IT-supported Knowledge Repositories: Increasing their Usefulness by Supporting Knowledge Capture

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Abstract

Organizations use various resources to achieve business objectives, and for financial gain. In modern business, knowledge is a critical resource, and organizations cannot afford not to manage it. Knowledge Management (KM) aims to support learning and to create value for the organization. Based on three levels of inquiry (why, what, how), work presented in this thesis includes a synthesized view of the existing body of knowledge concerning KM and hence a holistic characterization of KM. This characterization reveals a strong dependency between KM and Learning Organization (LO). Neither of them can be successful without the other. We show that a KM project resulting in an IT-supported knowledge repository is a suitable way to start when the intention is to initiate KM work. Thus, our research focuses on IT-supported knowledge repositories.

Large numbers of KM projects fail, and organizations lack support for their KM undertakings. These are the main problems that our research addresses. In order for an IT-supported knowledge repository to be successful, it must be used. Thus, the content of the repository is critical for success. Our work reveals that the process of capturing new knowledge is critical if the knowledge repository is to include relevant and updated knowledge. With the purpose of supporting the capture process, this thesis provides a detailed characterization of the capture process as well as guidance aiming to facilitate the implementation of the capture process in such a way that knowledge is continuously captured, also after the KM implementation project is completed. We argue that the continuous capture of new knowledge which can potentially be stored in the knowledge repository will, in the long term perspective, have a positive influence on the usefulness of the repository. This will most likely increase the number of users of the repository and accordingly increase the number of successful KM projects.

All the work presented in this thesis is the result of a qualitative research process comprising a literature review and an empirical study that were carried out in parallel. The empirical study is a case study inspired by action research, which involved participation in the project Efficient Knowledge Management and Learning in Knowledge Intensive Organizations (EKLär).
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Part I
Thesis Overview

This part provides a summary of the thesis. It also includes a description of the research aim and research objectives as well as the motivation of research in terms of the problems addressed by this thesis.
1 Thesis Summary

This chapter briefly summarizes the forthcoming content. By providing an overview we aim to facilitate the reading and understanding of how critical parts, such as research objectives and contributions, relate to each other. Before we describe the research aim and objectives (Section 1.2) and the research method (Section 1.3), we introduce and motivate our research focus (Section 1.1). A summary of the contributions (Section 1.4) and the publications (Section 1.5) stemming from our research work then follows accordingly.

1.1 Motivation for research

Organizations use resources to achieve business objectives and for financial gain. The most important resource in modern enterprises is the human brain (Nordström and Ridderstråle, 1999). Modern organizations must be proficient learners in order to survive. “The ability to learn faster than your competitors is your only lasting competitive advantage” as put by a HR manager in Sweden. Thus, knowledge is vital, both as a resource and as a competitive advantage.

Furthermore, knowledge is necessary for producing products and services, improving business processes and so on. Therefore, to gain and sustain competitive advance organizations must manage their knowledge resources, referred to as knowledge management (KM). The working definition of KM used in this thesis is based on our literature review and empirical experiences and influenced by how Jennex, Smolnik and Croasdell (2007) describe KM success as follows:

*KM is to provide the appropriate knowledge to those that need it when it is needed with the purpose of improving organizational effectiveness in order to be competitive, reach business objectives and be profitable. This includes knowledge reuse and learning, i.e. knowledge creating.*

However, many KM projects fail (Senge, 1999; Storey and Barnett, 2000). One reason for this is that there is a lack of systematic support for implementing KM in organizations (see e.g. Wong and Aspinwall, 2004). That
KM projects fail and the lack of implementation support are the problems that our research addresses. While project failure costs money, failure in a KM project also costs loss of knowledge and no organization can afford to waste their most important resource.

KM consists of a number of interrelated activities that may be supported using information technology (IT). One way to provide appropriate knowledge to those that need it when it is needed is to implement IT-supported knowledge repositories that also prevent knowledge from being lost when a specific employee leaves the organization. IT-supported knowledge repositories are the focus of our research, and we claim that this is the core of knowledge work and where KM efforts should start. Storing knowledge in an IT system results in the rudiments of a KM process (Sandelsands, 1999). Furthermore, we claim that developing an IT-supported knowledge repository is a reasonable way for an organization wanting to achieve maturity as a Learning Organization (LO) to start. Our results confirm this.

A successful IT-supported knowledge repository is one that fulfills its aim: to support employees work performance by promoting knowledge sharing and knowledge reuse in the organization. Hence, the success of an IT-supported knowledge repository is dependent on whether or not the repository is actually used. For a knowledge repository to be used the user must perceive that its usage will greatly enhance their performance at work (Sharma and Bock, 2005). Hence, what is stored in the repository is critical for success. In order for knowledge to be stored in the repository it needs to be captured. Thus, to be able to manage knowledge, the ability to capture it is a key aspect (Matsumoto, Stapleton, Glass and Thorpe, 2005). Furthermore, according to Jennex et al (2007), capturing the right knowledge is necessary for KM success. This is also strengthened by Sharma and Bock (2005) who manifested that quality, for example, reliability and relevance, in the knowledge repository has to be high for knowledge re-use to take place. Hence, we consider the process of capturing knowledge to be critical for the success of an IT-supported knowledge repository. Therefore, the research aims to support the process of capturing knowledge in order to increase the usefulness of IT-supported knowledge repositories.

The main target groups for our research are project leaders in KM projects, leaders in strategic positions, and other researchers in the KM and IS communities. Furthermore, parts of the thesis are relevant to all employees involved or interested in KM work and the guidance is of specific interest for KM project leaders.
1.2 Research Aim and Research Objectives

Failure in storing the “right” knowledge, in terms of, for example, relevance and correctness, results in employees feeling that using the repository does not support them in their daily work. Hence, the use of the repository will decrease and the KM project will fail accordingly. However, capturing the “right” knowledge is not enough. The way in which the captured knowledge is packaged, stored and made accessible to the users is also crucially important, because it must be possible to find when needed. Employees seek knowledge from a knowledge repository if they perceive that its usage enhances their daily work performance due both to the quality of the required knowledge and the ease of finding it (Sharma and Bock, 2005). However, failure in capturing the “right” knowledge can never be compensated by successful packaging. Hence, our research is focused on the capture process. More specifically, our research aim is to:

*Contribute to increasing the usefulness of IT-supported knowledge repositories by supporting the process of capturing new knowledge to be included in the repository*

In this way we hope to increase the number of IT-supported knowledge repositories that are used and hence also the number of successful KM projects. Furthermore, since there is a lack of awareness of the complex issues related to an effective knowledge capture process and the benefits achieved through it (Hari et al, 2005), the work presented in this thesis will also reduce this lack of awareness.

The process of capturing new knowledge starts when knowledge with the potential to be incorporated in the repository is identified and closes when the identified knowledge is passed onto the process of packaging and storing knowledge, or a decision is made that the identified knowledge should not be stored. The capture process takes place when a knowledge repository is created for the first time, and every time new knowledge is generated that has potential relevance for an existing repository. It is crucial to understand that new knowledge is not regularly generated, e.g., once or twice a week, and, accordingly, guidance for the capture process must enable knowledge to be *continuously* captured. This ability to continuously capture new, relevant and correct knowledge challenges the long-term survival of a repository, since failure will eventually result in a repository that is out-dated and irrelevant. Thus, users will most likely abandon the use of the repository. Therefore, developing and implementing an IT-supported knowledge repository does not only involve building the repository itself, but also involves implementing processes which ensure that the repository will be maintained.
We plan to support the capture process by enhancing its understanding and presenting guidance for its systematic implementation. The effective implementation of knowledge capture enables rapid dissemination of new ideas and growth in core capabilities as well as organizational growth (Hari et al, 2005). The need to understand the capture process from a holistic perspective is clear. Hence, before seeking deep knowledge about knowledge repositories and the capture process, we need holistic knowledge about KM to understand why KM is important, what it is about and how to perform it. These three levels of inquiry are in accordance with Van Gigch (1991). Consequently, the research objectives for this thesis are:

- **Research Objective 1**: Characterize Knowledge Management from three levels of inquiry (why, what, how).
  Why? To establish a synthesized view of KM based on three levels of inquiry in order to create a foundation for the research as well as discover areas where research is needed

- **Research Objective 2**: Characterize the process of capturing new knowledge to be included in IT-supported knowledge repositories.
  Why? To increase the understanding and awareness of the capture process and to gain knowledge about what the guidance should support

- **Research Objective 3**: Develop guidance for facilitating implementation of the capture process so that relevant and correct knowledge is continuously captured.
  Why? To reduce the lack of KM implementation support and hence contribute to increasing the number of successful KM projects

The relationships of research aim and research objectives are described in Figure 1:1.

Research Objective 1 aims to provide the necessary understanding and insights at a general level so that the research can focus on the relevant issues and problems using a suitable research approach. Based on Research Objective 1, Research Objective 2 aims to provide detailed and specific knowledge about the capture process, so that the work of developing the guidance can focus on relevant issues and problems. Furthermore, this detailed and specific knowledge in itself is important in order to achieve the research aim. Keeping the holistic description (Research Objective 1) in mind, as well as the specific characteristics of the capture process (Research Objective 2), Research Objective 3 aims to develop guidance for facilitating implementation of the capture process so that relevant and correct knowledge is continuously captured. The research process which aims to fulfill these research objectives is summarized in the following section.
1.3 Research Method

This brief summary only provides an overview of the approach. For a detailed description and motivation of the approach, see Chapter 5.

In order to achieve the research objectives a qualitative research process was conducted. The research process comprises a parallel study which includes a literature review and an empirical study. The empirical study is a case study inspired by action research, which involved participation in the project Efficient Knowledge Management and Learning in Knowledge Intensive Organizations (EKLär). The empirical study rendered possible the observation of matters in their practical context, and helped identify what to focus on in the literature review. Moreover, the theoretical study gives us “new” knowledge concerning the area of research, including knowledge about what to observe and focus on in EKLär, and how to run the project. The empirical and theoretical studies influenced each other and both are inputs to the qualitative analysis which merges these data. Therefore, the results can be described as a synthesis emerging from a combination of theoretical and empirical data. In order to achieve external empirical grounding we used ex-

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1 EKLär was supported by Vinnova, The Swedish Governmental Agency for Innovation Systems.
experts in the field, both researchers and a practitioner who is a professional expert in the area. The research process is summarized in Figure 1:2.

While all data, empirical as well as theoretical, are inputs to the qualitative analysis, some research results derive mainly from empirical data and some mainly from theoretical data. Research Objective 1 is about gaining general understanding that is not limited to one domain. Thus, the research results related to Research Objective 1, derive mainly from theoretical data. The results related to Research Objective 2 and Research Objective 3, concern the capture process. To the best of our knowledge, the literature lacks a deep and detailed focus on the capture process in the context of IT-supported knowledge repositories. Thus, research results related to Research Objective 2 and Research Objective 3, are heavily influenced by our case study. One case study can be justified if it is purposeful and provides a large amount of information (Gummesson, 2001).

1.4 Contributions

The research process, which aims to achieve the three research objectives, resulted in a number of contributions. Contributions related to Research Objective 1 synthesize the existing body of knowledge concerning KM and LO and hence extend existing research. They also provide a firm foundation for further advancing the knowledge in the area, and uncover that the capture process, when developing IT-supported knowledge repositories, is an area where research is needed. We therefore consider the contributions related specifically to the capture process, see Research Objectives 2 and 3, to be the
The research process aiming to achieve Research Objective 1 has created a synthesized view of KM based on a systems perspective with three levels of inquiry as described by Van Gigch (1991). The use of a systems perspective and these three levels of inquiry provide holistic knowledge and understanding about, for example, the role of KM and knowledge repositories in organizations as well as how they relate to each other. This holistic way of describing KM, which provides an alternative way of categorizing existing research, is the main contribution of the work aiming to achieve Research Objective 1. The synthesized view includes nine contributions that together characterize KM from the three levels of inquiry. Since Figure 1:3 visualizes how the contributions relate to the three levels of inquiry and hence enables the holistic understanding of KM, we claim that Figure 1:3 is also a contribution.

Figure 1:3 The nine contributions from the perspective of three levels of inquiry
The contributions can briefly be described as follows:

1. **A conceptualization model that describes the relationship between a Learning Organization (LO) and Knowledge Management (KM)**
   This model describes how key concepts in the LO and KM areas relate to each other. By doing so the model reveals that KM drives organizational processes as well as learning, i.e. the proposed model describes why KM is important. Furthermore, the model clarifies that KM is a part of a LO and how KM relate to LO. It is presented in Section 7.1 and has resulted in the publication Aggestam (2006c).

2. **A route for reaching maturity as a Learning Organization (LO)**
   From the perspective of why KM is important, this model describes stages in becoming a LO, that is, achieving maturity as a LO. Thus, we can talk about an initial version of a maturity model. Furthermore, the model clarifies the role of Knowledge Management when an organization wants to achieve maturity as a LO. The model aims to both establish directions for how to become a LO and to assist people and organizations in determining their position in relation to a set of stages. It is presented in Section 7.2 and has resulted in the publication Aggestam (2006b).

3. **A model that visualizes what Knowledge Management (KM) is about**
   This model clarifies different types of KM and how they relate to each other. Hence, the model also describes what KM using knowledge repositories is in relation to KM in general. The model is presented in Section 8.1 and is used in, e.g., the papers Söderström and Aggestam (2007), Aggestam and Backlund (2007), and Aggestam and Lichtenstein (2007).

4. **A framework that describes what IT-supported knowledge repositories are and also shows the capture process in this context**
   The proposed framework illustrates what IT-supported knowledge repositories are about and includes, e.g., the knowledge and information cycle as well as a separation between the organizational and individual level. It shows the capture process in this context and hence the proposed framework aims to serve as a basis for us when developing the implementation guidance. It is presented in Section 8.2 and has resulted in the paper Aggestam (2006a).

5. **The extended Strategic Knowledge Management framework (e-SKM) that describes IT-supported knowledge repositories from a strategic perspective**
   This extended framework takes a strategic perspective and provides further knowledge and understanding about what developing IT-supported
knowledge repositories concerns. It is presented in Section 8.3 and has resulted in the paper Aggestam and Backlund (2007).

6. A model that visualises processes, activities and stages included in KM
This model clarifies the relationship between different stages, activities and processes in KM work. Hence, the model also describes the relationship between how to conduct KM work in general and KM work using IT-supported knowledge repositories. The model is presented in Section 9.1.

7. An account of Success Factors showing potential problems and difficulties in a KM project aiming to result in an IT-supported knowledge repository
This account describes factors that are important to address in order to ensure success of the repository. The factors are presented in Section 9.2 and have contributed to the paper Aggestam (2007a).

8. A set of general guidelines for how to prepare an IT-supported KM project
Awareness of Key Success Factors (KSF) early in the implementation process makes it possible to more effectively and efficiently adjust a KM project. These guidelines aim to prepare the target organization with the purpose to better manage and meet KSF during the KM project. The guidelines are presented in Section 9.3 and have contributed to the paper Aggestam (2007a).

9. Lessons learnt when applying the extended Strategic Knowledge Management framework (e-SKM)
This contribution describes lessons learnt concerning the development of knowledge repositories while applying the extended SKM framework to data collected in the EKLär case. These lessons are described in Section 9.4 and have contributed to the paper Aggestam and Backlund (2007).

1.4.2 A characterization of the process of capturing new knowledge to be included in IT-supported knowledge repositories
The research process aiming to achieve Research Objective 2 has increased our knowledge and understanding of the capture process. In order to be able to understand complex phenomena we have to study them from different perspectives. The central part of this characterization is that it includes three different perspectives of the capture process. These three perspectives to-
gether provide a relatively complete picture of the capture process which is necessary in order to be able to implement and run this process in an efficient way. Furthermore, knowing what the capture process concerns is a prerequisite for developing suitable guidance. To the best of our knowledge, the literature lacks this relatively complete picture of the capture process, and hence these contributions are a valuable contribution to existing research. Each of the three perspectives corresponds to a contribution:

1. **A characterization of Key Success Factors (KSF) for the capture process**
   This contribution also includes categories of KSF at a more detailed level concerning the critical activities of identifying knowledge and evaluating knowledge. The different categories of KSF are presented and described in Chapter 12 and this work has resulted in the papers Aggestam and Lichtenstein (2007) and Aggestam, Persson and Backlund (2008).

2. **A framework showing seven types of knowledge loss in the capture process**
   In the capture process there is knowledge that escapes identification and therefore does not have the potential to be stored in the repository. This is an unwanted knowledge loss. Furthermore, there is identified knowledge that should not be stored since it does not contribute to the goal of the repository. Sorting out this knowledge and not passing it onto the package and store process is a wanted knowledge loss. An efficient capture process involves managing different types of knowledge loss. The proposed framework includes two wanted types and five unwanted types of knowledge loss. The framework is presented in Section 13.2 and has resulted in the paper Aggestam (2007b).

3. **An overview of the relationships between inputs to the repository, daily work and different types of knowledge**
   This contribution reveals that knowledge created in specific knowledge creating activities proceeds through ordinary business processes before it may be incorporated in the repository. It also reveals that, except for ordinary business processes, only specific events may generate knowledge that should be incorporated directly in the repository. This overview is presented in Section 14.3.

Together these three contributions reveal issues and aspects that the guidance must take into consideration to facilitate the implementation of the capture process so that knowledge is continuously captured. Since it is impossible to implement a process of continuously capturing knowledge without understanding what this process concerns, we want to emphasize the impor-
tance of these contributions for achieving the research aim. They also contain crucial knowledge for developing the guidance for the capture process.

1.4.3 Guidance for facilitating implementation of the capture process so that relevant and correct knowledge is continuously captured

The research process aiming to achieve Research Objective 3 has resulted in six different guidance elements. The guidance, included in Chapter 17, claims to cover the most critical parts identified when characterizing the capture process. With regard to the lack of systematic support for implementing KM in organizations (see e.g. Wong and Aspinwall, 2004), we argue that this guidance is a valuable contribution to both practitioners and researchers.

The characterization reveals that the most critical activities in the capture process are:

- Identify new knowledge
- Evaluate identified knowledge
- Pass knowledge that should be stored onto the packaging and storing process

Furthermore, the characterization reveals that an effective capture process involves efficiently managing KSF and knowledge loss.

The structure of the guidance can be compared with a box, the lid of which provides a detailed overview of the capture process and shows how the other five guidance elements, included in the box, aim to facilitate the capture process. Thus, the guidance consists of the following parts:

- **The “lid of the box”**: An overview of the capture process including how the contents of the box aim to facilitate this process (Guidance element G0)
- **The “content of the box”**
  - Guidance for the preparation phase (Guidance element G1)
  - Guidance for the identification activity aiming to reduce unwanted knowledge loss (Guidance element G2)
  - Guidance for the evaluation activity in order to increase wanted knowledge loss (Guidance element G3). This work has contributed to the paper Aggestam, Persson and Backlund (2008).
  - The role Capture Process Manager (CpM) – A work role description (Guidance element G4)
Checklist showing what must be done with regard to the capture process before closing the project (Guidance element G5)

The main target group for this guidance is project leaders for such a KM project. However, parts of the guidance can be used by employees to facilitate their daily KM work. Furthermore, the guidance can be used by researchers when performing case studies.

Figure 1:4 visualizes how the different contributions influence and relate to each other as well as to the three research objectives.
1.5 Publications

The claims in this thesis are supported by the following publications.

Conference Proceeding


Aggestam, L. (2006b) *Towards a maturity model for learning organizations – the role of Knowledge Management* Accepted for publication in the proceedings of the 7th International Workshop on Theory and Applications of Knowledge Management (TAKMA 2006) held in conjunction with the 17th International Conference on Database and Expert Systems Applications (DEXA 2006), 4-8 September 2006 in Krakow, Poland


**Journal publication**


The following paper has been submitted for publication:


**Book Chapter**

2 Thesis Outline and Reading Advice

The basic approach of this thesis is top-down. Holistic perspectives and more general material (e.g., characterizing KM) are presented before more detailed material (e.g., characterizing the capture process). The thesis is organized in accordance with the research objectives. The background and definition of the research area, which constitute the foundation and the points of departure for achieving the research objectives, as well as the research method, are presented in Part II (Chapters 3-5). The contributions are presented in Parts III (Chapters 6-10), IV (Chapters 11-15) and V (Chapters 16-18). Final remarks and future research plans are presented in Part VI (Chapter 19). For those familiar with the knowledge area and only interested in the contributions, we recommend reading Parts III-V. In order to provide the possibility of only reading selected parts of particular interest, we decided to make each part autonomous even if this means that we sometimes have to repeat material included earlier in the thesis.
The purpose of each part and reading advice are as follows:

**Part I: Thesis Summary (Chapters 1-2):**

**Purpose:** To provide both an introduction and a summary of this thesis.

**Reading advice:** We recommend reading this part first and all the chapters included in it. Any subsequent reading decisions are based on this. If, for example, you are more interested in some of the contributions, we recommend reading that/those chapter/s.

**Part II: Background and Research Method (Chapters 3-5):**

**Purpose:** To provide a theoretical background and to illustrate the points of departure for the research work. This includes a description of how we worked in order to achieve the research objectives.

**Reading advice:** Chapter 3: It was decided that a description of what we mean in this thesis by IT-supported knowledge repositories should be included in a separate chapter since this understanding is required to understand our contributions. We recommend that all read this chapter.

Chapter 4: The theoretical background is included in a separate chapter so that those already familiar with this area of knowledge can disregard this chapter. However, we recommend that all read the summary of KM included in the last part of Section 4.2.3.

Chapter 5: We recommend that those interested in our method of work in achieving our research objectives read this chapter. Otherwise, proceed directly to the next chapter.

**Part III: A Characterization of Knowledge Management from Tree Levels of Inquiry (Chapters 6-10):**

**Purpose:** To present KM from the three levels of inquiry (why, what, and how) in order to provide a holistic description of KM. This involves describing and discussing how we achieved Research Objective 1. Furthermore, this part includes our first set of contributions.

**Reading advice:** Even if the included contributions relate to each other, it is possible to read only that/those chapter/s of interest to you. However, we recommend that all carefully study Figure 6:1 in order to understand how the contributions relate to the three levels of inquiry.
Part IV: A Characterization of the Capture Process (Chapters 11-15):
Purpose: To provide a detailed description of the capture process and to describe and discuss how we achieved Research Objective 2. This part includes our second set of contributions.
Reading advice: Chapters 12-14 describe the capture process from different perspectives. It is possible to read that/those chapter/s that interest you, but to obtain a more complete picture of the capture process, and to understand why the guidance presented in Part V is structured the way it is, you need to read the whole part.

Part V: Guidance for Implementing the Capture Process (Chapters 16-18):
Purpose: To present guidance to be used in a KM project that aims to result in an IT-supported knowledge repository in order to facilitate establishing the capture process in such a way that enables knowledge to be continuously captured also after the KM project is completed. This presentation also shows how we have achieved Research Objective 3 and includes our final set of contributions.
Reading advice: In order to facilitate an understanding of why the guidance is structured the way it is and what it aims to support, Chapter 16 includes a summary of Chapters 12-14. If you are only interested in the guidance, disregard this summary and proceed to Chapter 17.

Part VI: Final Remarks and Future Works (Chapter 19)
Purpose: To provide some final remarks concerning whether this thesis has achieved its aim and research objectives as well as present some thought about how to proceed.
Reading Advice: For those interested in our suggestions for future research, it is recommended that you read this chapter.
Part II

Background and Research Method

This part provides a theoretical background to our research area and hence illustrates the points of departure for the research.

Earlier experiences influence us. Thus, this part starts by describing what IT-supported knowledge repositories are from our point of view, i.e. from an Information System’s point of view.

It also includes a description of our research process, aimed at achieving the research objectives, and the motivation for our way of working.
This thesis aims to contribute to the research area of computer and systems sciences. In this chapter we explain our view on how IT-supported knowledge repositories are related to this area.

Organizations develop knowledge repositories for the purpose of disseminating knowledge in support of learning and knowledge creation. They do this in order to be competitive, reach business goals and be profitable. Furthermore, developing, maintaining and using knowledge repositories is one part of KM work in an organization. From the perspective of the working definition used in this thesis (see Section 1.1 or Section 4.2.3) we can define the purpose of IT-supported knowledge repositories as providing the appropriate knowledge to those that need it when they need it in order to improve organizational effectiveness.

Modern KM is inseparable from computer-based technology (Holsapple, 2005), and this thesis focuses on knowledge repositories that use information technology (IT) to build the repository which then disseminates the knowledge by using, for example, Internet technology. It is possible to build repositories without IT, but due to the capabilities of IT to support the storage and dissemination of knowledge, repositories built without IT are outside the scope of this thesis. In the following, the concept of “knowledge repository” refers to IT-supported knowledge repositories, which are sometimes called Electronic Knowledge Repositories (EKR) in the literature, for example, Kankanhalli et al (2005) and Sharma and Bock (2005).

Both information systems and IT-supported knowledge repositories aim to manage information and knowledge in order to support an organization in achieving its business goals. In Section 3.1 we discuss further similarities between IS and IT-supported knowledge repositories, and in Section 3.2 what a successful IT-supported repository is. Finally, in Section 3.3, we describe the development process including a discussion of Key Success Factors (KSF) and how an organization can prepare from the perspective of these factors.
3.1 Similarities between IT-supported knowledge repositories and Information Systems (IS)

Modern Information Systems (IS) consist of IT, data/information, and people. They aim to manage and supply information in order to support the organization in achieving its business goals. By managing and supplying information we mean that the system assembles, stores, processes, delivers and presents the information (e.g. Avision and Fitzgerald, 1998). Information can be processed by IT, but knowledge requires humans (Swan et al, 1999). Knowledge derives from information (Davenport and Prusak, 1998; Wiig, 1993) and the transformation process, when information changes to knowledge, is individual and happens within people. Hence we cannot store *knowledge* in a repository, we store information that people can transform to knowledge. Nevertheless, the term “knowledge repository” is used in the KM community to denote this type of repository. For a further discussion concerning the relationship between information and knowledge, and how they are used in this thesis, see Section 4.2.1. An IT-supported knowledge repository corresponds to the IT and data/information parts of an IS that members of an organization use in order to achieve business goals. The repository and the members who use it together constitute together a Knowledge Management System (KMS), which aims to manage and supply information in order to support knowledge creating and learning that is relevant for the organization in achieving its business goals. KM is not just IT; the use of IT must have benefits and result in increased organizational productivity and effectiveness (Jennex, 2005). The similarities between IS and KMS mean that a KMS that includes IT-supported knowledge repositories can be viewed as being an IS.

Both IS and KMS are what Alter (2003) calls IT-reliant work systems.

“IT-reliant work systems are work systems whose efficient and/or effective operation depends on the use of IT” (Alter, 2003, p. 367).

A KMS aims to support learning, and enable knowledge creation by enhancing the exchange and sharing of explicit and tacit knowledge. This is in accordance with the definition of an organizational KMS (Meso and Smith, 2000). An analysis of these systems from the technical and socio-technical perspectives indicates that an organization should adapt the broader socio-technical view when developing, implementing and maintaining organizational KMS in order to gain long-term strategic benefits (Meso and Smith, 2000). This implies that organizations need to consider both IT and organizational culture, members of the organization etc. (Meso and Smith, 2000). This is in accordance with our view on how to develop, implement and maintain a successful IS.
KM technologies include, e.g., decision support systems, document management systems, groupware, business modelling systems, messaging, search engines, workflow systems, web-based training, information retrieval systems, electronic publishing, intelligent agents, knowledge-mapping tools, help-desk application, database management technologies, enterprises information portals, data ware houses and data mining tools (Park et al, 2004). IT-supported knowledge repositories can use different types of these technologies, and consequently fit in more than one of these groups. However, the used technology must at least fulfill the requirements of storing knowledge and disseminating it in an efficient way. For example, IT-supported knowledge repositories can be interpreted as decision support systems when information stored in the repository is used to support decision-making.


This discussion is also in line with Jennex’s (2005) working definition of KM:

“KM is the practice of selectively applying knowledge from previous experiences of decision making to current and future decision making activities with the express purpose of improving the organization’s effectiveness” (Jennex, 2005, p. iv)

A DSS is a computer-based IS (Turban, 1990) and the similarities between IT-supported knowledge repositories and IS are then further strengthened. Further discussion concerning IT-supported knowledge repositories and their relationships to DSS, or other types of IS, do not contribute to the purpose of this thesis. However, Park et al (2004) include DSS as an example of KM technology, and we can therefore ask ourselves if a KMS is one type of IS, or is it the other way around?

KM shares the same user perspective as information management, which is a subset of IS and which focuses on user satisfaction and not on the efficiency of technology (Prusak, 2001). This is in accordance with the broader socio-technical view of KM. The focus on user satisfaction in KM is for example present in discussion about which technologies are appropriate for sharing different types of knowledge (Prusak, 2001). There are different types of IS, and in accordance with the definition of IS, a KMS is one such type. Holsapple (2005) discusses the relationship in the opposite way, arguing that the value of computer-based technology comes from its contribution to KM. This implies that KM is the system, and IS the subsystem.

“[KM] is the enveloping domain in which IS is indispensable and in which IS finds its non-technological footing and basis” (Holsapple, 2005, p. 50).
Jennex (2006) discusses the relationship in the same way:

“However, while the IS component is important, in order for KM to be effective as a change or transformation tool, it must include more; it requires management support and an organizational culture” (Jennex, 2006, p. 4).

It is possible to argue for both these opinions. IS assembles, stores, processes, delivers and presents information in order support the organization in achieving its business goals (e.g. Avision and Fitzgerald, 1998). KMS support the organization by handling information for the purpose of enabling knowledge creation. In this respect we can regard KMS as a type of IS. In an organization it is the members who act and strive to achieve business goals. Any type of action based on information stored in an IS requires transformation to knowledge. From this perspective all IS can be regarded as being KMS. We see no point in developing this discussion further. The main thing to be conscious about is the strong relationships and similarities between IS and KMS. Consequently, we can state the following:

- Methods, tools etc. in the Information Systems Development (ISD) area have the potential to be useful when developing a KMS
- Researchers in the IS area are also researchers in the KM area

Holsapple (2005) considers the last point as an effect of the inclusive perspective, but in accordance with the system’s approach we regard this as a fact irrespective of whether IS is the system or the subsystem.

### 3.2 A successful IT-supported knowledge repository

There is no common definition of what a successful IS or KMS is. IS and KMS include IT and people, and we realize that to be successful both IS and KMS have to manage technological and human aspects. In an organization, work processes must integrate KM processes, and to use an IS effectively requires its integration in routines, processes etc. Hence, both IS projects and KM projects need a combination of technical and human elements (Davenport and Prusak, 1998).

Jennex et al (2007) present a first basic definition of KM success:

“KM success is reusing knowledge to improve organizational effectiveness by providing the appropriate knowledge to those that need it when it is needed” (Jennex et al, 2007)

From our point of view this definition is also a definition of successful IT-supported knowledge repositories. Furthermore, we argue that this definition
is also suitable for defining IS success; it only requires changing the word “knowledge” to “information”.

Successful IS projects are commonly cited as those that have met agreed upon business objectives and have been completed on time and within budget (Procaccino, Verner, Overnyer and Darter, 2002). Cost and time savings are normally defined as the measures of success of an IS (Jiang, Klein and Discenza, 2001). This view represents the one of the developers (Jiang et al, 2001), and an analysis of the users’ perspective may arrive at a different result. Nevertheless, an IS must be successful from the perspective of the organization. The organizational approach, when discussing a successful IS, stresses the importance of the members of the organization, since they constitute the organization. In the literature the most widely used measure ifor system success is user satisfaction (Lin and Shao, 1999; Jiang et al, 2001).

When discussing KMS success the same situation applies. The key to KM success is not to properly store and disseminate knowledge or to collaborate; it is to store and disseminate knowledge and to collaborate. The roles of people in knowledge technologies are integral to their success (Davenport and Prusak, 1998). We agree with Linberg (1999) that the only criteria for IS success among all involved parties are that they meet user requirements, achieve purpose, meet time schedules and budgets, generate happy users and achieve required quality. We also extend his statement to include KMS. This is in accordance with the broader socio-technical view of organizational KMS (Meso and Smith, 2000). It is people that transform data and information into knowledge, and IT can store and distribute data and information effectively. Thus, we argue that a knowledge repository cannot fulfill its aim and be a success if it is not used, no matter, for example, how good the technology is or whether the development of it has met schedules and budgets or not. We want to emphasize that having actual use as a requirement for success does not contradict Jennex et al’s (2007) finding that usage is not a good measure for success since it is possible to take part of the content in a knowledge repository without learning anything and/or without obtaining any benefits from the perspective of the organization.

A large number of KM projects fail (e.g. Storey and Barnett, 2000; Senge, 1999), and so do IS projects (e.g. Jiang et al, 2001); that is, they do not result in a successful KMS or IS. In order to change this negative trend there must be a learning paradigm; organizations must learn from their own experiences and not make the same mistakes over and over again (Lyytinen and Roby, 1999; Ewusi-Mensah and Przasnyski, 1995). This strengthens the importance of the context; to have an organization with a culture where employees want to share knowledge, and with organizational processes that enable and
stimulate learning and knowledge sharing. This culture characterizes a Learning Organization (LO) further discussed in 10.1.

3.3 The development process

The way humans share and use knowledge should guide the development of KM management tools and techniques (Prusak, 2001). Software alone does not solve the knowledge management problem, and does not make a knowledge creating company (Davenport and Prusak, 1998; Park et al, 2004). This strengthens the need to adopt the socio-technical view compared to the technical view. It is not enough to build knowledge repositories; they must be used if the KMS as a whole is to succeed. To stress this fact, in this thesis we say develop knowledge repositories when we mean the whole KMS, and build knowledge repositories when we only refer to the IT-system and its information. Good technology implementation does not determine KM success, but it affects the amount of time it takes to get pay-back from a KM initiative (El-Gabri, Caldwell and Oppenheimer, 2003). No expert group or department should have the exclusive responsibility for creating new knowledge if there is to be success (Nonaka and Takeuchi, 1995). Davenport and Prusak (1998) argue against a technology-centred KM approach, but argue that a technology infrastructure is a necessary ingredient for successful knowledge projects. We claim that the situation is exactly the same when developing an IS.

There are also opinions that technology “...has little or no role in generating new knowledge, optimising its use or in supporting a learning culture...” (Loermans, 2002, p 291). We disagree. If information is to support the use and generation of new knowledge, it is of great importance how this information is stored and disseminated. Like an IS, a computer-supported knowledge repository must be in symbiosis with the organization.

“An exclusive inclination towards either a pure technological or social view may lead to an incomplete picture of what is needed for a successful KM effort.” (Wong and Aspinwall, 2004, p. 102).

A supportive organizational culture, the nature or personality of an organization, can enable the successful implementation of KM technologies (Park et al, 2004). This is the same for IS. An organization’s history influences information systems development (Lang, Masoner and Nicolau, 2000). The organizational structure can influence both information flow and other aspects of the information process (Barlow and Burke, 1999). To integrate KM is according to Loermans (2002) more of a cultural challenge then a technical one. In both types of projects it is important to stress the cultural chal-
Developing an IS or a KMS is a large and complicated task. Methods for ISD can be of assistance in designing these systems. Requirements Engineering (RE) aims to decide what the system should do and results in a requirements specification for the desired new system. RE is a key issue in ISD (Dahlstedt; 2004), and can be defined as follows:

“...all the activities devoted to identification of user requirements, analysis of the requirements to drive additional requirements, documentation of the requirements as a specification, and validation of the documented requirements against the actual user needs.” (Saiedian and Dale, 2000, p. 420).

Doing this is also necessary when developing a KMS. RE is an iterative process, which requires co-operation between different stakeholders (Dahlstedt, 2004). High quality in the RE phase decreases development and maintenance costs, and we can hence conclude that RE and the requirements specification are of great importance for IS success. This is also well established in the literature (e.g. Pohl, 1998; Sutcliffe, Economou and Markis, 1999; Cherry and Macredie, 1999). One main activity in RE is Requirements Elicitation (e.g. Kotonya and Sommerville, 1997; Loucopoulos and Karakostas, 1995; Pohl, 1998). We claim that Requirements Elicitation is crucial for the success of the whole development process, irrespective of whether a KMS or an IS is developed.

Requirements Elicitation concerns gathering/eliciting relevant knowledge in order to develop a suitable system. This may sound simple, but it is a complex and difficult process (Leffingwell and Widrig, 2000: Pohl, 1998). For example, the relevant knowledge is available in a variety of representations and is distributed among many stakeholders: There are conflicting desires; stakeholders have different opinions about the meaning of requirements and they rarely have a clear view of their requirements (Kotonya and Sommerville, 1998; Pohl, 1998). The objective of Requirements Elicitation is to make the hidden knowledge about the system explicit in such a way that everybody involved can understand it (Pohl, 1998). This can be compared with the knowledge conversion mode externalization in the learning spiral of Nonaka and Takeuchi (1995), see Section 4.2.2. Methods and techniques from Requirements Elicitation should be useful in KM.

In order to be able to understand complex phenomena, as, e.g., organizations and their IS, we have to study them from different viewpoints. A viewpoint
is, according to Kotonya and Sommerville (1998), a collection of information from a particular perspective and by integrating the information from each viewpoint the overall requirements can be derived. The identification of the relevant sources and the possibility of obtaining all the necessary information from them are essential (Pohl, 1998). One source in Requirements Elicitation is stakeholders such as different types of users, developers, managers etc. If the user’s real requirements are not identified the user will not be satisfied with the system. This explains why it is so important to carry out the process of Requirements Elicitation in an effective way (Kotonya and Sommerville, 1998). This entails careful analysis of the organization, the application domain and business processes where the system will be used, not just asking involved people what they want (Kotonya and Sommerville, 1998; Leffingwell and Widrig, 2000).

When IS and KMS are developed and implemented, in any context, a number of Success Factors (SF) determine whether or not the effort will succeed. In earlier research work we examined these factors in IS development. Based on this work we developed a framework which aims to manage SF emerging from organizational issues involved in IS development. The framework should be used in a planning phase in order to prepare the organization to take care of these factors during the development process. In light of the strong relationship between KMS and IS, these factors and the framework should have the potential to be useful also when developing IT-supported knowledge repositories. The remainder of this section therefore includes a summary of SF for IS development and their relationships. For a more thorough description, we refer to Aggestam (2004).

Success factors in IS development can be categorized as emerging from economic, technological or organizational issues (Ewusi-Mensah and Przasny- ski; 1994). Planning should focus on organizational factors, because they influence other ones. Our work is delimited to these factors. Furthermore, our work aims to identify “… the conditions that need to be met to assure success of the system” (Poon and Wagner, 2001) and we refer to such conditions as Key Success Factors (KSF). All SF cannot be KSF. If there are too many factors, more than 4-6, they are probably too detailed and all of them are probably not critical (Avison and Fitzgerald, 1995). These types of success factors are often referred to as Critical Success Factors (CSF) in the literature, but because we do not use the research approach designed to elicit CSF (Rockart, 1979) we will use the term, Key Success Factors, in this thesis.

Based on an extensive literature review in the IS and organizational development areas, four KSF emerging from organizational issues have been identified (Aggestam, 2004):
- **To learn from failed projects:**
  The framework does not explicitly take this into consideration, it requires it. This is something a Learning Organization is good at.

- **To define the system’s boundary, both for the whole system and for relevant subsystems:**
  The system’s boundary concerns the business border. It constrains what needs to be considered and what can be left outside (Van Gigch, 1991). Only if the organization as a whole is clear about its aim and works on a principle of shared values can small units be allowed to take responsibility for running themselves (Barlow and Burke, 1999).

- **To have a well defined and accepted objective aligned with the business objectives:**
  A successful IS should meet agreed upon business objectives (Ewusi-Mensah and Przasnyski 1994, Milis and Mercken 2002). An organization should be examined from different perspectives (Pun 2001) which in turn is a prerequisite for defining the goal.

- **To involve, motivate and prepare the “right” stakeholders:**
  How well an IS will work in an enterprise depends on the user involvement in the development process (see e.g., Cherry and Macredie, 1999; Pohl, 1998; Browne and Ramesh, 2002). The success of this involvement depends on how well people work and communicate (Saiedian and Dale 2000), Commitment from management is crucial if the project affects a large part of the organization (Milis and Mercken, 2002).

A framework was developed, based on these KSF (Aggestam, 2004). The use of the framework has been tested through a case study (Aggestam, 2005), and a theoretical application to a B2B setting (Aggestam and Söderström, 2005; Aggestam and Söderström, 2006).

A framework is “... a suggested point of view for an attack on a scientific problem” (Crick and Koch, 2003, p.119). While the building blocks in the KSF framework, see Figure 3:1, are not new in themselves, the combination is. The framework should be used iteratively at different levels of abstraction: first to the whole project (“the system”) and then to identified critical, parts (“subsystems”). In order to provide a clear description, we have chosen to do so in a sequential manner.
The target organization should define the system’s boundary and relevant subsystems. The objective must then be defined and relevant stakeholders identified. The objective should be well defined, analyzed and described in different complementary frames and at different levels of detail. It should always support the business objective, which requires IS- and business strategies to be clearly aligned. Relevant stakeholders should be motivated and prepared for future participation and involvement in the ISD process. Both motivation and preparation must thus be adapted to the various types of stakeholders. The motivation process should focus on stakeholder needs of knowledge and confidence. Stakeholders will feel confidence and motivation if the objective’s description is adapted to them and explained in a way that they obtain knowledge about how it will affect them and why the project is important. The most suitable stakeholder description should be chosen, which could mean more than one description. User participation and user involvement is a communication process. The preparation process should thus focus on educating stakeholders about concepts in order to make future communication easier and more effective.
4 Setting the Scene – A Theoretical Review

Our research focus is IT-supported knowledge repositories which is a part of KMS in the Knowledge Management (KM) domain. KM aims to increase organizational productivity and effectiveness by enabling learning in organizations. Learning and the accumulation of (new) knowledge always start with the individual (Jensen, 2005) and knowledge is created by individuals (Nonaka and Takeuchi, 1995). Thus learning is when changes in knowledge happen inside an individual. When one or more members of the organization have learnt, the system’s thinking implies that the organization as a whole has learnt. In accordance with Jensen (2005) and with respect to our problem domain Knowledge Management, we regard learning, in this thesis, as changes in individual knowledge. It is outside the scope of this thesis to discuss how an individual learns, what happens inside the individual etc. Therefore, different learning theories will not be discussed, either in this theoretical review or in the remainder of this thesis.

A Learning Organization (LO) is an organization that is proficient at organizational learning (OL) (Tsang, 1997). The Learning Organization (LO) is therefore the desired state of context of the problem domain since successful KM requires learning. An organization cannot be a LO without efficient Knowledge Management work. The opposite relationship also holds. Research focus, research domain and desired state of research context are summarized in Figure 4:1:

![Figure 4:1. Research focus, domain and desired state of context](image-url)
The tight relationships between IT-supported knowledge repositories, KM and LO are strengthened by e.g. Jennex and Olfman (2002) who found that the three areas, organizational memory, OL and KM are related and have an impact on organizational effectiveness. We consider IT-supported knowledge repositories to be one part of the organizational memory.

A Learning Organization must always serve the broader aims of the organization (Davenport and Prusak, 1998). Furthermore, due to a turbulent economy and accelerated technological change, the need for organizations to learn and change is increasing (Nonaka and Takeuchi, 1995). When an insight grows with regard to an organization’s intellectual capital it is necessary to involve stakeholders, both inside and outside the organization. This requires using the latest and the best information systems (IS) and information technology (IT) (Edvinsson and Malone, 1998).

“A pragmatic position implies the necessity to make abstractions with remaining linkage to an actable world” (Goldkuhl, 2004, p. 19).

Bearing this in mind, i.e., not forgetting reality and why we are doing this research work, we describe and characterize the desired state of research context, the Learning Organization, in Section 4.1, and the research domain, Knowledge Management (KM), in Section 4.2, in order to further position the research focus. The research focus is already discussed in Chapter 3.

4.1 A Learning Organization – the desired state of context

Today, organizations must be proficient at learning if they are to survive. If an organization learns more slowly than the environment it is doomed (Wiig, 1993). In a way all organizations that exist today must be learning organizations. However, the concept of “Learning Organization” refers only to organizations that are good at Organizational Learning (OL) (Tsang, 1997). Most organizations do not learn from their failed projects; they make the same mistakes over and over again (Ewusi-Mensah and Przasnyski, 1995, Lyytinen and Robey, 1999), and therefore cannot be regarded as Learning Organizations. A Learning Organization is organized in such a way so that the work itself is challenging and employees have more reasonable control over how it should be done (Jensen, 2005).

OL and LO share ideas. Both are concerned with processes for acquiring information, interpreting data, developing knowledge, and sustaining learning (Kezar, 2005). Although the terms, OL and LO, are sometimes used interchangeably (Tsang, 1997), we consider them to have different meanings.
While the concept Learning Organization focuses on an organization as an entity, a form of organization, Organizational Learning could be compared with the process of learning; learning activities or processes in the organization (Sicilia and Lytras, 2005; Loermans, 2002; Yeo, 2005).

According to Kezar (2005) there are differences between these two areas of study:

- LO tends to focus more on external threats as the reason to foster learning and looks for external forces and logic to prompt learning.
- OL tends to focus more on internal concerns for performance and learning as part of the condition of human beings within settings.

Organizational learning is performed in the organization. Thus, a LO must be able to meet the demands of both its internal and external environments (Yeo, 2005). Despite the differences between the two areas of study, they overlap. It is therefore difficult to discuss them separately. However, in order to obtain a holistic view and a clear structure we have chosen to discuss LO and OL separately.

In Section 4.1.1 we discuss what constitutes a Learning Organization, and in Section 4.1.2 what Organizational Learning is.

### 4.1.1 What is a Learning Organization?

An organization consists of individuals, and individuals form groups. A group is when its members have a shared history (Schein, 2004). An organization can consist of one or more interrelated groups, and the system’s thinking is hence obvious. An organization is the result of people doing things together for a common purpose (Schein, 2004). The organization as an entity is not able to learn. It is the individuals in the organization who learn, but this process is stimulated by social interaction.

Wenger (1998) discusses learning as social participation and argues that this focus implies it is possible to talk about learning from the perspectives of communities and organizations. For communities it is about refining their practice and ensuring new generations of members, and for organizations about sustaining the interconnected communities (Wenger, 1998). While we agree with his discussion in general, the fact still remains: it is the individuals who learn. A community is a group, and groups evolve their own culture which we consider implies the same thing that Wenger (1998) describes as learning for communities and organization. We return to the organizational culture in the following.
A Learning Organization is one that facilitates the learning of all the individuals in the organization (Pedler et al, 1989). It supports individual learning by its organization, structure, routines, and culture. The culture and design of the organization takes into account the needs of the individuals in it (Kline and Saunders, 1993). It is organized in such a way that it scans for information in its environment, creates information itself, and encourages the individuals in a team to transfer knowledge between them (Jensen, 2005).

The environment enriches and enhances the organization as a whole (Kezar, 2005, Pedler et al, 1989). This must in turn be guided by the structure and the vision, which in turn are dependent on the strategic leadership of the organization (Jensen, 2005). In a LO members know why, but in other organizations they know how (Jensen, 2005). The members are also provided time for learning, which management regards as real work (Davenport and Prusak, 1998). A Learning Organization has a culture that supports learning and innovation (Wiig, 1993).

One key to learning is to obtain feedback and to allow the time for reflection, analysis, as well as assimilate the implications of what the feedback has communicated (Schein, 2004). A learning culture must therefore value reflection and experimentation, and must provide its members the time and resources to do it (Schein, 2004). The environment thus promotes a culture of learning, a community of learners, and it ensures that individual learning enriches and enhances the organization as a whole (Kezar, 2005). The process of learning must ultimately be made part of the culture, not just a solution to a given problem (Schein, 2004).

We can see that a learning culture is a crucial characteristic of being a LO, but what does the concept “culture” mean? Culture can be regarded as the result of a group’s accumulated learning about values, assumptions etc., and it evolves with the strength of its dependence on the length of the group’s existence, the stability of the memberships in the group, and the emotional intensity of the actual historical experiences the group has shared (Schein, 2004). The culture of a group can be defined as

“...a pattern of shared basic assumptions that was learned by a group as it solved problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems “ (Schein, 2004, p.17).

Consequently, it takes time to foster a new culture, e.g., a learning one. It is the leader who initiates this process by imposing his or her beliefs, values, and assumptions, but culture only arises when the assumptions of individuals
lead to shared experiences (Schein, 2004). According to Schein (2004) culture basically emerges from three sources:

- the beliefs, values and assumptions of the founders in the organization
- the learning experiences of group members as their organization evolves
- new beliefs, values, and assumptions brought in by new members and leaders

These three sources impact differently on the organizational culture depending on the context. In the beginning, the founders form the culture, and as long as the organization is successful this culture defines the leadership. If the organization has problems and difficulties, the leadership must do something. How they manage this challenge, their ability to step outside the culture and start more adaptive evolutionary change processes, decides if they will remain in the organization or not. These ideas of Schein (2004) are described in Figure 4:2.

![Figure 4:2 Culture from the perspective of leadership (Based on Schein, 2004)](image)

We consider leadership to be of crucial importance to the development of a learning culture, but it is the members who form the culture. When difficulties occur, for example, external threats in the form of increasing competition, it is a leadership responsibility to address the problem. To change a culture is not easy, and takes time. The most common culture change mechanism observed is filling key positions with people who have the beliefs, values, and assumptions that are viewed by senior leaders as the necessary ones for the future growth and survival of the organization. However,
the quickest and easiest ways are changes in the reward and punishment system (Schein, 2004).

