology are needed.

5.2 Determining approach to KM

Technological infrastructure for communities of practice has been concluded to be important. Thus, by examining how IT for knowledge sharing is implemented and used may provide

insight into what KM approach has been used for each technology. Then, by looking at the technologies individually and as a whole, we can gain a broader picture and perhaps draw conclusions.

Firstly, e-mail can be regarded as something which has been in place for a relatively long time. It is now an inherent part of communication and is much more time efficient than traditional mail. However, indications reveal it may be used too much and social aspects like organizational culture, structure or values have not been included when introduced. It also suffers from limitations such as; only providing asynchronous communication abilities and knowledge created in conversations remains in the mail-box. There are two technologies which have been introduced in several organizations to actively reduce limitations of e-mail. These are the blog and IM. This tells us organizations do look for improvements and may not be entirely satisfied with or have recognized the limitations of e-mail. E-mail and IM does however reduce the possibility to reuse knowledge. This can partially be solved by the blog. There are indications of the blog being introduced with a socio-technical approach in HR2 and HR4 as it is intended to leverage knowledge. However, a socio-technical approach is not clear as it was also indicated blogs are only used to a limited extent, even by the informants.

A FAQ can effectively be used to instruct how to solve certain problems, even with video. Four organizations have introduced the FAQ to make instructions and routines available to employees in an easy manner. HR2 also suggested an interesting approach as to the usage of the FAQ where tacit knowledge can be extracted from online interactions. However, the FAQ itself does not support conversations and there is no complex combination of technology, organizational structures, corporate cultures and communities. Wikis do however carry more capabilities and potential, as they permit information or knowledge to be collaboratively constructed. HRIT did not succeed to introduce these and IT1 and IT2 use Wikis merely for instructions and routines. This raises the question why? It indeed supports what has been found in research on the introduction of collaborative technologies; a technical approach to KM has been used.

Discussion boards have been used for quite some time on the Internet. The results show they are still used for private networking purposes and several organizations have introduced these on their Intranets. However, the purpose of their introduction seems unclear and there is only a limited use amongst employees. This could be explained by the age of discussion boards. It is now being replaced with modern social network services, which provide similar and additional functionality in an enhanced form.

This table (Table 2) provides an interpretation based on the previous discussion and the results of this study. It concludes the approach to KM used for each technology, how it is

perceived and what type of knowledge sharing it is used for. Communication is regarded as conveying information and conversations are interactions between two or more people.

Table 2

	Used by	KM approach	Perceived as	Used for
E-mail	All	Technical	used, problematic	Communication, conversation
Discussion boards	All	Technical, bottom-up	used	Communication, conversation
Social networks	All	Bottom-up	used	Communication, conversation
IM	HR1, IT2, HRIT	Technical	used, liked	Conversation
Blog	HR2, HR4	Socio-technical	limited use	Communication, conversation
Wiki	IT1, IT2, HRIT	Technical	used as FAQ	Communication
FAQ	IT1, IT2, HR2, IT3	Technical	limited use/used	Communication

Table 2 shows us that there are three IT solutions used by all organizations for sharing knowledge. These are e-mail, discussion boards and social network services. All three are used for communication and conversations. E-mail is regarded as problematic and attempts have been made to either replace it or reduce its use. Discussion boards and social network services have both been introduced bottom-up, the latter being relatively new with additional functionality. This is used in eight out of nine organizations by many individuals for private professional networking. Table 2 also shows us consultant businesses tend to use more technology. This may be explained by geographical dislocations and larger amounts of employees relying more on technology for interaction.

The interpretation in Table 2 indicates nearly all IT for knowledge sharing is either introduced with a technical approach to KM or bottom-up. It could therefore be argued organizations have not put enough effort in introducing IT for knowledge sharing. This may be due to the fact that face-to-face interaction is highly regarded and some organizations may not

experience geographic dislocations. However, results show both organizations and their employees are actively seeking better IT solutions to support knowledge sharing. For example, several organizations implemented alternatives to e-mail and many employees are using discussion boards and social network services. In addition, organizations can generally be said to be commonly improving or investing in new IT systems and are currently using social network services for marketing and recruitment purposes. My point is that organizations do not seem to have a legitimate reason not to put effort into the introduction of IT for knowledge sharing. The explanation may thus lie in knowledge. Perhaps there is yet again a need for knowledge spanning both the HR and the IT department.

An additional aspect from Table 2 also becomes clear. There are several individual pieces of technology being used for knowledge sharing and the integration between them seems inadequate. This means “islands of knowledge” are created which perhaps only may be shared through face-to-face interaction.