As we can see, a Learning Organization is about the organization as a whole, an entity. It concerns concrete things, such as its structures and organization, but above all more abstract aspects, such as individual attitudes and “feelings”, the culture. This is not strange considering the fact that it is individuals who are the organization and it is the individuals who learn. Regardless how well the organizational processes are structured and support learning, the organization will never become a learning one if the members do not want to learn. Culture as a concept is abstract, but its consequences in, for example, behaviour are concrete (Schein, 2004).

A Learning Organization is “...continually expanding its capacity to create its future.” (Senge, 1990, p. 14). According to Senge (1990) the core of a Learning Organization is based upon five “learning disciplines”, each providing a dimension in building a learning organization:

1. **System’s thinking:** This is the conceptual cornerstone, the fifth discipline that ties the four following core disciplines together. System’s thinking clarifies patterns, and helps us see how to change them effectively. One can only understand the system by contemplating the whole, not any individual subsystem. However, the system consists of subsystems and a change in one or more of these results in changes in the whole. This way of thinking and perceiving the world enables us to understand that we must consider ourselves as connected to the world, not separated, and that our experiences are created from our own actions, not caused by someone or something “out there”.

2. **Personal mastery:** This is the motivation of each individual. Senge (1990) talks about the “spiritual foundation”. It starts by making it clear what really matters to us, a process that must continue in order to achieve more clarity and depth. People accomplished in this discipline are able to realize the results that matter most deeply to them. An organization’s capacity to be a learning one can be no greater than that of its members.

3. **Mental models:** This concerns deeply ingrained opinions, assumptions, pictures etc., that affect how we interpret as well as respond and act in the world. Two persons with different mental models can interpret the same thing differently. This discipline starts with trying to identify our perceptions of the world, to bring them to the surface and really question them.

4. **Team learning:** This is the fundamental unit in a Learning Organization. When a team learns the individual member grows more rapidly. This discipline starts with dialogue, and also how to recognize patterns that undermine learning.

5. **Shared vision:** This concerns the capacity to hold a shared picture of how the organization wants to create the future. When there is a genuine shared
vision people excel and learn because they want to. While a shared vision emerges from personal ones, many leaders have personal visions that are never shared.

Each of the five disciplines can be considered on three levels: practices, principles, essences. These levels are in accordance with the three levels of inquiry defined by Van Gigch (1991). We must know why we do something, what to do, and how to do it. Senge’s (1990) five disciplines are integral components in a Learning Organization, providing applicable and useful tools and methods (Gorelick, 2005). The work of Senge (1990) has been widely referred to by both academics and professionals. It is also in accordance with the system’s approach, and covers, as we see it, the main aspects that characterize a Learning Organization. Therefore, these disciplines have had an important influence on our work.

Social participation in a group enables learning, and we agree with Senge (1990) that Team learning is a fundamental part of a Learning Organization. Nevertheless, we want to stress that it is the subsystem, the members, who learn, and, as a consequence, the whole system, the group/team, learns. Learning at team level concerns the evolution of the group’s culture. Senge (1990) also stresses the importance of the leadership. Learning Organizations demand a new view of leadership, the leader as designer (Senge, 1990).

“They are responsible for building learning organizations where people continually expand their capabilities to understand complexity, clarify vision, and improved shared mental models – that is they are responsible for learning” (Senge, 1990, p.340).

The first step in building a Learning Organization requires a leader who inspires the vision of learning organizations (Senge, 1990). This is in accordance with Schein (2004).

The concept, Learning Organization, emphasizes the characteristics of an organization that encourages its members to learn. OL focuses on how learning is developed in organizations (Yeo, 2005), and can be described as a continuous learning cycle (Gorelick, 2005). From this perspective, an organization can never come to a point in time when it can declare itself to have become a LO in the sense of reaching an end point (Gorelick, 2005). This implies that to be a LO is a continuous process. We have now discussed what a LO is, and will continue by describing OL.
4.1.2 What is Organizational Learning?

Organizational learning is a prerequisite for organizational success (Loermans, 2002), and it concerns processes in the organization (Sicilia and Lytras, 2005; Yeo, 2005). Actors are members of the organization, and members form groups. Learning can therefore be performed at an individual level, a team level and an organizational level. Regardless of level, the learning in itself is always individual (Jensen, 2005; Senge, 1990; Schein, 2004).

Knowledge is created by individuals (Nonaka and Takeuchi, 1995). Only they can think and act, and individual learning is needed for organizational learning (Marquardt and Reynolds, 1994). Individual learning implies organizational learning. While, individual learning always results in changes in individual knowledge, it does not always result in changes in organizational knowledge. We consider organizational knowledge as something that remains, for example, in the culture, in the knowledge repositories, and also in the organizational processes and structures, even when employees leave. Therefore, the concept “Organizational Learning” (OL) has at least two kinds of meaning:

- When a member of an organization has learnt, the organization as a whole has learnt. We can talk about organizational learning.
- Individual learning results in changes in the individual knowledge. When it also results in changes in organizational knowledge we can talk about organizational learning.

These meanings indicate that organizational learning requires individual learning, and both types of OL are important for the organization. The main difference is that the second meaning implies that individual learning does not always result in organizational learning. In order to be able to separate the two meanings of organizational learning, the concept Organizational Learning will henceforth refer to the second meaning, that is also changes in organizational knowledge. Otherwise we use the term Individual Learning, or only learning, where Organizational Learning in accordance with the first meaning is included. When knowledge moves from the individual to the organization, organizational progress is made (Gore and Gore, 1999). Under what conditions does individual learning become organizational knowledge, i.e., means organizational learning? Agyris and Schön (1996) recognize two distinct but complementary answers:

- Organizations function as holding environments for knowledge. For example, in the minds of individuals, organization’s files for actions, decisions, policies etc, as well as in physical objects that members use as references and guideposts as they go about their business.
• Organizations directly represent knowledge in the sense that they embody strategies for performing complex tasks that might have been performed in other ways.

Some parts of organizational knowledge described above can be interpreted as casual in the view of the organization; knowledge in the minds of individuals will not remain when employees leave. We interpret it as concerning a large number of individuals, and therefore it is not casual. Change in organizational knowledge is something that takes time and presupposes that more than one individual has learnt the same thing. There must be some kind of “collective individual learning”. From this perspective, Organizational Learning is considered to depend on the collective cognitive processes of individuals (Yeo, 2005). Nonaka and Takeuchi (1995) discuss learning as consisting of two kinds of activity:

• Obtaining know-how in order to solve a specific problem based on existing premises
• Establishing new premises to override the existing ones.

We consider that the first of these activities corresponds to Individual Learning. This kind of individual learning results in changes in individual knowledge, but does not imply changes in organizational knowledge. The second activity corresponds to OL, changes in individual knowledge imply changes in organizational knowledge, because new premises in an organization presuppose that more than one person shares them. Creation of knowledge involves interaction between these two activities (Nonaka and Takeuchi, 1995), and therefore changes of knowledge, both individual knowledge and organizational knowledge, involves interaction. Organizational knowledge creation is a process that organizationally amplifies the knowledge created by individuals and crystallizes it at the group level (Nonaka and Takeuchi, 1995). A great leverage for an organization to move toward becoming a learning one lies in capturing the artefacts of the collective cognition of organizational members (Yeo, 2005). This is in accordance with our use of the concept Organizational Learning.

Organizational Learning that results in changes of the part of organizational knowledge that concerns the culture, presupposes questioning values and assumptions (compare with Figure 4:2). Organizational Learning has been referred to as Double loop learning in contrast to Single loop learning:
• Single loop learning: Learning changes the strategies, but leaves the values unchanged (Agyris and Schön, 1996). Individuals become more proficient at what they already can do (Jensen, 2005). How to achieve existing goals without changing organizational performance, values etc.

• Double loop learning: Learning that results in changes in the values (Agyris and Schön, 1996). Strategies may change concurrently or as a consequence.

In accordance with our definition of OL, that OL results in organizational knowledge, both single loop learning and double loop learning are Organizational Learning since both require individual learning and imply changes in organizational knowledge. Double loop learning concerns the culture, and therefore takes a long time. In a LO organizational learning is a part of the culture (Schein, 2004).

Learning requires interaction between knowledge and individuals. If this interaction exists in a group, knowledge will hopefully be spread among its members and result in both individual and organizational learning. The organization must support and stimulate the knowledge-creating activities of individuals (Nonaka and Takeuchi, 1995). Group processes as well as organizational processes must be organized in such a way that they enable both individual and organizational learning. The processes must enable knowledge dissemination and the culture must encourage knowledge sharing. How an organization manages its knowledge is therefore crucial for organizational development (Blodgood and Salisbury, 2001). Knowledge management (KM) is about managing knowledge.

4.2 Knowledge Management – the research domain

In order to gain and sustain competitive advance organizations must learn and manage their knowledge resources. Learning in organizations requires that an individual uses information to create knowledge, and transforms knowledge into information that other members of the organization can use (Jensen, 2005). Supporting this is what KM is about.

This section focuses on describing our research domain, Knowledge Management. While we discuss how knowledge relates to concepts such as information and data in Section 4.2.1, we describe different types of knowledge in Section 4.2.2. These sections are then the basis when we provide an overview of KM as it is described in the literature in Section 4.2.3.
4.2.1 Knowledge – information – data: How do they relate?

There is no commonly accepted definition of these relationships, and our experience indicates that in practical life they are often used interchangeably. This is something we have to be aware of when carrying out empirical studies. Nevertheless, these concepts are not interchangeable (Davenport and Prusak, 1998).

“Understanding what those three things are and how you get them from one to another is essential to doing knowledge work successfully.” (Davenport and Prusak, 1998, p. 1).

This section aims to define what we mean when we use these concepts in this thesis. We are aware that more related concepts than these three exist, e.g., wisdom and competence. However, in view of our research purpose and the concepts we have experienced that organizations use, these three were chosen.

One common view in the IS community is that information is interpreted data (Avision and Fitzgerald, 1998; Langefors, 1966). The word “interpreted” here refers to “interpreted by people”. Wiig (1993) defines the relationship by claiming that for data to be information it must be presented in context, indicate some purpose, and be organized so that it has relevance to a problem, issue or something else. Compared to data, information has a meaning (Davenport and Prusak, 1998). These two views do not necessarily contradict one another. It is a matter of the requirements for the interpretation. Must people be involved in this interpretation? In accordance with the second view we claim that interpreting data so that it becomes information can be achieved by putting the data in a context. In this thesis information is interpreted data, where interpretation does not require the involvement of people. This is in accordance with Davenport and Prusak (1998) who compare information with a message; it has a sender, a receiver, and a purpose.

Knowledge derives from information (Davenport and Prusak, 1998; Wiig, 1993). It is constructed through processes of social interaction, where issues of power and social inclusion/exclusion come to the forefront (Swan, Scarborough and Preston, 1999). The importance of culture is obvious. Activities aiming to create knowledge take place within or between people (Davenport and Prusak, 1998), but the real transformation process, when information changes to knowledge, is individual and happens within people. Furthermore, knowledge has a potential to generate action (Davenport and Prusak, 1998; Schreiber, Akkermans, Anjewierden, de Hoog, Shadbolt, Van de Velde and Wielinga, 2000). It also has a function to produce new information (Schreiber et al, 2000), which is important in the view of KM. The relationship between data, information and knowledge, is described in Figure 4:3.
4.2.2 Different types of knowledge

There are different types of knowledge (e.g., Nonaka and Takeuchi, 1995), and with respect to knowledge type, IT has different capabilities (e.g., Hansen, Ireland and Hoskisson, 1999; Blodgood and Salisbury, 2001; Nonaka and Takeuchi, 1995). In the literature there are different kinds of categorizations. Common distinctions are between internal and external knowledge as well as explicit and tacit knowledge. Wiig (1993) terms knowledge that people hold in their minds internal knowledge. Knowledge that is held, e.g., in books and IT systems, is external knowledge. Based on the discussion in the former section, we claim that external knowledge is the same as information.

This work concerns IT-supported KM. When “knowledge” is kept outside of people, e.g., in a repository, it is its corresponding information which is stored, not the knowledge itself. External knowledge is independent of people, and can therefore, from the perspective of an organization, be thought of
as organizational knowledge. Another type of knowledge is embedded in products, systems, structures etc. (e.g. Wiig, 1993; Davenport and Prusak, 1998). This can also be regarded a type of external knowledge. According to Davenport and Prusak (1998), embedded knowledge is independent of those who have developed it, and thus because of that it has some organizational stability.

Another common distinction in the literature is between tacit and explicit knowledge (see e.g. Gore and Gore, 1999; Loermans, 1993; Nonaka and Takeuchi, 1995; Wiig, 1993). Tacit knowledge is not easy to identify and to express (e.g. Nonaka and Takeuchi, 1995; Blodgood and Salisbury, 2001). Explicit knowledge is easier to express and can, in contrast to tacit knowledge, also simply be processed by a computer (Blodgood and Salisbury, 2001; Nonaka and Takeuchi, 1995). However, tacit knowledge is highly personal and concerns insights and intuition. It is rooted in individual actions, experiences, ideals etc. (Gore and Gore, 1999; Nonaka and Takeuchi, 1995). This type of knowledge is at the same time contextual and culturally influenced (Busch and Richards, 2004). It can be difficult to identify if tacit knowledge really is tacit or if it is embedded. Identifying if tacit knowledge really is tacit or embedded can be difficult, i.e., is it tacit knowledge that drives the process or is it embedded in the product (Davenport and Prusak, 1998)? Embedded knowledge can be tacit for one person and explicit for another, depending on how and where it is embedded, and how consciously an individual uses it.

Loermans (2002) describes tacit knowledge as knowledge that resides in people’s minds, and explicit knowledge as knowledge that has been documented and codified. We consider this description concerns what we term external and internal knowledge in this thesis. Furthermore, from the perspective of a person, tacit knowledge can be compared with embedded knowledge. Explicit knowledge can either be internal or external. Internal knowledge can be further categorised into two categories (Gore and Gore, 1999; Wiig, 1993). Table 4:1 summarizes the relationships between tacit/explicit and internal/external. Internal tacit knowledge is personal and inaccessible to the conscious mind, e.g., “know-how”, and internal explicit knowledge is available to our conscious mind (Wiig, 1993).

<table>
<thead>
<tr>
<th>Table 4:1. Different types of knowledge from the perspective of an individual</th>
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<td>Tacit knowledge</td>
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<td>Explicit knowledge</td>
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45
KM aims to support learning, changes in knowledge. A key to this is the degree to which tacit knowledge can be captured and transformed into explicit knowledge (Gore and Gore, 1999). This can be compared with one of the knowledge conversion modes in the learning spiral of Nonaka and Takeuchi (1995) who define four modes:

- **Socialization** (from tacit to tacit): Starts by building teams whose members share experiences and mental models
- **Externalization** (from tacit to explicit): Triggered by successive rounds of meaningful dialogue using metaphors and analogies in order to reveal hidden tacit knowledge
- **Combination** (from explicit to explicit): Concepts formed by the team are combined with existing data and knowledge outside the team to create more shareable specifications
- **Internalization** (from explicit to tacit): The new explicit knowledge is used to broaden, extend, and reframe their own tacit knowledge.

This learning spiral is well-known and often referred to. It has its epistemological foundation in the distinction between tacit and explicit knowledge. Interaction between these types of knowledge—knowledge conversion—is performed by individuals, not by the organization itself. If the knowledge is to spiral itself organizationally, it must be shared with others or amplified at the group or divisional level. The context should be distinguished by what characterizes a Learning Organization.

The core of organizational knowledge-creation processes takes place at the group level, but the organization provides the necessary conditions. From the perspective of internal and external knowledge we find that socialization and externalization concern internal knowledge, combination external knowledge, and internalization both external and internal knowledge. If tacit knowledge is to be shared within an organization, it has to be converted to explicit knowledge, and it is when this conversion takes place that organizational knowledge is created (Nonaka and Takeuchi, 1995). One important aspect of KM is to “make” knowledge explicit, so that it can be transformed to information and disseminated to other members of the organization through an IT-system.

Different types of knowledge demand, or belong to, different types of strategies (Wong and Aspinwall, 2004; Blodgood and Salisbury, 2001), and with respect to knowledge type, IT has different capabilities (e.g. Blodgood and Salisbury, 2001; Nonaka and Takeuchi, 1995). Explicit knowledge is easily definable and accessible, and also easily transmitted through IT systems (Blodgood and Salisbury, 2001; Gore and Gore, 1999; Nonaka and Takeuchi, 1995).
4.2.3 Knowledge Management - an overview

KM concerns managing knowledge in such a way that benefits the organization. This includes knowledge sharing; to manage the knowledge so that knowledge relevant to the organization can be easily captured, spread, and used. KM refers to the process in which organizations assess the data and information that exist within them (Kezar, 2005), and then store and disseminate it for people to transform into knowledge for the purpose of learning. Thus, KM focuses on the result, the output from the learning process (Loermans, 2002).

KM should include both explicit and tacit knowledge, because if it only concerns explicit knowledge then it could be difficult to distinguish it from information management (Loermans, 2002). Learning requires that individual personal knowledge is transformed into information that other members of the organization can use (Jensen, 2005). KM is a response to the concern that people must be able to translate their learning into usable knowledge (Kezar, 2005). When we store knowledge in a knowledge repository, we transform knowledge to information and store the information, since this is the only way we can store knowledge. This information, or stored knowledge, is accessible for other employees to use, i.e., it is usable knowledge in their learning process. Translating individual learning into information, or stored knowledge, that others can use is one important part of KM. This discussion is summarized in Figure 4:4.

![Figure 4:4. KM from the perspective of learning](image)

IT is a prerequisite for effective KM (e.g. Holsapple, 2005; Screiber, et al, 2000; Wong and Aspinwall, 2004), and when KM is discussed in this thesis we refer to IT-supported KM. Technology used effectively to communicate is one prerequisite of a learning organization (Sandelands, 1999). Furthermore, certain kinds of technology can be considered better drivers or facilitators for achieving the status of Learning Organization (Sicilia and Lytras, 2005). For example, Semantic Web technology is a potential catalyst for
learning organizations (Sicilia and Lytras, 2005). Thus, KM involves a combination of technical and human elements (e.g. Davenport and Prusak, 1998; Bubenko jr et al, 2001; Wong and Aspinwall, 2004), but the actual KM is carried out by people (Bubenko jr et al, 2001). In addition, to provide value, KM must have a vision (e.g. Davenport and Prusak, 1998; Jarrar, 2002; Nonaka and Takeuchi, 1995; Mentzas, 2001). For example, which business goals should the codified knowledge support? Setting goals is a management issue (e.g. Davenport and Prusak, 1998), and management has a central role in KM (e.g. Gore and Gore, 1999; Jarrar, 2002).

In the KM context, IT has two generic capabilities: codifying knowledge and creating networks (Hansen et al, 1999). KM work using IT-supported knowledge repositories, as it is described in this thesis, creates some sort of network for the purpose of disseminating information codified and stored in the repository. While codifying and storing knowledge is more appropriate for explicit knowledge, creating networks in order to enable people to share knowledge directly is more appropriate for tacit knowledge (e.g. Davenport and Prusak, 1998; Blodgood and Salisbury, 2001). In the effort to codify tacit knowledge, its critical components can be lost, and actual knowledge can also more easily be imitated by external entities/organizations (Blodgood and Salisbury, 2001). It is thus important, when attempting to transform tacit knowledge to explicit, to thoroughly consider how central it is for the organization, from the perspective of competitive advantage, and if imitation by other organizations could eliminate this competitive advantage (Blodgood and Salisbury, 2001). If there is a risk transforming tacit knowledge to explicit, keeping track of people with particular knowledge is an alternative (Blodgood and Salisbury, 2001). It is important to identify the tacit knowledge and decide to what extent an organization can or should codify it. However, recognizing the degree of tacitness of the organization is a difficult task (Blodgood and Salisbury, 2001). Often, according to Blodgood and Salisbury (2001), managers have to rely on their intuition to do this, but new metrics, such as the ones developed by Edvinsson and Malone (1998), could be used.

There are different types of KM depending on how they aim to support learning. Organizations learn and build knowledge for different purposes and with different methods. Therefore we need to consider it from the perspective of how organizations accumulate knowledge, insights, and valuable expertise over time (Wiig, 1994). Based on this, Wiig (1994) has categorized KM into three different types:

1. **Accumulate knowledge in people:** Train and educate people in order to transfer skills and know-how, and improve ways of performing tasks. This type accumulates knowledge by distributing it between the members of an
organization, and an IT-supported knowledge repository can be used to support the distribution of knowledge. Even if knowledge is accumulated in people and results in individual learning, it can also result in changed routines. Thus interaction between Individual Learning and OL is clear. In relation to Figure 4:4 “Information” is disseminated among people through communication. With regard to IT we can identify blogs, networks, discussion forums etc.

2. **Accumulate knowledge in repositories outside people**: Document knowledge and build repositories and databases for the purpose of distributing knowledge. This type accumulates knowledge by, e.g., storing its corresponding information, which is independent of an organization’s members, in computerized repositories. This knowledge is thus available to an organization even when a member leaves. Accumulated knowledge such as this is organizational knowledge, which constitutes a part of the organizational explicit memory. From this perspective it results in a change of organizational knowledge, and must be regarded as a result of OL. Even if the knowledge is accumulated outside people and results in OL, it also results in individual learning when a member of the organization uses the organizational memory. Consequently, the interaction between Individual Learning and OL is clear. In relation to Figure 4:4 “Information” is disseminated among people through some kind of media where it is stored. We can use IT to store and disseminate data and information.

3. **Accumulate knowledge by embedding it, for example, in routines outside people**: Embed knowledge in standards, technology and operating practices in order to improve technology and the way it is used. This type accumulates knowledge by embedding it in processes, routines etc. outside people. It is available to an organization even when a member leaves, and is therefore a result of OL. When the knowledge is accumulated outside the people and results in OL, it also leads to individual learning when a member of the organization uses the standard, or participates in the practice. Thus, the interaction between Individual Learning and OL is clear. In relation to Figure 4:4 “Information” is disseminated among people through the use of routines, technology etc. When building and developing an IT supported knowledge repository, knowledge in the form of links, structures etc. will be embedded, as well as in the routines for using the application.

In order to further describe KM and to position the research focus the spectrum of Binney (2001) is used. Binney (2001) presents a more comprehensive view compared to many others, e.g. Nonaka and Takeuchi (1995), Edvinsson and Malone (1998), Davenport and Prusak (1998). The KM spectrum consists of the following six elements (Binney, 2001):
1. **Transactional KM**: This element embeds knowledge in the application of a technology. The use of it is through interaction with the system in a transaction to assist a customer problem, e.g., Help Desk applications. When building knowledge outside people through storing it in computerized repositories, embedded knowledge is in the application. The routines for interacting with this application also include embedded knowledge. This element can be compared to the type Wiig (1994) describes as embedded knowledge in standards, technology etc, and constitutes a side-effect with regard to the type of KM our research is focused on.

2. **Analytical KM**: This element creates new knowledge from large amounts of data or information, e.g., Data Warehousing. It is outside our research area because the tools in themselves create the new knowledge.

3. **Asset management KM**: This element focuses on processes associated with the management of knowledge assets, both the management of codified explicit knowledge and that of codified intellectual property, e.g., Knowledge Repositories. Furthermore, this element concerns the codification of tacit knowledge into explicit knowledge, and making it available for others in the organization to share. Our research addresses this element.

4. **Process-based KM**: This element covers knowledge concerned with improvements of work-processes, e.g., Business Process Engineering (BPR) and Methodology. This element is enabled by, e.g., Process Modelling Tools, and, as with the previous one, is concerned with the codification of tacit knowledge into explicit knowledge and making it available to be shared by others in the organization. Our research addresses this element.

5. **Developmental KM**: This element aims to increase the competencies and capabilities of the knowledge workers in an organization, e.g., skills development and teaching. It covers both the transfer of explicit knowledge and the planned development of tacit knowledge. In addition, this element is enabled by, for example, On-line and Computer-based training. While this element is important for all KM work, how it is done is not within the scope of this thesis.

6. **Innovation/creation KM**: This element provides an environment in which knowledge workers can meet in teams and collaborate for the purpose of creating new knowledge, e.g., Virtual teams. This element is enabled by, e.g., e-mail and Video Conferences. Although, it is not focused on in this thesis, because it mainly concerns supporting members’ ability to meet, this element is an important parallel process.
From the perspective of Binney (2001), knowledge repositories include both a product and process perspective in the form of “Asset management KM” and “Process-based KM”.

When modelling knowledge processes one important aspect is identifying variables that can be affected by management (Davenport and Prusak, 1998). The organizational culture constrains the efficient use of IT tools designed to facilitate knowledge creation, capture, storage and distribution (Park et al, 2004). There is a correlation between cultural attributes, the successful implementation of KM technology and knowledge sharing (Park et al, 2004). Examples of cultural attributes that have high or moderate correlation with KM technology and knowledge sharing include team-oriented work, sharing information freely, trust, and employee support. Attributes that have a negative relationship include calmness, compliance, and stability (Park et al, 2004). For KM initiatives to be successful there must be a supportive knowledge-sharing organizational culture. However, a process of cultural change is extremely difficult and time-consuming (Park et al, 2004). People judge information on the basis of who provides it (Davenport and Prusak, 1998). This fact implies both encouraging a culture where the quality of the knowledge is more important than the source (Davenport and Prusak, 1998), and to clearly showing the source.

To implement KM is not an easy task (Wong and Aspinwall, 2004). Gore and Gore (1999) argue for the creation of a vision as the first step, followed by a review of the existing organization of explicit knowledge. A second area according to Gore and Gore (1999) concerns when new information becomes available, which is often in the form of a new IT system. This could be compared with externalization in the learning spiral of Nonaka and Takeuchi (1995). While implementation seems to be easier in a new project (Remus and Schub, 2003), the real challenge is to launch KM after the project is ended. Davenport and Prusak (1998) present a number of factors that lead to the success of knowledge projects:

- a knowledge-oriented culture
- technical and organizational infrastructure
- senior management support
- a link to economics and industry value
- a modicum of process orientation
- clarity of vision and language
- nontrivial motivation
- some level of knowledge structure
- multiple channels for knowledge transfer
The most critical factors, according to Davenport and Prusak (1998), include the knowledge oriented culture, organizational (human) infra-structure, and senior management support. Carrying out Knowledge Management requires parallel work at the strategic level as well as operational level. Hung et al (2005) put it this way:

“… [KM is] a systemized and integrated managerial strategy, which combines information technology with the organizational process. Knowledge management is a managerial activity which develops, transfers, transmits, stores and applies knowledge, as well as providing the members of the organization with real information to react and make the right decisions, in order to attain the organizational goals” (Hung et al, 2005, p 165).

While the management has the responsibility for the strategic level, all the members of the organization are responsible for the daily KM work. The literature describes activities which are essential in daily KM work. Although these descriptions initially appear to differ, an analysis of many of them reveals that the activities which appear are almost the same, but have different names.

- Create and discover/identify knowledge
- Store knowledge (information, our remark)
- Use, i.e. share and apply knowledge
- Transform/innovate knowledge

These activities are performed at an operational level. Most people in an organization that carry out KM activities need to execute them in their daily routines (Davenport and Prusak, 1998). It is important that employees who do not participate in a distinct KM process understand the essential steps they have to accomplish (Remus and Schub, 2003). The first and last activities are somewhat partly similar and the cyclic nature is obvious. The success of the performance of these activities depends on the strategic level as well as the organizational culture. What knowledge with regard to the strategy should be stored? How is the knowledge stored, and which technology is used? Do the members of an organization want to contribute with knowledge and share with others? In order to provide value, KM must be adapted to business and knowledge processes (Remus and Schub, 2003). This is a management issue. According to Davenport and Prusak (1998) an organization that wants KM to succeed must perform well with three sub-processes: Knowledge generating, Knowledge Codification and Coordination, and Knowledge Transfer. In the following we summarize the three sub-processes identified by Davenport and Prusak (1998).
Sub-process 1 Knowledge Generation: This sub-process concerns performing activities to increase knowledge. There are different modes of knowledge generation:

- Acquisition: e.g., buying knowledge from hired individuals with a specific kind of knowledge
- Dedicated resources: establishing units for a special purpose
- Fusion: bringing people with different perspectives together for the purpose of working on a special project
- Adaptation: refers to a firm’s ability to adapt which mainly depends on existing resources being utilized in new ways and employees being open to change
- Knowledge networking: relates to groups of knowledgeable people being brought together by common interests

Sub-process 2 Knowledge Codification and Coordination: This refers to putting organizational knowledge in a form that makes it accessible to those who need it, and it corresponds to the activity storing knowledge, i.e., how to codify without losing anything important.

“"The challenge is to codify knowledge and still leave its distinct attributes intact, putting in place codification structures that can change as rapidly and flexible as the knowledge itself" (Davenport and Prusak, 1998, p. 87).

Some structure is needed, but too much destroys it. Four principles for successful coding are as follows:

- Principle 1: What business goals should the codified knowledge serve? This is the why-perspective. What knowledge should we store, and why? Since this is a management decision, the importance of a KM vision and strategy is obvious. This principle is necessary for the activity to discover knowledge. Consequently, it must be a common vision in the organization, and thus accords with Senge’s discipline of a common vision. Furthermore, without this principle it is impossible to know what knowledge to discover. It is also a requirement of the two following principles.
- Principle 2: Identify knowledge appropriate to achieve these goals, regardless in which form it exists. While this is also a management responsibility, we consider this work is carried out by the members of the organization. This principle is important to bear in mind when carrying out the activity to discover knowledge. Is the knowledge discovered relevant with respect to the business goals it should serve?
- Principle 3: Evaluate knowledge to identify if it is useful and appropriate for codification. Although this is a knowledge manager’s responsibility, we consider that this work requires a dialogue between the codifier and
the members who have identified the knowledge in the former sub-
process. This principle concerns the activity to store knowledge.
• Principle 4: Identify an appropriate medium for codification and distri-
bution. Davenport and Prusak (1998) argues this is the codifier’s respon-
sibility, but we stress the importance of an IT-strategy. This principle de-
limited the activity of storing, as well as how the knowledge stored can
be used, i.e. the third activity.

All of these principles are important for KM work. Although, management is
mainly responsible for them, the actual KM work is carried out by the mem-
ers of the organization.

Sub-process 3 Knowledge Transfer: More or less structured knowledge is
always transformed in the firm. When there is a need to transfer knowledge,
the methods in use must suit the culture. The method of transfer will influ-
ence velocity; the speed with which knowledge moves through an organiza-
tion, and viscosity, to what extent the original knowledge is actually ab-
sorbed and used. There are many cultural factors that inhibit knowledge
transfer, and influence its success. Examples of these cultural factors include
trust, vocabularies, frames of references, time, reward system, and intolera-
ce for mistakes or need for help. They are a part of the organizational cul-
ture. Furthermore, transfer requires a common language. People who share
the same culture can communicate better and transfer knowledge more effec-
tively than people who do not.

Substantial portions of these three sub-processes concern the strategy and the
organizational culture. The significance of the problem domain, the Learning
Organization, for the success of KM is obvious, and must been taken into
consideration.

Knowledge processes can also be categorized according to whether they
concern knowledge creation or knowledge reuse (Davenport, Jarvenpaa and
Beers, 1996). This thesis focuses on knowledge reuse. Despite its importance
and that research about it exists, knowledge reuse is relatively unintegrated
(Markus, 2001). The knowledge reuse process includes the following stages
(Alavi and Leidner, 1999; Andersen Consulting, 1999):

• capturing or documenting knowledge
• packaging knowledge for reuse
• distributing or disseminating knowledge
• reusing knowledge

These stages are in accordance with the four activities discussed above. In
the knowledge reuse process there are three different roles (Markus, 2001):
knowledge producer or source, knowledge intermediary, and knowledge consumer or reuser. These roles can be executed by the same or different human(s) or group(s), and they can also be performed by IT (Markus, 2001). From the perspective of our research the IT-supported knowledge repository corresponds to the knowledge intermediary. When a knowledge consumer wants to reuse knowledge the following four activities are performed (Markus, 2001):

- Defining the search question
- Searching for, and locating, experts or expertise
- Selecting an appropriate expert or expert advice from the results of research
- Applying the knowledge

Defining the search question is an essential step, and knowing what question to ask is one aspect that separates experts from novices. We consider these activities should be performed in an iterative manner. This is in accordance with Foster’s (2005) non-linear model of information-seeking behaviour. Foster’s model identifies three iterative core processes, which are performed within the limit of a cognitive approach, as well as an internal and external context. Foster’s core processes include activities such as problem definition, seeking and exploring information, as well as judging and integration. These activities are in accordance with Markus’s four activities. When a knowledge consumer reuses knowledge there is a type of knowledge mediation. Braf (2004) identifies three basic types of knowledge mediation:

**Knowledge mediation triggered by specific problems:** The person needing knowledge is the one who initiates this type of mediation. The need is a result of an experienced specific problem and the motive that initiates the mediation is to solve the problem. The person requiring the knowledge wants to use the knowledge directly, and pulls it from different sources from an evaluating approach. We consider that this type of mediation concerns the operational level, and is performed by members of the organization in their daily work. The ease of finding relevant knowledge depends on the organization’s maturity with regard to KM and being a learning organization. This is an issue for the strategic level.

**Knowledge mediation triggered by typical problems:** The person needing knowledge is not the one who initiates this mediation. The motive that initiates this type of mediation is to solve the typical problem. While the typical problem might originate from specific ones, this concerns dealing with a general problem in order to reduce those of the future. The person who initiates this is not a knower or a knowledge needer, but rather a third person, for example, a staff manager. This type of mediation tends to require some
planning and structure, and the initiator pushes knowledge in a more designed approach compared to the former type. When and by whom this knowledge will be utilised depends on the future. We consider that this type of mediation concerns the strategic level, even if future utilization is done at the operational level by members of the organization in their daily work.

**Non-problem driven knowledge mediation:** Any person can be the one who initiates this type of knowledge mediation. This type is more a pure coincidence influenced by personal attitudes and interest, and performed with an evaluating approach. The mediated knowledge could be used directly, in the future, or not at all. Even if the concrete knowledge mediation is performed by members in their daily work, we consider that this type of mediation concerns the organizational culture. Does the culture stimulate curiosity, a positive attitude to share knowledge?

In all the three types of knowledge mediation both the strategic and operational levels are present, although with different dominance. The first two are triggered by an experienced problem, and Markus’s (2001) four activities are applicable, but in different perspectives. The first type, triggered by a specific problem, has the same perspective as Markus (2001), the consumer of knowledge. The second one, triggered by a general problem, is more from the supplier’s perspective. Despite this, we consider Markus’s four activities applicable even here. The third, triggered by coincidence, has no correspondence in the activities described by Markus (2001). IT-supported knowledge repositories could be a source from which knowledge is pulled as well as pushed. Therefore, the first two types of knowledge mediation are the most relevant for this thesis, and thus, as a consequence, Markus’s (2001) four activities.

Markus (2001) also identifies four types of knowledge reuse situations, mainly differentiated by the purpose of the reuse and the knowledge reuser in relation to the source. In the first two groups the consumer and producer are the same or similar. In the last two the consumer differs substantially from the knowledge creator. These last two groups have been called knowledge transfer as opposed to knowledge sharing with colleagues. The four knowledge reuser groups Markus (2001) identifies are:

**Group 1 Shared work producers:** The knowledge reuser is closest to the source because they actually produce the knowledge themselves. There are two different types in this group, homogenous groups (e.g., software development teams), and cross-functional teams (e.g., project teams). This group has few challenges in their knowledge reuse because they themselves create and document the knowledge they later reuse. Their primary problems are
capturing ones and searching through records to find what they want. We regard this as knowledge mediation mainly triggered by a specific problem.

**Group 2 Shared work practitioners:** The knowledge reuser is close to the source. Knowledge is produced for each other’s use. This group comprises people with the same role but in different places. Although, they share general knowledge, they have difficulties reusing knowledge produced by other members of their community. One reason could be a lack of the needed contextual knowledge. They have difficulties selecting from available documents, and the reputation of the person who contributes the document is important for the selection. However, once they locate and select the knowledge they need, they have few difficulties applying it. Shared work practitioners often rely on networks. From the perspective of the knowledge reuser, we regard this as knowledge mediation triggered by a specific problem. From the perspective of the initiator who pushes the knowledge that will be reused, we consider this as knowledge mediation triggered by a general problem.

**Group 3 Expertise-seeking novices:** This refers to novices’ access to experts and expertise. They experience difficulties in all the stages of knowledge reuse. It is difficult to define the search question, locate and select experts and expertise, and reuse even carefully packed knowledge, i.e., applying expert answers and advice. In the worst cases they do not even know that they need experts. These difficulties increase the further away the reusers are from the knowledge producers in terms of knowledge. When they have a specific search question, they experience difficulties in their selection activity. We consider that knowledge mediation for this group is often triggered by pure coincidence influenced by personal attitudes and interest.

**Group 4 Secondary knowledge miners:** These people are often divorced from the source of knowledge they want to use. They have a more analytical expertise that novices lack, and if they use a disciplined methodology their chances of reuse may be greater than those of the typical novice. This includes data mining. It is unclear to us which knowledge mediation dominates here, but we interpret it as mainly triggered by a specific question.

The two first groups both need contextualized knowledge whereas work practitioners can use raw records more effectively. Expertise-seeking novices need decontextualized knowledge, but contextual information in order to re-contextualize information for their unique settings. Secondary knowledge miners can benefit from in-depth knowledge of the contextual influences on the creation of records stored in repositories (Markus, 2001). From the perspective of our research focus, we can claim that different groups of users need different things from repositories. In the organization the reposi-
tory together with its members form the Knowledge Management Systems. Both the IT-system and the users are necessary for its success. The IT-supported knowledge repository has no value if it does not meet user requirements and supports the organization in achieving its vision. The importance of user satisfaction is obvious. However, it is not enough to meet user requirements in the form of knowledge needs. The system must also be easy to use, integrated into their processes, work properly technically etc. The similarities with IS are obvious.

To summarize, Knowledge Management aims to support learning in order to create value for the organization, and is, according to Kezar (2005), a response to the concern that people must be able to translate their learning into usable knowledge. An organization cannot afford not to manage its knowledge and corresponding information. There is no consensus concerning how to define KM, but based on our literature review and how Jennex et al (2007) describe KM success, the working definition of KM used in this thesis is as follows:

KM is to provide the appropriate knowledge to those that need it when it is needed with the purpose of improving organizational effectiveness in order to be competitive, reach business objectives and and be profitable. This includes knowledge reuse and learning, i.e. knowledge creating.

One part of KM is IT-supported knowledge repositories.

While KM is a management issue, the real KM work is carried out by the members of an organization. How successful this work is depends on strategy and organizational culture, closely followed by IT (Hung et al, 2005). The importance of the context, the learning maturity in the organization, is clear. In order to provide value, KM must be adapted to business and knowledge processes (Remus and Schub, 2003), and it must have a vision (e.g. Davenport and Prusak, 1998; Nonaka and Takeuchi, 1995; Remus and Schub, 2003).

The scene has been set for us to present our research method and our contributions. Our contributions depict how we achieve the research objectives, and are the results from carrying out the research process. In the next chapter we describe our research process.
5 Research Method

The main difference between formal research and other knowledge seeking activities is how the process is carried out and that research is highly self-conscious (Williamson with Burstein and McKemmish in Williamson, 2002). The method, “... the process of knowing...” (Gummesson, 2001, p.27) is the research design aiming to achieve the research aim. The research method must therefore be both chosen and criticized taking the aim of the research into account (Chalmers, 1999). The purpose of this chapter is to describe and discuss the research method from the perspective of the research aim:

Contribute to increasing the usefulness of IT-supported knowledge repositories by supporting the process of capturing new knowledge to be included in the repository.

In order to achieve this research aim a literature review and an empirical study have been conducted in parallel. The literature review has been used to gain “new” general knowledge. It is general in the sense that it is not limited to a specific domain. This knowledge has also guided us in setting up the empirical study. Furthermore, the empirical study has been used to gain knowledge and understanding about developing an IT-supported knowledge repository in “real life”, as well as given us an opportunity to practice theories in an organizational context.

The literature review (Section 5.2.2) included both books and papers, and focused on the KM literature as well as the literature about learning organizations. The empirical study (Section 5.2.1) was a case study with action research components. It was conducted through participation in the project Efficient Knowledge Management and Learning in Knowledge Intensive Organizations (EKLär)\(^2\). All the data have been analyzed using a qualitative approach (Section 5.2.3) in order to achieve the research objectives.

In this chapter we present our points of departure, summarize what we have done and argue for our methodological choices. Section 5.1 describes the points of departure and how the research process was planned, Section 5.2

\(^2\) Supported by Vinnova, The Swedish Governmental Agency for Innovation Systems.
shows how the research process has been conducted, while Section 5.3 discusses the suitability of the chosen process as well as its strengths and weaknesses.

### 5.1 Points of departure

Earlier experiences influence our way of thinking and interpreting the world and accordingly also our methodical choices. We have entered the Knowledge Management area from an Information Systems (IS) perspective in which the information technology (IT) artefact is taken for granted. We also have a pedagogical background, including a teacher’s degree, and many years of practical teaching experience. Thus, even if the specific learning process is outside the scope of this thesis, we can never forget the importance of the learning process for all types of KM work. Hence, our pedagogical experiences also influence the research work presented in this thesis.

The world is complex. The aim of research and theory development is to manage the world, as well as to gain knowledge about it (Chalmers, 1999; Holme and Solvang, 1997; Williamson with Burstein and McKemmish in Williamson, 2002). This is in accordance with the ontological approach called relativism (Chalmers, 1999; Patton, 2002). Developing an IT-supported knowledge repository is a complex task. A knowledge repository interacts with and is dependent on other things in the world such as IT, people, organizations etc. In order to improve the development and management of knowledge repositories we must understand them from a holistic perspective, both how they relate to other things in the world and what they are about. A system is a number of related objects (Langefors, 1966; van Gigch, 1991), which in turn relate to other systems (Avison and Fitzgerald, 1998; Eriksson, 1986). We thus claim that before we could develop guidance for the process of continuously capturing knowledge to be incorporated in an IT-supported knowledge repository, we were forced to study KM and knowledge repositories from a holistic perspective which meant using a system approach. This includes studying KM from the three levels of inquiry (why, what, how) as described by Van Gigch (1991).

This research aims to contribute to increasing the usefulness of IT-supported knowledge repositories. Hence, the results emerging from this research work should contribute to practice. A pragmatic approach implies an interest for actions in their practice context; what are the practical consequences, as well as what works and what does not work (Goldkuhl, 2004). Thus, we must gain knowledge about developing IT-supported knowledge repositories in reality. Knowledge about reality is gained through social construction, such as, e.g., language, consciousness, shared meanings and documents. This is in
Thus, an interpretive field study of an implementation of a knowledge repository was performed within the EKLär project. To assess quality in this interpretive study, the work was guided by ideas that are conceptualized in the principles proposed by Klein and Myers (1999).

A qualitative research process is suitable when the research purpose is to gain a better and deeper understanding of the problem, to see the whole (Holme and Solvang, 1997; Patton, 2002). This was required if we were to achieve our research aim and research objectives. Furthermore, since Research Objective 1 aims to characterize KM and Research Objective 2 the process of capturing knowledge, a descriptive study was suitable. A descriptive study aims to characterize a phenomenon and tends to use qualitative data (Tanner in Williamson, 2002). Hence, we collected and analysed qualitative data in order to understand the research area and then in some way characterize it. However, Research Objective 3, aims to give guidance for implementing the capture process, and a more prescriptive approach is required for this last objective.

A literature review is critical for any research project (Webster and Watson, 2002):

“...A review of prior, relevant literature is an essential feature of any academic project. An effective review creates a firm foundation for advancing knowledge. It facilitates theory development...” (Webster and Watson, 2002, p.xiii)

However, the points of departure imply that theoretical findings must be observed and tested in practice. Things, concepts etc., which have been studied in the literature, how are they used in reality? It is the application of a concept which becomes the criterion of its value (Dewey, 1931). It was therefore necessary to conduct both a theoretical study and an empirical study. While the empirical study rendered the possibility of observing things in their practice context, it also provided new perspectives in reading the literature. The theoretical study helped to identify what to focus on and how to act in the empirical study. Knowledge from the literature review was transformed to something useful in practice (Holme and Solvang, 1997). Thus the theoretical and empirical studies influenced each other, and simultaneously were inputs to the qualitative analysis, which merged these data.

Due to the case study performed in the EKLär project, the results have an internal empirical grounding, and in order to also achieve external empirical grounding we consulted experts in the field, both practitioners and researchers. Furthermore, the Enterprise Knowledge Patterns (EKP) approach that
we used in the EKLär case has been developed and applied throughout earlier projects funded by the European Commission: as Electrical Enterprise Knowledge for Transforming Application (ELEKTRA) and Hypermedia and Pattern Based Knowledge Management for Smart Organizations. Hence, the EKP approach has been validated and accordingly revised. The results of ELKTRA have been reported in ELEKTRA Consortium (1999) and in Roland et al (2000), and the results of the HyperKnowledge have been reported in Stirna et al (2002) and Persson et al (2003). The literature review resulted in external theoretical grounding, and the qualitative analysis results in internal theoretical grounding. Figure 5:1 summarizes this discussion.

There are no universal criteria for judging qualitative research (Patton, 2002). As Figure 5:1 illustrates, the research process is a part of the grounding. All research methods are affected by the targeted audience, not only by the purpose (Patton, 2002). Our audience comprises both researchers and other professionals in the field. Since this is a dissertation, it therefore also has an audience in the form of a committee, which will evaluate the quality of the methodological process (Patton, 2002). The only way to evaluate the methodological process is to judge what has really been done, and this requires a clear description of the process. Intuition is like a brother or sister to common sense (Gummesson, 2001), and not easy to describe. Thus Section 5.2 does not include a description of how our minds were thinking, only what we have done.
5.2 The research process

The research purpose and objectives should guide the delimitation of the objects of study, (Patton, 2002). Theory informs the research process and helps us to plan the research method (Williamson in Williamson, 2002). The process was planned and performed based on the points of departure, but is of course influenced by our earlier experiences in the IS area as well as in the pedagogical area. According to the points of departure a parallel literature study and an empirical study were conducted throughout the entire project. Since the theoretical data is influenced by the empirical study, and vice versa, and both studies have been inputs to the qualitative analysis the results can be described as a synthesis emerging from both the literature review and the empirical study. In some results it is easier than in others to identify and trace the empirical data, and other the theoretical data.

Now, the aim of our research is to **contribute to increasing the usefulness of IT-supported knowledge repositories by supporting the capture process**, and the research objectives of our research are as follows:

- **Research Objective 1**: Characterize Knowledge Management from three levels of inquiry (why, what, how).
- **Research Objective 2**: Characterize the process of capturing new knowledge to be included in IT-supported knowledge repositories.
- **Research Objective 3**: Develop guidance for facilitating implementation of the capture process so that relevant and correct knowledge is continuously captured.

Research Objective 1 concerns gaining *general* and holistic understanding that is not limited to one domain. Furthermore, it aims to reveal areas where research is needed. Thus, the importance of a theoretical review addressing Research Objective 1 is clear.

“An effective review … closes areas where a plethora of research exists, and uncovers areas where research is needed.” (Webster and Watson, 2002, p.xiii)

In the contributions related to Research Objective 1, the traceability of theoretical data is also clearer than compared to that of empirical data. Research Objective 2 and Research Objective 3 are about the specific process of capturing knowledge. To the best of our knowledge, the literature in general lacks a deep and detailed focus on the capture process in the context of IT-supported knowledge repositories and how it relates to other organizational processes. Thus, in the contributions related to Research Objectives 2 and 3,
the empirical element is clearer. The research process is described in Figure 5:2.

Figure 5:2. An overview of the Research Process

“Analysis and interpretation are part and parcel of the same issue: how to make sense of data” (Gummesson, 2005, p. 311), and this has also been regularly done throughout the whole process. The qualitative analysis is how sense has been made of the empirical and theoretical data, so it can be communicated to others through papers and this thesis (Williamson and Bow in Williamson, 2002).


There is no formula for how to do this, and results depend on the skills of the analyst (Patton, 2002) as well as methodological considerations in view of the research purpose and research objectives, i.e., “points of departure”.

While experts have been used to achieve external empirical grounding, submitting the results of the research to and attending peer reviewed conferences have exposed the research to other researchers, which enhanced the identification of any critical knowledge gaps existing in our research. Furthermore, results and ideas have been discussed with a professional expert in the field. This person works within the domain of our research in a large Swedish company as a HR manager, and is also a member of the Society for Organizational Learning (SOL)³. Henceforth, this person is referred to in this

³ www.solonline.org
thesis as “the professional expert”. Based on many years practical experience in our research area, the professional expert has the ability to evaluate if ideas and results are potentially useful in practice as well as give valuable inputs for how to proceed. The consultations with the professional expert were performed through two personal interviews based on open questions and e.mail conversations. Both interviews, which lasted 2 and 1.5 hours respectively, were recorded and transcribed. The e.mail conversations were more specifically aimed to ground particular results, on which the professional expert provided opinions in order to evaluate and further increase them. As mentioned, these consultations also provided valuable input in the same way as the case study.

Despite the fact that parallel studies were conducted, and collected data were continuously analysed, it was decided to describe them individually in this thesis for the sake of simplicity and clarity. Section 5.2.1 explains the empirical study, Section 5.2.2 the literature study, while Section 5.2.3 describes the qualitative analysis. Furthermore, in order to enhance traceability between our contributions and the empirical data, we decided to present which data have influenced our findings when presenting the contributions. We are aware of the risk that this may decrease the traceability concerning where in the empirical study specific data were collected. However, we still believe that the advantage in increased traceability between the contributions and the data outweighs this disadvantage.

5.2.1 Empirical study: A case study and action research

The interpretive field study was conducted through participation in the EKLär project. Except aiding where to focus in the literature, the aim of the participation in EKLär from the perspective of the research project was twofold: firstly, it provided an opportunity to observe theory in a practice context and gain empirical experience as well as an understanding of how a real KM project can be implemented, and secondly, it provided an opportunity to test theory. Testing theory also made it possible to influence the KM implementation, and thus implement EKLär’s aim “…to develop and test a new approach for efficient KM in enterprises with a high degree of specialization and great geographical distribution.” (translated from the project specification). This second part implied assisting the involved stakeholders in their KM work as well as helping them to solve problems in this work, while creating knowledge at the same time.

A case study helps to develop an understanding of social phenomena in their real context (Darke and Shanks in Williamson, 2002; Gummesson, 2001). Action research as a method is often chosen when the research aims to solve specific problems within, e.g., an organization, and where there is a search
for practical benefits for the involved stakeholders (Gummesson, 2001; Oosthuizen in Williamson, 2002; Patton, 2002). This is also in line with our pragmatic approach

“Action research is concerned with purposeful action.“ (Oosthuizen in Williamson, 2002, p.171).

Through the careful planning of our participation in the project we argue that we have been able to achieve both the aims and within the limit of this project performed both a case study and action research.

Three researchers were involved in the EKLär project. In the beginning, we defined the research roles in accordance with the two parts of the aim of why we participated in EKLär. Two of the researchers entered the project as active participants aiming to conduct action research, and the third as an independent observer aiming to do a case study. The author of this thesis had the role of the independent observer. During the course of the project, the author’s knowledge and understanding about Knowledge Management and developing knowledge repositories increased. As a result, at the conclusion of the EKLär project, the author of this thesis became increasingly more active and the role as an independent observer then became unclear. Hence, we started to tape the project meetings in order to enhance the possibility of observing at the end of the project also.

Action research is carried out in a cyclic iterative manner (Oosthuizen in Williamson, 2002), and this approach helped us to plan the work with regard to our different roles, see Figure 5:3.

The research in action research is involved and subjective action, but can be consciously reflective as well as objective and reflective (Gummesson, 2001). Through the separation of the roles of observer and active participant, we enabled the objective and reflective parts. Cases are units of analysis and case data consists of all the information one has about a case (Patton, 2002). To collect data, different techniques such as observation, interviews, and document analysis, which are typical for case study research, (Darke and Shanks in Williamson, 2002), were used. This input of real-world data enabled the formation of relevant concepts, and to attempt extant theory (Gummesson, 2001). In action research, solutions and insights are generated in an explorative manner, and there must be sensitivity for this throughout the project (Oosthuizen in Williamson, 2002). In this respect the case study has also provided valuable input.
Figure 5:3. The different research roles from the perspective of a typical action research cycle (developed from Oosthuizen in Williamson, 2002, p. 162)

Action research aims to change something in practice, and to create knowledge (Oosthuizen in Williamson, 2002). In terms of methodological orthodoxy, there is a need to ask if our empirical study really is both action research and a case study, or if it is only action research. As previously mentioned, our pragmatic approach allowed us to choose the most appropriate method compared to methodological orthodoxy (Patton, 2002), and we therefore see no point in developing this issue. We have chosen to talk about a case study within the limits of action research, because this is the most appropriate way to describe what we have done. “Internal dialogue goes with external reflection” (Gummesson, 2001, p.46), and our approach highlights this. Furthermore, one of the points of departure was to describe the process as clearly as possible.

The Case
The project, EKLär, concerned the health care area. More precisely, it focused on the prevention and treatment of leg ulcers. A typical leg ulcer is complicated and affects different health care stakeholders, from patient and next of kin to municipal home healthcare, primary care, hospital care, and laboratory work. Three treatment units were included in this project:
• Home healthcare
• Primary care
• A hospital

The objective of these stakeholders is to provide the patient with the best possible treatment. One important resource for this is knowledge, and the sharing of it. The initiator of the project is the hospital. They experienced that too much of their time was used answering questions from primary care and nurses in the municipality. The EKLär project was a KM implementation project which aimed to develop a knowledge repository for learning and sharing of best practices with respect to treatment and prevention methods for leg ulcers\(^4\). During this work, in accordance with the project aim, an approach for efficient KM in enterprises was further evaluated and developed.

The approach chosen to build knowledge repositories, Enterprise Knowledge Patterns (EKP), combines Enterprise Modelling (EM) with organizational patterns (Persson and Stirna, 2002). Hence, the main components in the EKP approach to building knowledge repositories are as follows:

• An Enterprise Modeling (EM) approach supporting a set of structured, goal/problem-driven models to be used for capturing, structuring and representing organizational knowledge. This modeling approach is called EKD - Enterprise Knowledge Development (Bubenko et al 2001, Loucopoulos et al 1997). Versions of this approach have been successfully applied in a number of European companies. More about the applicability of EM as a stand alone approach and EKD in particular is available in Persson and Stirna (2002).
• Support for reusing existing knowledge, business designs, and enterprise models in the form of organizational patterns. Organizational patterns are generic and abstract organizational design proposals, which can be easily adapted and reused and that represent solutions to specific problems within an organization. Each pattern can be essentially considered a knowledge chunk that couples a problem with its solution, reflecting the context and the way in which the pattern can be applied. This principle of problem-solution coupling has been particularly appreciated by the knowledge workers (c.f. e.g. Rolland et.al. 2000, Mikelsons et.al. 2002, Persson & Stirna 2002, Stirna, Persson & Kaindl 2002, Persson et.al. 2003).
• A set of guidelines for conducting the knowledge acquisition and representation process. The basic assumption is that knowledge acquisition is strongly participatory, i.e. all involved actor and stakeholder types in an organization are required to contribute actively. Guidelines of conducting

\(^4\) The resulting repository can be found at www.vgregion.se/skassarwebben (in Swedish)
EM workshops are available in e.g. Bubenko, Persson & Stirna (2001) and Stirna, Persson & Sandkuhl 2006).

In order to facilitate the reuse of the knowledge embedded in patterns they are structured in two main components – the knowledge component and the usage component. The knowledge component answers questions such as, what problem does the pattern solve, and how this problem can be solved. The solution to the problem can be described through free natural language, diagrammatic description (e.g. an EKD goals model, process model, concepts model, etc.), multimedia content or a combination of all three. The usage component answers questions such as, when can the pattern be reused, how can the pattern be reused, what are the consequences of reusing the pattern, where has the pattern been reused, etc. An example pattern from the EKLär project can be found in Figure 5:6.

The reason for the EKLär project was twofold: It aimed both to develop and build the knowledge repository and to further evaluate and develop an approach for KM. The participation of the case study organizations in the EKLär project consisted mainly in developing the knowledge repository, but there was also a strong interest in the KM process as a whole.

The project was carried out in three main phases:

- Preparation
- Implementation
- Evaluation.

Different data collections were performed. “Qualitative findings grow out of three kinds of data collection: (1) in-depth, open-ended interviews; (2) direct observations; and (3) written documents.” (Patton, 2002, p. 4), and all these kinds of data collection were performed in the empirical study. Figure 5:4 summarizes the project as well as relates the different ways of collecting data to the different phases.

In the remainder of this section we describe how we worked in each phase. We remind the reader about our decision to present which data have influenced our findings when presenting the contributions. This means that the data are not included in the following description.
The preparation phase:
This phase continued for approximately six months, and its aim was to collect knowledge about the domain, and anchor the main purpose of the project. Considering that no real KM project work was performed in this phase, it concerned preparing for this work, and EKP was not explicitly used. Relevant documents, such as, for example, brief formal governing documents that describe a standardized way of handling patients in a specific situation were studied. Furthermore, two observations at the hospital and nineteen open-ended interviews were conducted. Open questions enable the collection of qualitative data and allow respondents to qualify their responses (Williamson in Williamson, 2002). The questions were based on a number of related knowledge areas aiming to examine the current state and future vision. In order to obtain as rich and holistic view as possible, there were different types of respondents with regard to the involved units, professions, and locations. The respondents are described as follows:

- Nine individuals work at the hospital. Among these, two are doctors, and the remaining are different types of nurses. In order to obtain information from individuals with different knowledge and from varying perspectives of leg ulcers a nurse assisted with the selection.
Nine individuals work in home health care. The respondents work in different locations in the municipality. One is the director. In order to interview different types of individuals with regard to experience, both in IT and work in general, location, and so on, the director assisted us with the selection of the respondents.

One individual works in primary care. A nurse at the hospital also assisted with this selection due to her knowledge about which nurses normally contact the hospital with questions about leg ulcers.

Each interview, which lasted approximately 30 minutes, was recorded and transcribed. Well conscious of the importance of obtaining relevant stakeholders who are motivated (Aggestam, 2004), much effort was made to explain the KM project objectives in such a way to ensure the respondents really understood the project and how it was going to affect them.

The observations were performed at the hospital, one in the ward and the other at the surgery. Each observation, during which notes were taken and various documents were collected, lasted half a day. Following the observations, the notes were transcribed, the collected documents were carefully read, and relevant data were recorded in a special document.

All the collected data were then analysed from the perspective of the purpose of this phase, and the result was presented in the project’s first report (Persson, Aggestam, Stirna and Stenfors, 2004). The respondents were informed about the status of the project using e-mail communication, and a copy of the report was offered to them for feedback.

**The implementation phase**

This phase continued for approximately 30 months, but due to a heavy workload and people on sick leave, no real work was carried out during the first 6 months of this phase. The aim was to develop a prototype of the repository as well as to implement work practices aiming to ensure the long term survival of the repository. In accordance with this aim, action research was conducted and carried out in iterative cycles (see Figure 5:3). Two steps can be identified:

- To implement the repository
- To prepare for maintenance of the repository

In the first step, the involved researchers’ roles as active participants and independent observer were clear. As the second step proceeded, the author of this thesis became more active, probably due to that the author’s knowledge and understanding about KM had increased at this stage in the project. Thus, we changed our data collection and started to tape the meetings.
The work was carried out according to the chosen KM approach (EKP) (Persson and Stirna, 2002). The first step focused on building the repository and at the same time performing this work in such a way that enabled the nurses to do it on their own after the project. While building the repository, important tools were enterprise modelling and organizational patterns, both with regard to knowing how to build the knowledge repository and from a data collection perspective. This step included both daily work to implement the repository, as well as hands-on learning to teach the stakeholders how to manage knowledge. The second step focused on ensuring the long-term survival of the repository by linking individual processes to organizational ones. Even if the developed enterprise models and organizational patterns were important tools for maintaining the repository, they were not explicitly used in this second step, but were rather prerequisites. Using a participatory approach, which means that the development work was carried out together with the members of the project group, the project meetings, in this second step, were focused on, for example, deciding the responsibility roles for different tasks and obtaining commitment from management for how to proceed.

The project group comprised people from the hospital and the researchers. Two nurses and one doctor from the hospital participated. The two nurses carried out the daily project work and participated in all the project meetings. They also built the repository and were responsible for pushing the work forward at the hospital. The doctor participated in meetings which aimed to delimit the work and determine strategic and tactical issues. Between the projects meetings, the nurses kept the doctor informed and obtained his opinion on various matters. At the conclusion of this phase a second doctor was involved. Furthermore, to anchor and motivate the project we arranged information meetings with the dermatology department and management people.

The researchers, who acted as active participants and mainly performed the action research with emphasis on “action”, are experienced in both modelling and facilitating. They are professional in the way described by Oosthuizen in Williamson (2002). One of them also led the meetings and acted as the project leader. The observer researcher, who also acted as secretary, taking notes and further in the project making recordings, but avoiding any active part in the discussion, is the doctoral student. This role distribution, with regard to the case study, enabled the observer to monitor without feeling that the other participants expected him/her to participate more actively. In order to enhance this possibility of also observing in the maintenance step when the doctoral student was more active, we started to tape the meetings. The observations also constituted a valuable input to the knowledge developed by the action research, when this was discussed in the phase called
“Reflecting/Analysis” (Figure 5:3). This deliberate role distribution was implicitly told to the others in the group. They knew that the active researchers were the experienced ones, and were going to lead the work. The researcher managing the project is also the doctoral student’s supervisor.

The project was carried out through regular meetings of the project group. These meetings can be regarded as “Action” as depicted in Figure 5:3. An average of one meeting a month, lasting a half to a whole day, was held. In accordance with EKP, they were conducted in a participatory manner. Data collection in the implementation phase was mainly carried out during these project meetings. The project meetings were documented through the models and patterns developed, and also by the detailed notes taken by the research observer. As mentioned, it was noted after the project had been proceeding for a time that the roles were becoming less defined in that the observer was becoming increasingly active. As a consequence, we started to record the meetings in order to compensate the potential loss of observation, and to define the work in our roles more clearly. The notes for each meeting were summarized in a protocol and sent to the participants for validation. The protocols were arranged according to the following structure:

- Time
- Participants
- Aim of the meeting
- A summary of the discussion
- What the participants should do before the next meeting
- Time of the next meeting
- Appendices in the form of models and patterns developed in the meeting

The different tasks allotted during the meetings were performed between them. In accordance with Figure 5:3 there were also meetings among the researchers, both formal and informal, in order to reflect on and plan the work from a project and a research perspective.

Further collected data include relevant documents as well as similar concepts and projects from other hospitals. All the data collected have regularly been discussed and analysed, and data from the literature review have also played an important role in this process. Furthermore, there were relevant discussions in the supervision situation between the research observer and the project leader. In the remainder of this section we describe each step more specifically:

To implement the repository: The EKP approach was most obvious in this step. The aim of the initial meetings in this step was to determine a starting point, which knowledge area to focus on. This work was carried out through
enterprise modelling with a participatory approach. The result was a “Knowledge map” in the form of a conceptual model. The Knowledge map shows knowledge areas to be included in the repository and how they relate to each other. A fraction of the Knowledge map can be found in Figure 5:5. The knowledge map can be compared with a detailed picture of the Eklär project’s knowledge goal. Hence it guides and limits the forthcoming work as well as enables structuring of the content.

![Knowledge map diagram](image)

Figure 5:5 A fraction of the knowledge map (Persson, Stirna and Aggestam, 2008)

The Knowledge map was a compromise between the identified needs in the preparation phase and what the hospital staff regarded to be the most important knowledge that needed to be disseminated. On this basis, the work to build the repository proceeded, i.e., identifying what knowledge should be captured, and how it should be packaged and stored. Organizational patterns, following the EKP approach, were used as a tool for this work. An example of a pattern developed in the EKLär project can be found in Figure 5:6. In this pattern, “Doppler examination”, refers to the same concept as in the Knowledge map Figure 5:5.

Consequently, through this work, the nurses at the hospital gained knowledge about working with patterns, and thus became increasingly autonomous. As a result, the nurses carried out more and more of this work between our meetings. When we judged their maturity in working with the patterns to be adequate, we entered a new phase in our meetings. One important issue was to decide which technical tool should be used to store the captured knowledge. It was decided to use EPI-server\(^5\), since the hospital had already decided to buy it. In this step, data from the project meetings were mainly collected through notes and models.

Name | Doppler examination  
---|---
Problem | What is included in a doppler examination? Which equipment is needed? How is a doppler examination carried out?
Criteria | The ulcer is older than 6 weeks
Goal | The goal is to achieve a correct evaluation of the ulcer and thereby give the patient the right treatment.
Solution | Included in a doppler examination is a measurement of arterial blood pressure including an ankle/arm pressure index and/or a vein examination. The following equipment is needed:
- Simple ultra-sound doppler for measurement of blood pressure
- Ultrasound gel
- Ordinary equipment for measuring blood pressure
- ...
- ...

Refer-ence | Doctor NN, 2006-04-04

**Figure 5.6** An example pattern showing the necessary equipment of examination with an ultrasound Doppler (Persson, Stirn and Aggestam, 2008)

To prepare for maintenance: A critical step in almost all projects is enabling the result to survive after the project is finished, which means the organization must be prepared for maintenance. In order for the knowledge repository developed in this project to survive, it must be used. This in turn requires that it is kept up-to-date, thus making the necessity to capture new knowledge clear. Based on this, the project meetings in this step were more process oriented compared to the previous ones. From the perspective of the spectrum of Binney (2001), we can say that this step addressed the process element of KM, while the previous one addressed the asset management element. Important parts of this work were to identify where and when in the organization knowledge, which has the potential of being stored in the repository, has been created, as well as to decide which knowledge that really should be incorporated, what criteria it must fulfill regarding relevance and correctness. Similar to the previous step this work was carried out with a participatory approach, and from the EKP perspective, this participatory element is the most obvious one here. Data from project meetings were mainly collected by recording, transcribing and notes. One critical factor is commitment from management. Meetings were conducted with persons at
management levels and agreements on time allotted for performing tasks related to the repository and the next KM goal were made.

The evaluation phase
This phase continued for approximately seven months and was performed in parallel with the previous phase. Its aim was to test and refine the prototype, as well as to disseminate information about the fact that it exists and about its usefulness. In order to test the repository six user observations were conducted. Each observation involved monitoring the user attempting to solve two patient cases while using the developed knowledge repository. The role of the author of this thesis was that of the observer. No user had used the repository before the time for observation. Before the user was given the link to the prototype, the observer briefly introduced the repository, explaining its history and aim. This explanation was consciously kept to a general level in accordance with the decision that we wanted give a minimum of information in order to observe how the user interacted with the repository the first time he/she saw and used it. The first impression is important for how we interpret things in the future.

Before the user went to the repository he/she was given the first of the two patient cases to solve. While working with the cases, the user was encouraged to “think aloud” about where he/she clicked, what he/she saw, impressions, feelings, thoughts, and so on. Sometimes during the observations the user forgot to talk, and wanted some feedback from the observer. In both these cases the observer was forced to interact, and we can talk about participant observation with an element of cooperative evaluation as it is described by Monk, Wright, Haber, and Davenport (1993). Participant observation is a suitable research method to understand complexity in situations and permits the observer to understand to an extent not entirely possible using only insights of others collected through interviews (Patton, 2002). Allowing the observed person to think aloud made it possible to record and later transcribe the observations. The observer also took notes about body language, thinking time, and so on. The test ended with some interview questions aiming to examine the possibilities of future success for the repositories. These open questions were based on Jennex and Olfman’s (2006) Success Model and hence focus on system, knowledge, and service quality, as well as the observed person’s intention to use the repository in the future. Also in the concluding interview, data were collected in the same way as during the observation.

The two patient cases were authentic situations and described something that really could happen in practise. They differed in purpose. The first one lacked a diagnosis and the aim was to test if the user could find information to support her/him in what to do. This is in line with the main purpose of the
repository. The second one was a case where the patient already had a diagnosis, but the treatment did not proceed as wanted. The aim with this second one was to test if the repository also supported this situation. The nurses who constructed the cases know that the repository contained all the relevant information also regarding this second case.

Each observation - including the concluding interview, but excluding the initial talk and explanations - lasted for approximately one hour. Four of the six nurses to be observed were selected by the two nurses in the hospital. The criteria for their selection were that they should belong to the main target group of users and work in primary care at different places in the municipality. One of the observed nurses was also interviewed in the preparation phase. The other two persons we observed were final year nursing students who also attended courses in the field of computer science.

The overall impression from the observations and interviews was that the nurses really liked the repository, its structure and the knowledge it contains. The observations thus only resulted in minor changes, meaning that there were no changes in how the repository was built, or how information was structured and presented. The minor changes concerned, for example, changes in used concepts, some clarifications and the use of red squares to emphasize some information. Even if we term these changes, “minor”, we want to stress their importance for the final result. Furthermore, the observations show the importance of the design for the way the repository is used. The main purpose of the repository is to guide the nurses in making a preliminary appraisal before identifying leg ulcer type and decide how to treat it. The design of the repository was based on this aim. From the observations we saw that this focus lead to design trade-offs impacting usage, because information regarding the aim about making a preliminary appraisal was easy to find, while other information required more experience of the repository, its structure and content. The minor changes we made after the observations also aim to support the user when trying to find information not regarding the main purpose.

The observations were also a part of the aim to disseminate information about the repository, that it exists and when and for what it can be used. All observed nurses stated afterwards that they were pleased with what they could find in the repository and that they would inform colleagues about it. Other ways of disseminating information about the repository were, for example, education days and approximately 15 e-mails to persons in some sort of management role associated with nurses who potentially treat people with leg ulcer.
5.2.2 Literature review

A literature review facilitates theory development and is an essential feature of any research project. (Webster and Watson, 2002). A literature review also helps to gain knowledge about what is already known in a certain knowledge area, and to obtain valuable advice about how to conduct the action research and what to focus on in the case study (Patton, 2002; Darke and Shanks in Williamson, 2002). What and where should we focus on? Is there any theory that confirms or rejects the observed phenomena? The literature review has been iterative in the sense that we have returned to the same literature again and again. This need to go back to the same literature has been triggered by reading some (new) information or gaining (new) empirical knowledge. Throughout the literature review we kept a summary and an overall impression of each reference, which enabled such an iterative aspect. This can be clarified by the following example: Nonaka and Takeuchi (1995) is widely referred to and hence a necessary contribution to the theoretical review. During one of our initial modelling meetings, knowledge conversion was observed, and we therefore returned to Nonaka and Takeuchi (1995) in order to refresh our knowledge on the subject. Further aspects in their theory were then noticed. One could say the practical work gave us “new glasses” to read with. We analyzed the project from the perspective of this theory, and identified that we had left the socialization mode and were working in both the externalization and combination modes. This helped us to understand the role of the patterns, and also more clearly identified where to proceed in the view of knowledge conversion. We gained both knowledge and advice about how to proceed, as well as further understanding of the role of patterns in knowledge conversion. The empirical study, both in the form of action research and case study, gained valuable input.

The literature review started with KM material in order to identify what KM is about; its aims and what processes and activities KM includes. “Browsing” is a typical technique when the aim is to find the kernel in a specific knowledge area (Bates, 2002). We use keywords, such as KM and Knowledge Management, for this technique in our search for journal and conference papers. These keywords resulted in a large number of hits, and we therefore combined them with others, such as, “definition”, “implementation”, “overview”, “IT”, “success”, “failure”, and “activities”. Based on our purpose we selected papers through reading titles and abstracts. Three papers that made an early impression were Binney, (2001), Gore and Gore (1999), and Wong and Aspinwall (2004). At this stage we also used the indexed catalogue in the library, which belongs to the technique Bates (2002) calls “searching”. Parallel to this we also started to use the technique “linking”, which is finding new references from the reference lists of others (Bates, 2002). The three books of the following authors, found through linking, have
all had a significant influence on our opinions about KM: Nonaka and Takeuchi, (1995), Wiig, (1993), and Davenport and Prusak, (1998). Through this review we recognize that KM has objectives at different levels of abstraction: How to do KM, what to do in KM, and why to do KM. This is in accordance with Van Gigch (1991), who defines three levels of inquiry. As a consequence we broadened the literature review in order to understand why and what. KM aims to support organizational learning and the Learning Organization. Through using all the three techniques browsing, searching and linking, we extended the literature search to include material about organizational learning and learning organizations. Peter Senge is an author who made a great impression on us in this knowledge area. The strength of this approach is in its breadth and includes the three levels of inquiry (Van Gigch, 1991). Reviewing journal and conference papers, as well as books from both the KM area and the organizational learning area, we obtained the needed holistic perspective.

This broad and holistic approach was in accordance with our points of departure and aimed to fulfill Research Objective 1. The ongoing literature review was made more specific and focused on the capturing process in line with Research Objectives 2 and 3. The continuing use of the “browsing” technique, meant our search strategy from this point can be considered as deeper with regard to the fact that the keywords used were more specific and pointed to the capturing process and its related activities. We used a combination of words, such as capture, knowledge repository, IT, identify, and evaluate. From the perspective of Research Objectives 2 and 3, there were not many hits, and we decided to try another strategy. We therefore started to identify relevant journals. This work was mainly performed by examining where articles found earlier were published. We then searched for articles in these journals by reading through more or less all the titles and abstracts from the last six years. This search was mainly carried out in the Journal of Knowledge Management (ISSN: 1367-3270), Journal of Knowledge Management Practice (ISSN 1705-9232) and International Journal of Knowledge and Learning (IJKL). When we found something useful, we used the technique, “linking”, to find more relevant articles. We can conclude that it was difficult finding articles that focus on our specific topic. To the best of our knowledge there are no books on this specific topic. However, we found interesting parts in books that are about knowledge repositories or KM. Furthermore, our experienced difficulties and the lack of literature in this specific area of maintaining IT-supported knowledge repositories, strengthen the need of our research.
5.2.3 Qualitative analysis

A continuous element in the research process has been to analyze the empirical and theoretical data in a qualitative manner. Therefore the term literature review and not literature analysis has been used. The qualitative analysis has been conducted using the steps described by Williamson and Bow in Williamson (2002):

1. Transcribe the data
2. Read through each document
3. Categorize the data
4. Write memos
5. Conceptually organize the categories
6. Form tentative ideas
7. Ask questions and check hunches

The remainder of this section describes what was done in each step.

1. Transcribe the data: We typed all our collected data, both theoretical and empirical, into a word processor. The files and documents were organized in accordance with our work method, and we have one catalogue for the EKLär case, one for the literature review, as well as one for the papers. Each of the three catalogues includes sub-catalogues organized in time sequence and/or contents areas. The file structure and its contents can be described as follows:
   • The catalogue “EKLär” includes all the files from the project, for example, catalogues for “Models and patterns”, “Official documents”, and the catalogue “Meeting notes”, in which sub-catalogues organized in a time perspective are included. Each document’s contents and how it is structured depends on its aim, e.g., the meeting documents are organized as described in Section 5.2.1.
   • The catalogue “Literature review” includes all the files from the literature review. This catalogue includes catalogues for different time periods. This approach enables us to follow our own development and to trace the date a specific piece of literature was read for the first time. Each catalogue includes documents with different contents according to its purpose, e.g., there are documents which retell specific book or paper and others that provide an overview of the papers and books that include something about a specific theme. This catalogue also includes the document mentioned in Section 5.2.2, in which summaries and overall impressions about each reference were recorded.
   • The catalogue “Articles” includes all the files related to papers written during the research process and contains classifications for each paper. The papers result from different ideas raised through this process, and
therefore this catalogue also includes all the documents that originated from steps d. “Writing memos”, e. “Conceptually organizing the categories”, and f. “Form tentative ideas”.

This structure enables the remaining steps in the analysis, and also makes it possible to store, in a structured way, documents produced by other steps.

2. **Read through each document:** We occasionally read through each document, which enhanced overall understanding and refreshed our memories.

3. **Categorize the data:** We categorized the data according to relevant themes and headings such as learning organizations, organizational learning, knowledge management, knowledge, and success factors. This facilitated thinking about the data at a more in-depth-level and identifying relationships between different categories. The selection of category in which these documents were saved, depended on the categorized data. For example, if the data only emerged from the EKLär case it was saved in this catalogue.

4. **Writing memos:** “A memo is merely a name for a document which is used to write ideas or information about interviews or categories” (Williamson and Bow in Williamson, 2002, p.298). As soon as an idea or a thought was raised we noted it in a special document, which then functioned as a list of ideas, and used as a basis for papers and this thesis. The document was saved in the catalogue “Articles”.

5. **Conceptually organizing the categories:** Continuously throughout the process we tried to draw pictures of relationships, and to identify keywords that aimed to identify similarities and differences. In our analysis this step also included the one Williamson and Bow in Williamson (2002) term “Undertake word searches”. Documents that originated from this step were saved in “Articles”. A concrete result of this process is the paper “Learning Organization – Which came first, the chicken or the egg?”.

6. **Form tentative ideas:** We wrote down our ideas in a form that resembles a research paper format.

7. **Ask questions and check hunches:** The author of this thesis discussed ideas with her supervisor, colleagues, researchers and the professional expert. Based partly on these discussions we returned to earlier steps in order to check the feasibility of our tentative ideas. This resulted in modifications, additions, and sometimes even rejections.
All of these steps were conducted in an iterative process, and at times some also parallel to each other. Each publication can be regarded as a tentative idea, emerging from the former steps, and good enough to finally survive the last step. Comparing data with data, with existing theories, and results from previous searches is a key to qualitative research analysis (Gummesson, 2005). In the steps termed “Categorize the data”, “Conceptually organising the categories” and “Ask questions and check hunches” comparisons were done. Due to the fact that our qualitative analysis includes both theoretical and empirical data and that the different type of data have influenced each other, it is impossible to separate and align each research result with only one of the studies: “... theory generating and theory testing are Siamese twins and not separate, consecutive stages.” (Gummesson, 2001, p.40). We consider that this approach has had positive affects on our results which already from the beginning were both empirically and theoretically grounded. However, it has potential negative affects on traceability, which Lincoln and Guba (1985) term “conformability”. This is further discussed in Section 5.3.

5.3 Discussion of the research method

A quantitative approach is not better than a qualitative approach or vice versa (e.g. Gummesson, 2001). Which approach is best depends on the research purpose. A qualitative inquiry enables a holistic approach and an increased understanding of social processes and relationships (Holme and Solvang, 1997). An important part of this type of inquiry is also to develop a basis for theory development (Holme and Solvang, 1997). The social perspective is crucial in KM, and the profile of our research aim and a qualitative inquiry match each other. From the perspective of the research aim, a quantitative approach is no alternative, “... in a statistical survey tacit knowledge remains just that – tacit.” (Gummesson, 2001, p. 32).

The interpretive field study was performed in the EKLär case. Klein and Myers (1999) propose seven principles for evaluating field studies. Their first principle “... suggests that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form.” (Klein and Myers, 1999, p.72) This is in accordance with our system’s approach. Accordingly, this principle has guided our work. For example, we have tried to iterate between the capture process as a part and the global context that describes what a successful knowledge repository is, and between parts of the capture process and the context of the whole capture process. In accordance with Klein and Myers’ second principle we have tried to clearly describe the research setting of the EKLär case, including its historical background of habitually sharing knowledge, as well as the interaction between the researchers and participants (the third princi-
With regard to their third principle, we believe that we have not so clearly described how the understanding of the author has improved during the work, we have instead established it. The understanding of the author of this thesis has continuously improved with the findings and the findings are well described in the thesis. However, on reflection, this is probably not enough and hence a lack in our interpretive study. Concerning Klein and Myers’ fourth principle, our qualitative analysis merged empirical and theoretical data, and the issue of abstraction and generalization is also further discussed in the forthcoming section. In order to enable the principle of dialogical reasoning and the principle of suspicion, the fifth and seventh principles, our points of departure as well as how the empirical data has influenced our findings are described (see e.g. Appendix B and Appendix C). However, it is impossible to describe everything that has influenced this research, but we hope the reader thinks it is enough. The remaining principle then, the principle of multiple interpretations, Klein and Myers’ sixth principle, may be the weakest part of the case study. We tried to seek out multiple viewpoints concerning the repository, but were not able to find any real differences, only minor ones as, for example, when the concept “diagnosis” was discussed. If this means that we have not been sensitive enough about different viewpoints or that there have not been any critical differences is hard to say. However, the fact that the repository is being used and the hospital management is committed to a similar project concerning pressure ulcers, may imply that the case study has also fulfilled this principle.

Furthermore, the empirical study includes action research. Iversen, Mathiasen and Nielsen (2004) have formulated six criteria to guide action research in order to avoid pitfalls when performing this type of research. When describing our case study we had these criteria in mind. However, in order to clarify the action research, we summarize it in relation to these criteria:

- **Roles:** We have described the different roles in the EKLär project and how they developed over time. E.g., the role of the author of this thesis became more active and the nurses more autonomous. It is important to clarify this, since action research is collaborative in nature.
- **Documentation:** What and how data are collected and how data quality is ensured are other parts of the criteria. Examples of what data were collected are included in our presentation of the contributions. However, we have shown how data were collected in different phases of EKLär (Figure 5:4) and described how data quality was ensured, e.g., by returning documents to members of the project group and recording interviews.
- **Control:** The project leader controls the process, but it is important to remember that the hospital owns the repository, i.e. controls it. During
the project the nurses became increasingly autonomous and gradually took over the work and hence also the control.

- **Usefulness:** The observations in the evaluation stage were one important input in order to establish usefulness of the repository. Another input is statistical data that e.g. show the number of visitors to the repository. Furthermore, the nurses included in the project team noticed that in discussions other nurses often referred to the repository as a natural part of their daily work.

- **Theory:** When discussing our contributions we describe and discuss how our empirical experiences relate to the existing body of knowledge.

- **Transfer:** We tried to describe our case in detail to enhance judging under what conditions our results can be used in other contexts. Furthermore, it is important to remember that our theoretical study is not limited to a specific domain and that our results have been exposed to experts. This is further discussed in accordance to Transferability.

A problem with a qualitative approach is that it is very difficult to know if the results are applicable in other contexts and domains. Based on the external empirical and theoretical groundings, we claim that our results may potentially be applicable, and future research aims to examine this further. In addition, our literature review has not been limited to a special domain and the consulted experts do not belong to the same domain as the case. In Part V of this thesis we present a guidance aiming to facilitate the implementation of the capture process. This guidance, as our other contributions presented, is both empirically and theoretically grounded, but nevertheless, one lack is that the guidance is not empirically tested. However, within the limit of this research project, it is not possible to attend another KM project, lasting approximately three years, using the guidance when implementing the capture process and then evaluating if using the guidance results in an increase of the use of the repository. Thus, performing this empirical investigation concerning the presented guidance is an important part of future research work. We come back to this in our last chapter which includes some final remarks.

There is no generally accepted criterion for how to evaluate qualitative research (e.g. Patton, 2002). Criteria such as reliability and representatively cannot be applied for case studies or action research (Gummesson, 2001). In this thesis we use the four criteria of credibility, transferability, dependability, and conformability suggested by Lincoln and Guba (1985). We consider they cover the main aspects when judging qualitative research, i.e., they are in line with the points of departure. The reason for choosing these criteria is that they have been widely referred to and used when evaluating qualitative research.
Credibility
Credibility concerns whether the results are credible to the persons involved, which in our case are those involved in the EKLär project. The implementation of this criterion corresponds to internal validity in quantitative research (Lincoln and Guba, 1985). There are three activities that increase the credibility (Lincoln and Guba, 1985): prolonged engagement, persistent observation, and triangulation. Through our participation in EKLär we have reached prolonged engagement and persistent observation. During our research work we have tried to triangulate, which is also a technique that strengthens credibility (Lincoln and Guba, 1985). There are two main types of triangulations, methods and sources (Williamson with Burstein and McKemmish in Williamson, 2002), and efforts towards both have been made. We have used different types of data collection and data collection techniques, as well as collected data at different times and from different people with regard to profession and location. Two techniques that aim to strengthen credibility are member checking and referential adequacy (Lincoln and Guba, 1985). By sending documents such as protocols, models, and the report back to members of the project group, our intention was to test our interpretations and conclusions. However, we received few comments on the documents. To verify that this did not imply they had not been read, we asked the participants on a number of occasions and they replied that they had no further comments. Perhaps a better method would have been if we had asked them to always send an e-mail after they had read the document to check for any feedback. The described work of increasing credibility focuses on our interpretation of events that occurred and data that was collected in the EKLär case. Together with the theoretical data this has been qualitatively analyzed, and our results are based on both empirical and theoretical data. Therefore, we consider that credibility is complicated, since empirical and theoretical data influence each other, and thus it is not possible to trace what in our findings emerged from theory and what from the EKLär case. This phenomenon implies a difficulty for participants to identify exactly what in the results have been their contributions. Thus, to enhance showing how data have influenced our findings, references and illustrative examples as well as quotations from the EKLär case are consciously included when describing our results and contributions. With regard to illustrative quotations from the case study, Orlikowski (1993) and Persson (2001) use a similar way of writing. All quotations included in the thesis are our own translations.

Dependability
Dependability and credibility are two sides of the same coin. Dependability in qualitative research corresponds to what reliability is in quantitative research (Lincoln and Guba, 1985). Due to the fact that it is impossible to replicate a project like EKLär, Lincoln and Guba (1985) recommend using techniques that overlap, similar to our efforts of triangulating when discuss-
ing credibility, and examining the research process and research product. This has been done through submitting the results to peer reviewed conferences and by discussions with the professional expert.

**Transferability**

Transferability concerns the degree to which the results are applicable in other domains. This criterion plays the same role as external validity in quantitative research (Lincoln and Guba, 1985). The research has included only one case study, which can be justified if it is purposeful and provides a large amount of information (Gummesson, 2001). We consider our participation in the EKLär project has provided purposeful information. How much the result is affected by the fact that some of the involved stakeholders were positive from the beginning is impossible to say. Furthermore, the literature review was not limited to the same domain as the case study. This implies valuable input for our ambition to formulate theories that have the potential to be applicable in other domains. In accordance with this ambition, we also consulted experts in the field, both the professional expert and other researchers. The judgement of transferability depends on the person who wants to use the results (Lincoln and Guba, 1985). Since this requires a detailed description of the domain from which the results originate, we tried to describe the empirical study and its domain with as much detail as possible, without the risk of losing the holistic view and general understanding.

**Conformability**

Conformability concerns objectivity in the report. The implementation of this criterion corresponds to objectivity in quantitative research (Lincoln and Guba, 1985). Our interactive approach (see Gummesson, 2001) has had potentially negative effects on traceability. This is a price we are prepared to pay due to our intention to “Be pragmatic, use all available roads to gain knowledge.” (Gummesson, 2001, p.29). We described which steps we performed in the qualitative analysis, but not how our minds were thinking. Furthermore, our participation in the EKLär project has influenced how we interpreted theory, but consciously reading literature not limited to health care has been an important part of our research. There is no real border between intuition and common sense, (Gummesson, 2001), and therefore not easy to describe. Conscious of the problem associated with the research process with regard to traceability, the ambition has been to report our process as clearly and objectively as possible. By examining that the results are supported by data and internally coherent, conformability will be established (Lincoln and Guba, 1985). Our submissions and attendances at conferences imply our results have been examined.

The evaluation based on the four criteria suggested by Lincoln and Guba (1985) highlight two main problems with our research process:
• The problem of tracing a specific result through the process
• The strong dependence on only one case

Even if we, throughout the process, have been conscious about these problems and tried to manage them, the fact remains: Traceability is a problem in the research process, and our results are dependent on the EKLär case. However, regarding the dependence on EKLär, we have strived to ground the results (see Figure 5:1) and used the theoretical data not limited to the health sector. We argue that this grounding work together with the fact that our participation in EKLär has given us purposeful insights and knowledge about how to run a KM project, justifies our dependence on the EKLär case. Furthermore, with regard to the EKP used being based on experiences in earlier projects, as, for example, ELEKTRA (Consortium, 1999b; Rolland et al, 2000) and Hyperknowledge (Stirna et al, 2002; Persson et al, 2003) and accordingly revised, the way of working in EKLär is also grounded in other projects.

In this context we must also ask ourselves how much the choice of the EKLär project to use the EKP approach has influenced our results; i.e., would the results have been different if another approach had been used in the project? We believe that the answer to this depends on whether we compare with a method, similar to EKP, that emphasizes issues as stakeholder participation and the use of Organizational Patterns or not. We consider that the main influence of EKP on our results is that it made it possible for us to observe a successful KM project, namely the EKLär project. The chances of this project being successful were judged to be quite substantial, since the approach had been used a number of times before and experiences had been systematically collected. The most complex issue was then to identify what in EKLär contributed to the success. Therefore, we argue, that EKP mainly influenced the EKLär project, not our results, and hence made it possible for us to observe and analyze a successful KM project. Without this possibility, we claim that it would have been much harder to, for example, develop suitable guidance for the capture process.

Regarding the traceability, it could have been increased and the problem would have decreased, if each study during the process had been analyzed separately. Unfortunately, this approach would not have had the same positive influence on the content of our results, since one important strength with them is that they derive from a quality analysis based on both empirical and theoretical studies; i.e., are both empirically and theoretically grounded. Thus, the quality of the content would not have increased if each study had been analyzed separately; eventually it would even have decreased. A pragmatic approach allows us to choose the most appropriate method compared to methodological orthodoxy (Patton, 2002), and we assumed that this ap-
approach was the most appropriate. We have had the possibility to both observe and test theory in “real-life”, and at the same time obtain valuable help with regard to our focus in the literature review.
Part III

A Characterization of Knowledge Management from Three Levels of Inquiry

Based on three levels of inquiry (why, what and how) this part provides a holistic characterization of Knowledge Management. It shows how we achieved Research Objective 1 and constitutes the first set of contributions included in this thesis.
6 Introduction

One basic problem in KM is that organizations lack support for implementing it. The aim of our entire research project is to contribute to increasing the usefulness of IT-supported knowledge repositories by supporting the capture process. To achieve this aim we must have knowledge and understanding about IT-supported knowledge repositories and KM work in general, how they relate to each other, how they contribute to learning and achieving business objectives etc. In accordance with our point of departure we used a system’s approach including three levels of inquiry to achieve this holistic knowledge of KM. This holistic description includes nine contributions which also aim to depict how we achieve the first research objective:

Research Objective 1: Characterize Knowledge Management from three levels of inquiry (why, what, how)

The nine contributions are results from exploring the KM area in order to gain general understanding and insights not limited to one domain or one type of KM. Thus, they derive mainly from the theoretical review.

“A review should identify critical knowledge gaps and thus motivate researchers to close this breach (Watson and Webster, 2002, p.xix)

Based on this explorative work we delimited the continuous research work to the part of KM where new knowledge is captured in order to be incorporated in a knowledge repository.

Even if the contributions included in this part of the thesis derive mainly from the theoretical review, we want to emphasize that the empirical study governed what to focus on in the literature study, and made it possible to observe theory in practise. This also constitutes valuable input for our qualitative analysis. The contributions can therefore be described as a synthesis emerging from combining theoretical and empirical data. They also benefited from the experts’ feedback.

The research work aiming to achieve this research objective has resulted in a synthesized view of KM based on three levels of inquiry as described by Van Gigch (1991). Thus, in order to clearly show how the contributions and
the three levels of inquiry relate, we present them in accordance with these levels, see Figure 6:1. Figure 6:1 enables a holistic understanding of KM from the three levels of inquiry, and hence we claim that this constitutes a tenth contribution.

Figure 6:1. The results from the perspective of three levels of inquiry

In the following we describe each of the nine contributions.
7 Why Knowledge Management?

An organization must manage its important resource knowledge. Managing knowledge aims to support learning in order to be more competitive. The strong relationship to Learning Organizations is clear. The literature often emphasizes LO or KM, but we strongly believe that there should be a move towards emphasizing LO and KM. In our experience, when the literature addresses both, it is done too superficially.

KM and LO cannot survive without each other (Loermans, 2002). An organization that wants to become a learning organization must therefore pay attention to both at the same time. This requires an understanding of their different features and goals, as well as about their relationships. This section describes how LO and KM relate to each other, and also include an answer to the question, why Knowledge Management. The description consists of two models which are the contributions from this work (Figure 7:1).

The conceptualization model is described and discussed in Section 7.1. The model that describes the stages of becoming a LO is in Section 7.2, while we end this chapter with some concluding remarks in Section 7.3.

**Contributions:**

A conceptualization model that describes relationship between a Learning Organization (LO) and Knowledge Management (KM)

Has resulted in the paper Aggestam (2006b)

A model that describes a route of reaching maturity as a Learning Organization (LO) and hence clarifies the role Knowledge Management (KM) can take

Has resulted in the paper Aggestam, L. (2006c)

Figure 7:1 Contributions describing how KM and LO relate to each other
7.1 A conceptualization model of LO and KM

“A high-quality review is complete and focuses on concepts (Webster and Watson, 2002, p. xv)

The proposed conceptualization model (Figure 7:2) is the result from a comparative analysis of key concepts identified in the review of the literature in the areas of KM and LO. It describes how key concepts in these areas relate to each other. By doing so the model reveals that KM drives organizational processes as well as learning, i.e., the proposed model describes why KM is important and that KM is dependent on the culture, leadership etc. Hence the reciprocal relationship between KM and LO is visualized and it is clarified that KM is a part of a LO. This, together with the fact that the model gives a synthesized view of KM and LO as described in the literature, which extends existing research, are the main contributions of the model. To understand how KM and LO influence and relate to each other is necessary in order to introduce KM work in an efficient way. We argue that the synthesized view presented in the model enables this understanding.

Figure 7:2. A conceptualization model of LO and KM

The identification of key concepts and the comparative analysis of them are based on the literature review (Chapter 4). The conceptualization model is also supported by our empirical experiences in EKLär. The comparative analysis indicates that most keywords appear explicitly in both domains, but at different levels of abstraction. An example is the keyword “Culture”; a LO
has a culture, which is a part of the organization, but KM work is constrained by the organizational culture, that is, KM is conducted within the culture. The fact that LO and KM are at different levels of abstraction also explains why four keywords appear explicitly only in one domain. An example is the keyword “External factors”, which only appears in LO. “External factors” correspond to factors outside the organization, e.g. competitors and customers, and “Internal factors” to those factors inside the organization, e.g. organizational culture and IT. As a subsystem in the world, an organization must interact with other subsystems in the world and hence more directly manage external factors. KM is carried out in the organization; it is a subsystem in the organization. KM is therefore more focused on internal factors. If the KM literature mentions external factors at all, it is done in an implicit way, and they are discussed as factors that the organization must manage. That KM can be regarded a subset of LO is also the opinion of the professional expert.

The forthcoming discussion is based on our literature review (Chapter 4), and we do not include the theories again in this section.

The work of Senge (1990) has been widely referred to by both academics and professionals, and thus the model is influenced by Senge’s ideas. The fifth discipline, *System’s thinking*, is a cornerstone of how learning organizations must look at and reflect about the world. This is why the conceptualization model is shaped as an eye which regards the world from a system’s thinking perspective. *Personal mastery, Mental models, and Team learning* are in our opinion different perspectives of the organizational culture.

The leader’s initiates the culture development process by imposing his or her beliefs, values, and assumptions. However, culture only emerges when individuals’ assumptions lead to shared experiences (Schein, 2004). The importance of a *Shared vision* is well stated in the literature, and the conceptualization model must therefore place great emphasis on it. A shared vision is a part of the organizational culture; it refers to the common values and assumptions in the organization. The importance of a KM vision has been made clear several times in the EKLär case. Due to its significance, it should be an explicit part of the Learning Organization, and not only of the organizational culture.

In accordance with the analysis the model regards LO and KM as system and subsystem respectively. They are two inseparable parts when an organization wants to become a learning organization. A LO can be compared to a learning system with distinctive characteristics that are able to meet different types of demands. The model shows different types of both external and
internal demands. Learning and knowledge-creating is performed by individuals, but it is important for the organization to provide the appropriate context for them (Nonaka and Takeuchi, 1995). This context should ensure that individual learning enriches and enhances the organization as a whole. The desired context is the Learning Organization which has a culture that promotes a culture of learning. It supports personal mastery, and the work with mental models, and also encourages team learning. In the organization there is suitable IT-support to enable communication, knowledge dissemination, embedded knowledge etc. The vision of the organization is not the “leader’s vision”, but rather a shared one that has emerged from personal visions. Creating this type of learning culture, including a common vision, is the leadership’s responsibility, but the work must be performed by all the members of the organization.

KM enables individual learning, which is a prerequisite for both organizational learning and organizational processes. KM must be integrated and adapted to business and knowledge processes. When an individual learns something he or she obtains new knowledge. Individual learning always implies organizational learning, but not always changes in organizational knowledge. The new individual knowledge will be stored (hopefully) in personal memory, and not only used in its present form but also as a basis of transformation into new knowledge. In order to stimulate learning for other members of the organization the knowledge must be transformed to information and stored in the organizational memory, e.g., in knowledge repositories. This implies changes in organizational knowledge, and is a result of organizational learning. When this information is shared and used it gives rise to learning and new knowledge. KM is concerned with new knowledge. It supports both individual and organizational learning by taking care of the result, the knowledge, and making it available to individuals in the organization. This stimulates learning and the creation of new knowledge, both individual and organizational. Effective KM is a prerequisite for being a LO and also assumes a LO. Both organizational culture and processes must support learning and knowledge sharing.

The conceptualization model visualizes that LO and KM are dependent on each other. KM aims to contribute to organizational processes, that these can be performed in a more effective way. To achieve this aim requires knowledge management that enables learning, e.g., storing knowledge in organizational memory in such a way that it will be used. This in turn requires integrating KM work in existing processes. Individuals and processes act within the limit of the organization. How this environment encourages KM work in different ways is crucial for KM to achieve its aim. The conceptualization model also visualizes that KM can be regarded as a subsystem of LO. Questions raised within the limit of KM work therefore touch aspects coupled to
the environment, the organization, and vice versa. Another aspect is that changes in KM result in changes in the organization, and changes in LO affect and change KM work. The process of becoming a LO must be performed at different levels of abstraction. In the following section we present an initial version of a maturity model that aims to establish directions for becoming a LO. The model also highlights the role of KM in this process.

7.2 A route for reaching maturity as a LO – the role of Knowledge Management

The proposed model shows three stages for achieving maturity as a Learning Organization. Thus, it can be compared with an initial version of a maturity model. Furthermore, the proposed model (Figure 7:3) clarifies the role KM can take: KM can be regarded as a tool for achieving maturity as a Learning Organization, because starting with a concrete KM project in order to become a LO implies using KM as an approach to becoming a LO. This is in accordance with Senge (1994) who argues that giving an organization tools and methods to use will lead them to new ways of thinking.

![Figure 7:3. Stages for achieving maturity as a LO](image)

The proposed model for achieving maturity as a LO is based on the work presented in the previous section and triggered by experiences in the EKLär project. When we analysed data collected in the EKLär case, we identified a large number of issues related to becoming a LO. One example from the EKLär case refers to issues concerning knowledge vision. For example, will other knowledge areas be included in the repository in the future, and in that case what areas? This issue concerns the knowledge vision, and thus indicates that a KM project is a possible first step to becoming a LO. A discussion with the professional expert strengthens this observation.