5.3 The lack of knowledge strategies

Perhaps the easiest way to determine a comprehensive knowledge strategy may simply be to get a feel for an organizations' culture as establishing a knowledge sharing culture is a key in KM (HR2; Yang, 2010). Therefore, it should be relatively easy to discover a comprehensive knowledge strategy. HR1 stated a knowledge sharing culture is established. It was indicated all other informants did not recognize this as taking place in their organization. There may be several explanations for this, such as informant bias or lack of knowledge or perhaps the right interview questions were not put forward. It may also be in place yet taken for granted within an organization. That is however another indication of a lack of comprehensive knowledge strategy. In addition, when searching for informants it was in most cases unclear as to who was the most suitable person to speak to and in which department (i.e. HR or IT dept.).

Originating from previous discussions, table 2 provides us with insight that eight out of nine organizations demonstrate a lack of a comprehensive knowledge strategy. The ninth organization, HR1, has indeed implemented this. However, a technical approach for their knowledge sharing technologies appears to have been used. This in turn demonstrates knowledge sharing barriers may be hard to overcome. The technologies implemented may therefore not experience usage success or be used to their full potential. In addition, the manufacturing companies are indeed not using social computing as to the extent of the IT and consultant businesses. Perhaps this is due to their hierarchical structure as suggested by HR2. However, there may be other explanations, such as deliberately choosing not to even though they have considered it in a socio-technical approach. Another reason may be level of competition. A low level of competition in certain fields may be the reason for a lack

of knowledge strategy. Age and knowledge about the KM field could also matter. Perhaps KM is too new phenomena for decision makers to acknowledge. Thus, its importance and social computing will not be considered as they may not be familiar with online behavior and technology.

Choosing an appropriate knowledge strategy has been tested empirically to have the ability to improve organizational performance and innovation (López-Nicolás & Merono-Cerdan, 2011). Knowledge strategies will, however, differ within organizations depending on specific needs. Indications show HR1 is working actively with KM. HR2 and HR4 may be at least partially using a knowledge strategy.

5.4 Why social network services are the future for KM

There have been several guidelines for designing a KM system. These can be found in literature and empirically within this study. Looking at them as a collective, a KM system design may emerge.

First, it has been concluded that applying IT to enable KM should support the process of implementing a knowledge strategy and provide infrastructure for communities of practice. This is imperative as learning and innovation takes place in communities of practice. Competence systems can support the first step of a knowledge strategy. However, communities of practice need a technological infrastructure. Davenport (2005) stated that the best way to include knowledge within knowledge work is to embed it into the technology that its practitioners use to do their jobs. Additionally, Lundin (2005) found it is not the access to information and knowledge itself that triggers learning. Thus, IT-support for knowledge sharing needs to be integrated as a technology supporting several different needs rather than just storing information. Stenmark and Lindgren (2004) concluded that KM systems should be integrated within everyday work, include familiar functionality and contain a reward system to assure participation. Furthermore, Hong, Suh, and Koo (2011) recently constructed an online communication tool as a KM system. This included functionality concluded and tested to be important to overcome knowledge sharing barriers. The tool provides discussion board functionality and includes support for user profiles, rewarding, anonymity, rating, tagging, post privacy control, subscription and post editing (i.e. wiki). The HR2 informant also concluded that in order for online knowledge sharing to be effective, quality needs assuring. This can be done by introducing a rating functionality among a critical amount of people.

We now have a range of features available to construct an IT solution for communities of practice. However, there are several criteria that need fulfilling in order to succeed and we firstly need to look at everyday work and familiarity. Looking at the technologies used in organizations as a whole can help us identify an organizations need. Table 2 provides useful

information for this. Firstly, a tool would have to support both communication and conversations (see discussion above). Secondly, IM is liked and its functionality should thus be included as criteria. It does not however support both communication and conversation alone. Third, the blog has potential but does not support sufficient features and does not experience usage. Fourth, discussion board functionality is commonly used, as introduced bottom-up, but is however being overtaken by social network services.

Before concluding what a new KM system could look like, it may be useful to examine what is perceived as problematic. Firstly, knowledge sharing barriers need to be overcome by individual organizational plans (i.e. strategies). Secondly, e-mail seems far from perfect. Third, documentation may sometimes be a problem. However, a form of documentation is actually being conducted by using e-mail, instant messaging or posting to a discussion board or blog. It is however often in an unstructured way. Fourth, “islands of knowledge” are being created as technologies are running and used separately (see discussion above).

Following the criteria of familiar functionality and given the bottom-up introduction of social network services, a KM system could therefore be designed based on its functionality. It is a technology supporting knowledge creating, sharing and storing. Social network services can therefore become a powerful KM tool. Being more modern than a discussion board, they include useful functionality from IM and e-mail whilst supporting employee networking. Not only do social network services support communication and conversations, they can also effectively replace the blog. In addition, they can also produce the critical amount of people needed for quality and contains rating functionality. Further, using social network services as a KM system would effectively overcome the “islands of knowledge” phenomena, keeping a substantial proportion of knowledge at the source. They may additionally be the solution for the documentation issue as modern technology, such as data mining and semantics may have the ability to support the structure of information (Cheung et al., 2011).