In the analyzing work, we merged the comparison of keywords described in the previous section with empirical data collected from EKLär in order to identify how a KM project influences an organization into becoming a learn-
ing one. In the EKLär case the keyword “Culture”, for example, appeared when issues about knowledge sharing in general and how to change routines were raised. There were discussions such as:

“How to take care of knowledge a person has gained in a course?” “How do we get the nurses to use the [knowledge repository] instead of the telephone?” (nurses in a project meeting)

In the remainder of this section we elaborate the model to indicate how to achieve maturity as a LO.

The analysis indicated that OL can be regarded as a link between KM and LO. A KM project aims at developing mechanisms for sharing knowledge in the organization, with the ultimate goal being to support learning. Learning occurs at an individual level. When an individual has learnt, it indicates that a step towards organizational learning has been taken. OL is a result of collective cognitive processes (Yeo, 2005) and establishes new premises, routines etc., but it always starts with individual learning. Therefore KM is a first step towards OL. A LO is proficient at organizational learning. It is the members of the organization who learn, but the LO has a culture, structures, processes etc that facilitate learning processes. Developing this environment takes time. One or two organizational learning processes, or building a knowledge repository or starting a network is not enough, but a step in the right direction.

To be a LO is continuous work. An organization can never come to a point in time when it can declare itself a LO in the sense of some final achievement (Gorelick, 2005). The initial version of the maturity model indicates a route for reaching maturity as a LO. For example, this means that an organization with effective KM work has also achieved some maturity as a LO. Figure 7:3 illustrates that the organization with effective KM is closer to the stage of LO. The model also suggests a route for reaching maturity as a LO. It is therefore both descriptive and prescriptive.

The implementation of a KM project triggers many discussions. Examples from the EKLär case include: How do we integrate this into daily work?; How do we store knowledge so that users learn what we want them to learn?; How does the top management look at these questions?; and How do we act in order to change this routine? Questions address issues concerning both Organizational Learning and Learning Organizations and hence also a learning culture. They begin the process, first in the minds of individuals, and then in discussions, processes, structures, routines etc. A first step towards Organizational Learning and in becoming a Learning Organization has been taken. This is in accordance with the system’s approach and the
conceptualization model (Figure 7.2). Well conscious about the importance of organizational culture for a successful KM project (Busch and Richards, 2004; Chua and Lam, 2005; Davenport and Prusak, 1998; Hung et al, 2005; Park et al, 2004; Sandelands, 1999; Sun and Scot, 2004) we want to emphasize that the model is not contradictory to this. As discussed, a KM project stimulates and promotes the development of a learning attitude and culture. How well this culture and attitude is disseminated and accepted throughout the KM project, and the organization, influences the chances of success for the KM project. Furthermore, the degree of maturity that the organization already has, with regard to a learning culture, influences the chances of carrying out a successful KM project and, in the long term, the potential of becoming a LO.

The initial version of the maturity model includes both a time perspective and different levels of abstraction. A KM project is more concrete for the involved individuals than a LO project, but at the same time it raises questions and discussions central to becoming a LO. As previously mentioned, a LO has a learning culture. The strength of an organizational culture is dependent on the length of its existence, the stability of the group’s membership, and the emotional intensity of the actual historical experiences they have shared (Schein, 2004). Consequently, it takes time to foster a new culture, e.g., a learning one, and this work takes longer than a KM project. However, the questions raised in a KM project imply that a step in the right direction has been taken.

The proposed model is also a basis for identifying what to measure. If an organization is at the first stage of maturity, there is no point in measuring attitudes, for example. One part of future work is to detail each of the stages, and develop general guidelines for how to measure maturity from the perspective of our model.

7.3 Concluding remarks

The work of describing and characterizing what a Learning Organization is and its relationship to KM has resulted in two models. The conceptualization model provides an overview and visualizes how key concepts in the areas relate to each other. The model that describes stages for achieving maturity as a LO establishes directions for becoming a LO. Both these models are at a reasonably generalized level, but detailed enough to describe why an organization should perform KM work. The models show the strong dependency between LO and KM, and neither can be successful without the other. Our results reveal that a KM project has potential if the intention is to initiate a process of becoming a Learning Organization (Aggestam, 2006b). Accord-
ing to Senge (1994), the tools and methods to use will lead organizations to new ways of thinking. Working with a KM project triggers questions and new ways of thinking relevant to becoming a Learning Organization. The KM project can be compared with an approach the purpose of which is to lead all the members of the organization to new ways of thinking.

The conceptualization model is strongly dependent on Senge’s (1990) ideas. Depending on one person’s ideas can be regarded as a limitation for the model, but in this case we claim the opposite. As previously mentioned, Senge (1990) is widely referred to, and the content of his ideas is well represented in the literature. Thus, we argue that Senge’s ideas imply a stable basis for the model. However, a limitation to the model that shows stages for becoming a LO, is its weak empirical grounding. It was triggered by EKLär, and our experiences from this project have strongly influenced the model. We do not know how representative the EKLär case is. Perhaps it was a pure coincidence that all these questions relating to OL and LO were raised in this KM project. However, the literature analysis confirms our experiences in the EKLär case. We therefore claim that our participation in EKLär contributed to the right insight, as described by Darke, Shanks and Broadbent (1998), concerning the fact that a KM project is a possible first step to becoming a LO. Furthermore, the professional expert agrees that a KM-project could be a practical way of creating insights about the needs of a LO. However, the professional expert calls attention to the fact that there are other ways of accomplishing this; the first stage must not be a KM project. We do not disagree, but with regard to the aim of this work, relating KM and LO in order to explain why KM is important, we do not consider that other ways are in the scope of this objective.

Based on the results we recommend practitioners in strategic positions who want to initiate a process of becoming a Learning Organization, to start with a KM project at an operational level. There is no point discussing why, because it will be too vague (Senge, 1994). A KM project is more concrete for the involved individuals, and concurrently it raises questions and discussions central to becoming a LO. Performing a KM project can be compared to throwing a stone into water, thus causing all the circles. The KM project can be the stone, and a LO the circles. Working with a KM project triggers fostering a LO, and a LO requires KM. Effective KM requires, among other things, a supportive learning culture, and a LO, in turn, requires that knowledge in the organization is managed in an effective manner. Even if the organization explicitly starts with KM, it can be discussed where the organization will reach maturity first, in KM or in LO. In order to follow up and motivate, it is important to measure. As previously mentioned, building knowledge repositories has advantages from the aspect of measurement. For
example, it is easy to measure the number of times an individual has used a special part of the repository.

Our results also show that a Knowledge Management project in the form of developing an IT-supported knowledge repository is a suitable choice. This type of KM project is concrete and contributes to other types of KM which also strengthens and motivates our research focus. In Chapter 8 and Chapter 9 we present results concerning what KM is about and how to perform it. These results are in themselves a refinement of the models presented in this section.
8 What is Knowledge Management?

Knowledge Management work has the purpose of providing the appropriate knowledge, both tacit and explicit, to those employees that need it, when it is needed, in order to better perform work tasks. This presupposes that an employee transforms the needed knowledge from its related information, stored e.g. in a knowledge repository, to knowledge; i.e. learn. KM aims to enhance learning. Learning is always individual, but can result in organizational knowledge and then we can talk about organizational learning. Organizational knowledge is knowledge that remains in the organization even if an employee resigns: We argue that increasing the amount of organizational knowledge is one important part of KM. Organizational knowledge can e.g. be embedded in routines, stored in repositories or be a part of the culture.

There are different ways of accumulating knowledge in organizations and organizations learn and build knowledge for different purposes and with different methods. The development of IT-supported knowledge repositories is one way of doing this. When discussing and doing research in the KM area, we need to consider what type of KM to focus on and position it to KM in general. In the literature there are different ways of categorizing KM (e.g. Wiig, 1994; Binney, 2001). In order to understand what IT-supported knowledge repositories are about and how they relate to the KM domain we made a qualitative analysis of existing theories.

This work has resulted in two models: one that visualizes what KM is about and a framework showing what IT-supported knowledge repositories are about. In the literature, KM is often discussed without clarifying what part of the KM domain is in focus. One important contribution of these models are that they help us to position and explain how IT-supported knowledge repositories relate to the KM domain and contribute to other types of KM. The models can be used to position research in the KM domain and they can also be used as an analysis tool for adapting existing models to the specific type of KM that IT-supported knowledge repositories concern. In order to show their usefulness as analysing tools, we used them to adapt and extend the Strategic Knowledge Management (SKM) framework (Carlsson, 2001) to IT-supported knowledge repositories. This work resulted in an extended version of the SKM framework, and also gave us further knowledge and understanding about what developing IT-supported knowledge repositories
concerns. The contributions included in this chapter are summarized in Figure 8:1.

**Contributions:**

A model that visualises what KM is about
Included in, e.g., the papers Söderström and Aggestam, L. (2007) and Aggestam and Backlund (2007)

A framework that describes what IT-supported knowledge repositories are and also shows the capture process in this context
Has resulted in the paper Aggestam (2006a).

The extended Strategic Knowledge Management framework (e-SKM) that describes IT-supported knowledge repositories from a strategic perspective
Has resulted in the paper Aggestam and Backlund (2007)

These models together characterize what KM is about, both in general and with regard to our focus on knowledge repositories, and how important concepts, such as external/internal knowledge, explicit/tacit knowledge, organizational knowledge etc. relate to each other and to KM.

The model visualizing what KM is about is described and discussed in Section 8.1, and the framework for IT-supported knowledge repositories in Section 8.2. In Section 8.3 we explain how we used them to adapt the SKM framework to IT-supported knowledge repositories as well as the resulting extended SKM framework. We end this chapter with some concluding remarks in Section 8.4.
8.1 A model that visualizes what KM is about

When dealing with a topic where an accumulated body of research exists, a thorough review and then proposing models that synthesize and extend existing research is recommended (Webster and Watson, 2002). The proposed model (Figure 8:2) is the result from a synthesis of existing theories presented in Chapter 4. We will not include the theories again in this section, only refer to those theories that have had an explicit influence on the proposed model. The proposed model shows what KM is about and is a valuable tool for positioning KM research to the KM area in general. To the best of our knowledge, research in the KM area often lacks this position.

Figure 8:2. What KM is about including research domain and research focus

There are different types of KM with respect to how it supports learning. The three types categorized by Wiig (1994) overlap, contribute and support each other. Two of them, accumulating knowledge in repositories and embedding it in e.g. routines, concern accumulating knowledge outside people, which refers to external knowledge. Accumulating knowledge in repositories can, from the perspective of the organization, be considered, external explicit knowledge, and its accumulation by embedding it, external tacit knowledge. From the perspective of Wiig’s (1994) categorization this thesis focuses on KM work which accumulates knowledge outside people in order to disseminate it to support learning. From this perspective IT, is a prerequisite for effective KM, and one way of accumulating knowledge outside people is to develop IT-supported knowledge repositories. These repositories are also in themselves a part of the organizational knowledge and can as such be regarded a result of organizational learning.
The creation of new knowledge is a critical component of an organization’s ability to learn and adapt (Loermans, 2002). To create knowledge is to use information for a productive purpose in a certain context (Jensen, 2005). This information can be found in a repository or shared with a colleague in a discussion. The aim of knowledge repositories is to enable individuals to learn, that is, the third type of KM that according to Wiig (1994) aims to accumulate knowledge in people, but the content in the repository is a part of the organizational knowledge. In turn, this individual learning results in valuable input for Organizational Learning and new organizational knowledge, e.g., embedded knowledge in routines and culture. Furthermore, the development process of repositories also contributes to organizational knowledge in the form of embedded knowledge in the technology and in work processes that use the repository. Thus, knowledge repositories support the other two types of KM identified by Wiig (1994). From this discussion we can see that developing repositories results in both individual and organizational knowledge and we can talk about individual as well as organizational learning.

Another way to accumulate knowledge outside people is to evolve the culture. Since culture can be explained as the result of a group’s accumulated learning about values, assumptions etc. (Schein, 2004) it will not change even if an employee resigns. It could be maintained that the first and third way of Wiig’s (1994) categories, accumulating knowledge in people and accumulating knowledge by embedding, both concern the culture, since changing routines and know-how presupposes some form of common values and assumptions as well as individual learning. Therefore, these changes in organizational knowledge take time, i.e., the consequences of these types of KM can not be identified after a short time span. However, accumulating knowledge in people need not result in changes in culture, since it depends on how many people learn the same things and share the same (new) values and ideas. The second way of Wiig’s (1994) categories, accumulating knowledge in repositories, has a shorter time perspective. It also enables different types of learning. Sandelands (1999) argues that to capture and store knowledge in an IT-system, results in the rudiments of a KM process. Our research focuses on IT-supported knowledge repositories, and when developing this type of KM, knowledge in people is both input and desired result. Important side-effects are embedded knowledge to improve technology and the way it is used.

Organizational knowledge remains even when employees resign. From the perspective of a member of the organization, organizational knowledge is external knowledge. Furthermore, from the perspective of the organization, knowledge in a repository can be considered explicit, and embedded knowledge and culture as tacit. Knowledge repositories are sometimes referred to
as organizational memory (e.g. Jennex and Olfman, 2002). However, in comparison with people, we claim that all organizational knowledge can be compared with organizational memory, in which the repository corresponds to explicit knowledge, and embedded knowledge and knowledge in the culture to tacit. From the perspective of Binney’s (2001) six elements, developing knowledge repositories includes both a product and a process perspective. There must be processes associated with the management of the knowledge repository and improvements of work processes in order to support different types of knowledge conversion, as described by Nonaka and Takeuchi (1995). The application of technology when building the repository embeds knowledge in the application and the use of it. Binney (2001) terms this, transactional KM, which is a side-effect of building knowledge repositories.

Figure 8:2 summarizes this discussion and proposes a model that visualizes what KM is about, and how knowledge repositories contribute to KM work in general. The shaded circle and the bold text is our research focus. From the perspective of IT’s two generic capabilities of codifying knowledge and creating networks (Hansen et al, 1999), knowledge repositories include codified knowledge which is disseminated in some sort of network created by using some sort of Internet. Networks could also be created in order to share knowledge directly between people, but this is outside the scope of this thesis. Two factors that often cause KM to be inefficient are asymmetry of knowledge, which often means abundant knowledge on a subject in one department and a shortage somewhere else, and localness of knowledge (Davenport and Prusak, 1998). People usually obtain knowledge from their organizational neighbours. Knowledge repositories counteract asymmetry and localness of knowledge. Organizational learning uses knowledge repositories as its knowledge base (Jennex and Olfman, 2002) and Figure 8:2 visualizes that knowledge repositories contribute to other types of organizational knowledge as well as individual knowledge. This together with the factors concerning asymmetry and localness of knowledge motivate and strengthen our research focus.

KM is about increasing organizational knowledge in order to support learning, i.e., accumulate knowledge inside people. From the perspective of knowledge as a product, all types of KM are enhanced if the actual knowledge is identified and captured. For IT-supported knowledge repositories this is a requirement, but for the other types knowledge can be accumulated without explicitly identifying and capturing it. For example, working together with a task can result in routines that are neither formal nor documented. However, identifying and capturing knowledge is a crucial part of all types of KM.
The literature describes activities and processes which are essential in daily KM work. We consider they cover that type of KM which is the focus of this thesis. However, in our experience, the literature often lacks a definition of the type of KM they are describing and discussing. We argue that the work presented in this section could be used to position KM type in order to achieve a clearer and more precise description. In the next chapter we describe, on a more detailed level, what IT-supported knowledge repositories are about.

8.2 A framework describing what IT-supported Knowledge Repositories are about

The proposed framework (Figure 8:3) is the result of a qualitative analysis principally based on theoretical data. Our literature review focused on weak points in existing frameworks and desirable characteristics for a framework showing what IT-supported knowledge repositories are about. In this work, the following characteristics are found to be desirable:

- A technological as well as a human/social view needs to be taken into consideration
- Showing where information transforms to knowledge and vice versa.
- Separation between external and internal knowledge should be possible.
- Points where potential knowledge losses occur should be identified.
- Organizational and individual levels should be separated.

Even if we can never ignore the significant influence our participation in the EKLär project has had both with regard to our focus in the literature and how we have interpreted the theoretical data, the proposed framework is based on our literature review. Hence, the novelty of the framework lies in the combination of the building blocks, not the building blocks themselves. The proposed framework extends the body of knowledge by synthesizing existing theories and including the desirable characteristics summarized above. To the best of our knowledge, there is no other framework that includes all these characteristics, only some of them. A framework aims to attack a problem from a specific point of view (Crick and Koch, 2003). The problem the proposed framework aims to attack is how to support organizations in their effort to successfully perform KM. This requires knowledge of what KM is about.

We discussed the framework with the professional expert, who felt familiar with the framework, and expressed the opinion that it mirrors reality.
“The timing is right for this” and “I can clearly recognize this from my work with securing knowledge in organizations.”

are statements from the professional expert. Furthermore, the professional expert stressed the importance of being able to find the stored knowledge. In a way this is taken for granted in the framework, and lies implicit in the process, “A Human takes part of stored information”. However, we are not completely satisfied with the concept, “Social view”, but the professional expert had no better name for this perspective. In the EKLár case we used the proposed framework as a tool for identifying what we did, and what remains to be done, which organizational process is now in focus, which process is next, etc. This does not imply that we validated the framework itself, only the use of it.

![A Knowledge Vision](image)

Figure 8:3. A Framework for IT-supported knowledge repositories (FIT-KM)

The concept, knowledge life cycle, is referred to in the literature (e.g. Remus and Schub, 2003). The concept of life cycle presupposes both “birth” and “death”. However, knowledge does not “die”, it transforms. Consequently, we want to discuss a cycle, not a life cycle. From the perspective of knowledge storage, dissemination and sharing, IT is a prerequisite for effective
KM (Loermans, 2002; Wong and Aspinwall, 2004), and according to our definition of information and knowledge, we can never store knowledge. Thus, we propose discussing a cycle of knowledge and information. When storing knowledge, it changes between different states, and there are also some knowledge losses. It is possible to trace these types of losses to at least three stages in the knowledge and information cycle, see Figure 8:4.

![Figure 8:4 Knowledge loss from the perspective of a knowledge and information cycle](image)

With regard to these types of knowledge loss some created knowledge will never be stored in the knowledge repository. This is not only negative, because there is knowledge that should not be stored. For example, it is important to consider how central it is for an organization from the perspective of competitive advantages, and whether imitation by other organizations could eliminate these advantages (Blodgood and Salisbury, 2001). According to Swan et al (1999), codification of tacit knowledge may reduce the knowledge creating potential of an organization. The system should support the business, and if captured knowledge does not do this then its supported information should not be stored. This stresses the importance of the knowledge vision. Furthermore, some tacit knowledge cannot be captured, and some knowledge is difficult to store as information. These types of loss should be minimized as much as possible. Since the proposed knowledge and information cycle shows how information transforms to knowledge and vice versa when disseminating knowledge using an IT-supported knowledge
repository, it is included in the proposed framework for IT-supported knowledge repositories (Figure 8:3).

The proposed framework illustrates what IT-supported knowledge repositories are about and includes the knowledge and information cycle. In accordance with knowledge repositories in relation to KM in general (Figure 8:2) the purpose of the repository is to support learning and increase individual knowledge. In addition, inputs to the repository come from existing knowledge, that is, from people and organizational knowledge, such as other repositories, documents and routines. The main concept of knowledge repositories is the reuse of existing knowledge in order to enhance learning, thus the creation of new organizational knowledge is clear. The aim of the framework is to serve as a basis for developing the implementation guidance. Since it is impossible, within the limits of this research project, to develop guidance for all the work involved in developing an IT-supported knowledge repository, another purpose of the framework is to support us when deciding how to delimit our work. Researchers in Knowledge Management are the main target group, but the framework can also serve as a conceptual model to help different types of practitioners understand what KM is about, what types of processes the organization must support and enable, etc. Practitioners in strategic positions are therefore also an important target group for the framework.

KM must have a vision (e.g. Davenport and Prusak, 1998; Gore and Gore, 1999; Jarrar, 2002; Nonaka and Takeuchi, 1995; Mentzas, 2001; Remus and Schub, 2003). What business goals should the codified knowledge support? The importance of the vision in the selection process was also stressed by the professional expert.

“It’s difficult to make people remember that they don’t need to store everything.”

The remainder of this chapter describes the framework for IT-supported knowledge repositories (FIT-KM), and for reasons of simplicity this will be done in a sequential manner based on each process in the framework.

**Capture New Knowledge:**

*Input:* External and internal knowledge, and already stored information.

*Process:* Aims to capture both external and internal new knowledge, new from the perspective of the IT-system. Sometimes this knowledge is also new from the perspective of the consciousness of the members of the organization. This process presupposes that knowledge is identified, and also includes a selection process: Is the knowl-
edge new? Should it be stored, e.g., considering the knowledge vision?

There is knowledge that is difficult to capture, and some part of this knowledge may not even be possible to identify. Tacit knowledge plays an important role (Busch and Richards, 2004), and it is therefore important to minimize this knowledge loss. In a KM project it is a good idea to start with a review of existing external knowledge (Gore and Gore, 1999), e.g., information stored in documents and databases. This corresponds to combination, one of the knowledge conversion modes in the learning spiral of Nonaka and Takeuchi (1995).

In an organization with a low degree of maturity in KM, one approach to capture new knowledge can be participatory modelling and seminars led by a professional facilitator (Bubenko jr et al, 2001). It is in accordance with the characteristics of internal knowledge that this approach enables capturing and making internal knowledge explicit. This is also supported by Busch and Richards (2004) who have identified repeated contacts as one of three parameters conducive to tacit knowledge transfer.

Culture is important for tacit knowledge (Busch and Richards, 2004), and it is important that organizational culture and structure support this process through, e.g., networks, meetings, and reward system. Most people in an organization that perform KM activities need to do so in their normal daily activities (Davenport and Prusak, 1998). It is therefore necessary to provide time for these activities (Siemieniuch and Sinclair, 2004).

**Output:** External and internal knowledge.

**View:** There must be a climate that encourages individuals to both contribute their own knowledge and value that of others. Organizational culture and climate are important aspects in this process (Busch and Richards, 2004).

**Package and Store information:**

**Input:** External and internal knowledge.

**Process:** Aims to package and store information in such a way that it is easy to find, share, use and complement. In this process new knowledge is often identified and captured, and there is an iterative relationship between this process and the previous one.

From a knowledge storage, dissemination and sharing perspective, IT support is a prerequisite for effective KM (Loermans,
2002; Wong and Aspinwall, 2004, Bubenko jr et al, 2001). According to our definition of information and knowledge, we cannot store knowledge, we store information that supports knowledge transformation. Information changes to knowledge in the interaction with people (Swan et al 1999), which we call the knowledge process. The question is hence, how should we manage this type of information in an IT-supported system in order to enable the knowledge process and learning?

This process puts organizational knowledge in a form that makes it accessible to those who need it. However, how can it be codified without losing important aspects (Davenport and Prusak, 1998)? It involves both evaluating knowledge for usefulness and appropriateness for codification - a knowledge manager’s responsibility - and identifying a suitable medium for codification and distribution - a codifier’s responsibility (Davenport and Prusak, 1998). There is knowledge that is difficult to store as information and in this process there is also some knowledge loss.

The reputation of the person who contributes the information is important when selecting available information (Davenport and Prusak, 1998; Markus, 2001), and therefore it should clearly indicate the source. Another important area in this process is Human Computer Interaction (HCI).

In the development phase in organizations with a low degree of maturity in KM, it is important to work with simple structures, such as, e.g., organizational patterns (Persson and Stirna, 2002), in order to identify relevant knowledge chunks. When the maturity is higher, the IT-system in itself, both the structure and the interface, must have been developed in such way that it is easy to store new knowledge chunks.

**Output:** IT-stored information that can be found easily.

**View:** This process is an interface between the technological and human/social view. The technology dominates this activity, but has no value if it does not support KM.

**A Human Takes part of Stored information:**

**Input:** All stored information.

**Process:** Aims for humans to take part and use stored information in order to support problem solving. An individual shares the information and values it in relation to the need and what is already known. If the information is relevant according to both task and earlier knowledge, i.e. the person does not already know it, the informa-
tion will be used and applied. This scenario, in accordance with the definition of knowledge, will result in information transforming to knowledge (Swan et al, 1999).

It is important to educate people in the IT-system, i.e., where and how the knowledge-supported information can be found. People judge information on the basis of who provides it, and it is therefore important to encourage a culture in which the quality of the knowledge is more important than the source (Davenport and Prusak, 1998; Busch and Richards, 2004).

Output: Information that will be used.
View: This process is an interface between the technological and human/social view. There must be a climate that encourages individuals to take part of the organizational knowledge, but also education in how to use the IT system.

Information changes to knowledge - a process in the human mind

Input: Information that will be used.
Process: Aims to transform information to knowledge. A learning process takes place at the individual level, and consequently there is learning in the organization. New knowledge, internal and/or external, is created at the individual level. If the knowledge is also new from the perspective of the IT-system and/or in the consciousness of other members of the organization, then, in accordance with the system’s approach, the whole organization has learnt.

A Learning Organization is good at KM (Loermans, 2002), and despite the knowledge being new or not, from the perspective of the organization, there is learning in the organization. According to Gore and Gore (1999), the main reason for the adoption of a KM approach is knowledge creation.

Output: External and internal knowledge.
View: This process in the human mind is from the human/social perspective, and there must be a culture that supports and encourages it.

The presented framework FIT-KM shows what IT-supported knowledge repositories are and visualises the desirable characteristics identified in our literature review.

Since FIT-KM and the model that visualizes what KM is about (Figure 8:2) have the potential to be useful when adapting existing models to the context of IT-supported knowledge repositories, we describe how we used them to adapt the Strategic Knowledge Management (SKM) framework (Carlsson,
2001) to IT-supported knowledge repositories in Section 8.3. This work also gave us further knowledge and understanding about what developing IT-supported knowledge repositories is about.

### 8.3 The extended SKM framework (e-SKM)

Employees’ knowledge is a valuable asset, and knowledge sharing between them can be modeled as a network of relationships (Remko and Buijsrogge 2006). IT-supported knowledge repositories use a repository as one node in the network and Internet to disseminate the information in the network. Based on the assumption that networks should be the context for strategic KM, Carlsson (2001) proposes the Strategic Knowledge Management (SKM) framework. The goal of this section is to learn more about what developing knowledge repositories concerns, as well as to show the usefulness of the model that visualizes what KM is about (Figure 8:2) and the framework for IT-supported knowledge repositories (Figure 8:3) as analysis tools. We adapted and detailed the SKM framework using this model and framework as analysis tools. Furthermore, we also applied it to analyze data in the EKLär case to establish the usefulness of the resulting extended SKM (Section 9.4).

Before presenting the analysis and the extended SKM framework (Section 8.3.2), we provide a summary in Section 8.3.1 of the SKM framework.

#### 8.3.1 The Strategic Knowledge Management framework (SKM)

Based on the resource-based view, Carlsson (2001) proposes a framework for Strategic Knowledge Management (SKM). In SKM it is suggested that gaining and sustaining a competitive advantage through knowledge and knowledge processes consists of three phases and six tasks. Figure 8:5 describes SKM. Our interpretation is that the arrows in SKM show how the six tasks influence each other.

![Figure 8:5 A model of SKM (From Carlsson 2001)](image-url)
In the following paragraphs we present a brief description of each task. Readers willing to extend their knowledge of the framework and its tasks are referred to Carlsson (2001).

- **Strategic vision.** As the name implies, this task is focused on identifying the purposes for incorporating knowledge management into the business, as a means for gaining and sustaining competitive advantage. The purposes must be made available in the strategic vision of the organizations, but the form in which it is made available is of secondary importance.

- **Knowledge vision and identification of key knowledge-related resources.** This task is focused on identifying the KM resources in which the organization must invest, in order to gain competitive advantage. The importance of aligning the knowledge vision to the strategic vision is also pinpointed. Furthermore, the knowledge vision is also to be considered guidance to the types of KM resources needed, but it does not specifically describe how these resources are to be acquired, designed, implemented, and used.

- **Design.** This task addresses how the requirements stated in the knowledge vision can be accomplished. The core of this task is to develop strategic knowledge architectures, i.e., combining the knowledge resources, in order to put the knowledge vision into effect.

- **Knowledge protection.** This task can be divided into two broad categories. Firstly, protecting the knowledge and the (network-based) processes from being imitated by competitors, and secondly, protecting the knowledge from value erosion. Carlsson (2001) also exemplifies so-called isolation mechanisms to protect the knowledge and its sources. The mechanisms are, besides legal and contractual measures: 1) Ambiguity, 2) Complexity, and 3) Time advantage.

- **Implementation.** This task concerns how to promote the knowledge management activities and support to the organization. It involves different tactics for implementing the knowledge-related resources. Focus is put on their competitive implications and economic performance.

- **Usage.** This task concerns the organizational usage of the knowledge-related resources. The general questions may be directly applied to evaluate the usage of the knowledge-related resources. The outcome of such evaluation may in turn affect the strategic vision and knowledge vision.

### 8.3.2 The extended SKM framework (e-SKM)

The SKM framework (Carlsson 2001) covers all types of strategic KM. Our research focus is knowledge repositories, and we analyzed Carlsson’s (2001) framework from this perspective. Based on this analysis, we extended and adapted the SKM framework to knowledge repositories. In order to enhance traceability we numbered each identified extension (Figure 8:6).
Theoretical Analysis

The analysis was performed in two steps: Firstly, we analyze the framework with respect to how knowledge repositories relate to KM in general (Figure 8:2), and secondly with respect to the perspective of knowledge repositories (Figure 8:3).

Step 1: SKM for knowledge repositories from a holistic perspective (based on Figure 8:2)

The requirements formulated in the knowledge vision result in a design decision to develop an IT-supported knowledge repository. The design task should consider how knowledge repositories relate to KM work in general. Accumulating knowledge in a knowledge repository aims to enhance learning, i.e., accumulating knowledge inside people. The repository’s design must be adapted to the users since it influences usage. This is covered in SKM. The design will also influence the usage and is a valuable tool for how the repository will be used. Therefore, the arrow between design and usage in the SKM framework should be double headed (1) to indicate mutual influence.

The knowledge created by an employee in a learning situation is a potential input to the repository. The need to link this individual process to a general one is important (2). This, in turn, requires a separation between the organizational and individual levels, which is lacking in the SKM framework (2). Developing repositories also contributes to embedded knowledge, which in turn is a way to protect it. This relationship is highlighted by the arrow from Implementation to Protection.

Both content and process are included in the Design task (Carlsson 2001). Our analysis shows the importance of distinguishing between processes to manage the repository, i.e., “Asset management KM” and the improving work processes, i.e., “Process-based KM”. From our point of view, Usage refers to the individual use in daily work, which should be a part of everyone’s job (e.g. Davenport and Prusak 1998), and Implementation refers to organizational processes for managing the repository. Daily use is a valuable input for managing the content of the repository, for example, when it is being updated. Again, we emphasize the importance to link individual processes to organizational ones (2).

Step 2: SKM for knowledge repositories from a specific perspective (based on Figure 8:3)

In comparison to the proposed framework for IT-supported knowledge repositories (FIT-KM), the SKM framework lacks a separation between organizational and individual levels, as well as between processes at a more opera-
tional level. The lack of separation between the organizational and individual levels was revealed in step 1. With respect to FIT-KM, we claim that Usage is the only task in the SKM framework which resides on the individual level. Usage, in the meaning of using information in the repository, includes (at an operational level) an individual taking part of the information as well as transforming it to knowledge, i.e., learning. Implementation concerns capturing new knowledge, as well as packaging and storing it (Figure 8:3). The processes, A Human Takes part of Stored information, and Information transforms to knowledge, are individual processes at an operational level, while Capture New Knowledge, and Package and Store Knowledge are organizational processes at an operational level. The SKM framework needs to be extended with these operational processes (3) and the separation between individual and organizational levels (2).

Both FIT-KM and the SKM framework visualize that Usage and Implementation influence each other. After complementing these tasks with the operational processes, and the separation between individual and organizational levels, this influence can be shown on a more detailed level. The stored knowledge is the information that can be used for knowledge creation, and this newly created knowledge provides potential input to the capturing process (6). These two arrows (6) replace the double headed one between Usage and Implementation. The individual usage is carried out within the limits of organizational processes. This discussion also highlights the importance of how knowledge is stored with respect to how it is used (1).

FIT-KM highlights knowledge loss. Some types of knowledge loss are desired, such as information that is not supported by the knowledge vision. Therefore, we claim that there is a connection between Knowledge vision and identification to Implementation (4) that should be made explicit. It is important to have a clear notion of the degree to which certain knowledge is crucial for the competitive advantage of the organization, and if plagiarism by other organizations could jeopardize this competitive advantage (Blodgood and Salisbury 2001). This can also result in a desired knowledge loss, which from our point of view is covered by the Protection task, which influences what to store. However, knowledge may exist which we want to store, but cannot with regard to the design choices, e.g., an open network, even if it is in line with the knowledge vision. Backlund and Strand (2002) identified situations where the participants in an inter organizational network considered some knowledge not shareable due to company policies. This can affect the Design as well as the Knowledge vision and identification. Therefore, we argue, that the relationship between Knowledge vision and identification and Protection must be mutual (7).
Another distinction made in FIT-KM as opposed to the SKM framework is between the technological and the social/human view. We refer to the social/human view in terms of the organizational culture, the importance of which is well stated in the literature (e.g. Busch and Richards 2004, Chua and Lam 2005, Davenport and Prusak 1998, Hung et al. 2005, Park et al. 2004, Sandelands 1999, Sun and Scot 2004). IT enables knowledge reuse, but the real KM is carried out by people (e.g. Bubenko jr et al. 2001, Jennex and Olfman 2006). Culture more or less influences all knowledge work processes. Its consequences are most notable in Usage. However the work to affect organizational culture has a long time perspective and must hence be a part of all the tasks in the framework. For example, the design of reward systems to encourage employees to share and reuse knowledge must also be a result of a strategic decision. Culture is made explicit in the extended SKM framework (5).

The SKM framework has been extended to guide an organization in designing and developing an IT-supported knowledge repository, in accordance with the analysis, see Figure 8:6.

![Figure 8:6. The extended SKM framework](image)

To validate the extensions, we used a case analysis and applied the extended SKM framework to analyze data collected in the EKLär case. The case study underlines the importance and the applicability of the extensions of the SKM framework. All the extensions, except number 7, are explicitly observable in EKLär. This work also helps us to better understand how to implement knowledge repositories, and thus the lessons learnt from this work are included in Chapter 9. The case study has also shown the extended SKM framework’s potential for being useful.
8.4 Concluding remarks

The work describing what KM and IT-supported knowledge repositories are about and how repositories relate to KM in general has resulted in two models and an extended framework. The model that visualizes what KM is about provides an overview as well as positions the research focus. In addition, FIT-KM shows what IT-supported knowledge repositories are about and highlights different important related aspects identified in the literature review.

The proposed framework for IT-supported knowledge repositories can be interpreted as a detailed picture of the shaded circle in the model that visualizes what KM is about. Even if both these models are more detailed compared to the conceptualization model of LO and KM (Figure 7:2) and the initial version of a maturity model (Figure 7:3), they are at a reasonably generalized level. However, we consider them detailed enough to fulfill the aim of describing what IT-supported knowledge repositories are about and position this part of KM work to Knowledge Management in general. Furthermore, they provide a valuable basis for deciding where to focus in the development of the implementation guidance.

A limitation with these models is their weak external empirical grounding. The model that visualizes what KM is about is a synthesis of existing theories and has no other empirical grounding except that our participation in the EKLär project influenced how we interpreted the literature and that it is included in Söderström and Aggestam (2007) and Aggestam and Backlund (2007). The proposed framework has been reviewed by only one professional in the field, but its usefulness has been tested in EKLär. Furthermore, it has been peer reviewed and accepted for publication (Aggestam, 2006). With regard to what we need according to Research Objective 1 and the large amount of literature we reviewed, we do not consider this to be a problem. Considering that these models aim to provide a foundation on which we can base the development of the implementation guidance, we also argue that there is no need for stronger empirical grounding at this stage. The external empirical grounding will become notably stronger when presenting the guidance.

The model and the framework, FIT-KM, presented in this part of the thesis, are valuable contributions to our future research, but they also have other target groups. The model can serve as a tool for positioning KM research, which we claim is necessary to be stringent and clear. In our experience too many talk about KM without being precise about what part of KM is being referred to. So far, we have used this model for positioning purposes in, e.g., Söderström and Aggestam (2007), Aggestam and Backlund (2007), and Ag-
gestam and Lichtenstein (2007). The work of adapting and extending the existing SKM framework (Carlsson, 2001) also shows the usefulness of the models as analysis tools. Furthermore, this work also provides us with more insight about KM work in the form of IT-supported knowledge repositories. The proposed FIT-KM framework provides researchers with a basis for developing implementation guidelines, and practitioners a visual picture of what this work is about. The framework could also serve as a map for practitioners in strategic positions, enabling them to orient themselves and identify their position in the process.
9 How to Perform Knowledge Management?

Knowledge Management aims to support individual and organizational learning. KM is a management issue, but the real KM work is carried out by the members of an organization. Performing KM work includes processes and activities concerning both knowledge reuse and knowledge creation. Furthermore, to be successful in this work presupposes managing a number of Success Factors (SF).

In order to understand and gain knowledge about how to perform KM work and how IT-supported knowledge repositories are included in this work, we made a qualitative analysis of existing theories (Chapter 4), and applied the extended SKM framework (Figure 8:6) to the EKLär case. However, this is not enough for understanding how to perform KM work using IT-supported knowledge repositories; we must also gain knowledge and understanding about potential problems and difficulties in this work to be able to facilitate their implementation. Thus we made a qualitative analysis for the purpose of identifying Success Factors for a KM project aiming to develop a knowledge repository. In order to further understand and gain knowledge about these SF, as well as to discover similarities between KM and ISD projects, we analyzed the identified SF from the perspective of our earlier work concerning Key Success Factors (KSF) in an ISD project. This work revealed that the KSF preparation framework for ISD (Figure 3:1) is applicable to a KM project aiming to develop a knowledge repository, and we developed general preparation guidelines for this type of KM project accordingly. The contributions included in this chapter are summarized in Figure 9:1.

Together these contributions describe how to perform KM and potential problems and difficulties during this work. They also provide some guidelines to be used in the planning phase in order to prepare the target organization as much as possible. The model that visualizes how to perform KM also helps us to further position IT-supported knowledge repositories according to the KM domain.
The model showing how to perform KM is described and discussed in Section 9.1, potential problems and difficulties in the form of Success Factors in Section 9.2 and the preparation guidelines in Section 9.3. Before some concluding remarks in Section 9.5, we describe, in Section 9.4, lessons learnt when applying the extended SKM framework to the EKLär case.

9.1 A model that visualizes how to perform KM

The proposed model (Figure 9:2) shows included processes, activities and stages. It starts from the work aiming to describe what KM is about (Section 8.1) and is the result from a synthesis of existing theories presented in Chapter 4. The novelty of the model is that it synthesizes sub-processes, activities and stages in KM that are described in the literature and also includes knowledge mediation as described by Braf (2005). We do not include the
theories again in this section, only refer to those that have had an explicit influence on the proposed model.

Performing KM work well presupposes carrying out the three sub-processes, knowledge generation, knowledge codification and coordination, and knowledge transfer (Davenport and Prusak, 1998). The management and strategic levels are obvious for each sub-process identified by Davenport and Prusak (1998). Furthermore, as mentioned and discussed in Chapter 4, we consider that these sub-processes are on a higher level of abstraction compared to activities that the literature describes as essential in KM work. For clarity reasons, we include the summary of these activities again:

- Create and discover/identify knowledge
- Store knowledge (information, our remark)
- Use, i.e. share and apply knowledge
- Transform/innovate knowledge

In order to further show how to perform KM and how IT-supported knowledge repositories relate to this work, we correlate the sub-processes identified by Davenport and Prusak (1998) to the four activities above and to the research focus of knowledge repositories. Table 9:1 summarizes this discussion.

Table 9:1 Sub-processes and activities in KM in relation to research focus

<table>
<thead>
<tr>
<th>Sub-process</th>
<th>Key activity</th>
<th>Relation to research focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Generation</td>
<td>Identify knowledge</td>
<td>Belongs to problem context. Important as input.</td>
</tr>
<tr>
<td>Knowledge Codification and Coordination</td>
<td>Store information</td>
<td>In research focus</td>
</tr>
<tr>
<td>Knowledge Transfer</td>
<td>Use and transform</td>
<td>In research focus</td>
</tr>
</tbody>
</table>

**Knowledge generation** is somewhat distinct from the daily work, and not a part of the element that Binney (2001) terms Process-based KM. It mainly belongs to our problem context. Consequently, this sub-process is not a focus of our research. However, explicit steps must be taken to ensure that knowledge generated from different modes of knowledge generation as described by Davenport and Prusak, 1998) is transferred to the wider organization. This is the responsibility of management. Transferring the generated knowledge belongs to the operational level, and requires all the four activities mentioned above. The key is to identify when potential knowledge has
been generated, and the activity to capture knowledge is in focus. We there-
fore only pay attention to this when trying to identify the generation of new
potentially relevant knowledge from the perspective of the knowledge re-
pository.

**Knowledge codification and coordination** includes the storing activity.
With regard to our limitation to *IT-supported* knowledge repositories, the
principles for successful coding described by Davenport and Prusak (1998),
see Chapter 4, are important and relevant to our research focus. Although,
management is mainly responsible for them, the actual work is carried out by
the members of the organization. The importance of the KM vision is well
stated in the literature and in knowledge codification and coordination this is
explicit stated. According to Davenport and Prusak (1998) Patricia Seeman,
a consultant and former managing director of the Right First Time knowl-
dge project at Hoffman-LaRoche, puts it this way: “Relevance is far more
important than completeness” (Davenport and Prusak, 1998, p. 69).

**Knowledge transfer** concerns the organizational culture, and manage ment’s
importance in this matter has already been discussed several times in this
thesis. The third and fourth activities, using and transforming knowledge, are
relevant for this sub-process. The transfer of knowledge is a part of daily
work, and a part of the element that Binney (2001) calls Process-based KM.
Consequently, this sub-process is important for our research area.

Knowledge processes can be categorized according to whether they concern
knowledge creation or knowledge reuse (Davenport, Jarvenpaa and Beers,
1996). Knowledge repositories are about knowledge reuse in order to en-
hance learning, i.e., knowledge creation. We interpret knowledge creation as
corresponding to the sub-process knowledge generation, and knowledge
reuse to the other two sub-processes. This strengthens our discussion that
the sub-process, knowledge generation, is not in research focus, only the
result of it. When a knowledge reuser wants to reuse knowledge he/she de-
defines the search question, searches, selects and applies the knowledge (Mar-
kus, 2001). When knowledge is reused, there is a type of knowledge media-
tion. Braf (2004) describes three types of knowledge mediation, and in all of
them both the strategic and operational levels are present, but with different
dominance. From the perspective of how to do KM, mediation triggered by a
specific problem dominates at the operational level and mediation triggered
by a general problem at the strategic level. Mediation triggered by a general
problem is more concerned with strategic planning and longer time perspec-
tive. This is also in accordance with the discussion about how the types of
knowledge mediations (Braf, 2005), and Markus’s (2001) four activities,
performed when a person wants to reuse knowledge, relate to each other (see
Chapter 4).
The stages in knowledge reuse, capturing or documenting knowledge, packaging knowledge for reuse, distributing or disseminating knowledge and reusing knowledge (Alavi and Leidner, 1999; Andersen Consulting, 1999), correspond to the four activities described above. This strengthens our impression that the literature often discusses knowledge reuse even if this is not explicitly mentioned. The identify activity is a requirement if knowledge is to be captured. This further clarifies that even if knowledge generation as a sub-process is not included in the focus of this thesis, the identify activity is. This activity aims to take care of the result, that is, new generated knowledge, and is the link between knowledge generation and knowledge codification and coordination. The identify activity is critical for knowledge repositories, because if we not identify new created knowledge it will never be stored. This is in accordance with the model that describes what KM is about (Figure 8:2), because here we can see that personal knowledge is an important input to knowledge repositories.

This discussion about how to perform KM is summarized in Figure 9:2

Substantial portions of the three sub-processes concern the strategy and the organizational culture. The significance of the problem domain, the Learning
Organization, for the success of KM is obvious, and must been taken into consideration.

Performing KM work is complicated. Organizational culture, management support, vision, technology, and integration in business processes are examples of factors that affect its success. As mentioned, while leaders and management are responsible for the KM work, the daily KM work is carried out by members of the organization. Activities performed include identifying, storing, using and transforming knowledge. These are conducted by different roles at an operational level, and must be guided by a common knowledge vision, which is the management’s responsibility. This thesis focuses on IT-supported repositories to support knowledge reuse and to stimulate knowledge creation. Reusing knowledge implies that a member learns and creates knowledge. If this knowledge is new from the perspective of the repository it is a potential input to the repository, which is in accordance with what KM is about (Figure 8.2). Thus, even if the sub-process, knowledge generation, is not in focus, the knowledge which is generated is of great importance. Identifying and capturing this new knowledge is a prerequisite for the knowledge to be disseminated, and for the repository to include relevant and updated information. The importance of the identify activity is obvious. If there are not enough processes to take care of relevant generated knowledge there is no possibility of feeding the repository with relevant and updated information, which is necessary for success of the repository. Performing the relevant sub-processes and activities in KM work successfully, illustrated in Figure 9.2, successfully implies managing KSF. Otherwise, these factors will cause problems and difficulties. In the next section we describe KSF in a KM-project aiming to develop an IT-supported knowledge repository.

9.2 A categorization of Success Factors (SF) for developing an IT-supported knowledge repository

Problems and difficulties are conditions that have to be managed for a project to succeed. This is what Success Factors are about. Thus, in order to gain knowledge and understand potential problems and difficulties in a KM project aiming to result in an IT-supported knowledge repository, we qualitatively analyzed our theoretical data (Chapter 4) to identify SF in this type of KM project, and then categorized the identified SF in accordance with KSF for ISD. This categorization approach also enhanced the discovery of similarities and differences between KM and ISD projects. The main contribution of this work is our new way of categorizing SF, which synthesizes the existing body of knowledge concerning SF in this type of KM and includes describing them in a novelty way (Table 9.2). Furthermore, it strengthens the
similarities between this type of KM project and an ISD project. The main target groups for this comprehensive description are researchers in the area, and different types of practitioners in strategic positions.

An IT-supported knowledge repository is a KMS which fulfills the requirements of an IS. SF emerging from organizational issues are the most dominating group of factors in ISD, and they also influence factors dealing primarily with economic and technological ones (Ewusi-Mensah and Przasnyski, 1994). The work is therefore delimited to SF emerging from organizational issues. The first step of the data analysis was therefore to identify SF in general and sort out factors not emerging from organizational issues. An example of a factor that was sorted out was the failure to contain the cost in the KM project. The next step was to analyze the remaining factors. Methods, techniques and tools in ISD should also be applicable in developing KMS, and we have used Aggestam’s (2004) four groups of organizational factors as an analyzing tool in this second step:

- To learn from failed projects
- To define the system’s boundary, both for the whole system and for relevant sub-systems
- To have a well defined and accepted objective aligned with the business objectives
- To involve, motivate and prepare the “right” stakeholders.

Factors that do not belong to any of these four groups have formed a separate group. Two side-effects of this approach are that it will strengthen or weaken the assumption that theories, methods and tools in ISD are useful in developing KMS, and that it will show if the planning framework we developed for ISD (see Aggestam (2004) or Section 3.3) has the potential to be useful in a KM project. The result is summarized in Table 9:2.

In the remainder of this section, we briefly discuss the analysis. For a more comprehensive discussion, we refer to Appendix A.

Two groups of factors, *To learn from failed projects* and *To define the system’s and the subsystem’s boundaries*, are necessary prerequisites for managing the other three groups of factors. Conducting a successful KM project requires reusing knowledge and experiences gained from other projects, in order not to make the same mistake again. To be able to describe the objective, analyze and manage asymmetry of knowledge, identify relevant stakeholders etc. requires knowledge of the scope, and important aspects of the project. Where is the project going to happen? What parts, as both departments and processes, are involved and affected?
Table 9.2. SF when developing knowledge repositories from the perspective of KSF in ISD

<table>
<thead>
<tr>
<th>KSF in ISD</th>
<th>Appearance when developing a repository</th>
</tr>
</thead>
</table>
| To learn from failed projects | - KM is critical for the organization (Chua and Lam, 2005)  
- The opportunity to learn is lost if failure is ignored, denied, or repressed (supported by Chua and Lam, 2005; Sandelands, 1999)  
- Evaluation of professional training and teamwork (Hung et al, 2005)  
- Systematic effort to track and measure the success of KM projects (Chua and Lam, 2005)  
- Identify and transfer best practices in the company (Senge, 1999) |
| To define the system’s boundary, both for the whole system and for relevant subsystems | - A more holistic view, to determine the scope, is important (Wong and Aspinwall, 2004)  
- To manage knowledge only within silo-oriented communities represents great risk that business-critical knowledge is neglected (Chua and Lam, 2005)  
- Asymmetry of knowledge is a problem (Davenport and Prusak, 1998)  
- Managers must understand how other departments conceptualize their contribution to the whole (Sandelands, 1999) |
| To have a well defined and accepted objective that aligns with the business objectives | - A vision, a clear mission, is important (e.g. Call, 2005; Chua and Lam, 2005; Gore and Gore, 1999; Davenport and Prusak, 1998; Remus and Schub, 2003; Senge, 1999)  
- There must be a knowledge vision, which should be aligned to the strategic vision (Carlsson, 2001)  
- A link to economics and industry value, to business strategies and objectives (supported by e.g. Call, 2005; Carlsson, 2001; Chua and Lam, 2005; Davenport and Prusak, 1998; Jarrar, 2002; Senge, 1999; Sun and Scot, 2005; Wüg, 1993; Wong and Aspinwall, 2004)  
- The organizational intention, the strategy, must support the knowledge spiral (Nonaka and Takeuchi, 1995; Blodgood and Salisbury, 2001)  
- A benchmarking strategy is one of the most important CSF (Hung et al, 2005)  
- The organizational culture is a CSF (e.g. Busch and Richards, 2004; Chua and Lam, 2005; Davenport and Prusak, 1998; Hung et al, 2005; Park et al, 2004; Sandelands, 1999; Sun and Scot, 2004)  
- There must be a knowledge sharing attitude (Call, 2005; Chua and Lam, 2005; Sun and Scot, 2005; |
<table>
<thead>
<tr>
<th>Remaining SF</th>
<th>To involve, motivate and prepare the “right” stakeholders.</th>
<th>To integrate KM in business processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busch and Richards, 2004) -Political processes between different stakeholders, e.g. IT and media affairs, must be managed (Chua and Lam, 2005). -Tacit knowledge and behavioural issues must receive sufficient attention (Chua and Lam, 2005). -The content, its relevance, current interest, and structure, is important (e.g. Chua and Lam, 2005), Davenport and Prusak, 1998; Hung et al, 2005; Wiig, 1993) -The project must convince the users (Chua and Lam, 2005) (supported by e.g. Senge, 1999; Sun and Scot, 2005)</td>
<td>-Senior management support is one of the most critical factors. (e.g. Chua and Lam, 2005; Davenport and Prusak, 1998; Hung et al, 2005) -Top management has the responsibility for the vision. (Gore and Gore, 1999; Davenport and Prusak, 1998) -The tremendous importance of project management (Nonaka and Takeuchi, 1995) -Management must recognize the role of the individual in knowledge creation and understand the value of the human capital (Edvinsson and Malone, 1998; Gore and Gore, 1999; Sun and Scot, 2005) -Relationships increase the flow of information (Sun and Scot, 2005) -Full participation from the employees is necessary (Chua and Lam, 2005; Hung et al, 2005) (also supported by Sandelands, 1999; Senge, 1999) -Participation requires teaching (Hung et al, 2005; Davenport and Prusak, 1998) e.g. clarity of language (Davenport and Prusak, 1998; Sandelands, 1999) -To overcome individual imperatives as wanting to be where they are (Sandelands, 1999; Sun and Scot, 2005) -Trust is important. (Call, 2005; Davenport and Prusak, 1998, Sandelands, 1999)</td>
<td>-Incorporate KM in managerial fashion cycle (Swan et al, 1999) -Adapt KM to business and knowledge processes (Remus and Schub, 2003) -There are business functions which are critical knowledge functions (Wiig, 1993) -To manage asymmetry of knowledge (see the 2:nd group of factors about the system’s boundaries)</td>
</tr>
</tbody>
</table>
To have a well defined accepted objective aligned with the business objectives is a group of SF that implies a lot of hard work. Obtaining a well defined objective in a KM project involves analyzing it from different perspectives, at different levels of abstraction, and paying a large amount of attention to culture and political processes. If the purpose is to build and develop knowledge repositories, these analyzes must also include what knowledge should be stored, how it should be stored etc. To involve, motivate and prepare the “right” stakeholders focuses on both leaders and other members. While the leaders have the responsibility, full participation from employees is necessary. Convincing employees to participate is influenced by trust and relationships.

As a result of the analysis approach the description is structured in five groups, which enables an understanding of what constitutes the problems. The analysis also reveals that KSF in ISD are applicable for a KMS development project. This strengthens the assumption that theories, methods and tools developed for ISD have the potential to be useful in a KMS project. However, the result indicates some differences between how the factors appear, and two aspects of the KSF are more stressed when developing a knowledge repository compared to ISD:

- The organizational culture
- The content

Another difference is the fifth group of KSF, which has two factors:

- To integrate KM in business processes
- To manage asymmetry of knowledge

Both these factors are more or less taken for granted in an ISD project. An IS should support the organization in its efforts to achieve the business objective, and must therefore be integrated in business processes. However, to pay explicit attention to this is important for both KM and ISD projects. The second factor concerning asymmetry of knowledge is not mentioned in relation to ISD. An IS aims to handle information in order to support the organization in achieving its objectives. This aim includes managing asymmetry in information.

By identifying and analyzing organizational SF, we recognized difficulties and problems that must be managed for a KM project aiming to result in an IT-supported knowledge repository to succeed. This work emphasizes the fact that to carry out a successful KM project is a complex task. Because of the limitation to SF emerging from organizational factors we argue that the
Factors have the potential to be applicable for KM work even if IT is not included.

The work also revealed further similarities and differences between KM and ISD projects. Based on this we can conclude that the ISD planning framework derived from KSF emerging from organizational issues (Section 3.3) has the potential to be useful when preparing an organization for a KM project which aims to develop an IT-supported knowledge repository. When applying the framework the differences between how KSF appear in ISD and in a KMS project must receive extra attention. In the following section we describe some general guidelines emerging from applying the framework. The purpose of the guidelines is to prepare for the development of an IT-supported knowledge repository.

9.3 General preparation guidelines for developing an IT-supported knowledge repository

If project managers are aware of KSF early, they can make more effective and efficient project adjustments (Procaccino et al, 2002). The developed general guidelines presented in this section should be used in the planning phase in order to prepare for the development of an IT-supported knowledge repository. They are the result of applying the framework of Aggestam (2004) (Section 3.3), and at the same time paying attention to the result presented in Section 9.2. The framework has been applied both theoretically and empirically. In the empirical application we worked in EKLär with the adapted description of the objective, that is, we described the objective in different ways depending on which stakeholder group we were talking with (Aggestam, 2005). This is one fundamental part of the framework.

The adaptive descriptions had a positive effect on the majority of the stakeholders and motivated them towards the project. This really enabled the work during the process. Two concrete examples of this include the willingness to find the time to participate in meetings, and participating in testing the prototype. It is worth stressing that after the motivation process, the attitude change was more obvious in the knowledge consumers’ group than the producers’. Possibly, this phenomenon depends on the fact that we more or less took for granted that all the producers were positive, because the initiators of the project belong to this group. We should possibly have made more effort to analyse this group, even identifying sub-groups, as well as how the description of the objective should be adapted for this group and its sub-groups. However, this confirms the fundamental aspect of describing the objective in an adaptive way for relevant stakeholders, “key-persons”.
The main target group for these guidelines is practitioners in strategic positions. The guidelines should be tested and detailed. From this perspective the researchers in the knowledge area are a target group.

The guidelines presuppose a KM vision. If there is no KM vision, this work should be done first. If there is no time, which is often the case, we recommended initiating this work in parallel. Furthermore, the guidelines should be used iteratively and also in parallel in the planning phase. However, in order to describe them as clearly as possible, it is done in a sequential manner. In order to enhance traceability, concepts in italics refer to the framework (Figure 3:1). However, it is not necessary to understand how these guidelines map to the framework to understand them.

1. Identify where the KM project is going to happen, i.e. define the System’s boundary. What departments/part of the enterprise does it concern? Is it already now possible to identify cultural differences and/or asymmetry of knowledge? Which subsystems, i.e. departments/parts/processes etc, are critical for the success of the actual project? Parts including future users and the technical department are often critical. Are there any business processes that are more important than others?

2. Analyze the objective for the whole KM project, the system, in complementary different frames. We recommend starting with the neutral frame. Each description must clearly indicate how this objective description supports or contributes to the KM vision, the why-level. Due to the significance of the organizational culture in a KM project, the human resource and political frames need some extra attention. It is essential to analyze which content contributes to the KM vision. If there is no KM vision, then align to the business objectives. Carefully document the questions that arise in relation to the KM vision for use when this work starts. Each description must also include ideas about how to integrate the KM work in (important) business processes. This step often reveals critical subsystems as parts and processes (see the first step). In future iterations let important included parts/departments be the whole. In these iterations it is also critical to analyze if there are any cultural differences between involved departments/parts, and be prepared for asymmetry of knowledge.

3. Identify relevant stakeholders. This work is dependent on the former steps. Are there any key-persons with regard to critical subsystems as parts and/or business processes? Key-persons concern both formal and social status in the organization. If there are a large number of persons, it is a good idea already in this step to group and rank them according to their importance to the project.
4. **Motivate** relevant stakeholders, “key-persons”. Explain and describe the objective in an adaptive way with regard to each type of stakeholder. This requires choosing the most suitable type/s of the objective’s description. If finding a description for any of the stakeholder/s is difficult, this indicates deficiencies in the work performed in step 2. If there are no resources to do this on an individual basis, use the groups identified in the former step. The objective should be explained in such a way that the individual stakeholders can transform this information to knowledge about how the project will affect them and why carrying it out is important. Motivating and convincing stakeholders require that they understand what the project is about, how it will affect them, and why it is important to carry it out both from their own perspective, and that of the organization. One important aspect is convincing the people in the organization of the importance of integrating KM into their daily activities. When performing this work be prepared for existing cultures in different departments, and for asymmetry of knowledge with regard to the scope or related areas. It is also important to collect information about what content each stakeholder considers important at this initial stage. This is not only a valuable input to former steps, but also for future work. For example, when testing a prototype ensure that any critical content from the perspective of the users has been implemented, since this will encourage their motivation.

5. **Prepare** relevant stakeholders: This process should focus on educating stakeholders in different terms and concepts in order to facilitate future communication. It can be compared with the type of KM that Wiig (1994) describes as aiming to accumulate knowledge in people.

    Restart from number 1, and let a critical subsystem, a department/part or business process be the system, the whole. The why level in step 2 must be in alignment with the objective for the whole system. Repeat this until all the important subsystems have been analysed at a system’s level.

The general guidelines presented above help the organization prepare for a KM project aiming to result in an IT-supported knowledge repository. That project preparation should be an integrated part of implementation work is one lesson learnt when applying the extended SKM to the EKLär case. This is described in the next section.
9.4 Lessons learnt when applying the extended SKM framework (e-SKM) to EKLär

While applying the extended SKM framework (e-SKM) to data collected in the EKLär case, we learnt some lessons concerning how to perform KM work. In order to be as clear as possible we describe the theoretical analysis, and then structure the following description in accordance with the three phases of the project: preparation, implementation and evaluation. Furthermore, to enhance traceability, we present tasks and concepts from the extended SKM framework (Figure 8:6) in italics, and include the numbers that refer to our extensions of the framework (Figure 8:6).

The preparation phase focuses on the users from a preparation perspective. The framework itself has more of an implementation perspective. However, preparation must take important tasks into consideration and be ready for them, and by applying the extended SKM we learnt relevant things for the preparation phase:

- **Usage**: To desire to use the repository requires motivation, i.e. to believe that it contributes to daily work. The preparation process contributes to this, and makes the future users feel that they are involved from the beginning and that their opinions are important.

- **Design**: What content do the users want to find? What type of language should be used? How should information be presented and disseminated to suit the daily work? (In our case this means concise and precise information.) Observations from the case highlight the importance of users’ influence on design. This is strengthened in the evaluation phase and is also in accordance with Carlsson’s (2001) relation between Usage and Design.

- **Culture (5)**: In the case we observed users had no problem learning from people who have the same education as themselves. We interpret this as a part of a knowledge sharing culture. The extent to which IT is a part of each individual’s daily work varies. Both reflections add to the body of knowledge concerning the importance of taking organizational culture into account.

- **Link individual processes to organizational processes (2)**. The case highlights the importance of connecting individual work processes to organizational ones. From the users’ perspective there must, for example, be time for using the repository as well as having access to computers and the Internet. The case can be regarded as a virtual organization, and there can be different cultures and processes in different parts of it. Hence it remains to be shown whether SKM covers virtual organizations.

- **(6)** The interviews that were made in the EKLär case reveal the importance of this, and questions about how new knowledge created in, e.g.,
primary care can be captured in the hospital and stored in the repository were raised. This also relates to the fact that the case can be regarded as a virtual organization.

**The implementation phase** concerns developing the repository, and all tasks except **Usage** should be involved.

- **Strategic Vision**: In our interpretation of the case it is hard to discern the strategic vision from the knowledge vision. This is perhaps due to the fact that the strategic level for the whole hospital was not explicitly present in the EKLår case. One reason for this may be that the hospital’s top management was not involved. However, the need for a strategic vision became clear later in the process, mainly in Design.

- **Knowledge Vision and Identification**: It is not clear to us whether this refers to the knowledge vision in general or to the specific project. We interpret this task not to be project specific, and as a consequence, we miss the project goal in the framework. From our point of view this task concerns the KM strategy, and its importance became more and more clear as the project proceeded. Questions such as: “What is the knowledge vision? What is the strategy? How do we want to use the knowledge resource for the whole hospital?” were asked. We believe that these are questions about the knowledge strategy. With regard to the perspective of Blodgood and Salisbury (2001), it was not clear if knowledge creation or knowledge transfer should be emphasized. Organizations have four choices, from a resource based view (Blodgood and Salisbury 2001), and these are two of them. With respect to the fact that SKM has its origin in the resource based view, it is not strange that this was noticed. However, it also shows the importance of explicitly discussing and deciding the organizational change strategy; does it concern creation, transfer or protection of knowledge?

- **A knowledge Goal is missing**: In the case, we observed the importance of asking questions such as: “Which knowledge do we want to disseminate in order to reach the project goal? What do we want to teach the personnel?”, which reveal the obvious importance of the knowledge goal. This goal must be in line with the former one about the knowledge vision and identification. As we see it, the knowledge goal is missing in the framework, or is this what the former one is about? The first meetings aimed to identify a starting point, which became a compromise between the results from the preparation phase and the initial results of the implementation phase. This strengthens the fact that the preparation phase needs to be an integral part of the extended SKM.

- **Design**: From the perspective of this task, the importance of a well stated and clear project goal is further stressed. Design should include repository content and structure. That is, what pieces of knowledge should be included and how should they be related in order to reach the business
goal (4)? Furthermore, issues concerning the type of network, that is, open or closed, must be resolved. If there are no legal aspects, such as confidentiality, an open network may be considered. It is important to identify the connection points between the individual and organizational processes (2). Presently, this is mostly done from the suppliers’ perspective. However, in order to become useful the repository must be aligned to fit both end-users’ and repository managers’ needs. Notably, in the EKLär case, neither group has a high level of IT maturity. Finally, the information stored must be concise, since no user has the possibility of spending much time browsing it, and preferably utilizing multimedia and pictures.

• **Protection:** According to Carlsson’s (2001) definition, protection is not a key issue in this project. This is due to the project’s goal and the type of organization involved. There is no knowledge to protect, since to reach as many users as possible is a goal of everyone involved. Another aspect of protection, to our knowledge not regarded in SKM, is knowledge that others want to protect, for example, legal aspects. This was obvious in the EKLär case, probably with regard to the fact that it is in the area of health care. As we see it, this important aspect should be included in this task.

• **Implementation** concerns capturing knowledge, and packaging and storing information (3). The project constantly revisited the knowledge goal (4) when evaluating whether new knowledge should be incorporated in the repository or not. The fact that the same stakeholders (i.e. the domain experts) capture and package the knowledge provided valuable input concerning the links between the patterns stored.

• **Culture:** The case indicates a knowledge sharing culture where the existing knowledge sharing habits could be utilized in the project (5).

In **The evaluation phase,** **Usage** is in focus. The importance of how the repository has been designed is obvious:

• The main purpose was to guide the nurses in doing a preliminary appraisal before identifying leg ulcer type and to design how to treat it. The design was based on this aim. From the observations, we see that this focus leads to design trade-offs impacting usage. Information regarding this aim is easy to find, while other information requires more habitual use of the repository, as well as its structure and content. How the repository is used depends on the design (1).

One important contribution to the subject domain from the EKLär project is the analysis concerning which knowledge chunks to incorporate, what they should include and how they should relate to each other. The importance of using a tool such as, for example, EKP is highlighted, and we argue that the need to have a method/tool which supports the structure part in the design
task must be emphasized. Furthermore, attitudes towards computers and the repository form an important success factor. This is a part of the culture (5), and highlights the importance to anchor and motivate the project in a preparation phase. As indicated in the SKM framework (Carlsson 2001), the importance of the IT architecture in Design was obvious, but, with regard to the case and its nature (public health care with limited competition), only a subset of the analysis questions are relevant. From an updating perspective, it is important to separate between Knowledge generating processes and organizational ones. Here we also see a further aspect of connecting individual processes to organizational ones (2). It not only concerns Usage, but also implementation, that is, how to identify capture points, which refer to situations when knowledge, in daily work, is exchanged between employees. One important aspect was found to be how the IT architecture fits the work processes (2). From this we conclude that the IT infrastructure must be an explicit issue in Design.

In conclusion, the most important lessons learnt from applying the extended SKM to a health care domain case are summarized as follows.

• The importance of identifying explicit goals on different levels (Strategic Vision, Knowledge Vision and Knowledge Goal), and aligning them to each other.
• The importance of the design, i.e. repository structure, for how the repository is used.
• Project preparation must be an integrated part of implementation work.
• The importance of linking individual processes to organizational ones, both from Usage and Implementation in the Strategic Knowledge Management framework.
• Legal aspects are to be perceived as another facet of Protection in the Strategic Knowledge Management framework.

9.5 Concluding remarks

The work of describing how to perform KM work, as well as potential problems and difficulties when developing IT-supported knowledge repositories, has resulted in one model, a categorization of SF, and general guidelines for preparing for the development of knowledge repositories. The model provides an overview of included sub-processes, activities and stages, as well as further positioning the research focus. The categorization of SF and its related preparation guidelines describes potential problems and difficulties, as well as how the target organization can prepare in order to improve the chances of managing these factors during the development work. The importance of preparation is also one important result from applying the extended SKM framework to the EKLär case.
An important limitation of the model showing how to perform KM (Figure 9:2) is the lack of empirical grounding. This model is a synthesis of existing theories and has no other empirical grounding except that our participation in the EKILär project influenced how we interpreted the literature. However, considering the large amount of literature about KM and that some of the literature is empirically grounded, we do not regard this to be a problem. Furthermore, concerning Research Objective 1, we need an overview of how to do KM and IT-supported knowledge repositories, as well as how they relate, that is not delimited to a specific case or domain. Considering that this model, in combination with the other eight contributions, aim to provide a basis for developing the implementation guidance, we also argue that there is no need for stronger empirical grounding. The model clarifies, for example, which processes, activities and stages are included when working with knowledge repositories, and thus fulfills its aim to show how to perform KM and positions knowledge focus to knowledge domain. As mentioned, the external empirical grounding will be notably stronger when presenting the guidance.

The categorization of SF emerging from organizational issues provides the necessary information for gaining knowledge about the problems and difficulties in an IT-supported KM project aiming to result in a knowledge repository. One limitation is that this description is restricted to SF emerging from organizational issues. Another is that the description does not relate to any of the processes in the proposed framework for IT-supported knowledge repositories (Figure 8:3). From a preparation perspective, we do not regard this to be a problem. Success Factors emerging from organizational issues are the most dominant group, and influence other types of factors. These factors must be in focus in a planning phase, where there is no need to know in which process they appear. However, from an implementation perspective, these limitations are more serious. In order to support the KM work we need knowledge about all types of factors, and which SF dominates in each process. This aspect is a part of future work. Furthermore, we claim that with regard to the factors’ limitation to organizational issues, they have the potential of being applicable to KM development work even if IT is not included. Therefore, the description of SF provides an overview of problems to be managed in general KM work, and an overall understanding of what a purposeful support should take into consideration.

A successful KM project requires managing SF effectively. If the organization prepares itself for the project, the chances of managing these factors effectively increase. The presented general guidelines are a valuable contribution to more than one target group. Their usefulness to practitioners in strategic positions is obvious. Good preparation increases the chances of the
success of the KM project, which in turn enables the KM work in the organization. The guidelines are both theoretically and empirically grounded, although it is a limitation that they are not empirically tested further. This is necessary to be able to detail the guidelines as well as develop them into different groups adapted to different types of enterprises. With regard to the fact that the presented guidelines are general, we claim that empirical testing is a part of the work of detailing them.

The application of the extended SKM framework to the EKLär case revealed a number of important aspects in the preparation and implementation of a knowledge management project. Thus, applying the extended SKM framework shows aspects relevant to the operative level, “how” to perform KM, and a part of future work is further adapting the extended SKM framework by including the lessons we learnt: However, with regard to Research Objective 1, Characterize Knowledge Management from three levels of inquiry (why, what, how) in order to gain holistic knowledge about KM, we do not think this work is relevant at this stage of research. It is more about paying attention to the learnt lessons when developing the support.
10 Discussion of the Characterization of KM

The results presented and discussed in Chapters 7-9 depict how we achieved Research Objective 1: Characterize Knowledge Management from three levels of inquiry (why, what, how). KM has been characterized from the three levels of inquiry, and hence we claim that the first research objective has been achieved. Using the three levels of inquiry, KM has also been characterized from a holistic perspective.

If an organization is to survive it is necessary to manage its most important resource, “Knowledge”. The aim of KM is to create value for the organization (Wong and Aspinwall, 2004), and achieve competitive benefits, through enabling and supporting learning as efficiently as possible. Successful KM requires an environment that enables learning. A Learning Organization is therefore the desired state of the organization when implementing effective KM. A Learning Organization can be thought of as an environment that promotes learning. It is the members of the organization who learn, but a LO has a culture, structures, processes etc. that facilitate the learning process. Organizations understand that they need to know how to do well, and to take advantage of this knowledge in the best possible way (Davenport and Prusak, 1998). This is what KM is about, managing knowledge to support knowledge reuse and knowledge creation in such a way that employees will perform their tasks efficiently. How organizations do this is crucial for organizational development (Blodgood and Salisbury, 2001). Three levels of inquiry, why, what and how, in accordance with Van Gigch (1991), have been identified. In order to obtain a holistic picture of KM, as well as to understand both what KM in general is about, and knowledge repositories specifically, as well as how to perform it and why it is important, we characterized KM on these three levels of inquiry. If we do not have this holistic knowledge about KM, there is a great risk that the guidance we intend to develop will focus on the wrong aspects and not achieve its aim; to increase the number of IT-supported knowledge repositories used, through supporting the capturing process in order to increase the quality of the content.

Knowledge Management is a complex area with different focuses and methods. The results presented in this part of the thesis reveal that to develop a KMS in the form of an IT-supported knowledge repository is a suitable way to start when the intention is to initiate KM work with the aim of achieving
maturity as a Learning Organization. This motivates and strengthens our research focus. Developing an IT-supported knowledge repository is concrete. It contributes to other types of KM (see Figure 8:2), to accumulate knowledge inside people, as well as to embed knowledge and influence the culture. At the same time it triggers questions that initiate fostering a learning culture. This is in accordance with the system’s approach. Developing knowledge repositories is a subsystem in the area of KM, which in turn is a subsystem in a Learning Organization. Changes in a subsystem affect the whole system. Therefore we recommend that practitioners in strategic positions, who want to initiate KM work that drives towards becoming a Learning Organization, start with a KM project that aims to develop an IT-supported knowledge repository.

“Knowledge repositories can help reinforce an organization’s cultural rituals and routines.” (Davenport and Prusak, 1998, p. 147).

Knowledge repositories focus on knowledge reuse to generate new knowledge. The generated knowledge is in turn a potential input for the knowledge repository. There must be processes to manage the repository, and improvements in the work processes for using and updating it. The process, Capture New Knowledge, aims to manage the repository from the perspective of updating the repository. It presupposes that newly generated knowledge is identified, and also includes an evaluation element. Should the identified knowledge be stored in the repository? Identifying and capturing new relevant knowledge is a prerequisite to enable the knowledge repository to include relevant and updated information. Furthermore, the perceived quality of the knowledge in IT-supported knowledge repositories affects the use of it by knowledge seekers (Sharma and Bock, 2005), and the success or not of the repository.

We have delimited the remainder of the research work to the process of capturing new knowledge. An important process to facilitate is the capture of knowledge for an IT-supported knowledge repository, since a KM system’s success involves “capturing the right knowledge” (Jennex et al, 2007). Hence, the ability to capture knowledge is a key aspect of being able to manage knowledge (Matsumoto et al, 2005). The identify activity is the connection between knowledge generation and knowledge capture (see Figure 9:2). In addition, and from the perspective of FIT-KM (Figure 8:3), this activity can be regarded as the interface between the process “Capture New Knowledge” and its inputs, and hence it also starts the capture process. Further motivations for the delimitation are partly that identifying and capturing knowledge are prerequisites for all types of KM work, and partly that a review of existing explicit knowledge, in order to identify and capture knowledge, is a reasonable start to initiate KM work. Already introducing work
practices that enable the integration of KM work in business processes in this first process, is also crucial if the Knowledge Management work is to survive after the project. Incorporating knowledge sharing in the organizational culture is perhaps the most important factor for the success of KM system implementation (O’Donovan, Heavin and Butler, 2006).

While developing the guidance, we were not only interested in how to identify and capture knowledge within a KM project. One key issue concerns how this process can proceed after the implementation project ends and the repository is in use and maintenance phase. This represents the real challenge for KM. Thus, capturing new knowledge is a KM process that takes place both when a knowledge repository is initially created in a KM project as well as in ongoing KM work every time new knowledge that is potentially relevant to be incorporated in an existing knowledge repository is generated. As previously discussed, the latter is critical for maintaining usefulness and trust in the repository over time.

We believe that the way in which the capture process is performed during the implementation project establishes the premises for if, as well as, how the future KM work is carried out after the project. If the KM project is to achieve its objective, i.e., support learning and be an approach for organizations to achieve maturity as a Learning Organization, the capture process must be executed in such a way that it stimulates and encourages this work as an integrated part of organizational processes. We claim this requires that a KM project includes the identification activity and capture process at least twice, both at the start and as a process that supports effective and continuous maintenance of the knowledge repository. The reason for this is that executing this process makes different demands depending on whether it is carried out in the initial phase or as a permanent part of ongoing KM work. Therefore, developing a successful IT-supported knowledge repository includes much more than building it.

As previously mentioned, the repository should help the organization be competitive. This in turn requires a number of things: capturing the “right” knowledge, a culture that encourages the members to share knowledge, a common vision, as well as a suitable IT-system etc. Routines and strategies for using the system must also be an integrated part of other processes. The repository must really be interpreted as contributing to the performance of the work, it must be used. There is no doubt that organizations need KM, the question is how they can implement and subsequently manage it (e.g. Gore and Gore, 1999; Offsey, 1997; Sena and Shani, 1999; Wong and Aspinwall, 2004). This question together with the fact that a large number of KM projects fail (e.g. Storey and Barnett, 2000; Senge, 1999) demonstrate the need for this research.
Part IV

A Characterization of the Capture Process

This part provides a detailed characterization of the capture process as well as describes and discusses how we achieved Research Objective 2. This part constitutes the second set of contributions included in this thesis.
11 Introduction

Knowledge Management (KM) aims to support learning and create value for the organization. IT-supported knowledge repositories support learning by enhancing the sharing and reuse of knowledge, a core of KM work. The success of an IT-supported knowledge repository is dependent on whether or not the repository is updated, correct and relevant. In order for knowledge to be stored, it must first be captured, which indicates the criticality of the process “Capture New Knowledge”. With the holistic perspective in mind (Part III), the scene is set to present how we achieved Research Objective 2: Characterize the process of capturing knowledge to be included in IT-supported knowledge repositories.

The aim of our research is to contribute to increasing the usefulness of IT-supported knowledge repositories through facilitating the understanding of the capture process, as well as developing guidance for the implementation of this process in such a way that knowledge is continuously captured. Since knowledge is not created in a regular manner, it is critical that the capture process is continuously performed. Research Objective 2 aims to provide us with knowledge about the capture process including what in the process the guidance must pay attention to in order to achieve the research aim, and how it relates to other processes and activities in the organization. In order to achieve Research Objective 2 we identify and describe Key Success Factors (KSF) for the process of continuously capturing knowledge when developing an IT-supported knowledge repository (Chapter 12). These factors must be managed in the KM project to ensure that the repository will contain updated, correct and relevant information in the long term. Capturing knowledge is about identifying as much knowledge as possible, evaluating it and then sorting out the knowledge which should not be stored. Then, the remaining knowledge should be passed onto the process “To package and store information”. Identifying, evaluating and passing concern the interface of the capture process. Thus we develop a framework that not only aims to provide an overview as well as a holistic picture of the situations in which knowledge potentially escapes capturing, but which also stresses the importance of not passing all identified knowledge onto the next process of packaging and storing, i.e., it identifies different types of knowledge loss, wanted and unwanted (Chapter 13). Our results demonstrate how critical the aspect of having organizational knowledge about where to find knowledge is, be-
cause if it is not found, there is none to evaluate and pass on. Thus, at a gen-
eral level, we also describe where, in daily organizational work, different
types of knowledge most likely generate input to the repository (Chapter 14).

The results characterizing the capturing process, summarized in Figure 11:1,
are contributions from this thesis. They are derived from empirical and theo-
retical data. In accordance with a qualitative analysis, we have compared
data with data, with existing theories, and results previously presented in
Part III. In order to enable traceability and enhance understanding about how
the data have influenced our findings, this is described in relation to each
contribution, although we risk the recurrence of some data.

![Figure 11:1 Contributions characterizing the capture process](image)

The contributions are presented and discussed in the remainder of this part.
While Chapter 12 contains the description of KSF, the framework showing
different types of knowledge loss is in Chapter 13. The overview of the rela-
tionships between input to the repository, daily work and different types of
knowledge is described in Chapter 14. We conclude this part by discussing
our work, which aims to characterize the capture process, in Chapter 15.
12 Key Success Factors (KSF) for the Capturing Process

In the literature, the topic of Success Factors (SF) in knowledge management work is frequently discussed, for example, by Davenport and Prusak (1998), Hung et al (2005), Montequin (2006), as well as Storey and Barnett (2000), and in this thesis (see Section 9.2). We can also find studies identifying SF with regard to employee contribution of knowledge to IT-supported knowledge repositories (e.g., Kankanhalli et al., 2005; Jan & Jeffres, 2006). However, since employee contribution of knowledge is only one aspect of the knowledge capture process, more research is needed to identify and understand SF for this important knowledge process. It is the aim of this chapter aims to fulfill this need.

The capture process consists of two activities; to identify knowledge and to evaluate if the identified knowledge should be packaged and stored in the repository. There are SF for the capture process that more specifically influence the identify or the evaluate activities, and there are SF difficult to link to only one of these two activities, i.e., SF that more generally influence the capture process. Before proceeding, we want to remind the reader that Key Success Factors (KSF) in this thesis refer to “…the conditions that need to be met to assure success of the system” (Poon and Wagner, 2001, p.395). This means that in order to be sure of success when starting a KM project, all KSF have to be already met at the beginning. However, since this is more or less never the fact, the critical issue is to carry out the KM project in such a way that these factors are met when the project is concluded. Hence, the guidance must take KSF into consideration, and the importance of being aware of KSF in the capture process is clear. Furthermore, we want to emphasize that even if all the KSF have not been optimally met when concluding the KM project, it can still be a success, although you cannot know for sure. The number of KSF should be limited. If there are too many factors, more than 4-6, they are probably too detailed and all of them are probably not critical (Avison and Fitzgerald, 1995). We want to remind the reader that we do not use the term Critical Success factors in this thesis, since we do not use the research approach related with eliciting CSF (Rockart, 1979).
In this chapter we identify and describe KSF for the identify activity (Id-KSF), for the evaluate activity (Ev-KSF), as well as KSF difficult to link to only one of these activities, i.e., more general factors (Gen-KSF). Subsequently, based on these three categories of KSF, we extract the KSF for the capture process (Capture-KSF). Figure 12:1 shows how these four categories of KSF relate to KM work, and to each other, and in what sections they are presented.

Before presenting the categories, a summary of the analysis procedure employed is provided in Section 12.1. In order to enhance traceability and describe the complex pattern of factors that influence the capture process as clearly and detailed as possible, we then describe the Id-KSF (Section 12.2), Ev-KSF (Section 12.3) and Gen-KSF (Section 12.4), before presenting the Capture-KSF (Section 12.5). Describing Id-KSF and Ev-KSF results in knowledge about KSF for the capture process at a more detailed level, which in turn increases our knowledge and understanding of the capture process. Thus, through a comparison to Gen-KSF, we also more clearly and extensively discuss Id-KSF and Ev-KSF. Furthermore, Gen-KSF are important parts of the holistic picture of KM and already discussed in Part III of this thesis. We end this chapter with some concluding remarks.

12.1 The analysis procedure

The procedure consists of six steps. The output from each step and how this output contributes to the next step are visualized in Figure 12:2.
In order to enable traceability we kept empirical and theoretical data separated throughout the analysis. To show how different data influenced our findings, we describe this in Appendix B and C and include references and illustrative examples as well as quotations from the case study performed in the EKLär project. With regard to illustrative quotations from the case study, Orlikowski (1993) and Persson (2001) use a similar way of writing. All quotations are our own translations.

The six steps in the procedure can be summarized as follows:

1. Complement the account of organizational success factors (SF) in a KM project (see Section 9.2) with technological and economical success factors found in the literature. This was done by reviewing theoretical data from which the account of organizational factors in a KM project stems. Output: A theoretically grounded account of SF for a KM project.

2. Analyze these SF for a KM project from the perspective of how they may influence the capture process. Output: A theoretically grounded account of SF for the capture process.

3. Analyze data collected in all the three phases of the EKLär case; the preparation, the implementation and the evaluation phases, in order to identify SF that influence the process of capturing knowledge. The following explains where relevant data in each phase of the EKLär case were found.

   A. The preparation phase of the EKLär project: Data collected through interviews were a valuable contribution, for example, when developing the Knowledge map where data were collected about what the nurses in home health care want to learn. In order to iden-
tify this knowledge area, and how included knowledge chunks relate
to each other, we first developed a conceptual model of knowledge
areas to be included in the repository, referred to as "Knowledge", in
the implementation phase (see 2.2.1). The observations demon-
strated the importance of integrating the capture process to daily
work, because otherwise it would be difficult for employees to find
time for capturing knowledge. Material originating from studying
documents contributed directly to the repository and to the knowl-
dge goal. We can thus conclude that this way of working is impor-
tant in order to identify knowledge and formulate the knowledge
goal.

B. The implementation phase of the EKLär project: Data collected
in the project meetings are the main contribution from the EKLär
project. Studying the documents played the same role as described in
the preparation phase.

C. The evaluation phase of the EKLär project: From the capturing
perspective, the collected data showed the importance of letting the
repository include functions that facilitate user contributions to the
repository in terms of opinions and feedback.

In order to clarify, we stress that data collected in the project meetings of
the implementation phase dominate. It is in the implementation phase
that the capture process was carried out. Output: An account of empiri-
cally grounded SF for the capture process.

4. Analyze both accounts (output Step 2 and output Step 3) of factors with
the aim of conceptually organizing groups of SF from the perspective of
whether the factor mainly influences the capture process’s identify activ-
ity or the evaluate activity. SF difficult to link directly to any of these ac-
tivities form their own third group called “Other”. We want to empha-
size that when a SF fitted into more than one group it was placed in
“Other” if the factor was described/observed on a more general level and
did not specifically relate to any of the activities. Output: Empirically
and theoretically grounded SF grouped in the capture activities Identify
and Evaluate, and Other.

5. Conceptually analyze and describe each group of SF with regard to how
they influence the activities, identify and evaluate, and the capture proc-
есс in general. This work revealed the KSF for each of the groups Iden-
tify, Evaluate and Other. Output: A description of KSF for the identify
activity, evaluate activity and KSF difficult to link to only one of these
activities.

6. Analyze KSF in the three groups and their relationships, both to the cap-
ture process and between the groups. We did this in order to clarify how
these KSF influence the process of capturing knowledge and if some of
them overlap. Output: An account and a conceptual model of KSF for
the capture process (see Figure 12:5).
Step 5 of the procedure results in the following three categories of KSF:

- 4 KSF for the identify activity (Id-KSF)
- 6 KSF for the evaluate activity (Ev-KSF)
- 5 KSF hard to link to only one of the identify and evaluate activities (Gen-KSF)

Each category consists of conditions that must be met to assure success. The number of factors in each category is limited, to not more than six. The requirements of being key success factors are fulfilled for each category.

Both the identify and the evaluate activities are parts of the capture process. Thus, based on the system’s theory, we argue that the 4 Id-KSF, the 6 Ev-KSF and the 5 Gen-KSF influence the capture process. However, with regard to how we, in this thesis, define KSF, all these fifteen factors cannot be critical for the capture process. This process is at a higher level of abstraction compared to the identify and evaluate activities. Therefore, from the perspective of the capture process, these fifteen factors are probably too detailed and all of them are probably not critical for the capture process. This is in accordance with how Avison and Fitzgerald (1995) explain the situation when the number of factors is more than six. With regard to the fact that the categories, identify and evaluate, are parts of the capture process, there is also a risk that some of the factors overlap. Therefore, in order to extract those factors critical for the capture process, in Step 6 we analyzed how all these KSF, regardless of category, relate to each other and to the capture process. This work confirms our thought about overlapping, but also shows that sometimes this overlap indicates that a factor is critical for different aspects of the capture process. For example, a KM project goal is critical for evaluating if identified knowledge should be included, but it is also critical that the KM project goal is aligned to KM vision and business objectives. The former aspect was identified as an Ev-KSF and the latter as a Gen-KSF. The work in this last step resulted in five KSF for the capture process and a conceptual model showing their relationships (Figure 12:5).

“The conceptual model illustrates what ought to be happening to achieve the objectives specified in the root definition” (Avison and Fitzgerald, 1998, p. 126).

The objective to be achieved is a successful capture process in which relevant knowledge is continuously being captured. In addition, the accounts of Id-KSF and Ev-KSF are also described in conceptual models. The used notation in the conceptual models is inspired by the EKD notation (Persson and Stirna, 2002).
12.2 KSF for the Identify activity (Id-KSF)

Section 12.2.1 includes a summary of the analysis, while Section 12.2.2 includes the Id-KSF as well as a conceptual model showing how the Id-KSF influence the identify activity and factors that in turn influence the Id-KSF.

12.2.1 A summary of the analysis

In order to enhance traceability and show which data, that is, which Success Factors (SF) mainly influenced our findings, we provide, in Appendix B, a comprehensive description of how we analyzed our data, including references and illustrative examples as well as quotations from the case study performed in the EKLär project, for the purpose of identifying Id-KSF.

When grouping SF according to whether they mainly influenced the identify or the evaluate activity (Step 4 in the analysis procedure), the largest number of success factors related to the identify activity. Based on this, and together with the fact that this activity triggers the capture process, we argue it is crucial that the guidance we aim to develop supports the identify activity to maintain good quality in the content. The need to systematize the identify activity is clear.

Although we found success factors for the identify activity in both the empirical and theoretical data, its appearance is more common and clearer in our empirical data. In the literature, the activity, identify knowledge, is mentioned more in passing or implicitly when the management and capture of knowledge is discussed in general. For example, while the importance of managing tacit knowledge is frequently discussed (e.g. Busch and Richards, 2004; Nonaka and Takeuchi, 1995), as well as the need to learn from failure (e.g. Chua and Lam, 2005; Lyytinen and Roby; 1999), the identify activity is not explicitly explored. Davenport and Prusak (1998) discuss the identification of knowledge that is appropriate for reaching business goals, and Chua and Lam (2005) argue that valuable knowledge remains obscured, because of a lack of effective mechanisms to distill knowledge from debriefs and discussions. These two references are examples of the identify activity being more explicitly mentioned, although only in passing. We claim that without the empirical data the risk of missing the crucial importance of the identify activity would have been higher.

In order to enhance reader understanding, keywords and phrases are italicized in the forthcoming summary.

If the culture is characterized by willingness to share knowledge, this process is enhanced. Furthermore, input from users must be encouraged and enabled,
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and supported by e.g. IT. It is important to identify what knowledge to cap-
ture, the knowledge area, and where to find the knowledge related to that
area. To identify what knowledge to capture that is to be shared, includes
paying attention to what the providers want to be taught and what the users
want to learn. This can be compared with developing a concrete and detailed
picture of the knowledge goal; a Knowledge map for orienteering the KM
project. However, knowing what to capture is not enough, the necessary
knowledge must be found. Knowing where in the organization it can be
found requires understanding the asymmetry in the organization and potential sources, inside as well as outside the organization.

In the EKLär case, two main approaches for identifying knowledge were
revealed: 1) Focusing on existing external knowledge and the experience
based knowledge of the nurses and doctors 2) Focusing on daily work proc-
desses and activities. These different approaches were used in different phases
of the EKLär case and also mainly focused on different types of knowledge.
The first approach, focusing on existing external knowledge and project
members’ own experience, was used when building the repository for the
first time, and, except the project members’ own knowledge, the main focus
was on external knowledge. The second approach, focusing on daily work,
was used when preparing for maintenance, and here the focus was on em-
bedded knowledge. From the perspective of organizational knowledge, em-
bedded knowledge can be regarded as organizational tacit knowledge
(Figure 8.2). The KM project should include different types of knowledge
(Part III), and the need to iterate the capture process during the implementa-
tion project is clear. When trying to identify where to find knowledge, it is
important to search both for different sources where relevant knowledge is
likely to be created as well as different signals which indicate that knowl-
edge may have been created. In the EKLär case we worked with capture
points. Regardless of approach, it is crucial that responsible actors in
the organization are identified and their work role descriptions are revised. This
is a management responsibility. From the perspective of Braf’s (2004) three
basic types of knowledge mediation, i.e., whether the mediation is triggered
by typical or general problems or if they are non-problem driven knowledge
mediations, we believe that implementing the repository mainly concerns
knowledge mediation triggered by typical problems, while preparing for
maintenance of the repository concerns mainly the two other types. Reasons
for this are that the implementation work focuses on typical problems and
requires some planning and structure, while the maintenance work is carried
out more by members of the organization in their daily tasks and more influ-
enced by the organizational culture and the willingness to share knowledge.
12.2.2 KSF for the Identify activity (Id-KSF)

Based on the analysis of SF for the identify activity, the following four KSF for this activity have been identified (visualized in Figure 12:3):

- **Id-KSF1**: Employees are willing to contribute with knowledge
- **Id-KSF2**: Work processes and IT systems enable input from different sources
- **Id-KSF3**: Organizational knowledge includes knowledge about where potential knowledge to be included in the repository can be found
- **Id-KSF4**: Organizational knowledge includes knowledge about what knowledge to capture

![Diagram of KSF for Identify activity](image.png)

**Figure 12:3. KSF for the identify activity and their influence factors**
Figure 12:3 visualizes both how the Id-KSF influence the identify activity and different factors that influence the Id-KSF.

It is not certain that all identified knowledge should be incorporated in the repository. The following section describes the evaluation activity, which aims to select what knowledge to pass onto the process “Package and Store Information”.

12.3 KSF for the Evaluate activity (Ev-KSF)

To enhance traceability and readability, the structure of this section is in accordance with Section 12.2.

12.3.1 A summary of the analysis

Appendix C includes a comprehensive description of how we analyzed our data, including references and illustrative examples as well as quotations from the case study performed in the EKLär project, for the purpose of identifying Ev-KSF. To enhance reader understanding, key words and phrases are italicized in the following summary.

The activity, evaluate knowledge, aims to select what to store, that is, sort out identified knowledge that should not be stored. Evaluating with respect to correctness also influences the reliability, and this kind of evaluation should be done by a person in whom the users have faith. For this, the role is as important as who does it, and, from a political perspective, this is also a sign of commitment. Other types of evaluation concern judging whether the knowledge is relevant with regard to the knowledge goal and intended users, whether it is already stored or not, and if it can be stored with regard to legal aspects and the organization’s protection policy. One valuable evaluation criterion in the beginning is what the end users regard as the most important aspect that should be found in the first prototype of the repository. This presupposes knowledge about the users already at the beginning of the project, and the need of preparation work which includes finding this out is clear. Some evaluation criteria require that the actual knowledge is packaged in some way, for example, correctness, which reveals an iterative element between the capture, and package and store processes. All these different types of evaluation require different types of criteria against which to value, and thus different types of competences. Different roles can be responsible for all or parts of the evaluate activity, but regardless of this, which role, “who”, is responsible for which part must be defined and the corresponding work role descriptions must be revised accordingly.
12.3.2 KSF for the Evaluate activity (Ev-KSF)

Based on the analysis of SF for the evaluate activity the following five KSF for this activity have been identified (visualized in Figure 12:4):

- **Ev-KSF1:** The evaluate activity is included in relevant work role descriptions.
  - Reliability
    - Quality assured
      - Is responsible for
    - Rule
      - Is enforced by
    - Person

- **Ev-KSF2:** Evaluation addressing correctness is performed.
  - The actual knowledge is packaged.
    - Protection of the knowledge for legal restrictions
      - Is part of
    - Protection of the knowledge from being modified
      - Is part of
    - Protection of the knowledge from value erosion
      - Is part of
    - Protection by external actors
      - Is part of
    - Protection of organizational knowledge
      - Is part of

- **Ev-KSF3:** Evaluation addressing precision is performed.
  - Examine if there are legal restrictions to store the identified knowledge
  - Examine if the identified knowledge is already stored in the repository
  - Examine if the identified knowledge is relevant with regard to the knowledge goal

- **Ev-KSF4:** Evaluation addressing relevance is performed.

- **Ev-KSF5:** Evaluation addressing explainability is performed.

- **Ev-KSF6:** The repository satisfies most important knowledge needs of the users.
  - Is part of

Figure 12:4. KSF for the evaluate activity and their influence factors
• Ev-KSF1: The evaluate activity is included in relevant work role descriptions
• Ev-KSF2: Evaluation addressing correctness is performed
• Ev-KSF3: Evaluation addressing protection of organizational knowledge is performed
• Ev-KSF4: Evaluation addressing relevance is performed
• Ev-KSF5: Evaluation addressing redundancy is performed
• Ev-KSF6: The repository satisfies most important knowledge needs of the users

Figure 12:4 visualizes both how the Ev-KSF influence the evaluate activity and different conditions that influence the Ev-KSF.

The following section describes SF for the capture process that were difficult to link to only one of the two activities, identify or evaluate.

12.4 KSF for the capture process on a more general level (Gen-KSF)

When we analyzed, in Step 5 of the analysis procedure (Figure 12:2) how the capture process and its included activities identify and evaluate are influenced by SF that influence the capture process more in general, we identified five categories of SF. Further analysis showed that each category represents a Gen-KSF, and each of the five Gen-KSF was accordingly formulated as follows:

• Gen-KSF1: There exists a well defined and accepted KM goal which is aligned with other strategies
• Gen-KSF2: The organization has a knowledge sharing culture
• Gen-KSF3: Daily work processes integrate the capture process
• Gen-KSF4: Sufficient resources are allocated for the KM project
• Gen-KSF5: Top management commits to the KM project

Except Gen-KSF4, issues pertaining to Gen-KSF had already been noticed when describing Id-KSF and Ev-KSF. This is not strange since identify and evaluate are parts of the capture process. SF that influence the capture process more in general are on a higher level of abstraction and thus also show other types of influence on and/or conditions for the capture process. Thus, SF that influence the capture process more in general, and accordingly also Gen-KSF, complement and refine our body of knowledge concerning conditions that influence the capture process, i.e., success factors for the capture process. Therefore, in the following, we describe each Gen-KSF.
Gen-KSF1: A well defined and accepted KM goal which is aligned with other strategies: The project must have a clear mission (Remus and Schub, 2003), and the first step in KM implementation is to create a knowledge vision. This is the management’s responsibility (Gore and Gore, 1999). A clear, concrete and detailed project goal, for example in the form of a Knowledge map, is necessary when evaluating whether identified knowledge is relevant or not. In the EKLär case, during the development of the Knowledge map, the project goal was in focus. As mentioned, the Knowledge map can be compared with a concrete and detailed view of the project goal.

“Which knowledge do we want to disseminate in order to reach the project goal? … What do we want to teach the personnel?” (a nurse in a project meeting when working with developing the Knowledge map)

In our experience, the literature often discusses knowledge vision regardless whether it means the overall knowledge vision or a more specific KM project goal. In the EKLär case, the vision was in focus when discussing how to structure the web page. For example, should leg ulcers be the main entrance or only one part of it, and how could the repository be extended in the future.

“What is the knowledge vision? What is the strategy? How do we want to use the knowledge resource for the whole hospital?” (a nurse at a project meeting packaging and storing)

The difference and relation between a knowledge goal and a knowledge vision was clear in the EKLär case. The vision concerns a strategic level and the goal a more operative one. However, the knowledge vision, in our experience, was not well known, if there really was one at all. Quotations, from project meetings in the implementation phase, which strengthen this impression are, for example:

“Is this relevant?” and “What vision does our management have?”

The vision must be aligned with other strategies (Carlsson, 2001), that is having a clear why perspective. The goal in turn must be aligned to the vision, indicating what to do. Identifying explicit goals at different levels and aligning them to each other is one lesson learnt in Aggestam and Backlund (2007).

“In some cases organizations pursue a KM initiative without aligning it with their overall business strategies and objectives, thus finding themselves to be less successful and not achieving their intended goals” (Wong and Aspinwall, 2004, p.95).
In the EKLär case, it was difficult to discern the strategic vision from the knowledge vision. This is perhaps due to the fact that the strategic level for the whole hospital was not explicitly present in EKLär. One reason for this may be that the hospital’s top management was involved. The reason why the EKLär case succeeded anyway may depend on the type of organization (public health care with a clear overall purpose, a knowledge sharing culture and with limited competition) together with the work performed in the preparation phase which aimed to anchor and motivate the project. In this work, a clear project goal and how it was described were important aspects.