Drawing on the empirically tested tool from Hong, Suh, and Koo (2011), the social networking tool would also have to include all their suggested functionality in order to become effective. This means the collaborative wiki functionality is included in the process of posting. Wikis have been suggested to improve innovation if used in the right way (Standing & Kiniti, 2011). Thus, developing the ability to interact and collaborate in wikis with social network services seems promising and may already be on our doorstep. It is merely a matter of organizational management: strategy and implementation.

5.5 A future KM system

Given today's technology, a social networking solution could contain support for voice and video calls while still supplying all important features suggested above. This would enable all features likened about IM. This future KM system would support work groups and workflows. It would be easy for employees and communities of practice to find each other, communicate and collaborate. It could support booking meetings and events and maintain discussions long after a meeting has taken place. Ironically, a similar tool called Google Wave has been previously developed but failed to succeed. Perhaps it was too early and the market unprepared for such advancements.

Further, this future KM system could support knowledge profiles as an addition to current CV functionality in social network services. Lindgren, Henfridsson, and Schultze (2004) argue about the importance of designing flexible and user-controlled reporting in competence management systems. I believe knowledge profiles should thus belong to the individual and could be used for recruitment and job applications. In this way organizations will find matching a competence gap much easier and it may also encourage more competition. The system would be an excellent networking and recruitment solution supporting integration with corporate systems.

However, such a tool exposes new issues such as privacy. Organizations would not want to use such a tool without having complete control of who can access what. Solving this would however enable communities of practice and work groups to collaborate across organizational borders. One could ask, should the tool be available online or implemented by each organization? Both may be viable options, but the latter does not allow for the suggested knowledge profiles. The privacy of these would also be important, especially if used online. Having an open and a closed section with login requirements could possibly solve this issue. Other issues such as proprietary, open source and ethics can also become important. This future KM system may also be a solution to concerns within the open innovation field. That is however beyond the scope of this study.

6 Conclusions

This section presents what has been concluded according to the aim and the main research questions of this study.

The preferred way of interacting and sharing knowledge is face-to-face. This is often taking place within communities of practice which are common in organizations. However, only consulting businesses seem to support them in some form or another.

When there is a competence need an employee can learn on-the-job and commonly gets support by mentoring and coaching programs. Formal training is also given and e-learning has been introduced to a limited extent. Organizations have developed different competence management strategies all supporting these functions. Competence systems are commonly observed but differ in sophistication and integration.

There are several IT solutions implemented and used that members of communities of practice can use for knowledge sharing. Generally, e-mail, discussion boards and social network services are used for communication and interaction. The latter two being introduced bottom-up. Several attempts have been made to introduce social computing tools in organizations. This has however failed or only experienced a limited usage. It was found almost all of these technologies have been introduced with a technical approach to KM. Furthermore, it was found that the majority of organizations in this study lack a knowledge strategy. The most comprehensive knowledge strategy was however found in the consultant businesses. Generally, a knowledge strategy is therefore needed. It contains the identification of core competencies and the supporting and development of communities of practice.

If an organization is to effectively succeed with the implementation and usage of social computing, a socio-technical approach to KM is needed. IT for KM should thus be applied according to a knowledge strategy. Knowledge strategies are individual to each organization and can improve performance, innovation and effectively help overcome knowledge sharing barriers.

This study's major contributions are twofold. Firstly, a knowledge need was discovered in both business segments thus demonstrating why the IT and HR departments need a closer co-operation. Secondly, this study was looking at the portfolio of social computing technologies implemented in organizations. Additionally, it explored several design criteria for KM systems. This was used to reveal an organization's need and it was thereafter concluded social network services can be used as a KM system, supporting communities of practice. However, they need additional functionality to effectively meet requirements.

There are limitations to these findings. The study included nine multi-national organizations in two broad business segments and relied solely on two data sources; qualitative interviews and a literature foundation. Despite its limitations, I believe that this study may be useful for future research and guidelines on knowledge strategies and infrastructure for communities of practice.

6.1 Recommendations

Organizations should develop comprehensive knowledge strategies. A socio-technical approach to KM is preferred when implementing IT for KM. As the HR and IT associated functions are merging, employee knowledge in this area is also needed.

Further studies should develop and test a KM system based on social network services and the wiki technology.

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Appendix A

Interview questions

- Describe the company and your role within it.
- How do employees learn within the organization?
- Describe your training methods.
- How is knowledge developed and sustained among employees?
- How is knowledge documented? What IT solutions are in use?
- How does the organization know if it has inadequate competence amongst employees?
- How can employees share knowledge? What technologies can support this?
- How is the organizational Intranet utilized and what functions does it contain?
- Is knowledge sometimes being lost within the organization and how is that addressed?
- What problems have been identified related to learning and knowledge sharing?
- How are social network services, such as facebook and LinkedIn, used and to what purpose?