Summary of Gen-KSF1: On order to run the capture process efficiently requires a well defined KM goal, aligned to the KM vision which in turn should be aligned to business objectives. A KM goal shows what to do and must be aligned to a KM vision which answers the why question. Without a concrete and detailed KM goal it is impossible to evaluate whether identified knowledge is relevant or not. From earlier work (see Section 3.3) we also know that the goal must be accepted. A well defined and accepted KM goal is also a wanted output from the pre study, or at least from the first part of the implementation phase.

Gen-KSF2: A knowledge sharing culture: The importance of a knowledge oriented culture and a knowledge sharing attitude are well known in the literature (see e.g. Call, 2005; Chua and Lam, 2005; Sun and Scott, 2005; Busch and Richards, 2004; Davenport and Prusak, 1998; Massey et al, 2005). This group is the one containing the second most factors. The culture influences whether people want to share knowledge, which in turn influences how easy it is to identify knowledge. To understand why employees want to contribute with knowledge to knowledge repositories requires using more than one dimension as, e.g., utilitarian, normative and collaborative (Jian and Jeffres, 2006). For example, using the utilitarian perspective means assuming that individuals are rational and act for the purpose of maximizing individual profits (Jian and Jeffres, 2006). To assess incentive and reward systems is one way to create a knowledge sharing attitude (Massey et al, 2005) which is in the limit of the utilitarian perspective. This was not of interest in the EKLär case probably because people working in health care are used to sharing knowledge about treating patients; a knowledge sharing culture exists. Even if culture begins with leadership, the culture itself is the result of the group’s accumulated learning (Schein, 2004). We claim, that this knowledge sharing culture together with the commitment to the project, are important reasons why the people involved in the EKLär project were so willing to contribute. As one of the nurses in the project group put it:

“We want to disseminate our knowledge. If we do this, they will learn and our telephone calls will decrease”.
The project must convince the users as well as involve them (Chua and Lam, 2005). In the EKLär project the preparation phase aimed to anchor and motivate the project goal, i.e., to convince the users and involve them at an early stage of the project, to give them an opportunity to influence it. Much effort was made to explain the goal in a way to ensure users understood why the project was important to them. We also had information meetings with other relevant departments in the hospital e.g. the dermatology and IT departments. We argue that these activities in the long term influence the willingness to share knowledge. Project preparation must be an integrated part of a KM project (Aggestam and Backlund, 2007). Relationships increase the flow of information (Sun and Scott, 2005) and stimulate knowledge sharing and trust. Collaborative and trust relationships are crucial to external knowledge acquisition and transfer (Seleim, Ashour and Khalil, 2005). The EKP approach used in the EKLär case and its participatory design enhance involvement, relationships and so forth.

For further reading about Culture, we refer to Part III of this thesis.

Summary of Gen-SCF2: A knowledge sharing culture increases the willingness to share knowledge. Culture evolves over time, and the leadership is critical for this evolvement. Suitable preparation work contributes to motivation and has the potential to increase willingness to share knowledge in a KM project.

Gen-KSF3: Daily work processes integrate the capture process: KM must be adapted to business and knowledge processes (Remus and Schub, 2003) and be fitted to the operational environment (Massey et al, 2005). The importance of integrating KM work in daily work processes is obvious, and here we can also see the need to link knowledge goal, knowledge vision as well as overall visions and strategies. The preparation framework (Figure 3:1) emphasizes these types of alignments, and is thus a potential tool in this kind of work.

Similar to other processes, the capture process is a selected stream of activities which are included in other ones (Nickols, 1998). Consequently, the capture process must be a part of business processes and both identifying and evaluating knowledge should be integrated and linked to daily work processes for the success of IT-supported knowledge repositories. In the EKLär case this work was performed during the project meetings while preparing for maintenance, and is included partly in Appendix B when describing SF for the identify activity and in Appendix C when describing SF for the evaluate activity. Furthermore, an extensive description of the work performed when we prepared for maintenance in EKLär is presented in Section 14.1.1.
Knowledge is created in specific knowledge generating activities (see Figure 9:2) as well as in ordinary business processes, which are both parts of daily work tasks. Thus, newly created knowledge needs to be identified in both. To integrate is to link individual processes to organizational ones. The need to do this is one lesson learnt in Aggestam and Backlund (2007). In the EKLär case the integration of the identify activity with daily work processes was based on capture points. This also revealed the need to specify who, which roles, are responsible for this and to whom identified knowledge should be passed in order to reach the evaluate activity. Relevant work role descriptions need to be revised, which is management’s responsibility.

As earlier discussed there are different types of evaluating which require different types of criteria as well as competences. There must also be defined roles for evaluating. Since this activity requires time, it is the management’s responsibility to allocate time for roles to perform this task. Furthermore, this must result in revised work role descriptions.

The approach of integrating the identify as well as the evaluate activities to daily work processes can, in the EKLär case, be summarized as follows:

- The identify activity – “Bottom up approach”: Try to identify capture points to use as connection points between individual and daily work processes by deciding who is responsible for each point.
- The evaluate activity: - “Top down approach”: Based on capture points, decide which roles are responsible for the different types of evaluating and complement their work role descriptions with this task.

Summary of Gen-KSF3: The capture process must be integrated into daily work processes. To achieve this is not easy, but the work with capture points in the EKLär case shows one potential way to proceed. Regardless of the approach, individual processes must be linked to organizational ones by including these tasks in corresponding work role descriptions. To revise work role descriptions is the management’s responsibility.

Gen-KSF4: Sufficient resource allocation: Different resources are needed in a KM project. Analysis revealed that from the perspective of the capture process, time and IT are relevant. Time as a critical resource for performing the identify and the evaluate activities are already mentioned when discussing Gen-KSF3 with regard to daily work that must integrate the capture process. The observations conducted in the evaluation phase of the EKLär case shows that the IT support influences the ability to identify knowledge. For example, the prototype includes a contact part by e-mail. In the preparation phase of the EKLär project we conducted observations in the dermatology, and leg ulcer departments of the hospital. Data from these observations
show, among other things, that some questions concern knowledge belonging to the repository. This means that other used systems, such as Telephone Advice, have potential for generating input to the repository, but also that other systems which “use” knowledge that may be included in the repository should refer or link to the repository.

Summary of Gen-KSF4: Employees must have sufficient resources for performing activities and tasks belonging to the capture process. The time resource is critical when integrating the capture process to daily work ones. Furthermore, different IT systems must also support the process. How the repository is structured, and how it is integrated to other systems, also influence the identify activity. However, this is a KSF for the whole KM work and, we claim, for all projects.

Gen-KSF5: Top management commitment: Top management does not directly influence the capture process, but rather establishes the conditions for it. As mentioned, it is responsible for establishing the vision (e.g. Gore and Gore; Blodgood and Salisbury, 2001) and goal of the project (e.g. Remus and Schub, 2003). In addition, top management is of crucial importance to the development of a learning culture, and also decides how to allocate and use available resources, which in turn influences the possibilities of integrating the capture process to daily work ones. Thus, top management directly or indirectly influences all groups of success factors relating to the process of capturing knowledge. To illustrate this, top management is described as a frame that sets the limits for all the other factors, in Figure 12:5.

Management must recognize the role of the individual in knowledge creation (Gore and Gore, 1999) and different levels of management are important. For example, the commitment of senior management (Hung et al, 2001; Davenport and Prusak, 1998) to resource allocation and developing a learning culture, and project management (Nonaka and Takeuchi, 1995; Chua and Lam) to resource control. In the EKLær case the management were committed, and the nurses had time for this in their daily work. In EKLær the need of management support on different levels was clear (Persson and Stirna, 2007). Political processes between different stakeholders must be managed (Chua and Lam, 2005), and commitment from management at different levels is one way of handling it.

Summary of Gen-KSF5: Top management commitment is necessary for success. It establishes the conditions for the capture process, as well as the whole project. It is responsible for establishing the vision and goal, allocating resources and revising needed work role descriptions. Commitment from different levels of management is needed to manage political processes as well as the other groups of success factors, for example, increased willing-
ness to contribute. However, this is a KSF for the whole of KM and, we claim, for all projects.

12.5 KSF for the Capture process (Capture-KSF)

The capture process consists of the two activities, identify and evaluate knowledge. We have identified and described KSF for these activities, as well as KSF that on a more general level influence the capture process. These three categories of Id-KSF, Ev-KSF and Gen-KSF together constitute SF for the capture process at a higher level of abstraction. To further characterize and identify what the guidance, that we aimed to develop, must support, we analyzed these three categories and their relationships, both jointly and to the capture process, for the purpose of extracting and identifying KSF for the capture process (Capture-KSF). The relationship between Capture-KSF and the other categories of KSF is summarized at the conclusion of this section.

The analysis work (see Section 12.1) reveals the following five KSF for the Capture process:

- Capture-KSF1: There exists a clear, detailed and accepted KM project goal which is aligned to the knowledge vision which in turn is aligned to business objectives
- Capture-KSF2: Organizational knowledge includes knowledge about where potential knowledge to be included in the repository can be found
- Capture-KSF3: The organization has a knowledge sharing culture
- Capture-KSF4: The capture process is integrated in daily work processes
- Capture-KSF5: Evaluation addressing correctness, protection, relevance and redundancy is performed

How these five KSF influence and relate to the capture process which consists of the identify and evaluate activities is visualized in the conceptual model in Figure 12:5.

The analysis revealed the importance of knowing *what* knowledge to identify. This should be documented in the KM project goal (Capture-KSF1). In addition, a clear and detailed project goal is also required for performing the evaluation process efficiently (Capture-KSF5). The analysis also revealed the importance of organizational knowledge about *where* potential knowledge to be included in the repository can be found (Capture-KSF2). There must be organizational knowledge about asymmetry in the organization as well as potential sources. Having a knowledge-sharing culture is important for the whole capture process (Capture-KSF3). However, its importance is
most clear in the identify activity, because a knowledge sharing culture and a willingness to contribute are required for potential knowledge to be identified. However, we claim that a knowledge-sharing culture also enhances willingness to evaluate, and therefore also supports the evaluate activity. For the capture process to be continuously performed, it must be integrated to daily work processes (Capture-KSF4).

Thus, individual processes for both identifying and evaluating knowledge must be linked to organizational ones. These assume that there are responsible employees, for both the identify and the evaluate activities, who in their work role descriptions have clear directions for how to perform this work as
well as time to do it. This is the responsibility of top management. Technological and economical success factors concern resources. IT is a part of daily work which must support the identify and evaluate activities, and time is a critical resource for all parts of KM work. Top management is responsible for resource allocation, knowledge vision and goal, and has a major influence on the organizational culture. Therefore, if top management does not commit to a KM project, neither the capture process nor the whole KM project will succeed. The analysis also revealed that the evaluate activity must address relevance, correctness and protection (Capture-KSF5), and evaluation criteria are needed.

Issues concerning each Capture-KSF at a more detailed level can be found in the three categories Id-KSF, Ev-KSF and Gen-KSF. To further clarify what the Capture-KSF are about, we conclude this section by summarizing the relationships between each Capture-KSF and the Id-KSF, Ev-KSF and Gen-KSF. This summary also supports the reader in finding information about a specific Capture-KSF.

**Capture-KSF1:** There exists a clear, detailed and accepted KM project goal which is aligned to the knowledge vision which in turn is aligned to business objectives

- Id-KSF4: Organizational knowledge includes knowledge about what knowledge to capture
- Ev-KSF4: Evaluation addressing relevance is performed
- Gen-KSF1: There exists a well defined and accepted KM goal which is aligned with other strategies

**Capture-KSF2:** Organizational knowledge includes knowledge about where potential knowledge to be included in the repository can be found

- Id-KSF3: Organizational knowledge includes knowledge about where potential knowledge to be included in the repository can be found

**Capture-KSF3:** The organization has a knowledge sharing culture

- Id-KSF1: Employees are willing to contribute with knowledge
- Gen-KSF2: The organization has a knowledge sharing culture

**Capture-KSF4:** The capture process is integrated in daily work processes

- Id-KSF2: Work processes and IT systems enable input from different sources
- Ev-KSF1: The evaluate activity is included in relevant work role descriptions
- Gen-KSF3: Daily work processes integrate the capture process
- Gen-KSF4: Sufficient resources are allocated for the KM project
- Gen-KSF5: Top management commits to the KM project
**Capture-KSF5**: Evaluation addressing correctness, protection, relevance and redundancy is performed
- Ev-KSF2: Evaluation addressing correctness is performed
- Ev-KSF3: Evaluation addressing protection of organizational knowledge is performed
- Ev-KSF4: Evaluation addressing relevance is performed
- Ev-KSF5: Evaluation addressing redundancy is performed
- Ev-KSF6: The repository satisfies most important knowledge needs of the users

### 12.6 Concluding remarks

This work revealed Key Success Factors in the process of capturing knowledge, as well as in the activities identify and evaluate, which have to be managed to ensure success. The KSF that are not met at the beginning of the KM project, need particular attention during the project. Hence, the importance of knowledge and understanding about KSF in the capture process when developing the guidance is clear. Some of the Capture-KSF have a direct influence on the capture process, for example, *Capture-KSF5: Evaluation addressing correctness, protection, relevance and redundancy is performed*, and some are more indirect, for example, *Capture-KSF3: The organization has a knowledge sharing culture*. The indirect factors can be traced to the holistic perspective presented in Part III. This strengthens our research approach in the sense that we base the deep and detailed research about the capture process on holistic and broad knowledge.

The process of capturing knowledge consists of identifying knowledge and evaluating whether it should be stored in the IT-supported knowledge repository. These two activities must be integrated in daily work processes, and management must give employees time and other resources to perform them. Culture, knowledge vision and knowledge goal influence these activities and the capture process as a whole. An efficient capture process requires a willingness to share knowledge. To prepare the organization to motivate and convince stakeholders to share knowledge, as well as to define an accepted knowledge goal is critical. This is what constitutes the preparation framework and its related guidelines (Section 9.3).

The improved management of Key Success Factors in the identify activity results in increasing the amount of new knowledge that is identified, while the amount of knowledge that escapes identification decreases. Hence, unwanted knowledge loss is reduced. Improved management of Key Success Factors in the evaluate activity results in increasing the amount of the right information being stored and decreasing information overflow. Hence,
wanted knowledge loss is increased. The following chapter presents a framework showing different types of knowledge loss; unwanted as well as wanted.
The effective management of knowledge loss, that is, decreasing unwanted knowledge loss and increasing wanted knowledge loss, is a necessary condition for a successful capture process. The first piece of advice that the American Productivity & Quality Center (APQC) gives in their book “Capturing Critical Knowledge from a Shifting Work Force” is to build awareness of knowledge loss (Hari et al., 2005). In this thesis we have so far addressed the KSF for the capture process, but not the different types of knowledge loss that may occur in it. This chapter aims to fulfill this need.

Knowledge loss belongs to the interface of the capture process. After briefly describing our way of working (Section 13.1), we present a framework showing seven types of knowledge loss in the capture process (Section 13.2). This framework is the main contribution from this chapter. We end this chapter with some concluding remarks (Section 13.3).

13.1 The analysis procedure

In Section 8.2 we present a framework for IT-supported Knowledge Repositories (FIT-KM) (Figure 8:3) that describes what IT-supported repositories are about. FIT-KM helps different types of practitioners understand KM work using knowledge repositories including what types of processes the organization must support and enable. However, FIT-KM also aims to serve as a basis for developing implementation guidance for developing knowledge repositories. From a guidance perspective, this research focuses on developing guidance for the process “Capture New Knowledge”. To enhance further reading, FIT-KM is found, once again, in Figure 13:1.
Knowledge loss in the capture process means that no new knowledge is stored in the repository. All types of knowledge loss in the capture process concern the interface between the capture process and its context. FIT-KM shows the capture process in its context. Thus, FIT-KM has been used as an analysis tool. The block arrows "External knowledge" and "Internal knowledge", from the capture process to the process "Package and Store Information", contain the output of the capture process. These block arrows include the result of the process "Capture New Knowledge", i.e., they are not a part of the real process, and therefore not included in the analysis. Focusing on the remaining parts of the interface of the capture process, FIT-KM shows three different inputs (a–c in Figure 13:2), where knowledge loss may occur. It also indicates two generic types of knowledge loss that may occur; knowledge that should not be stored (d in Figure 13:2) and knowledge that could not be captured (e in Figure 13:2).
Success factors (SF) are conditions that need to be met in order to ensure success (Poon and Wagner, 2001). Neglecting to manage SF that influence a, b and c in Figure 13:2 will result in pieces of knowledge not even reaching the capture process, i.e. increasing unwanted knowledge loss. In addition, neglecting to manage SF that influence d and e will result in unnecessary and incorrect storing of knowledge, i.e., decreasing wanted knowledge loss. For the purpose of identifying different types of knowledge loss, we hence carried out a second analysis of the data consisting of theoretical and empirical SF for the capture process (see Section 12.1). In this analysis we focused on how these factors influence the capture process’s interface, that is, on whether each factor mainly influences a, b, c, d, or e in Figure 13:2. Factors that did not belong to any of these groups probably do not influence the interface directly, and therefore we put them into a separate group called “Other”. Then we analyzed each group looking for potential knowledge loss.

The analysis revealed seven different types of knowledge loss, which we present in Section 13.3. Because the analysis used the same data, that is, success factors (see Chapter 12 and Appendixes B and C), we do not include examples of references and illustrative examples and quotations from the EKLär case in this chapter. However, grouping the SF according to how they influence the interface of the capture process provides a description of influences on the capture process. Hence, to both enhance traceability concerning the seven types of knowledge loss and the SF, and to further characterize the knowledge loss, we summarized how the influences from the SF relate to the different types of knowledge loss in Table 13:1.
13.2 Different types of knowledge loss in the capture process

The analysis results in seven types of knowledge loss. Five of these can be regarded as unwanted, because no employee has consciously chosen not to capture the actual piece of knowledge. Two types of knowledge loss can be regarded as wanted, because an employee has, for some reason/s, consciously chosen to not pass this knowledge onto the process of package and store. The analysis also reveals some deficiencies in FIT-KM as

- No separation between internal tacit and internal explicit
- The lack of a knowledge goal
- No separation between information stored in and outside the organization
- A division of external knowledge and information

Furthermore, the analysis reveals that the input “External knowledge” is both incorrect and unnecessary. It emerges from the individual level and concerns internal knowledge that an individual created when using information. External knowledge is the same as information and, as such, input to the capture process already covered in FIT-KM. Figure 13:3 shows the extended and updated version of the process Capture New Knowledge, including the seven types of knowledge loss.

With regard to the purpose of identifying different types of knowledge loss, the remainder of this section focuses on the seven types of knowledge loss.

The numbers in Figure 13:3 refer to the seven types of knowledge loss. Numbers 1-5 concern unwanted knowledge loss, because no employee consciously decided not to capture the knowledge. Numbers 1-3 refer to loss meaning that knowledge did not even reach the capture process, and the need of a structured approach to identify when new knowledge has been created is obvious. Numbers 4-5 refer to loss meaning that the actual piece of knowledge was identified, but for different reasons, for example, no employees were responsible for relevant KM tasks, it was not passed onto the package and store process. Numbers 6-7 concern wanted knowledge loss in the meaning that an employee chose not to pass the knowledge onto the package and store process, for irrelevance or legal reasons, for example. Knowledge losses 4, 6 and 7 are supported by the proposed cycle of knowledge and information (see Figure 8:4).
To manage different types of knowledge loss, it is not enough that knowledge is known and the knowledge owner is willing to share it, KM processes must also be integrated in organizational processes, and supported by technical tools. The approach using capture points that we used in the EKLär case shows one potential way of linking individual processes to the capture process (see Section 14.1.1). Furthermore, how the content is structured and packaged is important for the repository to contain relevant and updated information in the long term. Thus, the tool used for packaging and storing also influences what knowledge is captured. An iterative element is clear. However, this is a part of the process “Package and Store Information”, and outside the scope of this research.

We conclude this section with a brief summary of the seven types of knowledge loss. In these summaries, we focus on type of knowledge and why the discussed type of knowledge loss may occur.

**Knowledge loss 1:**
This knowledge loss concerns knowledge of which corresponding information is already stored somewhere, e.g., in documents, books and/or protocols. Even if it is already stored, it will probably be hard to find and reuse, if it is not integrated and related to other organizational knowledge. This stored
knowledge can be found inside the organization, in the actual department or in another one, or outside the organization, and it is probably structured and stored for other purposes compared to the repository. If no one knows about these different sources of knowledge, or does not think about them from the perspective of the actual KM work, it will not be identified and accordingly never reach the capture process. Furthermore, there is also stored knowledge which is known, but the person who knows about it does not want to disseminate it.

Knowledge loss 2:
This knowledge loss concerns internal explicit knowledge. The person who knows is the knowledge owner, and with regard to the fact that actual knowledge is explicit it must be known. Thus, the main challenge concerning explicit knowledge is to increase employees’ willingness to contribute it to the repository. Reasons for not wanting to contribute are, for example, that employees want to stay where they are and do not experience that they receive any benefits from sharing the knowledge. One further problem that may result in explicit knowledge not being identified is that the knowledge owner does not think about it as being relevant for the repository.

Knowledge loss 3:
This knowledge loss concerns internal tacit knowledge. Because the knowledge is internal, there are similarities to knowledge loss number 2. The person who knows is always the knowledge owner, and if this person is conscious of the knowledge, reasons for this type of knowledge loss concern willingness or ignorance of its relevance for the repository. However, with regard to the fact that the knowledge is tacit can mean that the knowledge owner being conscious of the knowledge or not varies. Furthermore, tacit knowledge is more difficult to identify compared to explicit knowledge, and the need for suitable approaches to identify this type of knowledge as well as work procedures to try to convert tacit knowledge to explicit is clear. These conditions are also relevant for knowledge loss number 4.

Knowledge loss 4:
This knowledge loss concerns internal tacit knowledge that is identified, but could not be captured. Compared to number 3, the person who knows is conscious about it and willing to share the knowledge, but the organization lacks suitable tools, competences etc. to capture it. An alternative is to store information about the owner. If this type of knowledge loss is significant, there is also a risk that the organization lacks methods, work procedures, and so on, that enhance converting tacit knowledge to explicit knowledge.
Knowledge loss 5:
This knowledge loss concerns all knowledge that has been identified and valued as important to disseminate through the repository. A critical issue then is to pass on the knowledge to the package and store process. Employees must have time for performing these tasks, as well as IT systems’ support. Furthermore, if this is not integrated in daily work processes, the risk that the knowledge will never be stored increases.

Knowledge loss 6:
This knowledge loss concerns knowledge that is identified, but should not, for different reasons, be passed onto to the package and store process. Reasons for not wanting to store identified knowledge are, for example, that it does not contribute to the knowledge goal, it is already stored, or storing it is prohibited. Furthermore, this type of knowledge loss also includes deleting already stored information, which can be the result of revising the content. Documented evaluation criteria adapted to the organization’s needs support this decision process. This is in accordance with the Ev-KSF described in Figure 12:4.

Knowledge loss 7:
There is tacit knowledge that cannot be stored without losing critical knowledge. If there is a risk of losing knowledge during storage, it is important to judge if it is worth it or not. An alternative is to store information about who has this particular knowledge. Some of these aspects have been discussed in knowledge loss number 4.

In order to further characterize the different types of knowledge loss and enhance traceability concerning how the SF relate to them, we summarize in Table 13:1 how influences from the SF relate to the different types of knowledge loss. As visualized by the table, the analysis reveals that some SF overlap between the groups of data. However, considering that some factors are quite general this is not surprising.
Table 13.1 Influences stemming from the Success Factors and how they relate to the different types of knowledge loss

<table>
<thead>
<tr>
<th>Influence stemming from the Success Factors</th>
<th>Loss no 1</th>
<th>Loss no 2</th>
<th>Loss no 3</th>
<th>Loss no 4</th>
<th>Loss no 5</th>
<th>Loss no 6</th>
<th>Loss no 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant knowledge can be stored both inside and outside the organization</td>
<td>X</td>
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<td>Relevant knowledge can be stored only in one/some department/s of the organization</td>
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<td>X</td>
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<tr>
<td>Information can be stored in different forms (text, pictures, films etc.)</td>
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<td></td>
<td>X</td>
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<tr>
<td>Relevant knowledge can be structured and stored for another purpose compared to that of the repository</td>
<td>X</td>
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<tr>
<td>Relevant knowledge can be held by employees that may not be willing to share it</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Relevant knowledge is not known meaning there is a lack of knowledge about that its existence and/or that it is relevant for the repository</td>
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<tr>
<td>Relevant knowledge can be explicit or tacit</td>
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<tr>
<td>Explicit knowledge is easier to identify compared to tacit</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Tacit knowledge can be transformed to explicit knowledge</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Identifying tacit knowledge and explicit knowledge requires different approaches</td>
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<td>X</td>
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<td>Storing tacit knowledge and explicit knowledge requires different approaches</td>
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<td>The KM project goal decides if identified knowledge is relevant</td>
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<tr>
<td>If the knowledge already includes the identified knowledge it should not be stored again</td>
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<tr>
<td>Storing new identified knowledge may imply deleting/revising already stored information</td>
<td>X</td>
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<tr>
<td>There must be employees who can decide if the identified knowledge is correct or not</td>
<td>X</td>
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<tr>
<td>All knowledge is not suitable for storing in the repository</td>
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<tr>
<td>When converting tacit knowledge to explicit knowledge there is a risk that critical knowledge element/s will be lost</td>
<td>X</td>
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<tr>
<td>Storing the identified knowledge may enhance imitation by external actors</td>
<td>X</td>
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<tr>
<td>There must be documented evaluation criteria against which to evaluate the identified knowledge</td>
<td>X</td>
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<tr>
<td>Restrictions for what kind of knowledge is allowed to be stored exist</td>
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<tr>
<td>Management’s commitment to the KM project</td>
<td>X</td>
<td>X</td>
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<tr>
<td>There is tacit knowledge difficult to capture and an alternative is to store information about the knowledge owner</td>
<td>X</td>
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<tr>
<td>There exist methods, work procedures etc.</td>
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180
which enhance converting tacit knowledge to explicit knowledge

| The maturity of integration between daily work processes and the capture process | X | X | X | X |
| Employees’ allocated time for performing KM work | X | X | X | X |
| The support of IT systems | X | X | X |
| The structure of the content in the repository | X | X | X | X |
| The used approach when implementing the capture process | X | X | X | X | X | X |

13.3 Concluding remarks

This work revealed seven types of knowledge loss and resulted in a framework showing them. To build awareness of knowledge loss is important (Hari et al, 2005), and we believe that our framework can be used in this work. When discussing the framework with the professional expert, this opinion was strengthened.

We are aware that loss 4 and loss 7 can, in a way, be regarded as the same type of knowledge loss, because there is tacit knowledge which is difficult to capture without losing critical knowledge element/s. However, to stress the importance of both working with socialization and externalization in order to transform tacit knowledge to explicit knowledge (knowledge loss 4), as well as being aware that transformed explicit knowledge may have lost critical element/s (knowledge loss 7), we decided to include both these types of loss in the framework. Furthermore, knowledge loss 6, in relation to loss 7, shows the need to evaluate with regard to different aspects (where) knowledge loss 6 concerns evaluation as described in Ev-KSF2, Ev-KSF3, Ev-KSF4 and Ev-KSF5 (see Section 12.3). Furthermore, knowledge loss 7 is related to Ev-KSF3 concerning protection, but this loss emphasizes the need to assess if storing the actual piece of knowledge means such a loss of critical knowledge elements that storing it is meaningless.

The criticality of the identify activity as a trigger for the whole capture process is discussed in Chapter 12. Before we present the guidance in Part V, we describe, in the next chapter, where in the organization different types of knowledge most likely generate input to the repository. To know this enables integrating the identify activity with daily work processes as well as managing knowledge losses 1-3 (see Figure 13:3). If these types of loss are not managed, the knowledge, as mentioned, may not even reach the evaluate activity.
From the perspective of daily work processes, the work thus far reveals that the capture process must be integrated into daily work processes, if the repository is to contain updated and relevant information in the long term, that is, to survive at all. The identify and evaluate activities as well as the activity that passes knowledge to packaging and storing must be parts of the daily working life. Furthermore, work descriptions for the roles concerned must include these activities.

The identify activity triggers the capture process. If this activity does not work, the capture process will fail and there will be no knowledge to evaluate and store. Hence, in the long term, the repository will not contain updated and relevant knowledge. Thus, this chapter aims to identify and describe where in daily work processes different types of knowledge most likely appear. Organizational knowledge about where potential knowledge to be included in the repository can be found is also a KSF for the capture process (see Chapter 12).

In an organization knowledge is created both in ordinary business processes and when an organization performs a specific knowledge generating activity, as, for example, education or consultation. Thus, from a knowledge generating perspective, the daily working life consists of ordinary business processes as well as specific knowledge generating activities. This is in accordance with Figure 9:2 where the identify activity is the connection between the two processes in KM “Knowledge generating” and “Knowledge codification and coordination” identified by Davenport and Prusak (1998).

In the EKLär case we implemented an IT-supported knowledge repository. This was performed within the limitations of the EKLär project, and the participants had the time to do it. The repository must be maintained after the EKLär project; maintenance must be a part of the normal daily working life. Thus, the starting point for this qualitative analysis was the empirical data collected in the EKLär case during maintenance preparation. While analyzing this data, we discovered relationships between capture points, or more precisely, input to the repository, daily working life and different types
of knowledge. To ground this finding, we discussed the discovered relationships with the professional expert, compared it with related existing theories and results previously presented in this thesis, and then revised the discovered relationships accordingly.

To enhance readability and traceability we structured the following sections in accordance with how we worked (see Figure 14:1).

Firstly, we describe how we worked in the EKLär case while preparing for maintenance as well as the analysis of this collected data (Section 14.1). This analysis resulted in a description of relationships between where to find relevant knowledge, daily working life and different types of knowledge (Figure 14:4). Secondly, we provide an excerpt from the discussion with the professional expert and an analysis of how this influenced our findings (Section 14.2) and present a revised version of the relationships (Figure 14:5). In Section 14.3, we then present related theories and results and how these influenced and resulted in the final, third, version, version 3, of the relationships (Figure 14:6). We end this chapter with some concluding remarks (Section 14.4).
14.1 The case

Well conscious that parts of the data presented in this section are already described in Chapter 12 and Appendices B and C, in order to enhance traceability we start by describing how the work “To prepare for maintenance” was performed in the EKLär case. We subsequently present the analysis.

14.1.1 "To prepare for maintenance” – a description from the EKLär project

We want to remind the reader that the author of this thesis, at this stage of the EKLär project, had increased her knowledge and understanding of KM and the development of IT-supported knowledge repositories. As a result, the author of this thesis was more active compared to earlier phases in the project and the different research roles became fuzzier. To enhance the observation possibilities, we therefore taped the meetings (see the description of the case in Section 5.2.1).

The knowledge repository must be kept up-dated. While making preparations for maintenance, we focused on preparing the organization for keeping the content of the repository current. Bearing this in mind, the knowledge repository is only as good as it is today, one part of this work involved identifying when, where and how in daily work processes newly created knowledge, potentially relevant for the repository, most likely appears. In the hospital, knowledge is created in ordinary care processes as well as in specific knowledge generating activities. Thus the capture work must cover both.

We started with participatory modelling. The participants were asked to write down when/where in daily life some sort of knowledge exchange occurred, in order to identify those daily activities likely to produce new knowledge for incorporation in the repository. We wanted to determine where we could possibly capture new knowledge, i.e., identify “capture points”. Therefore, our working name for this became “capture points”. It was quite a difficult task. An excerpt from the project meeting of the 18/10/05 illustrates this and demonstrates how the project leader guided our work with it:

One of the nurses: “This is not so easy. It [knowledge] grows over time… For example, someone reads a guideline somewhere; this is debated and is a part of discussions and, finally, someone says: Perhaps we should include this”

Project leader: “What then triggers the discussion? What input come from the outside and what comes from the inside, in other words, in your own processes?”
One of the nurses: “The growth of experience based knowledge generates an e-mail from the nurse to everyone in the group. Through this it will grow outside the hospital because when the patient goes home this knowledge is given to home health care by the treatment instructions. This information is given and shown to the nurse in home health…”

Project leader: “Be concrete then… Input from the outside can come from different places. How is it managed? How is it captured? For example, you have been on an education course, but you do not have time to work with this immediately and therefore you forget about it.”

The discussion resulted in us starting with inputs from the outside and then continued with internal ones. The work stages in this modeling session can be summarized in the following four steps:

1. Project leader: “What inputs from the outside are there?” Here the nurses have written, for example:
   - Contacts with other care providers
   - Visits
   - Industry contacts
   - Literature
   - Courses and conferences
   - Patient contacts
   - Education
   - Projects
   - Mail
   - Telephone calls

   The notes were put in a plastic sheet taped to the wall.

   Project leader: “Here we must examine more closely how this shows up internally.”

2. Project leader: “Which of these capture points can generate input to the knowledge repository in the long term?”

   These capture points were marked with a star. The discussion revealed that all the points can generate knowledge to the repository in the long term. This was something that the nurses were not conscious about earlier.

3. Project leader: “What internal sources are there currently? Formal and informal. Now we are talking about points, sources, but perhaps later we have to examine their flows.” Here the nurses, for example wrote:
   - Coffee breaks
   - Practical experience
• Mail
• Telephone calls
• Education
• Rounds
• Projects
• Work shift changes
• Formal short documents describing a standardized way of treating patients in a specific situation

4. The written notes as well as their relationships were discussed. As is clear from the points list above, many notes included capture points appearing externally well as internally.

At the conclusion of the meeting we decided to continue working with capture points in the following ones.

At our next meeting about capture points we changed our approach slightly. Since many notes included capture points which could apply both to the external and internal groups, i.e. mail, education, and projects, we realized that this grouping system was unproductive. Instead, we grouped the notes based on whether they stemmed from ordinary care processes or specific activities. We chose this division because the EKLär project aims to disseminate best practices which are developed and exist in the ordinary treatment processes of the hospital. However, in the hospital there are also what Davenport and Prusak (1998) term “Knowledge generating activities”, for example, the EKLär project, other projects as well as education courses. While knowledge generating activities are outside our scope, their results can potentially be incorporated in the repository and cannot be neglected. The key is to identify when potential knowledge has been generated, and the key is hence to focus on the activity that identifies the knowledge.

The grouping work proceeded and some further capture point issues were added. Instead of using plastic and notes, we now used computer and projector. The work resulted in two lists, see Figure 14:2, one including capture points in ordinary care processes and the other including capture points in specific activities. Based on these lists, we discussed, for each capture point, the type of influence and its importance for the repository. With important we meant how urgent it was to change the repository in accordance with the capture points and if a change was formally required or not. Initially we did not specify the importance aspect of these two issues, whether any change was urgent and formally required, we only discussed the degree of influence on the repository. For instance, a purchase of material is an example of a capture point that must immediately influence the repository, and it is formally required, while a photo of an interesting leg ulcer exemplifies a cap-
ture point that will not cause any consequences by not being immediately incorporated. This caused confusion when we recognized points both of which were urgent to enter into the repository, but for one of them there would not be any consequences, e.g. the photo, if there were any delays. After determining that capture points could be more or less required and more or less urgent to incorporate, we decided to rank each capture point in the following three groups according to type of influence:

1. Formally required e.g. by laws and contracts, direct influence on the content of the repository, urgent
2. Less formal as e.g. complementary information from a material supplier or knowledge obtained on an education day, direct influence on the content of the repository, urgent to less urgent
3. Weak, indirect influence on the content of the repository

An excerpt from the two lists of capture points was translated and is presented in Figure 14:2. The completed lists included 3 main capture points in ordinary care processes and 12 in specific activities.

Figure 14:2. An excerpt of the document concerning capture points

Only identifying capture points where knowledge for the repository is likely to be captured does not assure that newly created knowledge will be incorporated in the repository. Furthermore, from previous experience, all identified knowledge should not even be included. Thus, we continue discussing what issues for each capture points are important to define for newly created knowledge to be identified, evaluated and passed on the next process. These
issues were documented and the current final translated document is shown in Figure 14:3.

**For each capture point**

- Who is responsible for the activity?
- Who participates?
- Frequency
- Which knowledge capture tools can be used?
  - How to capture?
  - How to document? In EPI server?
- What is discussed (if it is a meeting, e.g. sit round)?
- Who is responsible for passing to responsible person/s for the repository?
- Selection criteria for the passing to person/s responsible for the repository? (what should be passed)?
  - Knowledge that clearly contributes to the goal of the repository
  - What are they going to look for? For example:
    - New/changed ways of working
    - Changes in professional roles/authorization
    - ...
  - How are work roles descriptions being influenced?
- Quality assurance

---

Figure 14:3: The first version of the document concerning issues for capture points

In the following project meetings concerned with capture points, we discussed and accordingly revised the documents presented above (Figure 14:2 and Figure 14.3).

The capture points (Figure 14:2) concern different areas of knowledge. Thus, the discussion also highlighted what type of knowledge areas we wanted to capture. The purpose of the repository is to share best practices with respect to treatment and prevention methods for leg ulcers. Two main knowledge areas were identified:
1. **Core knowledge**: This can be compared with the main purpose of the repository, e.g., preventive care, diagnosis and treatment. This knowledge has to be used in the daily work before being included in the repository and has high quality review requirements. It appears with irregular intervals and can be hard to capture.

2. **Other information**, e.g., links, literature tips and news in general, can be included in the repository more or less directly, and has lower quality review requirements. It appears regularly as well as irregularly in time, but is easier to capture.

To test the issues we identified for each capture point (see Figure 14:3), we chose specific capture points and tried to identify their issues. This work revealed deficiencies in the issues and the list was revised accordingly. Two examples to concretize this follows. We started with “Sit rounds (2)” in Figure 14:2, because we wanted to test a capture point that stemmed from ordinary care processes and concerned core knowledge without any formal requirement. Through this work, we discovered that the question “How often” must be identified from two perspectives. We had to try to estimate 1) how often the capture point occurs and 2) how often it involves knowledge likely to be stored in the repository.

Patient oriented staff meetings occurred once a week in two of the involved hospital departments, but the nurses thought that knowledge relevant to the repository is not created often. To further test the capture points we then chose a point that is always likely to imply input to the repository, Purchase of material (1). This work revealed, e.g., the importance of deciding who is responsible for Quality assurance. It also revealed that not too many people should be responsible for reporting to those in charge of the repository, otherwise, e.g., it is difficult knowing whether the different reports concern the same things or not.

To support the nurses in their future work with identifying important issues for capture points, a template was developed by the doctoral student based on discussions with the supervisor and the project group, and revised accordingly. The template includes issues identified while working directly with capture points in the EKLär case, but also matters discovered in other phases of EKLär, and issues found in the literature, for example, during the analysis of success factors (Chapter 12). This template is a part of the guidance, and further discussed in Part V.

### 14.1.2 The analysis procedure and the resulting relationships

We began by analyzing the first grouping of capture points, that is, whether the capture points appeared internally or externally. Regardless of group, the
analysis revealed that the capture points not only included activities in which the knowledge was created, i.e., the source, but also different signals indicating that knowledge, which potentially should be incorporated in the repository, had been created. For example, understanding gained in an education course can be discussed during a coffee break, and both education and coffee breaks had been identified as capture points. Furthermore, a capture point, such as, for example, coffee breaks, can sometimes be the activity in which knowledge is created and sometimes the signal that knowledge has been created. In addition, a knowledge generating activity can have more than one signal and one signal can belong to more than one knowledge generating activity. This also explains why some capture points belonged to both groups; a signal appearing inside an organization can stem from knowledge created externally or internally. After changing the approach and grouping “capture points” according to whether they stemmed from ordinary processes or not, this was not a problem. Thus, the concept “capture point” was kept throughout the project.

We subsequently continued analyzing the final version of ranked capture points grouped according to their source (Figure 14:2). While studying the ranking numbers the following relationships were identified:

- Capture points ranked as formally required, direct influence, urgent (group number 1) only belong to specific activities
- Ordinary business processes mainly included capture points ranked as less formal, direct influence, urgent to less urgent (group number 2). They accounted for 75 % of the identified capture points.
- Capture points ranked as weak, indirect influence (group number 3) are all, except one, in the group concerning specific activities
- There were more capture points belonging to specific knowledge generating activities then to business processes

The analysis revealed that capture points in specific activities formally required concern external knowledge which is easy to capture, for example, the purchase of material and revision of leg ulcers care program. Furthermore, the analysis also revealed that other capture points in specific activities that have a more indirect influence on the repository appear internally if they are important for the enterprise and could influence it. Because the grouping was made according to the source, not to the signal, these capture points belonged to knowledge generating activities. This is one reason why there were more capture points belonging to specific knowledge generating activities than to business processes (see the last point above). The time factor here is clear. Experience based knowledge develops in ordinary processes. If specific activities are to result in this type of knowledge they must be a part of the processes for some time.
“There is science based knowledge, but the clinical knowledge, the experience, decides what type of bandage to use. For example; This bandage is curling at the edges” (one of the nurse in a project meeting)

This is in accordance with how “core knowledge” is described in the EKLär case.

To clarify the relationships we took pictures. In this work we realized that different groups of capture points have clear relationships with external and internal knowledge, and identify relationships regarding what type of knowledge is generated for the repository from different activities. External knowledge, or information, concerns capture points in specific activities, and internal knowledge concerns capture points in ordinary processes. Figure 14:4 visualizes the identified relationships. If knowledge generated from specific activities is incorporated in the repository, the knowledge is either external and formally required and results in immediate input, or has passed through ordinary business processes. This implies, if one misses relevant, not formally required, knowledge generated in specific activities, it will be identified in ordinary processes. Figure 14:4 indicates that all input from ordinary processes when maintaining the repository is internal. We claim that this is only the fact if all external knowledge for the repository has been identified when building the repository, which, we believe, is never the fact in reality. Hence, if the identified relationships should also include the implementing phase, the input from ordinary business processes must be complemented with external knowledge unless the reviewing of existing material is not regarded as a specific activity.

Figure 14:4 is the first version that describes how input to repositories relates to daily work and different types of knowledge. This version, based on data collected in the EKLär case, is further revised according to input from the professional expert and from theory.
14.2 The view of the professional expert

As part of an interview with the professional expert, the pattern visualized in Figure 14:4 was discussed. The picture in itself, presented in Figure 14:4, was not shown. Instead the relationships were explained and drawn with a pencil on paper at the same time. We begin with an excerpt from this interview, and then describe the analysis.

14.2.1 An excerpt from the interview conducted 1/11/06

The following excerpt shows what the professional expert said when commenting the relationships between input to the repository and daily work processes that we discovered while analyzing the data from EKLär:

“Education hopefully implies doing a better job back at home... Having a consultant to help, for example with developing a help desk; the organization cannot do this on its own. The consultant works, in the best cases, together with the employees and teaches them and they will learn. Learning in daily work... Knowledge generation is not education or consultants? ... Yes, for example, visiting other companies and organizations. What happens then? How will this knowledge be captured? It depends on time, how close
in time. For example, about two years ago, I got knowledge about an interesting way to work with IT and processes. I visited the company and had an interesting discussion. At that time our organization was not ready for this. Now, one and a half years later, when our organization has a relevant project and I visit other organizations, things I learnt are a direct contribution to the project. There is something to put the knowledge into. This was not the situation one and a half years earlier, but the whole time I knew that I can call this organization again. I got pictures and their notes and I saved these. I also knew that I can call and who to call. You do not need to store the information in itself, you store information about who to contact. ... This is an example how visits can influence immediately, but also in the long term when you are ready... This depends on what stage you are at, visiting the same organization today rather than one and a half years ago; much more knowledge would be used immediately... Tacit or explicit knowledge varies over time... Tacit is more difficult to put into a knowledge repository directly, because tacit knowledge needs to filter through the enterprise. Tacit knowledge is about being familiar with knowledge and first when you practice you become familiar and then we are in the business process. But this means that it must be kept over time. This is the challenge. What would have happened in my example if I had quit? ... If you have a project, are included processes a part of business processes? I want it that way, because work is done. From protected incubator in the project to business processes. In the project there is a more clear objective steering and involved people are more open to news, but in present activities, there is resistance, perhaps not enough time, conflicts...”

14.2.2 The analysis procedure and the resulting relationships

While analyzing the discussion with the professional expert, we argue that the main relationships are confirmed. Education, visits and consultations are specific knowledge generating activities. In these activities, people gain knowledge which may influence work processes directly or in the long term. Compare the arrows from specific activities to ordinary business processes and to the knowledge repositories in Figure 14:4. If the organization is ready, i.e., has the needed maturity, or has a relevant project, these activities will, more or less, immediately influence the organization. Otherwise, it can take time and the knowledge may first be stored somewhere else. Of course, this storing can mean that the knowledge is included in a knowledge repository, this depends on the repository’s goal, but not in a repository aiming to share best practices because, this type of knowledge requires time.

The professional expert discussed tacit knowledge which is not included in the picture. Tacit knowledge requires time and must be practiced. Thus, input of internal tacit knowledge to the repository comes from ordinary busi-
ness processes and input of internal explicit knowledge to business processes comes from e.g. specific activities. The need to distinguish between tacit and explicit knowledge was also identified in our work on knowledge loss (Chapter 13). The professional expert also stressed the importance of time for the development of tacit knowledge. This is in line with Nonaka and Takeuchi’s (1995) knowledge conversion mode. Time is already in the picture, but must be aligned with the development of tacit knowledge more clearly. The professional expert argued that processes in a project are parts of ordinary business processes. A project is a specific activity that remains over time during which participants practice things. Thus, we argue, a project can generate internal tacit knowledge. However, when the project is finished, the challenge is to enable project processes to continue in ordinary business ones. This is what concerns preparing for maintenance.

Based on this analysis Figure 14:4 was updated as follows. The updated version is shown in Figure 14:5.

- Distinction between internal tacit and internal explicit knowledge
- A project with its issues is included
- Specific activities generate knowledge that may be stored somewhere else
- Time is more clearly related to tacit knowledge

![Figure 14:5](chart.png)

Figure 14:5: Relationships between potential input to the repository, different types of knowledge and daily work processes (Version 2)
The second version, visualized in Figure 14:5, is in the following section, based on theoretical data, further analysed and revised accordingly.

14.3 Relevant theories and the final version of relationships

To our knowledge no literature exists concerning the relationships between the identify activity, daily work processes and types of knowledge. Thus, we compared the main elements in Figure 14:5 with earlier results and theories in this thesis. The main elements are as follows:

- different types of knowledge
- ordinary work processes and specific activities
- the capture process, or more precisely, the identify activity

Therefore, the used theoretical data concerned the following:

- Different types of knowledge, external/information and internal, as well as tacit and explicit knowledge including knowledge conversion modes
- Knowledge generating activities and ordinary business processes
- The identify activity

The relationship between the main elements in Figure 14:5 and theoretical data used are summarized in Table 14:1.

Different types of knowledge, the first element, internal/external and tacit/explicit, as well as conversions between different types of knowledge, are frequently discussed in the literature. Knowledge derives from information and has a function to produce new knowledge. Thus information is also important. Different types of knowledge and information are also frequently discussed in this thesis, but mainly in Section 4.2. The second element in Figure 14:5 includes knowledge generating activities and ordinary processes. In the literature these two are mainly discussed separately or, otherwise, the literature is more concerned with establishing the importance of integrating these, but does not discuss how, or what relationships there are, and so on. Thus, our literature study concerning this element must focus on each. In this thesis knowledge generating activities are discussed in Sections 4.2.1 and 9.1. The identify activity, the third and last element, is thoroughly discussed in Chapters 12 and 13. Therefore, these chapters offer relevant theory.
<table>
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<th>Theory</th>
<th>Section (in this thesis)</th>
<th>References</th>
</tr>
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<td>e.g. Davenport and Prusak (1998); Wiig (1993); Wiig (1994); Nonaka and Takeuchi (1995); Gore and Gore (1999); Løermans (1993); Blodgood and Salisbury (2001); Busch and Richards (2004); Polyanl (1983)</td>
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<td>Knowledge conversion</td>
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<td>Identify knowledge</td>
<td>Chapters 12, 13</td>
<td>e.g. Chua and Lam (2005); Davenport and Prusak (1998); Massey et al (2005); Gore and Gore, (1999)</td>
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Most KM activities performed by employees need to be done in the daily working life (Davenport and Prusak, 1998). Thus, time must be provided for these activities (Siemieniuch and Sinclair, 2004). The need to examine the relationships between identifying knowledge and the daily working life is obvious.

The analysis of theoretical data supports the main characteristics of the relationships between input to the repository, daily work processes and different types of knowledge (Figure 14:5). Tacit knowledge is rooted in experiences, ideals, individual actions etc. and therefore takes time to develop. Projects continue from a start date to an end date, and render possible the evolvement of tacit knowledge. However, other specific activities which have a shorter duration time, for example, a one day education course, cannot result in tacit knowledge. These types of activities influence other processes in the organi-
zation more and can, in the daily working life, develop into tacit knowledge in the long term.

“… processes are not really discrete sets of related activities. They are instead selected portions of larger streams of activity.” (Nickols, 1998, p. 18).

From this we can see that there are processes in projects which confirm the discussion above as well as the professional expert’s statements:

“If you have a project, are processes in the project a part of business processes? I want it that way, because work is done.” (from the interview with the professional expert conducted 1/11/06)

Ordinary business processes can be regarded as larger streams of main activities that contribute to business results. In ordinary business processes, tacit as well as explicit knowledge is created and can be inputs to the repository. Often, when tacit knowledge is to be incorporated in a knowledge repository, a knowledge conversion is required. However, using media such as films and pictures enables storing certain types of knowledge which have a tacit dimension. Neither of the versions, Figure 14:4 nor Figure 14:5, include input from ordinary business processes to the repository of the types internal explicit knowledge and external knowledge. We considered this depends on the fact that the first version (Figure 14:4) is based on data collected in the EKLär case after the first version of the repository was built. When implementing the repository, one of the first steps was capturing already stored knowledge, external knowledge. This means that while preparing for maintenance, this type of knowledge was not in focus. However, it is not possible to capture all external knowledge the first time. Furthermore, EKLär aimed to share best practices, which often have the form of tacit knowledge. In order to obtain a more comprehensive and generic image of the relationships, the picture needs to be complemented with internal explicit knowledge and external knowledge.

External knowledge is “knowledge” stored outside people. However, since knowledge cannot exist outside the human, it is its corresponding information, not knowledge, that is stored. This information supports transformation to specific knowledge (see Section 4.2.1). From the perspective of employees, we experienced that this information is regarded as knowledge, because this is the way the stored information is used. Thus, the concept “External knowledge” has been retained in the picture, but complemented with “Information”.

Knowledge generating activities, as described by Davenport and Prusak (1998), do not include specific events such as purchase of material. In our
work, we used the concept “Specific activities” and included both knowledge generating activities and specific events. The review and analysis of the empirical data from the EKLär case revealed the need to distinguish between knowledge generating activities, as described by Davenport and Prusak (1998), and specific events. This is because the analysis showed that external, formally required knowledge, which must result in input to the repository, comes from specific events, not from knowledge generating activities in general. Knowledge from knowledge generating activities in general may influence ordinary business processes or is stored somewhere else. However, there may be specific knowledge generating activities that focus on knowledge which is in complete accordance with the implemented repository’s goal. We claim that in these specific cases the specific knowledge generating activity should be classified as a specific event in order to emphasize that this specific knowledge generating activity may result in knowledge being incorporated in the repository without first passing through ordinary business processes. Hence, it is important when organizations identify those events that may generate knowledge to be included in the repository, also pay attention to knowledge generating activities. This is also strengthened in the review and analysis of the data from the professional expert who, among other things, emphasized the need of having something to “… put the knowledge into”. If the repository aims to share, for example, best practices about something, as in the EKLär project, knowledge gained in knowledge generating activities will never be incorporated directly. If knowledge gained in a course or some other knowledge is to be directly included in the repository, it must be in complete accordance with the repository’s goal. Such a knowledge generating activity is a specific event.

Hence, the input of “External knowledge” from “Specific activities” to the repository in Figure 14:5 is input from specific events. Inputs from knowledge generating activities proceed through ordinary work processes before they can be included in a repository, unless the activity cannot be characterized as a specific event.

Based on this analysis Figure 14:5 was updated as follows:

- Distinction between knowledge generating activities and specific events
- Emphasizes the importance of identifying specific events
- Complements with external and internal explicit knowledge from ordinary business processes to the repository. This also makes it possible to align time to the development of tacit knowledge more clearly.
- Includes the concept information
- Removes specific examples from the EKLär case to make the picture more generic
The final version is shown in Figure 14:6.

14.4 Concluding remarks

This work has revealed where different types of knowledge most likely appear in daily work. The picture, Figure 14:6, provides a capture view of the knowledge repository and identifies where, in which processes, different types of knowledge most likely occur. Four of the most important lessons in identifying the relationship between input to the knowledge repository, different types of knowledge and daily work processes are:

- Created knowledge in knowledge generating activities proceeds through ordinary business processes before it may be incorporated in the repository.
- Specific events may generate knowledge that should be incorporated without proceeding through ordinary business processes
- Ordinary business processes generate input of all types of knowledge to the repository
• Input of tacit knowledge comes from ordinary business processes because development of tacit knowledge requires time

Based on these lessons learnt, we recommend focusing on identifying specific events as well as capture points in ordinary business processes when preparing for maintenance. This is also what Capture-KSF2 is about; organizational knowledge includes knowledge about where potential knowledge to be included in the repository can be found.

Moreover, even if the relationships are based on data concerning maintenance of a repository, we believe they are useful when implementing a repository. They show inputs to a knowledge repository from a process perspective and reveal where to focus. Figure 14:6, shows that the input of external knowledge to the repository does not only come from ordinary business processes. Furthermore, external knowledge is the easiest type of knowledge to capture from the perspective of the repository. Hence, we recommend starting with capturing external knowledge which is supported by Gore and Gore (1999).

This analysis is based on a case which aimed to develop a repository for sharing best practices with respect to treatment and prevention methods for leg ulcers. Whether this work could be applied to other types of repositories is hard to say. However, in an effort to be more generic, the work has been discussed and revised accordingly with the professional expert, as well as analyzed from the perspective of relevant theory. Furthermore, all repositories aim to enable the sharing of knowledge. The difference is what knowledge to share. Regardless of what to share, it is the different types of knowledge and where they can be captured that is relevant. Thus, we argue that the relationships between input to a repository, daily work processes and different types of knowledge identified in this chapter (Figure 14:6), have the potential to be applicable even when trying to identify capture points regarding other types of repositories.
15 Discussion of the Characterization of the Capture Process

The results presented and discussed in Chapters 12-14 depict how we achieved Research Objective 2: Characterize the process of capturing new knowledge to be included in IT-supported knowledge repositories. The results presented in this part of the thesis describe KSF and different types of knowledge loss for the capture process, as well as relationships between input to the repository, daily work and different types of knowledge. Our work on knowledge loss also revealed some deficiencies in FIT-KM according to the capture process, and therefore further detailed the capture process. Each result describes the capture process from one perspective, and together they characterize the capture process and show what the guidance must support. Hence, we claim that also the second research objective has been achieved.

The results are based on both theoretical data, and empirical data mainly collected in one case. This data is relative to the research purpose and provides a substantial amount of information; thus only one case can be justified (Gummesson, 2001). Furthermore, the results are grounded both internally and externally. The main advantage of the EKLär case is that we collected data throughout the whole project, from beginning to end, and gained knowledge, insights and experience about how the capture process relates and contributes to the knowledge repository and KM work in general. We have also kept in contact with the nurses after the conclusion of the project and therefore have had the opportunity to follow the development in the long term. This understanding is necessary when developing the guidance, because a guidance that supports the capture process without paying attention to the repository’s aim or its role from a holistic perspective will never succeed. As discussed when describing our research method (Chapter 5), traceability is a problem. Thus, in describing our work, we included concrete examples of how different types of data have influenced our findings.

Optimal management of KSF in the capture process means identifying all newly created knowledge, correct selection of what knowledge to store, and then passing on this knowledge to the package and store process. This means that all types of knowledge loss, wanted and unwanted, are managed, which
is what constitutes the capture process. The work concerning KSF and different types of knowledge loss are both based on success factors derived from theoretical and empirical data. By using different viewpoints, these two analyses together provide a more holistic, complete and detailed understanding of the capture process compared to using only one perspective. For example, the importance of tacit knowledge is clearer in the framework concerning knowledge loss compared to the description of KSF in which it is not explicitly mentioned. Furthermore, the framework concerning knowledge loss reveals that identifying knowledge includes identifying different types of knowledge, which in turn entails different requirements from the identify activity. These different types of knowledge must be managed in different ways to reduce knowledge that escapes identification. However, a general rule is that a knowledge repository should be used for explicit knowledge (e.g. Davenport and Prusak (1998); Blodgood and Salisbury, 2001). This opinion can be one reason why the importance of tacit knowledge is not as clear in the description of KSF. We argue that a knowledge repository can be used for sharing all types of knowledge, but sometimes knowledge conversions, as described by Nonaka and Takeuchi (1995), are required.

Another example of how the two analyses of success factors together provide a more complete and detailed description of the capture process concerns the need to integrate the capture process in daily work processes. Capture-KSF4 concerns integrating the whole capture process into daily work processes, while the knowledge loss framework, through loss number 5, emphasizes the importance of integrating, into daily work, the specific activity of passing the captured knowledge onto the next process of package and store. In the result concerning relationships between different types of knowledge and daily work (Chapter 14), tacit knowledge as an input to the repository is only generated from ordinary business processes. This indicates that Capture-KSF4, which concerns the capture process being integrated into daily work processes, is really critical for identifying tacit knowledge. Knowledge loss numbers 3, 4 and 7 concern tacit knowledge, but even the criticality of its integration in daily work processes is not clear when examining these specific types of knowledge loss. However, the result concerning relationships between different types of knowledge and daily work (Figure 14:6) illustrates the importance of ordinary business processes for input of all types of knowledge.

The knowledge that ordinary business processes must be integrated with the two activities in the capture process, identify and evaluate, and with the activity aiming to pass the captured knowledge onto the process of package and store is an important base from which to develop a guidance for the capture process. Furthermore, the work presented in thesis reveals that linking
individual tasks to capture points identified in processes in the organization is a potential approach when integrating the capture process with daily work. Managing knowledge loss must also be an important issue when developing the guidance, since this is what the capture process is about. Using knowledge loss as a foundation for developing the KM implementation guidance is, to the best of our knowledge, an approach that has not been used, previously. This approach was strengthened by the professional expert who commented the framework concerning knowledge loss as follows:

“It is a good thought model to get people to start thinking. The next part is that they need help.” (the professional expert in an interview 061101)

The contributions and their related analysis presented in Chapters 12, 13 and 20 embed knowledge about how to perform the capture process. This knowledge is valuable when developing the guidance, which is presented in the Part V.

From the three levels of inquiry, reflecting (why), diagnostic, (what) and action (how) (Van Gigch, 1991), the characterization of the capture process presented in this part of the thesis shows what the capture process is about and, accordingly, what the guidance must facilitate. The guidance in itself corresponds to the how level. However, the characterization of the capture process is also an important aspect for understanding why tasks that are recommended by the guidance should be performed.
Part V

Guidance for Implementing the Capture Process

This part presents guidance to be used in a KM project in order to facilitate the implementation of the capture process so that new knowledge is continuously captured. It also involves a description and discussion of how we achieved Research Objective 3. This part constitutes the third and final set of contributions.
16 Introduction

With the holistic perspective (Part III) and the detailed knowledge and understanding of the capture process (Part IV) in mind, we present guidance for implementing the capture process in this part. The research project aims to contribute to increasing the usefulness of IT-supported knowledge repositories by supporting the capture process. The guidance shows how we achieved Research Objective 3, Develop guidance for facilitating implementation of the capture process so that relevant and correct knowledge is continuously captured, and is the last contribution in order to achieve the research aim. The main target groups for this guidance are project leaders for such a KM project and researchers, for example, performing case studies. However, parts of the guidance can be used by employees to facilitate their daily KM work.

In accordance with our ambition to make each part autonomous, we summarize Part IV in Section 16.1 in order to describe what the guidance should support. If you are familiar with this, you can proceed directly to Chapter 17 which includes the guidance. Chapter 18 subsequently ends this part with some concluding remarks concerning the usefulness of the guidance.

16.1 What the guidance should support

Based on Part IV, this section presents a description of what the guidance should support, and, to enhance reading, it concludes with a summary.

The guidance cannot include everything concerning the capture process, but it should cover the most critical parts identified in the characterization of the capture process (Chapters 12-14). These critical parts are summarized in the KSF (Chapter 12) and in the framework showing different types of knowledge loss (Chapter 13). The relationships between input to the repository, daily work processes and different types of knowledge (Chapter 14) enhance knowing where to capture different types of knowledge. This knowing corresponds to Capture-KSF2 and supports managing knowledge loss numbers 1, 2 and 3 (Figure 13:3). The characterization of the capture process reveals that the most critical activities in the capture process are:
- Identify new knowledge
- Evaluate identified knowledge
- Pass knowledge that should be stored on to the packaging and storing process

The activity, identify knowledge, aims to decrease knowledge that escapes identification, i.e., decrease unwanted knowledge loss. The evaluate knowledge activity aims to decrease the storage of knowledge that should not be stored, i.e., increase wanted knowledge loss. The activity, pass the knowledge on to the package and store process, aims to decrease knowledge that is lost in the interface between these two processes. Thus, we argue that efficiently managing the capture process is to efficiently manage knowledge loss. Therefore, the developed guidance should facilitate managing the different types of knowledge loss that we have identified in the capture process (Section 13.3). To enhance reading, the framework showing knowledge loss in the capture process can be found in Figure 16:1.

The guidance must also manage KSF in the capture process. However, there are clear relationships between the types of knowledge loss and the KSF:

Figure 16:1 Different types of knowledge loss in the capture process
• Capture-KSF1, concerning the knowledge goal, influences loss numbers 1, 2 and 3 and is required for managing loss number 6
• Capture-KSF2, concerning organizational knowledge about where to find relevant knowledge, is required for managing loss numbers 1, 2 and 3
• Capture-KSF3, concerning the culture, is required for managing loss numbers 1, 2 and 3 efficiently, but this factors also influences managing all the other types of loss
• Capture-KSF4, concerning that the capture process should be integrated in the daily work process, is required for the whole capture process and accordingly for managing all types of knowledge loss
• Capture-CSF5, concerning evaluation is required for managing knowledge loss number 6, but it also influences managing loss number 7

Hence, managing knowledge loss also implies managing KSF for the capture process.

There are also relationships between the types of knowledge loss and the three critical activities identifying, evaluating and passing knowledge on to the process of package and store. Knowledge loss numbers 1, 2 and 3 refer to knowledge that in some way escapes identification. These types of loss mean that knowledge never reaches the capture process and accordingly has no chance of being incorporated in the repository. Knowledge loss number 4 concerns identified knowledge that is difficult to capture and incorporate in a repository. However, we must remember that a knowledge repository is only one channel for knowledge transfer and that multiple channels are needed (Davenport and Prusak, 1998). Knowledge loss number 4 concerns this; there must be other channels in the form of methods, ways of working, and so on, which enhance sharing knowledge as well as converting tacit knowledge into explicit knowledge, which is an easier type of knowledge to identify. Thus, managing knowledge loss number 4 is not explicitly facilitated by the guidance. The guidance aims to facilitate the capture process in the area of knowledge repositories, which starts with identification. Hence, other channels of knowledge transfer, for example, meetings and networking, as well as specific knowledge generation activities, as such are outside the scope of this thesis; only the knowledge which is generated, of which the identify activity is the link, is inside the scope.

However, knowledge loss number 4 also concerns the problem associated with losing critical element/s during the capture and store process when trying to store knowledge that is difficult to capture. This means that deciding not to store may be a way of protecting the knowledge from value erosion, and this is what the wanted knowledge loss number 7 is about. Hence, knowledge loss number 4 will only be facilitated from the perspective that
concerns loss number 7. In accordance with knowledge loss number 7, knowledge loss number 6 also belongs to the evaluate activity. Loss number 6 refers to identified knowledge that should not be stored, because it is not relevant, for example. Lastly, knowledge loss number 5 concerns knowledge that should be stored, but never reaches the package and store process. This loss belongs to the passing over activity, and often depends on deficiencies with regard to linking individual processes to organizational ones. The discussion about the relationships between the three critical activities (identify, evaluate and pass) and the different types of knowledge loss relevant for the guidance can be summarized as follows:

- The identify activity: knowledge loss numbers 1, 2 and 3.
- The evaluation activity: knowledge loss numbers 6 and 7.
- To pass on knowledge that should be stored: knowledge loss number 5.

The need to have persons responsible for the activities identify and evaluate, in terms of having these tasks in their work role descriptions, is well stated in Part IV. Furthermore, there must also be an employee responsible for the third critical activity, to pass knowledge that should be stored in the repository on to the packaging and storing process, because otherwise there is a risk that the actual knowledge never reaches this process. We claim that one person in the organization should have the overall responsibility for all three critical activities, since this reduces the risk of losing knowledge throughout the capture process. We call this person the Capture process Manager (CpM). This does not mean, however, that different types of evaluation cannot be performed by different people.

The characterization of the capture process (Chapters 12-14) also reveals that the capture process differs with regard to whether it is performed when starting the KM project or during preparing for maintenance. Furthermore, to ensure that the process of continuously capturing knowledge will survive after the project, the capture process must be integrated into daily work (Capture-KSF4). Hence, the KM project must include work that aims to link individual processes to organizational ones in order to increase the maturity of integration between the capture process and daily work. Thus, a KM project aiming to result in an IT-supported knowledge repository must include the capture process several times, and for each iteration the maturity of integration between the capture process and daily work ones should increase. Using the guidance should imply that the capture process is iterated during the KM project and should also facilitate how to work in different iterations. A checklist that facilitates the decision of when an organization has reached the needed maturity concerning the integration should therefore also be an important part of the guidance.
Furthermore, the need and importance of preparing for a KM implementation process is discussed in this thesis, and hence the guidance should also include a preparation element. To successfully implement the capture process requires knowledge about the process as such, for example, what activities are included and what decisions must be made. Hence, a detailed overview of the capture process including critical activities and decisions should be another important part of the guidance. This process overview also enhances understanding when and why the different guidance elements should be used.

To summarize, the guidance should include:
- A detailed overview of the capture process
- Guidance for preparing the KM project
- Guidance for the identify activity aiming to reduce unwanted knowledge loss
- Guidance for the evaluate activity aiming to increase wanted knowledge loss
- A work role description for the Capture process Manager (CpM). One critical task for this role is to pass knowledge that should be stored onto the package and store process
- Elements resulting in the capture process being iterated within the limit of the KM project. With regard to the three critical activities, the need to iterate is most clear and critical for the identify activity
- A checklist to support the decision when to conclude the project with regard to the capture process

The guidance is presented in the following chapter.
17 The Guidance

The structure of the guidance can be compared with a box; the lid provides a detailed overview of the capture process and shows how the five other guidance elements, included in the box, aim to facilitate this process. Thus, the guidance consists of the following six elements:

- Guidance element 0 (G0): The “lid of the box”: An overview of the capture process including how the content of the box aims to facilitate this process (Section 17.1.1)
- The “content of the box”
  - Guidance element (G1): Guidance for the preparation phase aiming to anchor the project and collect knowledge about the domain (Section 17.2.1)
  - Guidance element (G2): Guidance for the identification activity aiming to avoid that knowledge escapes being identified, i.e. reduce unwanted knowledge loss (Section 17.3.1)
  - Guidance element (G3): Guidance for the evaluation activity aiming to avoid that unnecessary and wrong knowledge is stored, i.e. increase wanted knowledge loss (Section 17.4.1)
  - Guidance element (G4): The role of Capture Process Manager (CpM) – A work role description aiming to support the CpM as well as the decision who to appoint for this role (Section 17.5.1)
  - Guidance element (G5): Checklist aiming to support the decision concerning when closing the project with regard to the capture process (Section 17.6.1)

Since the organizational culture is critical for all knowledge work, not only the capture process, the guidance does not explicitly include advice on how to create a knowledge sharing culture, such as introducing reward systems. However, by contributing to increasing the quality of the knowledge repository and hence helping employees, we argue that in the long term the guidance has a strong influence on the culture. Furthermore, the guidance is delimited to the capture process. Hence, our recommendation is to use it together with other guidance/support. The main target groups for the guidance are other researchers and project leaders for KM projects aiming to develop an IT-supported knowledge repository. However, parts of the guidance can
be used by the Capture process Manager, for example, the evaluation criteria (G3) and how to work with capture points (included in G2).

In the following, we present and discuss each guidance element. To enable for those readers who are only interested in the guidance, not the discussion, each element is presented in its own section.

17.1 G0: The capture process and guidance overview

G0 is consciously presented prior to some of its motivations and explanations, since it provides an overview that enhances understanding of the other elements.

The capture process starts when new knowledge, that has the potential to be incorporated in the repository, is identified. Signals indicating this are of different types, for example, mail, documents and discussions. In addition, the knowledge source and the context in which the knowledge has been created, are of different types. Regardless of source and type of signal, these signals trigger the identify activity and the capture process. When we know what knowledge to store, i.e., to pass on to the process “Package and store information”, or have decided that the actual piece of knowledge should not be stored, the capture process ends. The model describing the capture process and how the other guidance elements support this process is presented in Section 17.1.1, while we discuss the model in Section 17.1.2.

17.1.1 G0: The capture process model

This guidance element consists of a process model of the capture process in which the other guidance elements (G1-G5) are included (Figure 17:1). The three critical activities, identifying, evaluating and passing are marked with a thicker line. To visualize what parts of the capture process the guidance aims to facilitate, and hence enhance the reader’s understanding of the guidance elements G1-G5, these are included in Figure 17:1 as block arrows. The model visualizes that G1 should be used before the real capture process starts and that G2 and G3 concern the two critical activities identify and evaluate. G4 is about the Capture process Manager’s role, which concerns a person’s general responsibility for the whole capture process, including the third critical activity of passing knowledge that should be stored on to the package and store process. Finally, the last guidance element, G5, helps to decide when the capture process is implemented in such a way that knowledge is continuously captured.
Figure 17:1 The Capture process model and the guidance elements

The process model visualizes that the capture process is triggered by incoming signals indicating that new knowledge which may be included in the repository has been created, and it ends with the decision to store the knowledge or not. Furthermore, the capture process model has six terminators.
Five that mean knowledge not should be stored, i.e., wanted types of knowledge loss, and one that new knowledge should be passed on to the next process in order to be finally packaged and then stored in the repository.

In the next section we discuss the capture process model in more detail.

17.1.2 Discussion of Guidance element 0 (G0)

The overview of the capture process (Figure 17:1) treats knowledge as an object. Thus, we want to emphasize what we discussed earlier in this thesis. Knowledge belongs to an individual, we cannot separate it from its knowledge owner. Storing knowledge means storing its related information which requires that knowledge is transformed into information. Identifying the related information is an enormous challenge, which may also include different types of knowledge conversion described by Nonaka and Takeuchi (1995). However, Figure 17:1 shows how identified knowledge must survive different kinds of decisions if its related information is to be stored in a repository. If the actual piece of knowledge is not passed during these decisions it will never be stored. The need to clearly determine who is responsible for these decisions and for passing knowledge on to the package and store process is evident. To reduce the risk of unwanted knowledge loss throughout these decisions, we claim that one person in the organization should have the overall responsibility, a general Capture process Manager (CpM). This does not mean that different types of evaluation cannot be performed by different people. Hence, there must be an employee appointed as CpM who in his/her work role description has the time to be responsible for receiving identified knowledge, passing it through the different decisions, as long as it does not result in a decision not to store it, and carrying out the necessary documentation. We argue that the Capture process Manager is critical for the capture process to achieve its aim of capturing all knowledge that should be stored in the repository and passing it to the package and store process. What tasks should be included in the role Capture process Manager are further discussed in Section 17.5. Thus far, we have only stated the need of having a CpM.

In accordance with KSF for the evaluate activity (Ev-KSF), the identified knowledge must be evaluated with regard to relevance, redundancy, protection and correctness (see Figure 12:4). Hence, these types of evaluation are included in the capture process model. Notably, there is normally no single person who can do this evaluation, because different types of evaluation require different competences. We return to this when presenting the evaluation criteria included in G3 (Section 17.4). Except for value erosion, it is possible to perform evaluations concerning relevance, redundancy and protection, regardless the type of signal and whether the knowledge is packaged.
Evaluation concerning protection from value erosion requires some sort of packaging. It will not be possible to evaluate if the packaging will result in value erosion, if the knowledge is not packaged at all. Furthermore, storing knowledge means storing its related information, separating knowledge from the knowledge owner. To evaluate if this is possible and still retain the correctness of the knowledge also requires some packaging. Thus, the evaluation issues concerning “Value erosion” and “Correctness” require some initial packaging. This means that the knowledge in question is transformed to information and presented in a form that makes it possible to decide whether the stored information is correct or not and if any critical knowledge elements have been lost. The packaging format can, for example, be films, text documents and/or pictures. If the stored knowledge is not correct, it must be revised and then re-evaluated. This revision can result in value erosion. Thus, we argue that evaluation addressing correctness and value erosion must be re-iterated if any changes in the packaging occur. An iterative element is clear, which is also included in the capture process model. There are other situations when knowledge, after the final packaging, must be re-evaluated based on one or some of the criteria. For example, how the knowledge is packaged and stored can determine how easy it is to imitate, and the final packaging can result in critical knowledge element/s being lost. This indicates that to ensure quality in stored information may require a second evaluation in the process “To package and store knowledge information”. Hence, it is important to document if there is a need to re-check any criterion
in the package and store process as well as if the identified knowledge can potentially result in already stored information being deleted. This issue is included in G3.

The discussion above reveals that the evaluation activity is divided into several operations as well as decisions. This division enhances the fact that different work roles should be coupled to different types of evaluation, based on the type of competence required. With regard to the evaluation activity including a number of decision points, in the overview of the capture process (Figure 17:1) it can be interpreted that the evaluation activity is more complex than the identify activity. We argue that the number of decision points in the evaluation activity instead indicate that this activity is more explicit than the identification activity since it contains more detailed knowledge about what to do. The identify activity triggers the whole capture process, that is, it is necessary for the evaluation activity. In addition, the willingness to share knowledge is critical for the identify activity. Developing a knowledge sharing culture, a spirit of willingness to contribute with knowledge, is complex work which has a long term perspective. Therefore, we claim that the identify activity is fuzzier than the evaluation activity and also at least as complex, perhaps even more so.

17.2 G1: Guidance for the preparation phase

Some general guidelines to be used in preparation are presented in Part III of this thesis. However, because the guidance focuses on the capture process, we have extracted that part of preparation work which influences the capture process and its KSF. Firstly, we analyzed the general guidelines for preparation from the perspective of the capture process and its five Capture-KSF. Secondly, we analyzed the general guidelines for preparation according to the preparation work performed in the EKLär project with respect to how the these guidelines influence the capture process and facilitate the work with decreasing unwanted knowledge loss and increasing wanted knowledge loss. The preparation advice is presented in Section 17.2.1, while we discuss the advice from the perspective of KSF in the capture process in Section 17.2.2.

17.2.1 G1: Preparation advice

To facilitate the work that aims to prepare for managing key success factors in the capture process, we suggest project leaders focus on anchoring the project and collecting knowledge about the domain. This guidance element thus consists of advice concerning these two aspects. Furthermore, this advice clarifies that the main method in the preparation is meeting people and
talking with them. Thus, G1 also includes a suggested way of working when planning for these meetings.

1. **Advice for anchoring the KM project:**
The aim is to gain approval for the main purpose of the project from users and providers. If management is not already committed, this is also an important group of stakeholders to focus on.
   - **Why?**
     - Increase willingness to share knowledge which enhances identification.
     - Easier to motivate people to perform the evaluation activity
     - Management decides what projects the target organization should perform, how to use resources etc.
   - **How?**
     - Describe the KM project goal in an adapted way meaning explaining it in such a way that a stakeholder understands how it is going to affected him/her, how it will influence daily work, why it is important for him/her etc.
     - Allocate time for answering questions and show that all opinions are important.

2. **Advice for collecting knowledge about the domain**
   **The users’ domain:**
   - **Why?**
     - Obtain valuable input for constructing the knowledge map
     - Obtain knowledge concerning what knowledge is critical for inclusion in the first prototype of the knowledge repository
     - Reveal attitudes for sharing knowledge which influence willingness and identification
     - Reveal conditions (resources as time, IT…) for integrating KM activities in daily work
   - **How?**
     - Interviews
   **The provider’s domain:**
   - **Why?**
     - Reveal attitudes for sharing knowledge which influence identification and willingness to evaluate
     - Reveal conditions (resources as time, IT…) for integrating KM activities in daily work
   - **How?**
     - Interviews
**Way of working – A suggestion**

1. Identify “key persons” in different stakeholder groups. From a capture perspective these are mainly users and providers. However, do not forget that management is of critical importance in all the parts of the project. Being a key person concerns both the formal and social status in the organization.

2. Meet them individually, or in groups (2-3 persons) and discuss/talk with them in order to anchor the project and collect knowledge about the domain.

2a. Preparations before the meetings: Be clear about the KM project’s purpose and goal and why its implementation is important. This must be clear from the perspective of the different stakeholders you are going to meet.

2b. Agenda for the meetings: They can be planned according to the following:

- **Introduction:**
  - Project purpose and goal is described in an *adaptive way*
  - Presentation
  - Interview purpose
  - Experiences from other projects
  - …

- **The current situation in the KM project domain:**
  - Try to grasp how the KM project is related to daily work.
  - Describe as concrete as possible, e.g. a normal day.
  - Which knowledge, related to the KM project, is shared?
  - Problems in sharing, e.g. time consumption, computer support, political issues
  - Your role from the perspective of the domain that the KM project concerns: Are you a provider and/or user of knowledge?
  - How do you share the knowledge today?
  - Positive/negative aspects related to the KM project domain (these aspects may be included in other questions)
  - …

- **The future in the KM project domain:**
  - Vision for the KM project domain: Ask them to describe as concretely as possible their vision of a normal day concerning the KM area
  - Target group/s? Why?
  - What knowledge is there? Why? Concrete examples
Is any knowledge more important than other knowledge? Why?

Is there knowledge that cannot be stored? Why?

What obstacles can you see for achieving this vision?
  - Computer access
  - Culture
  - Time
  - ...

Other issues...
Conclusion: Make sure that the respondent has understood how the project is going to affect him/her, why it is important for him/her etc. and request him/her to come back to you if there are questions.

In the next section we discuss how using G1 may influence managing KSF in the capture process.

17.2.2 Discussion of Guidance element 1 (G1)

KSF in the capture process can be influenced by performing good preparation work. We argue that well performed preparation enables managing Capture-KSF1, Capture-KSF2, Capture-KSF3 and Capture-KSF4 in the capture process. Thus, this preparation work must be performed within the KM project which is also one lesson learnt in Aggestam and Backlund (2007).

The preparation advice aims to lead to positive stakeholders as well as a clear and accepted goal. That stakeholders are positive implies that the willingness to share and participate in the evaluation activity increases. Hence, with respect to the capture process, this preparation work facilitates the willingness to contribute with knowledge, which in turn enhances the identify activity and the evaluate activity. The willingness to share knowledge and participate in the evaluation activity is a part of the culture (Capture-KSF3). Culture evolves in a long time perspective, and thus it is important to start this work as early as possible. The knowledge goal and its alignment to the KM vision is a KSF for the capture process (Capture-KSF1), and also an important part of the preparation advice. With respect to the capture process, the knowledge goal influences what knowledge to capture, which in turn influences where to find the knowledge as well as the assessment of whether identified knowledge is relevant or not (Capture-KSF5). The advice emphasizes using adapted goal descriptions as a valuable tool to explain the project in order to motivate the stakeholders. There are different types of stakeholders and the preparation advice aims to address all the relevant ones, where management is one group.
Ideas about how to integrate the capture process into daily work routines (Capture-KSF4) presuppose, in our view, knowledge about the daily working life. To gain this knowledge is one purpose of the preparation advice. This advice also aims to result in knowledge about which knowledge to capture and where to find it (Capture-KSF2) in order to achieve the KM project goal. Another valuable contribution from gaining this knowledge is the identification of what the users consider to be critical knowledge to be included in the repository which they regard as being a valuable contribution to daily work.

In order to efficiently carry out the capture process and continuously capture knowledge to be incorporated in an IT-supported knowledge repository, the capture process must be integrated with daily work and the organization needs a knowledge sharing culture. Developing both a knowledge sharing culture and integration between individual and organizational processes has a long time perspective. The importance of starting this work as early as possible is clear and in accordance with the preparation advice presented in Section 17.2.1. This advice prepares the organization for the capture process and enhances the work of implementing a process for the continuous capture of knowledge to be incorporated in an IT-supported knowledge repository. We do not claim that this preparation work solves all the problems, only that it prepares the organization and increases its possibilities of success, i.e., decreases unwanted knowledge loss and increases wanted knowledge loss.

In the following two sections, we present the guidance elements that aim to facilitate the identify and the evaluate activities.

17.3G2: Guidance for the identification activity in order to reduce unwanted knowledge loss

The identify activity aims to identify “all” knowledge. When the project starts, it cannot be assumed that the project’s participants have any experience, and therefore the work and the discussion should be as concrete as possible. For example, at the beginning, the identify activity should focus on already stored information, but the continuous capturing of knowledge requires a focus on explicit and then on tacit knowledge in the on-going KM work. Hence, the KM project should iterate the capture process a number of times. The guidance aims to facilitate the increase of the integration between the capture process and daily work processes for each iteration. Furthermore, to enhance documentation, this guidance element also includes an initial version of a template (Figure 17:2)
Section 17.3.1 presents guidance for how the activity that aims to identify as much relevant knowledge as possible and also result in a process in which knowledge is continuously captured can be performed. Section 17.3.2 discusses the presented guidance.

17.3.1 G2: Recommendations for how to perform the identify activity

The identify activity requires knowledge about which knowledge to capture and where to find it, in order to achieve the KM project goal. Furthermore, when iterating the capture process within the KM project, the identify activity differs depending on when it is performed; at the beginning when the repository is empty, or later in the project when there is some content. Before the KM project in concluded, the identify activity must also include preparation for maintenance, which means that the individual identify activity is integrated with organizational processes to ensure the continuous capturing of knowledge. If knowledge is not identified, it can never be captured.

This guidance element consists of recommendations concerning how to work when performing the identify activity within the project. In order to clearly show how the focus must differ when the repository is empty compared to later in the project, these recommendations are structured into two parts. This structure, more or less, also forces the target organization to iterate the capture process within the limits of the project. Working with capture points is an important part of this activity when preparing for maintenance. Thus, the initial version of a template to be used when documenting capture points is included in this guidance element.

Part I. How to work in the first iteration when the repository is empty:

At this point, when the project starts, it cannot be assumed that the project’s participants have any experience, and therefore the work and the discussion should be as concrete as possible. Furthermore, this part includes two steps where Step 1 concerns the development of a knowledge map and Step 2 identifying knowledge. Step1 must be performed before Step 2.

**Step 1: Develop a concrete and detailed picture that shows what to include in the repository to achieve the KM project goal, i.e. develop a Knowledge map**

The Knowledge map is also a valuable tool in the evaluate activity.

Some advice in this work:
- Knowledge collected when using G1 is a valuable input
• Work **together** with relevant stakeholders, e.g. the Capture process Manager and some key persons
• Pay attention to what the users want to know about the domain knowledge and what the providers want to disseminate in order to identify which knowledge should be shared
• Be concrete. An example; ask knowledge providers to concretely describe which knowledge they want to disseminate
• If several knowledge areas are included, prioritize! In this work, knowledge that the users “must” find in order to motivate the use of the repository is important
• If the work reveals critical concepts/terms and how they should be defined, document this. This is important input for developing the interface of the knowledge repository.

**Step 2: Identify relevant knowledge which assumes some knowledge about where it can be found**

Relevant knowledge refers to knowledge that should be stored according to the Knowledge map.

We recommend starting with already stored information:
• In the own department
• In the own organization
• Outside the own organization

Then focus on knowledge
• possessed by the project’s participants (Often the project participants’ own experience based knowledge has been identified during the work with the knowledge map)
• generated in on-going knowledge generating activities.

Some advice in this work:
• The information can be stored in different formats, e.g. text, film and picture
• Base the search on the knowledge map and try to see the knowledge from this perspective and not the perspective from where it is stored
• Be attentive if there are any specific events that may generate knowledge for the repository directly
• Identified pieces of knowledge should be evaluated. Thus we recommend documenting all identified pieces of knowledge as well as giving each piece an id number in order to trace it through the evaluation process. An initial version of a template for documenting the evaluation includes this id number (see Figure 17:3).
Part II. How to work in the following iterations when the repository has some content: Work in parallel with the ongoing identification of knowledge (A) and preparing for maintenance (B).

A. Identify relevant knowledge – some advice:
- Do not forget the advice in Part I:
  - already stored information and knowledge possessed by the project members
  - document and give identified knowledge an id number
- Mainly focus on ordinary business processes, because already stored knowledge has been considered in the first iteration
- Be attentive for any relevant specific events that have not been noticed in the first iteration
- Relate identified knowledge to the knowledge map in order to already now determine whether it is relevant and/or if the knowledge map should been revised
- Relate identified knowledge to a capture point (see B) and document this. The initial version of a template for documenting the evaluation supports this (see Figure 17:3). If an identified piece of knowledge does not correspond to a capture point this may mean that a new capture point is identified. Furthermore, this is important information when revising capture points at least once a year (see Revise Capture points in B. Prepare for maintenance)

B. Prepare for maintenance:
The main approach is to first identify and describe capture points and then, for each capture point, link the identifying and evaluating activities to those employees responsible, and accordingly revise their work role description. A capture point can be described as a situation when knowledge is exchanged between employees.

Identify Capture points – some advice:
- Are there any specific recurring events that may generate input to the repository? In that case, regard this as a capture point.
- Focus on that/those type/s of process/es that the repository aims to store knowledge about. For example, if the purpose is to store knowledge about ordinary business processes, try to find capture points in these, because knowledge generated in e.g. specific knowledge generating activities relevant for ordinary business process will also show up here
- Involve key persons from relevant processes and brainstorm when in daily work there is knowledge exchange between two or more persons. Try to be concrete in terms of how we can see that it is an exchange, what is exchanged and by whom.

Describe Capture points – some advice:
- Describe and document properties of the capture point and its potential relationship to the repository. An initial version of a template for this documentation is presented in Figure 17:2.
  - Properties, describe, e.g.
    - In what situation/activity it has been noticed, i.e. give the capture point a name,
    - general short description,
    - employees responsible for the situation/activity,
    - participants in this situation/activity,
    - frequency of the situation/activity, and
    - content at a more detailed level.
  - Relationship, describe, e.g.
    - Frequency of knowledge generation in this capture point relevant to the repository
    - if it is formally required, and
    - signals indicating that knowledge relevant for the knowledge repository has been created.
    - employee/s responsible for reporting to the Capture process Manager. Corresponding work roles should be accordingly revised. Be careful when selecting employee/s for this reporting since it is critical.
    - Potential work roles for evaluating. Corresponding work roles should be accordingly revised.
- Prioritize capture points that are regarded as formally required and/or always generate input to the repository.

When no further capture points are found and all the found capture points have been documented, there is no need for further iterations of the identify activity within the limit of the project (compare with the checklist in Section 17.6.1). However, the capture points must be revised on a regular basis, at least once a year, and this is the Capture process Manager’s responsibility. The mapping between identified pieces of knowledge and capture points is important input to this work (see Part II A. Identify relevant knowledge – some advice).

- Identified knowledge that does not belong to any capture point indicates that the activity in which the knowledge has been exchanged has the potential to be treated as a capture point
- A capture point that does not have any identified pieces of knowledge indicates that this capture point is unnecessary

Since careful documentation of capture points and identified pieces of knowledge is critical, we recommend using some sort of template. For initial versions, see Figure 17:2 and Figure 17:3).
Capture point:
Identification number (Id): ____________________________

Date: ___________
Sign: ___________

**The Capture point:**

<table>
<thead>
<tr>
<th>General description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Responsible for the activity where it occurs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency (Always, Often, Seldom)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Content on a more detailed level (What pieces of knowledge may be exchanged?)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**The relationship to the repository**

<table>
<thead>
<tr>
<th>Frequency of generating knowledge to the repository</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always, Often, Seldom</td>
</tr>
<tr>
<td>Never -&gt; no further work</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If Always/Often, probably an important Capture Point</th>
</tr>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Formally required (Yes/No)</th>
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</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>If Yes, probably an important Capture Point</th>
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<tbody>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Signal/s indicating that knowledge has been created</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Responsible for reporting to Capture process Manager (work role and eventually name)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Work role description revised:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential work roles for evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work role description revised:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
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<td></td>
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</table>

Figure 17:2 An initial version of a template for describing a Capture Point
17.3.2 Discussion of Guidance element 2 (G2)

Apart from willingness, identifying knowledge requires knowledge about what knowledge to capture and where to find it. Hence, the importance of developing a concrete and detailed picture of the KM project goal, for example, a Knowledge map, is clear. To develop a Knowledge map requires, among other things, knowledge about who are the main users of the repository and who are the main providers of knowledge. The preparation process enhances this knowledge. Communication is a key success factor regardless of type of project. Thus, if the work with the Knowledge map reveals important concepts, we recommend carefully documenting them as well as what they mean. This enhances the forthcoming work and is also valuable input for developing the interface to the knowledge repository.

When the Knowledge map is complete, the “real” capture work can start. The reasons for recommending beginning with already stored information, that is, knowledge related to knowledge loss number 1 (see Figure 16:1), is that this knowledge is already transformed to information. Hence, this is also a concrete way of working, meaning that the actual knowledge is already stored in the form of documents, pictures, films, and so on. It is important to search in different types of stored media. The information can be found inside the organization, in the actual department or in another, or outside the organization in question, and it is important not to limit the review to the own department. Re-storing information and integrating it in the repository aims to enhance finding it. As the professional expert puts it: “Knowledge must also be possible to re-find”. We claim that an approach which enhances seeing already stored knowledge from another perspective, compared to how it is stored, is preferable, because one main challenge in this work is identifying knowledge that nobody knows about, or knows that it relates to the project. Reviewing already stored information can be regarded as a specific event. Our overview of the relationships between inputs to the repository, daily work and different types of knowledge (Figure 14:6) supports that there are specific events which may generate knowledge directly to the repository.

It is easier to identify and express internal explicit knowledge than internal tacit knowledge. Thus, with regard to internal knowledge, the explicit type should be in focus at the beginning of the project. Furthermore, tacit knowledge, if relevant, will proceed through business processes and appear there (see Figure 14:6). Another important source of knowledge, also when developing the Knowledge map, is the experience based knowledge of the project’s participants. Explicit knowledge can be found, for example, in ongoing knowledge generating activities. Another important source is what Massey et al (2005) calls drivers and owners of knowledge. For example,
project members are potential drivers and owners, and their experience based knowledge may, for instance, be relevant.

Integrating the identify activity into daily work processes assumes linking individual tasks/processes and organizational ones. Thus, the work of capture points is included in the guidance. To achieve this aim and have it serve as a tool for linking individual tasks/processes to organizational ones, each identified capture point has to be characterized:

- **The capture point as such:** In order to enhance the discovery of knowledge exchange, it is important to know how often a capture point occurs, as well as who is/are responsible for the capture point or activity in which it occurs, and others who participate. This also enhances deciding which employee should be responsible for reporting to the Capture process Manager (see the next point).

- **The relationship between a capture point and the repository:** The capture point’s importance is determined by the degree of formality required, as well as how often we consider that knowledge from it will result in updating the repository. If it is deemed never to generate input to the repository, it should not be the subject of further work. This detection can also be made in the evaluation work, since this identifies knowledge that not should be stored in the repository. Hence, capture points which do not, or very seldom, contribute input to the repository can be discovered and their related documentation revised accordingly. Another critical issue is discovering that knowledge relevant for the repository may have been exchanged, i.e., the signal indicating that person/s responsible have to act. If newly created knowledge is to reach the repository it must be reported to the Capture process Manager. We claim that deciding who is responsible for this reporting is critical for the whole capture process, because if the knowledge does not reach the Capture process Manager its chances of reaching any evaluation activity will decrease. Issues about the capture points as such, described previously, support this decision. It is also important at this stage to already try to identify the potential work role/s who will perform the evaluation concerning knowledge identified in a specific capture point and accordingly revise their work role descriptions. They would thus be prepared to include evaluation in their work tasks. Revising work role descriptions also creates conditions for aligning the evaluate activity to business processes and indicates that management is committed to the actual KM work.

These characteristics of capture points, and their documentation, are important in the work of integrating the capture process into daily work. Furthermore, if an employee who is responsible for part/s of the capture activity
leaves the organization, someone else must take over. Hence, careful docu-
mentation of identified capture points and their characteristics is required
(see Figure 17:2). In order to enhance traceability, we recommend giving
each identified capture point an identification number and then, during the
evaluation, using this number to document which capture point the identified
knowledge belongs to (Figure 17:3). This enhances the revision of capture
points, because if a piece of knowledge does not have a corresponding cap-
ture point, it may mean a new capture point has been revealed. On the other
hand, if a specific capture point never generates any pieces of identified
knowledge, it can be a signal to remove this capture point and revise the
related work role descriptions. Based on the work aiming to survey relations-
ships between identifying knowledge and daily work processes (Chapter 14),
the focus should be on specific events and ordinary business processes when
trying to identify capture points in daily work. We know from earlier results
that the context regarding tacit knowledge is organizational processes, and
therefore, these processes are also the sources for identifying tacit knowl-
edge. With regard to specific events, we recommend treating each one as a
capture point and trying to identify which recurring events, in themselves,
generate relevant knowledge/information.

The identify activity should be iterated until the organization has achieved
maturity in terms of integrating the identification activity with daily work
processes. One sign of this is when no further capture points are found and
all found capture points have been documented in accordance with the tem-
plate. However, new capture points can develop, and the work role descrip-
tion of the Capture process Manager should explicitly state the responsibility
for revising capture points. It is also important to emphasize that deficiencies
in the knowledge map can be revealed in the capture process. If a capture
point indicates that a specific piece of knowledge is relevant to the KM pro-
ject goal, but not to the knowledge map, this demonstrates that the knowl-
edge map should be revised. The same situation exists in the identify activity
when evaluation addressing relevance is performed.

17.4 G3: Guidance for the evaluation activity in order to
increase wanted knowledge loss
Knowledge which is, for example, irrelevant and incorrect should not be
stored if the aim is to achieve high quality in an IT-supported knowledge
repository. Hence, the evaluation process involves sorting out knowledge
that not should be stored, i.e., identifying wanted knowledge loss. The im-
portance of having evaluation criteria against which to assess is obvious.
Hence, this guidance element consists of six evaluation criteria. Since docu-
mentation is critical, and in order to enhance documentation of the evaluation, this guidance element also includes an initial version of a template (Figure 17:3). The evaluation criteria are presented in Section 17.4.1 and then discussed in Section 17.4.2.

17.4.1 G3: Evaluation criteria

For knowledge to be stored, it must pass the evaluation process. The six evaluation criteria presented in this section aim to support the process of deciding whether identified knowledge should be stored or not. Different types of evaluation require different competences and, hence, no single individual can normally perform all these different types of evaluations. However, having too many people involved results in a slower process in which the risk of losing knowledge increases. Thus we suggest that one requirement for the Capture process Manager role is the competence to at least carry out the initial evaluation addressing relevance, criterion number 1, and redundancy, criterion number 2. If such an initial evaluation discovers that the particular piece of knowledge should not be stored, no further evaluation is required and unnecessary work is avoided. Checking for value erosion requires that the actual piece of knowledge is packaged in some way, and this packaging can also influence correctness. Thus, the last two criteria, numbers 5 and 6, require some form of initial packaging, and should be performed at the conclusion of the evaluation stage of the capture process. Since criteria numbers 3 and 4 do not require any form of packaging, they can be carried out before criteria numbers 5 and 6.

In order to enhance understanding about when to use each criterion in the capture process, the criteria are presented in the order in which they should be used and accordingly occur in the capture process model (Figure 17:1). Furthermore, each criterion has a heading that corresponds to the decision points concerning evaluation in the capture process model.

The six evaluation criteria are as follows:

1. **Relevant?**
   Evaluate if the identified piece of knowledge contributes to achieving the goal of the actual knowledge repository. If it does not, it should not be incorporated in the knowledge repository. Notably, the evaluation performed when building the knowledge repository must also examine if the knowledge to be stored satisfies the most important needs of the users.

2. **Already stored?**
   Evaluate if the identified piece of knowledge is already stored in the repository. If so, examine if it needs to be revised/updated according to the newly identified piece of knowledge. If storing the particular
piece of knowledge means that already stored knowledge should be revised in some way, it is important to pass this information onto the package and store process.

3. Risk for imitation?
Evaluate if storing the identified piece of knowledge enhances the risk of imitation by external actors in such a way that may diminish the organization’s competitive advantage. If this is the case, the organization must examine if there are other ways of solving the problem, for example, by storing information about where the actual knowledge can be found or limiting access rights to the knowledge repository. It is critical to pass on information that influences how the actual piece of knowledge should be stored to the package and store process.

4. Right to store/share?
Evaluate if the identified piece of knowledge is protected by external actors. If this is the case, the degree of protection decides whether the knowledge should be stored or not. For example, if it is against the law it should not be incorporated in the repository. However, perhaps information about the knowledge owner could be stored.

5. Value erosion?
Evaluate if storing involves losing critical knowledge elements. However, before this can be done, different storage formats, e.g., text, picture, or film, must be evaluated. If storing results in the loss of critical knowledge elements, the organization must evaluate whether it is worth storing the knowledge at all. Perhaps an alternative is to store information about the knowledge owner. We recommend evaluating value erosion in the package and store process also, since the packaging itself may influence this criterion.

6. Correct?
Evaluate if the identified piece of knowledge is correct. For reliability reasons and as a quality assurance measure, it is of critical importance that the employee who makes this evaluation signs the actual piece of knowledge with both name and work role/title. Since storing may involve losing knowledge elements, this evaluation criterion, in accordance with criterion number 5, assumes some form of packaging, and we recommend it should be performed again in the package and store process.

It is important to document the evaluation activity in order to ensure traceability and to enable information that has been revealed during the evaluation work and is relevant for the package and store process to be passed on to this process. In order to support this documentation, an initial version of a template can be found in Figure 17:3. The criteria in the template are in the same order as in the capture process overview (Figure 17:1). Furthermore, to
support traceability and the revision of capture points, the initial version of
the template includes columns for an id number and its related capture point
for the identified piece of knowledge. With regard to the id number, we rec-
ommend a system that provides information about the type of knowledge,
e.g. a system in which one letter that indicates knowledge type is followed
by a unique number. The id number for each piece of knowledge can also be
used if additional comments that the template does not have space for are
needed. Relating the id number to a capture point, enhances the work of
revising capture points (see G2).

17.4.2 Discussion of Guidance element 3 (G3)

Checking for potential value erosion requires specialist knowledge, since
this concerns identifying if, and in that case which, critical knowledge ele-
ments have been lost when storing the actual piece of knowledge. Further-
more, checking the correctness also requires specialist knowledge. The as-
pects of correctness and value erosion are closely linked, because value ero-
sion may result in the knowledge not being correct anymore. In addition,
since both these types of evaluation require some sort of packaging, they
cannot be performed at the beginning, as an initial evaluation.

Two types of evaluation that do not require any form of packaging and
which can be addressed regardless of how the actual piece of knowledge has
been identified are those addressing 1) relevance and 2) redundancy. These
two types of evaluation should thus be performed as soon as possible in or-
der to quickly determine whether the identified piece of knowledge has the
potential to be stored or not. We claim that performing this initial evaluation
saves resources in the form of man-hours. The evaluations addressing the
right to store/share and the risk of imitation probably require some specialist
knowledge, but do not require storing the piece of knowledge. Hence, we
argue that these two types of evaluation should be performed in the middle
of the evaluate activity.
Figure 17.3: An initial version of a template for documentation of identified knowledge and its evaluation process.

<table>
<thead>
<tr>
<th>Id</th>
<th>Input: who and date</th>
<th>Knowledge description</th>
<th>Capture point (Id)</th>
<th>Relevant? Yes/No</th>
<th>Already stored? Yes/Yes, but must be updated/ Partly/No</th>
<th>Risk for imitation? Yes/No, but store information about the knowledge owner/No +sign and date</th>
<th>Right to store/share? Yes/No inclusive with regard to what and if storing information + sign and date</th>
<th>Value erosion? Yes inclusive in what ways/No, but store information about the knowledge owner/No +sign and date</th>
<th>Correct? Yes/No inclusive what to correct +sign and date</th>
<th>Decision regarding storing: Write date and sign +needed re-evaluation in the next process? - storing influences already stored information? Not store/Pass-relevant Store who owns the knowledge +sign and date</th>
</tr>
</thead>
</table>
The evaluation criteria aim to support the evaluate activity and hence the Ev-KSF:s which result in increasing different types of wanted knowledge loss. The conceptual model describing Ev-KSF (Figure 12:4) highlights the need to explicitly show who has carried out the correctness assessment (Ev-KSF2), because this enhances reliability. It is important to state both the person’s name and profession, because, from a political perspective, this is also a sign of commitment. The aspects of reliability and sign of commitment, together with the knowledge repository’s purpose, are also important when identifying the potential work roles who will perform the evaluation addressing correctness. The sooner these work roles can be identified, and the related work role descriptions revised, the better. This is what Ev-KSF1 is about. We also remind about the importance of trying to identify potential work role/s for the evaluate task when working with capture points and including this activity in the relevant work role description.

Ev-KSF3 involves both knowledge that is protected by external actors and knowledge protection of the own organizational knowledge where value erosion is involved. Hence, one evaluation criterion is not enough for protection. Thus, evaluation criteria 3, 4 and 5 together cover Ev-KSF3. Regardless of type of criteria, it is sometimes a better choice to store information about who has the particular knowledge. Protecting knowledge from unwanted imitation by external actors, criteria number 3, can be carried out in different technical ways, e.g., using passwords. This type of protection must also be addressed in the design of the IT-supported knowledge repository; for example, whether to use an open or closed network. If the actual piece of knowledge is considered critical and must be protected from imitation by external actors, the decision to store or not depends on estimated risks.

Ev-KSF4 concerns evaluating whether the identified knowledge contributes to the knowledge goal or not, and Ev-KSF6 concerns ensuring that the repository satisfies the most important knowledge needs of the users. This is what evaluation criteria number 1 is about. Ev-KSF6 is particularly important when testing the repository for the first time, otherwise there is a considerable risk that the first impression will be negative. Storing should contribute to learning in order to achieve the business goal and enhance competitiveness. However, the storage of irrelevant knowledge has the opposite result. It increases information overflow and makes it difficult for an employee to find what he/she is looking for. As the professional expert puts it: “Knowledge should not only be re-cycled, it should also be possible to re-find.”. Ev-KSF5 concerns determining if identified knowledge is already stored or not. The capture process aims to capture new knowledge which should potentially be stored, and this concerns evaluation criteria number two. However, when storing new knowledge, this can result in deleting already stored knowledge or updating it. This is a part of the Package and
Store process which follows the Capture process. Nevertheless, with regard to the importance of revising and updating the content in order to maintain a high quality in the repository in the long term perspective, we claim that if this is noticed already in the capture process the guidance should facilitate its documentation. Hence, it must be included in the guidance in some way.

17.5 G4 A work role description for the Capture process Manager (CpM)

The need to have an employee who has the overall responsibility for the capture process has already been stated; the person we call the Capture process Manager (CpM). This individual is responsible for receiving identified knowledge, deciding if it should be stored and, in that case, passing it on to the package and store process. However, it is important to emphasize that this does not mean that the CpM must perform all the work of the capture process. The CpM’s role is critical for the success of the capture process, because if identified knowledge is stopped somewhere in the capture process, or not passed on to the package and store process, it will never be incorporated in the repository. Thus, the appointment of a Capture process Manager is a critical decision for the success of the capture process. Hence, this guidance element includes a description of tasks and decisions for which the Capture process Manager should be responsible, as well as a description of the kinds of competences/qualities that a CpM needs. The guidance element is described in Section 17.5.1 and then discussed in Section 17.5.2.

17.5.1 G4: A work role description and needed competences for the Capture process Manager

The Capture process Manager can be regarded as the “spider in the web”, the web being the capture process, which is completely dependent on its context for success. Identified knowledge must be reported to and reach the CpM, and knowledge that should be stored must reach the package and store process. Besides the overall responsibility for the capture process, the Capture process Manager also has a more detailed responsibility for each of the three critical activities (identification, evaluation and passing). In the following, we describe, in more detail, what we claim the Capture process manager should be responsible for with regard to each of these critical activities. Furthermore, we also describe the qualifications a CpM needs, in order to have a reasonable chance of effectively performing this work.
**The Capture process Manager’s responsibility**

- **Identifying:**
  - Coordinating and keeping a record of reported identified knowledge. Here, a template in accordance with our initial version of documentation of identified knowledge and its evaluation process (Figure 17:3) is a valuable tool.
  - Managing capture points which includes identifying employees responsible for reporting identified knowledge to the CpM:
    - Documenting and keeping a record of capture points. Here a template in accordance with our initial version of documentation of description a Capture Point” (Figure 17:2) is a valuable tool.
    - The continuous, approximately once a year, revision of Capture points, meaning the review of existing Capture points and the search for new ones. Here, the documentation of the evaluation process as well as that of capture points are important tools.

- **Evaluating:** *In order to avoid unnecessary work, it is important that the evaluation is performed in accordance with G0, the capture process overview* (Figure 17:1).
  - Documenting and maintaining a record of the evaluation of each identified piece of knowledge. Here, a template in accordance with our initial version of documentation of the evaluation process (Figure 17:3) is a valuable tool.
  - Deciding if identified knowledge should be stored based on:
    - Relevance (Evaluation criterion number 1)
    - Redundancy (Evaluation criterion number 2)
  This initial evaluation aims to determine, as early as possible, whether an identified piece of knowledge should be stored or not. This is done in order to avoid unnecessary work.
  - Responsibility for evaluation based on the following criteria is carried out:
    - Imitation (Evaluation criterion number 3)
    - Right to store/share (Evaluation criterion number 4)
    - Value erosion (Evaluation criterion number 5)
    - Correctness (Evaluation criterion number 6)

- **Passing knowledge:**
  - Based on the evaluation, decide whether the identified knowledge should be stored or not
  - Passing knowledge that should be stored onto employee/s responsible for the process of “Package and store knowledge”
  - Informing the employee responsible for the process “Package and store knowledge” about relevant issues that have been discovered in the capture process. Here, the documentation concerning the evalua-
tion, e.g., a template in accordance with our initial version of documenta-
tion of a capture point (Figure 17:3), is critical input. The follow-
ning points include important issues:

- If any evaluation criteria, and, in that case, which criteria, have
to be re-checked after packaging but before storing
- If storing the particular piece of knowledge means revis-
ing/updating already stored information
- If storing includes security considerations to avoid imitation
- Important concepts and their meaning

**The Capture process Manager needs the following competences/qualities:**

- Insights and knowledge about how the repository should enhance daily
work
- Knowledge about
  - the domain
  - what is included in the repository
  - what should be included to achieve the goal of the knowledge re-
pository (the Knowledge map)
  - the intended users and their needs
- Understanding and knowledge about the capture process. This under-
standing can be enhanced by
  - The Project Overview included in this guidance (G0)
  - The description of key success factors in the capture process and
  how they influence the capture process (Chapter 12)
  - The framework showing different types of knowledge loss in the
  capture process (Chapter 13)
  - The relationships between inputs to the repository, daily work and
different types of knowledge (Chapter 14)
- Well known in the domain, has the confidence of others in the organiza-
tion
- Responsible
- Positive and with an active interest in the repository

Based on this list, we claim that the Capture process Manager should be
selected from the environment where main knowledge providers can be
found. Thus, the collected knowledge in the preparation process about the
providers’ domain and its included persons is valuable when deciding who
should be the Capture process Manager. Being a Capture process Manger is
not full time work. How much time that is required is hard to say, because it
varies depending on, for example, size and purpose of the repository.

In the following section we discuss the CpM role and G4.
17.5.2 Discussion of Guidance element 4 (G4)

To the best of our knowledge, the role of Capture process Manager has not been discussed in the literature previously. We want to emphasize that the role of Capture process Manager (CpM) is not the same as the role of Chief Knowledge Officer (CKO). The CKO role's main task is to make the whole organization conscious about the importance of knowledge as a resource, and mobilize efforts in accordance with this (Probst, Raub and Romhart, 2000).

“The CKO is responsible for managing intellectual capital and is custodian of KM practices in an organization” (Anderson, 2002, p. 1)

From these descriptions we can see that the CKO role has a general responsibility for all KM work. The CKO role should ideally also be a member of the top management team (Probst et al, 2000). The CpM role is responsibility for the capture process, which is a part of the KM work and performed at a more detailed level. Furthermore, from our point of view, the CpM role does not have to be a member of the top management team, only that he/she has good communications with this group, as well as their commitment and sponsorship. An examination of the literature with regard to a CKO’s responsibilities, strengthens the impression that the CpM role seems to be at a more detailed level and concerns a more limited area in KM work compared to the CKO role. In order to explain this impression, we discuss the two roles in the following. We subsequently describe the responsibilities and tasks of the CpM, as well as the needed qualifications, more specifically.

Three categories that refer to a CKO’s responsibilities can be identified in the literature (e.g. Anderson, 2002; Davenport and Prusak, 1998):

- Promoting/building a knowledge (sharing) culture
- Creating a knowledge management infrastructure
- Measuring the value of knowledge and KM practices for the organization and making it viable economically

As clarified by the work role description of a CpM, the CpM role has neither measuring nor economical responsibilities (the last point of the CKO:s responsibilities). With regard to the two other points of the CKO:s responsibilities, the CpM role has duties that aim to contribute to these points. For example, enhancing the continuous capturing of knowledge will increase the content’s quality and users of the repository will be helped and satisfied. When contributors feel that they help others, their own willingness to contribute with knowledge to the repository increases and this promotes a knowledge sharing culture (Kankanhalli et al, 2005). Furthermore, a used repository with high quality also has a positive influence on the knowledge
management infrastructure. Hence, our impression is that the CpM role is at a more detailed level and concerns a more limited area in KM work compared to the CKO role. Thus, we believe that the CKO role can include the CpM role, but can also be two different roles in an organization. In the latter case, the CKO role can be regarded as the chief of the CpM role. Whether organizations establish CKO and CpM positions or not depends on many aspects, for example, how are these functions performed today and how is the company organized. Furthermore, it makes sense to assign CKO functions to many different managers, especially in decentralized organizations (Davenport and Prusak, 1998). Nevertheless, the critical issue is an awareness in the organization that someone must perform and be responsible for tasks that we describe should be included in the CpM role. Furthermore, new positions/roles in KM work will be developed in the future (Probst et al, 2000), and the CpM role confirms this. In the following we describe and discuss the CpM role more specifically.

One of the most critical tasks of the CpM is to decide whether a piece of knowledge should be stored or not and, if the answer is yes, pass it on to the package and store process. If no one has this passing task in their work role description, it will probably not be integrated with daily work, thus increasing the risk of this kind of knowledge loss. This kind of knowledge loss is represented by number 5 in the framework showing different kinds of knowledge loss in the capture process (Figure 13:3). The passing responsibility also includes forwarding other important relevant information that has been revealed in the capture process and which is critical for achieving high quality in the repository and contributes to increasing its usefulness.

The CpM is responsible for the performance of the evaluations, but this does not mean he/she must do all of them. However, we argue that the Capture process Manager must have the competence to carry out at least the initial evaluation, which means evaluating relevance and whether the identified knowledge is already stored or not. The reason for this is to avoid unnecessary work. If the knowledge were to be passed on to others for all the criteria, the process would slow down too much and the risk of losing knowledge would increase. The obvious risk of losing knowledge when it is being passed between a number of employees during the evaluate activity also strengthens the need to have one employee that has the overall responsibility for the evaluation activity.

Maintaining a record of capture points is the Capture process Manager’s responsibility. Even if capture points should be identified and described before the KM project ends (see Section 17.6), new ones can develop and those already described can change. Thus it is the responsibility of the Capture process Manager to revise capture points. We claim that the work with cap-
ture points is critical, because if no one is selected to be responsible for reporting to the CpM, and relevant work role descriptions are not revised, the chances that identified knowledge will reach the evaluation activity decrease. Furthermore, a work role description that includes the task of reporting identified knowledge to the Capture process Manager is a link between the individual and organizational level concerning the identify activity and also shows that management is committed to this activity. We believe that templates in accordance with our suggestions (see Figure 17:2 and Figure 17:3) are, more or less, necessary in the work with capture points, because if identified knowledge does not correspond to a capture point this indicates that a new capture point may have been revealed. Furthermore, if a capture point has no identified pieces of knowledge, it may no longer be relevant.

To support the Capture process manager, he/she can use parts of G0, G2 and G3. An understanding of how the capture process relates to daily work and knowledge about what factors influence the process, as well as what types of knowledge loss must be managed are also important for the CpM. Thus, we claim that the descriptions of KSF in the capture process (Chapter 12), how they influence it, the framework showing different types of knowledge loss in the capture process (Figure 13:3), as well as the overview of the relationships between inputs to the repository, daily work and different types of knowledge (Figure 14:6) are relevant tools for the Capture process Manager.

17.6 G5: A checklist to know when the capture process is implemented

The purpose of the guidance is to facilitate the implementation of the capture process in such a way that ensures knowledge is continuously captured and passed on to the process of package and store knowledge. Continuously capturing knowledge to be incorporated in a repository results in high quality in terms of it being up-to-date, relevant, and so on. In order to implement a capture process that will be continuously performed requires its integration with organizational processes. To achieve this, the capture process must be iterated during the KM project in order to increase the maturity of the capture process integrations with organizational processes. When the capture process is integrated with organizational ones in such a way that it results in the continuous capture of knowledge, the organization has reached the necessary maturity in the capture process. Then, from the perspective of the capture process, it is time to decide to conclude the KM project. The timing of this decision is critical for the survival of the IT-supported knowledge repository, because if the decision is taken too early the repository will probably not include up-to-date, relevant and correct information in the long
term. To support this decision, we have developed a checklist based on the
guidance proposed in this chapter. This checklist, the fifth and last element
of the guidance (G5), is presented in Section 17.6.1 and discussed, accord-
ingly, in the following section.

17.6.1 G5: The checklist

The following six points aim to facilitate the decision whether the organiza-
tion has reached the needed maturity with regard to integration between the
capture process and daily work processes:

1. The existence of an updated Knowledge map
2. The capture process has been iterated at least three times
3. Capture points
   a. No new capture points can be identified at this stage
   b. Each identified capture point is documented
   c. Related work role descriptions are revised accordingly
4. The Evaluate activity:
   a. Has been iterated a number of times
   b. The last piece of knowledge was evaluated without any further detail-
ing or discussions concerning the criteria.
5. The Capture process Manager
   a. Has been appointed
   b. The CpM role has been included in this employee’s work role descrip-
tion
   c. Is autonomous. Has alone been responsible for at least
      • describing and documenting one capture point
      • evaluating and documenting two pieces of knowledge
6. Next step is commitment by Top management

When all these six checkpoints are achieved, that is, the answer is “yes” for
each of them, the target organization can, with regard to the capture process,
decide to conclude the KM project.

17.6.2 Discussion of Guidance element 5 (G5)

The capture process aims to capture the “right” knowledge. To know what
knowledge to capture and if identified pieces of knowledge are relevant with
regard to the purpose of the repository, a concrete and detailed picture of the
knowledge goal is needed; i.e., a Knowledge map. The Knowledge map
must be reviewed and revised accordingly throughout the project, but an
updated and revised Knowledge map that the participants regard as finished
must be accessible at the conclusion of the project.
The identify activity in the capture process focuses on different aspects with regard to when it is performed in the KM project; the need to iterate the capture process within the limits of the project is clear. This need also includes the evaluate activity, because even if the evaluation criteria are the same throughout the KM project they are better known and accepted at its conclusion. It is not possible to say how many times the capture process needs to be iterated. However, from the perspective of the identify activity, at least three iterations are required. The first is focused on developing the Knowledge map and trying to identify external knowledge. The second and third iterations are also focused on identifying and describing capture points. When no further capture points are identified, and all previous ones are documented, for example, in accordance with the initial version of a template (Figure 17:2), we believe that the organization has the needed basis with regard to capture points.

The evaluate activity involves a number of people, because different types of evaluation have to be performed. This means that the identified knowledge should pass between a number of people and the risk of losing it therefore increases. The importance of the Capture process Manager as the person with the general overview and responsibility is clear. However, considering the risk of losing the knowledge through the evaluation activity, it is important that this activity is as stringent and clear as possible. We believe that a number of pieces of knowledge must be identified and evaluated within the limit of the KM project. It is impossible to state how many times, but a key is that the last evaluation should be carried out without any need to further detail the criteria or discuss what they concern with regard to the organization.

That the Capture process Manager is critical for the success of the capture process has been discussed several times. Thus we can conclude that the CpM must be appointed and the related tasks must be included in his/her work role description before the project closes. We believe that being a CpM is not full time work, but it is important for the CpM to have enough time to carry out the tasks belonging to this role. Before concluding the KM project, the CpM must feel secure in his/her role as Capture process Manager and be autonomous. We believe a minimum requirement for this is that the CpM has alone been responsible for the documentation of one capture point and the evaluation of two pieces of knowledge (or two rows in the initial version of a template for describing identified knowledge and its evaluation process Figure 17:3).

Management commitment is necessary for the survival of the repository. This commitment is demonstrated by revised work role descriptions that reflect the appointment of a Capture process Manager, the selection of em-
ployees responsible for reporting identified knowledge to the CpM, as well as the evaluation of identified knowledge. Management commitment is also important from a political perspective. However, this commitment is not enough. Before concluding the project, the CpM and other involved persons must know how to proceed and what the next knowledge area is to focus on. This decision may require a new knowledge map and the review of external knowledge based on it. The complete developed guidance can then facilitate the work of the CpM, and from this perspective the whole guidance can, more or less, be useful for this group also. However, at this point, in the new project/phase, the Capture process Manager may perhaps take the role of project manager, and then, it is natural for the whole guidance to be useful.
18 Concluding Remarks Concerning the Guidance

Continuously capturing knowledge that has the potential to be incorporated in a knowledge repository aims to ensure its high quality. The guidance presented and discussed in Chapter 17 depicts how we achieved Research Objective 3: Develop guidance for facilitating implementation of the capture process so that relevant and correct knowledge is continuously captured. The guidance presented in this part of the thesis is limited to the capture process and aims to facilitate the implementation of a process to continuously capture knowledge. To achieve this aim, the guidance must facilitate how to implement and perform the most critical activities in the capture process, which also includes successfully managing knowledge loss and KSF for the capture process. Hence, the critical question is if the presented guidance achieves this. If it does, we can claim that also the third and last research objective has been accomplished. This chapter aims to explain and discuss why we argue that the presented guidance facilitates implementing and performing the most critical activities in the capture process. Since the identification and evaluation of knowledge are critical activities in the capture process, we also refer to the specific KSF:s of these activities (Section 12.2 and Section 12.3). To enhance reading, Table 18:1 summarizes the relations between the guidance and the critical activities, KSF and the types of knowledge loss.

Based on the characterization of the capture process presented in Chapters 12 to 14, we state in Section 16.1 that the most critical activities in the capture process are identify new knowledge, evaluate the identified knowledge and, if it should be stored, pass it on to the packaging and storing process. How these activities relate to each other and the guidance elements is visualized in G0. The guidance includes one specific element for facilitating the identify activity and one for the evaluate activity, while facilitating the passing activity is a part of G4 about the Capture process Manager’s responsibility. From the perspective of different types of knowledge loss, the passing activity concerns knowledge loss 5, and G4 hence includes support that aims to facilitate reducing this knowledge loss.
Knowledge loss 1, 2 and 3 concern knowledge that does not even reach the capture process and hence relates to the identify activity. Therefore, using G2 should facilitate managing these types of loss. G2 includes advice about reducing these types of knowledge loss by, for example, explicitly stating what knowledge to focus on, where to find it in different iterations, as well as how to characterize and work with capture points. This advice develops awareness concerning, for example, that identifying knowledge deals with different types of knowledge, and that potential knowledge can be found in different processes and activities and be stored in different forms, places and for different purposes. Furthermore, using the preparation advice (G1) results in, among other things, knowledge about the domain, which in turn enhances knowing what knowledge to capture when developing the knowledge map, and it enhances knowing where to find the knowledge. This is also what Capture-KSF1 and Capture-KSF2 is about. Furthermore, Id-KSF3 and Id-KSF4 concern organizational knowledge about what knowledge to capture and where it can potentially be found. One common aspect for knowledge loss 1-3 is that knowledge may escape identification, since the knowledge owner is not willing to share it. Increasing the willingness to share knowledge concerns developing a knowledge sharing and learning culture. This is not an explicit part of the guidance. Thus, since a knowledge sharing culture is a Capture-KSF (Capture-KSF3) and also a Gen-KSF (Gen-KSF2), and the willingness to contribute an Id-KSF (Id-KSF1), this is a deficiency in the guidance. However, we argue that in the long term the guidance will have a positive influence on the knowledge sharing culture. According to Kankanhalli et al, 2005, the enjoyment of helping others influences the willingness to share knowledge. In addition, the guidance aims to contribute to high quality in the repository, in order to help users in their daily work. Furthermore, using G1 in the preparation phase also has a positive effect on motivations and the willingness to participate in the capture process. We also want to remind that employees’ experience from collaborative projects, e.g. a KM project, is one important reason for future decision in contributing to IT-supported knowledge repositories (Jian and Jeffres, 2006).

From the perspective of different types of knowledge loss, loss 6 and 7 concern identified knowledge that should not be stored and hence relate to the evaluate activity. Thus, using G3 should facilitate managing these types of loss. G3 includes six evaluation criteria. These criteria cover the aspects described in Capture-KSF5, as well as the more detailed descriptions in Ev-KSF2, Ev-KSF3, Ev-KSF4, Ev-KSF5 and Ev-KSF6. The importance of the KM project goal for this evaluation process is well described in this thesis (e.g. Capture-KSF1, Id-KSF3 and Gen-KSF1), and hence the work performed when using G1 and G2 also contributes to managing knowledge loss numbers 6 and 7.
Thus far, we can see that the guidance includes elements to facilitate the three critical identify activities (identify, evaluate and pass knowledge onto the package and store process), as well as their related knowledge loss and most of their KSF. The only knowledge that the guidance does not pay explicit attention to is loss number 4, which concerns knowledge that is not possible to capture. As discussed and motivated in Chapter 16, the purpose of the guidance does not include covering this knowledge loss, since it is more concerned with the need of multiple channels for knowledge transfer, as well as methods and ways of working that aim to enhance knowledge conversion from tacit knowledge to explicit.

Capture-KSF4 is the only Capture-KSF for which we have not discussed if and, in that case, how the guidance aims to facilitate it. Capture-KSF4 is concerned with the capture process being integrated in daily work processes. The importance of integrating the capture process into daily work is also at a more detailed level noticed for the evaluate activity (Ev-KSF1) and in the category called general KSF for the capture process (Gen-KSF3). Furthermore, Id-KSF2 addresses that work processes and IT systems should enable input from different sources, which we regard is a consequence when the capture process is integrated into daily work. Facilitating the integration between the capture process and daily work is an important part of the guidance. Hence, the guidance includes an approach to link individual tasks in the capture process with organizational ones. This approach uses capture points to identify potential work roles/employees responsible for both reporting new knowledge to the CpM and evaluating identified knowledge, as well as accordingly revising their work role descriptions. Revising work role descriptions is management’s responsibility and carrying out this task thus also shows that management is committed to the KM work. By forcing the organization to iterate the capture process in the limit of the KM project and during these iterations focus on different things, such as different types of knowledge, capture points, and so on, the guidance aims to increase the maturity in the integration of the capture process with daily work. In order to support the decision about when the required maturity has been achieved, that is, when to conclude the project, the guidance also includes a checklist (G5).

The discussion is summarized in Table 18:1. In this table an (X) indicates that the guidance influence this aspect, even if it does not explicitly facilitate it.

The discussion clarifies that the guidance includes elements that aim to facilitate the activities identify, evaluate and pass knowledge on to the package and store process. Furthermore, the different types of knowledge loss of these activities are all covered, except knowledge loss number 4. However,
this is in accordance with what the guidance aims to support (see Section 16.1). Also the different categories of KSF are in some way covered by the guidance, although KSF regarding the culture are not explicitly dealt with. This is already discussed when describing what the guidance should support (see Chapter 16). Hence, we claim that also the third research objective has been achieved. The main deficiency of the guidance is that it does not explicitly include suggestions about how to introduce and develop a knowledge sharing culture. However, using the guidance has a positive influence on the culture. Furthermore, the organizational culture is important for more or less all the work in the organization and the effort of developing a learning culture must be on-going and performed in parallel. An organization can never come to a point in time when it can declare that is has become a Learning Organization in the sense of a final achievement (Gorelick, 2005). Hence, to be a Learning Organization is a continuous process.

Table 18.1 How the guidance supports the capture process

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<th>G0</th>
<th>G1</th>
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Part VI

Final Remarks and Future Work

This part includes some final remarks as well as our suggestions for future research work.
Our basic research problems are that many KM projects fail and that organizations lack systematic support for implementing KM. Hence, the aim of this research project is to *Contribute to increasing the usefulness of IT-supported knowledge repositories by supporting the capture process*. There are three main parts of contributions from the research project:

I  A characterization of KM including three levels of abstraction  
II  A characterization of the capture process  
III Guidance for implementing the capture process

These three contributions are in accordance with the three research objectives, and mean that the research objectives have been achieved.

Now, has the thesis fulfilled its aim? We claim that it facilitates the understanding of the capture process, its critical importance, and presents guidance for the capture process. However, will this contribute to increasing the usefulness of IT-supported knowledge repositories? We consider that it will do so. Nevertheless, we cannot know for sure, since within the limit of this research project, it is not possible to follow another KM project and evaluate whether the detailed understanding of the capture process and using the guidance will result in increasing the usefulness of the repository in the long term. Thus, conducting this empirical investigation with regard to the presented guidance is an important part of future work.

However, what we can know for sure is that all work presented in this thesis is theoretically and empirically grounded. We also know that the holistic description in Part III and the characterization of the capture process in Part IV facilitates the understanding of the capture process. In addition, we know that the guidance presented in Part V facilitates what it should (see Chapter18). Thus, the work presented in this thesis has the potential to support the capture process in such a way that positively influences the quality of the repository, and hence its usefulness. Furthermore, we want to emphasize that important parts of the guidance, such as working with capture points and revising work role descriptions, were used in the EKLär project and have contributed to the fact that the EKLär repository has so far been regularly updated. We also claim it is better to use a guidance that is empiri-
cally and theoretically grounded, even if it is not empirically validated, when performing a KM project, than having no guidance at all.

In Section 19.1 we provide some additional final remarks concerning the contributions presented in this thesis and in Section 19.2 we discuss future work.

19.1 Final remarks

IT-supported knowledge repositories focus on knowledge reuse to learn and to generate new knowledge. The process of capturing new knowledge aims to manage the repository from the perspective of updating it. If the capture process is to achieve its aim, people involved in this type of KM project need knowledge and understanding about the capture process. We claim that the characterization of the capture process presented in Part IV contributes to this need. Furthermore, people also need knowledge about how knowledge repositories contribute and influence KM work in general, and why the organizational culture plays such an important role in KM work. Results presented in Part III contribute to this need. Capturing new, relevant and correct knowledge is a prerequisite for the knowledge repository to include pertinent and updated information, and to result in a successful knowledge repository. Thus the process of capturing new knowledge is critical for success, and the guidance presented in Part VI aims to facilitate implementing it in a successful way. Furthermore, capturing knowledge is a prerequisite for all types of KM work, since all KM work includes some form of capturing.

One key issue when developing the guidance concerns how the capture process can proceed after the conclusion of the project and the repository is in its use and maintenance phase. This represents the real challenge for KM and is critical for maintaining usefulness and trust in the repository over time. How the capture process is performed during the implementation project establishes the premises for if as well as how the future KM work is carried out after the project. Thus, one cornerstone of the guidance is that the capture process is iterated in the project and during these iterations increases its maturity with regard to for example, integration between the capture process and daily work, awareness of capture points and responsible employees, detailed and adapted evaluation criteria, and an autonomous Capture process Manager who knows what to do and how to do it.

The capture process aims to feed the repository with new, relevant and correct knowledge, which is critical for long term survival and success. When contributors to the repository feel that they really help others in the organization and users of the repository really feel that the repository supports them,
it has a positive influence on the organizational culture. Furthermore, implementing and using a knowledge repository raises questions about how to share knowledge and learn from each other; and it contributes to an awareness of how to manage knowledge in the organization in order to be competitive. A used repository shows the importance of sharing knowledge and learning from each other, but we believe that it also reveals the need to have alternative ways of sharing knowledge, which in turn stimulates and encourages KM work in general and increases learning in the organization. The importance of a relevant, updated and correct repository for all KM work is clear. Furthermore, this stimulates learning in the organization and hence enables it to be competitive and achieve business objectives. In addition, this strengthens the holistic approach including three levels of inquiry used in the thesis.

KM is a complex area with different focuses and methods. The work presented in this thesis reveals that developing an IT-supported knowledge repository is a suitable way to start when the intention is to initiate KM work for the purpose of achieving maturity as a Learning Organization. According to Senge (1994), the tools and methods to use will lead organizations to new ways of thinking. Working with a KM project triggers questions and new ways of thinking relevant to becoming a Learning Organization. Hence, a KM project that aims to develop a knowledge repository, for example, can be compared with an approach that intends to increase the organization’s learning maturity.

To develop an IT-supported knowledge repository is concrete and it contributes to other types of KM. At the same time it triggers questions that initiate fostering a learning culture. This is in accordance with the system’s approach. Developing knowledge repositories is a sub-system in the area of KM, which in turn is a sub-system in a Learning Organization. Changes in a sub-system affect the whole system. However, if an organization initiates a KM project and the resulting knowledge repository is not used anymore after a year or so, because employees do not consider it supports them in their daily work, since the content is irrelevant and outdated, then the KM project will not lead employees to new ways of thinking, nor will it stimulate the development of a learning culture in the long term.

If a knowledge repository is to achieve its goal, that is, support knowledge sharing, reusing and learning, and be an approach for organizations to achieve maturity as a Learning Organization, the capture process must be implemented in such a way that it continuously captures relevant and correct knowledge. The importance of knowledge and understanding about the capture process as such and how to implement it is clear. This is not only with regard to the specific knowledge repository, but also with regard to initiating
a KM project as an approach that leads employees to new ways of thinking in order to achieve maturity as a learning organization.

Modern organizations must be proficient learners and cannot afford not to manage knowledge. KM aims to support learning, and, in order to achieve the maximum of success, the desired context is a Learning Organization. The work presented in this thesis characterizes what a Learning Organization is and its relationship to KM. It shows the strong dependency between them, and that neither can be successful without the other. There must be a culture that encourages members to both share knowledge with others, as well as reuse knowledge made available by other members. Although cultivating this culture is a management issue, it must be implemented by each member. Furthermore, the organization must manage knowledge in such a way that it enhances and enables knowledge sharing and knowledge reuse. Although organizations know the importance of knowledge management, the problem is the lack of support for implementing KM. The presented characterization of the capture process and the guidance aims to reduce this deficiency and increase the number of successful KM projects. The presented guidance is not empirically tested and thus this is an important part of future work. In the next section we discuss our plans for future work.

19.2 Future work

It is possible to identify at least three main areas for future work based on the findings presented in this thesis:

I Validate and improve practical the use of the guidance:
   o To facilitate practical use and validation of the guidance, extract the practical parts from the guidance and package them in a suitable way.
   o Apply the guidance to an organization and, if needed, revise it accordingly.

II The presented guidance is limited to the capture process. Another area for future research is therefore to develop guidance for parts not covered in the presented guidance:
   o Characterize the package and store process and develop guidance for it.
   o Characterize the process when employees use the repository and develop guidance that aims to integrate it in daily work and increase the use of the repository.

III The learning process in itself is outside the scope of this research, but we cannot neglect its importance to the success of knowledge repositories. Another area of future research is thus to introduce and use ideas
from cognitive science and Human Computer Interaction (HCI) together with pedagogical research, in order examine the learning process in relation to knowledge repositories.

The work presented in this thesis provides the foundation for future research into KM. There is an interest from both researchers and practitioners in developing support for different types of KM work, because there is a lack of KM implementation support. Such support is needed, since too many KM projects fail and no organization can afford to not manage their perhaps most important resource; knowledge.

The first main area for future work concerns the guidance as it is presented in this thesis. In order to enhance the practical use of the guidance and disseminate it, we plan to extract its practical parts and package them in a suitable way. With suitable we mean that they should be easy to learn and use. A suitable packaging also enhances their applicability. The guidance presented in this thesis is grounded in the literature as well as our experiences from the KM project EKLär.

An important part of developing a practical guidance is to test it in practice and then revise and update it accordingly. Hence, empirically testing the guidance is an important part of our future research work, and this is enhanced with a suitable packaging. Testing the guidance in a practical way may be problematic in the sense that we need to gain access to an organization that not only wants to perform this type of KM work, but also allows us to participate and operate in accordance with our guidance. However, as the awareness of the need to manage knowledge increases in modern organizations, we believe that this is a minor problem. A more significant problem, we believe, is that we want to test the guidance in another type of organization compared to the one in which EKLär was performed. This desire reduces the accessibility to potential organizations. However, our university is situated in an area where SME dominates, and thus we believe that a SME is a potential solution. An alternative method of testing while searching for a suitable organization is discussing the guidance with personnel working with this type of project. This in turn requires that we gain access to a representative group. However, with regard to our membership in SoL, we do have access to a suitable network.

The second area concerns the fact that the presented guidance aims to facilitate the implementation of a capturing process that continuously captures knowledge. With regard to the limitation of the capture process, the presented guidance should be used together with other support/guidance for the package and store process, since this is the second process from an implementation perspective (see Figure 8:3). However, this may be problematic,
since, to the best of our knowledge, no similar guidance for the package and store process exists. Hence, one of our plans for future work is to conduct the same research work with regard to the package and store process as we have done with the capture process in this thesis.

From a usage perspective, another important process is when employees use the repository. Thus, we also plan to characterize this process and develop guidance for it that aims to integrate the use of the repository into daily work as well as increase the use of the repository. This part of future work is clearly related to the third area of future work which concerns the learning process. As previously mentioned, the author of this thesis has a pedagogical degree as well as many years of teaching experience. This background has influenced the research presented in this thesis, for example, the emphasis on the need to examine what the users want to learn and what needs they have. The author’s pedagogical background has also influenced the thoughts concerning future research. It does not matter how good the quality of the repository is in terms of relevance, correctness, and so on, if it cannot be used to transform information to knowledge in order to improve the users’ performance of work tasks, as well as their ability to make better decisions, and so on. Therefore, a deep and detailed knowledge about how people learn from IT-supported repositories, the different types of learning styles, how they think and interact in order to learn, and so on, is critical when deciding how to store and present the captured knowledge. Furthermore, knowledge about the learning process is critical for all KM work, and therefore also enhances all types of knowledge work. To obtain a more holistic understanding of the learning process when using knowledge repositories, we plan to introduce and use ideas from HCI and cognitive science together with pedagogical research, in order to then focus on the learning process in relation to knowledge repositories.

The work presented in this thesis shows that we have achieved our three research objectives and fulfilled our research aim. Furthermore, the deep and detailed knowledge, as well as the insights and understanding about KM that we have gained from this research project, provides a solid foundation when planning how to conduct future research. The three main areas of future work are all potential fields in which to start, but in order to enhance the practical use of the guidance we plan to begin by packaging the practical parts of the guidance in such a way that an organization can use it without first needing to spend a lot of time learning how to use it. The reason for starting with this is the lack of KM implementation support and that it enhances the practical application of the guidance in an organization. The latter is a critical part of the forthcoming validation work.
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Appendix A:
How Key Success Factors in ISD appear in KM projects aiming to result in a knowledge repository

Key Success Factor 1: To learn from failed projects

If an organization does not learn from failed projects due to incompetence in managing experiences, its KM is strongly limited. A Learning Organization is one that is competent in KM. In a LO culture, routines, processes, personal minds, and so on, strive not to make the same mistakes again. People should create a new wheel, not reinvent the old ones (Sandelands, 1999). This requires managing experiences and knowledge gained from previous projects. This is what KM is about. Systematically tracking and measuring the success of KM projects (Chua and Lam, 2005), as well as evaluating teamwork and professional training (Call, 2005) are therefore important. The learning, for example, from failed projects, is for KM an aim in itself. KM is a prerequisite, a KSF, for this factor. It is also a requirement if an organization wants to be a learning one (Loermans, 2002; Wiig, 1993).

“If failure is ignored, denied or repressed, the opportunity to learn from past mistakes is lost.” (Chua and Lam, 2005, p. 7).

The best practices in the company should be identified and transferred (Loermans, 2002). One way to do this is to build and develop knowledge repositories. As we can see, learning from failed projects is also critical in KM projects, both from the perspective of capturing knowledge gained from failed projects, and from the perspective of disseminating and reusing this knowledge.

Key Success Factor 2: To define the system’s boundary, both for the whole system and for relevant subsystems

A KM project is not unlike other ones (Chua and Lam, 2005), and this key success factor is important regardless of type of project (Van Gigh, 1991).
It is important in a KM project to determine the scope (Wong and Aspinwall, 2004). If we do not know “where” the KM project is to happen, our attempts to define the objective and to identify relevant stakeholders and other resources will be strongly limited.

From this perspective, asymmetry of knowledge, which refers to often abundant knowledge on a subject in one department and a shortage somewhere else (Davenport and Prusak, 1998), is another problem. As long as knowledge is managed within silo-oriented communities, there is a great risk that business-critical knowledge that straddles across multiple groups is neglected (Chua and Lam, 2005). If we do not have an overview of involved parts/departments, it is impossible to do anything about this problem. In order to overcome this problem, managers must understand how other departments conceptualize their contribution to the whole (Sandelands, 1999). This involves knowledge about the culture in different departments. Consequently, defining the system’s boundary, both for the whole system and for relevant subsystems, is a critical success factor for a KM project. As in an ISD project, this factor has the character of a prerequisite from the perspective of the two following factors concerning the goal and the stakeholders. One important further dimension is the problem mentioned above, asymmetry of knowledge between different departments. Due to its importance, and because this aspect of the factor is either mentioned in Aggestam (2004) or included in the two following factors, means it has been placed in the group “Remaining KSF”.

**Key Success Factor 3: To have a well defined and accepted objective aligned with the business objectives**

It is important to establish a KM project with a clear objective which also has a link to economics and industry value (supported by, e.g., Call, 2005; Carlsson, 2001; Senge, 1999). There is a need for the KM initiative to be grounded in the organization’s strategy (Carlsson, 2001; Chua and Lam, 2005). Organizational strategy affects KM strategy (Blodgood and Salisbury, 2001), and the organizational strategy must support the knowledge spiral (Nonaka and Takeuchi, 1995). The importance of the strategic level of the KM objective is obvious. One building block for KM implementation is strategic priority (Jarrar, 2002). The strategy is in itself a type of knowledge (Firestone and McElroy, 2003) and a benchmarking strategy is one of the most important KSF (Hung et al, 2005). It is also of great importance to pay attention to business-critical knowledge that straddles across multiple groups (Chua and Lam, 2005). This stresses the importance of the former factor to identify relevant parts/departments.
There must be a knowledge sharing attitude (Call, 2005; Chua and Lam, 2005; Sun and Scot, 2005; Busch and Richards, 2004). This is a part of the organizational culture. There is a correlation between cultural attributes and the successful implementation of KM technology and knowledge sharing (Park et al, 2004). The importance of the organizational culture in KM is well established in the literature (e.g. Davenport and Prusak, 1998; Hung et al, 2005; Park et al, 2004; Sandelands, 1999). This stresses the importance of analyzing the objective from different perspectives, and paying attention to the existing culture in each one, which must be done both in the system and in relevant subsystems. Culture factors can be divided into three levels: personal, group and organizational (Chua and Lam, 2005). The analysis of the objective must pay attention to all these levels. One condition at an organizational level to promote the knowledge spiral of Nanoka and Takeuchi (1995) lies in developing the organizational capability of acquiring, creating, accumulating, and exploiting knowledge. The KM team must spend time deliberating on the potential barriers (Chua and Lam, 2005). A knowledge oriented culture and human infra-structure are also KSF according to Davenport and Prusak (1998).

Tacit knowledge and behavioral issues must receive sufficient attention (Chua and Lam, 2005). This stresses both the organizational culture and team learning. The key to success in knowledge creation lies in managing tacit knowledge (Nonaka and Takeuchi, 1995). Political processes between different stakeholders, for example, IT and media affairs, must be managed (Chua and Lam, 2005), which stresses the political frame (see Bolman and Deal, 1997). A KM project can be used as an object for political control (Chua and Lam, 2005). Informal political processes are a part of the organizational culture.

Content is important in KM, and if it is irrelevant, outdated, and so on, it can often cause failure (Chua and Lam, 2005). This also stresses the vision and understanding of the users’ needs. Furthermore, the knowledge structure is important (e.g. Chua and Lam, 2005; Davenport and Prusak, 1998; Hung et al, 2005). When building a knowledge repository, it is therefore important to consider the captured knowledge from the perspective of how it should be structured, and which knowledge chunks can be identified.

The analysis clearly shows the importance of having a goal in a KM project which is aligned to business objectives. The possibilities of achieving the goal will be strongly limited if it is not well known. This includes obtaining knowledge about the content. What should be stored, and how should it be stored and structured? The organizational culture is in itself crucial in a KM project, and therefore this perspective must receive sufficient attention in the work of analyzing and describing the goal. The analysis also indicates that
the organizational intention in turn must support KM (Nonaka and Takeuchi, 1995), which is not so clear in the ISD literature. In the KM literature we have not found any explicit discussion regarding the importance of having an accepted objective. Different stakeholders have to be convinced in a KM project (Chua and Lam, 2005; Senge, 1999; Sun and Scot, 2005), which we assume requires that the stakeholder have accepted the goal. From the perspective that KM is a potential approach for achieving maturity as a Learning Organization, the common vision stresses the importance of having an accepted objective. Having a well defined and accepted objective that is aligned with business objectives is hence critical for a KM project. The analysis also shows further dimensions, such as culture, political processes and content that must be an explicit part of the objective descriptions.

Key Success Factor 4: To involve, motivate and prepare the “right” stakeholders

One critical stakeholder group is leaders, both top management and project management. They have the responsibility for the vision, and they also have significant influence on the organizational culture. Another critical stakeholder group is the members at the operational level. Management must recognize the role of the individual in knowledge creation (Gore and Gore, 1999), and understanding the value of the human capital is a KSF (Edvinson and Malone, 1998).

Full participation from the employees is necessary (e.g. Chua and Lam, 2005; Hung et al, 2005). This requires teaching them how to enhance productivity through the utilization of the KM system (Hung et al, 2005), and to use clear language (Davenport and Prusak, 1998; Sandelands, 1999). Knowledgeable people cannot effectively share expertise, if they mean different things when they use familiar, essential terms (Davenport and Prusak, 1998).

Trust is also important (Call, 2005; Davenport and Prusak, 1998; Sandelands, 1999). Build relationships and trust through, e.g., face-to-face meetings, and create a common ground through education, discussions etc. in order to “solve” different cultures, vocabularies, frames of reference and so on (Davenport and Prusak, 1998). Even this is a part of the culture, and the leaders’ responsibility is obvious even here.

The analysis shows that the preparation and involvement of stakeholders in a KM project is necessary. We found no KM literature that discusses the importance of motivating the stakeholders to participate. Instead, the KM literature discusses that the project must convince them (e.g. Chua and Lam,
2005) to overcome individual thoughts about wanting to stay where they are (Sandelands, 1999; Sun and Scot, 2005). In our opinion, it is impossible to convince stakeholders, if they are not motivated for the change. Consequently, our analysis shows that to involve, motivate and prepare the “right” stakeholders is a KSF also in a KM project.

Success Factors in a KM project aiming to result in a knowledge repository that do not relate to a KSF in ISD:

- To integrate KM in business processes: It is necessary to incorporate KM in the managerial fashion cycle (Swan et al, 1999), and in order to provide value KM has to be adapted to business and knowledge processes (Remus and Schub, 2003). This integration is a limitation that has to be managed in order for a KM project, aiming to result in a knowledge repository, to be successful. The most successful organizations are those in which KM is a part of everyone’s job (Davenport and Prusak, 1998). Integrating KM in business processes is therefore a KSF in a when developing an IT-supported knowledge repository.
- To manage asymmetry of knowledge: This factor strongly relates to the importance of defining relevant subsystems. In order to enhance a holistic understanding, this factor was therefore discussed in relation to the group “To define the system’s boundary, both for the whole system and for relevant subsystems”.

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Appendix B: A description of what data influence our work aiming to identify Key Success Factors for the identify activity as well as how we analyzed the data

Asymmetry of knowledge with regard to all the involved units in the treatment of leg ulcers was one reason for developing the knowledge repository. The problem with abundant knowledge on a subject in one department and a shortage somewhere else (Davenport and Prusak, 1998; Chua and Lam, 2005) is well stated in the literature. Being aware of the state of the situation in different parts of the organization is a SF when trying to identify where to find potential knowledge to be incorporated in a knowledge repository. Massey, Ramesh and Montoya-Weiss (2005) talk about “Drivers and owners of knowledge”. In the EKLăr case the hospital was identified as “Drivers and owners” of knowledge, and the other involved treatment units as the main re-users of knowledge. Of course, nurses in primary care and home health care possess important knowledge about leg ulcers, for example, how a treatment works in daily life. However, with regard to the project goal this was not included in the first version of the repository. In the future, the vision is that the repository will also include knowledge produced by these treatment units.

With regard to implementing the repository and preparing for maintenance in the implementation phase in the EKLăr case, two different main approaches can be identified in relation to where knowledge is identified and to type of knowledge. However, in both implementing the repository and preparing for maintenance, a SF concerns what knowledge the nurses in the hospital want to share, that is, what they want to know / learn, and what the nurses in home health care want to know / learn. In order to identify this knowledge area, and how included knowledge chunks relate to each other, we in the implementation phase first developed a conceptual model of knowledge areas to be included in the repository, referred to as the “Knowledge map”. The Knowledge map can be compared with a concrete and detailed picture of the project goal, which sets the limits and also guides the
work, as well as indicates how to structure the content. How the repository is structured significantly influences how it will be used (Aggestam and Backlund, 2007), and this can be regarded as a SF.

The development of the Knowledge map was mainly carried out in the first three meetings of the implementation phase. The work was performed through enterprise modelling with a participatory approach in accordance with the EKP method. During these meetings, three nurses and one doctor from the hospital participated together with the researchers involved. At the beginning, the participants had difficulties describing what sort of knowledge they wanted to share. Therefore, using a concrete approach the nurses and the doctor were asked to write down on notes concrete examples of what they wanted to find in the knowledge repository when it was implemented. We then asked them to write down where this knowledge could be found today.

Project leader: “We should find a concrete entrance to understand what we are going to do. We start from the concrete knowledge content, and then we continue with where it exists and how it's created.”

In the notes they wrote for example:

- “Knowledge about how to write a referral when a patient needs care in the hospital for his/her leg ulcer”
- “Knowledge about how to get in contact with the foot team, leg ulcer department and the pressure team”
- “Diagnosis: Understand the principals for this and the referral criteria”
- “Leg ulcer treatment technique: Why and how it is used.”
- “Bandage material: Choice of alternative bandage: Costs, Different types, How to argue for choice of bandage”
- "Dressing techniques"
- “Who needs a Compression sock?”
- “Pressure measure - ankle/arm index.”

The participants were then instructed to put their notes on a large plastic sheet on the wall, grouping those that belonged together, and at the same time discarding any possible doubles. In that way, the work of finishing the Knowledge map continued. Thereafter, the project leader, in collaboration with the participants, further discussed and arranged the notes, and also complemented with arrows to show additional relationships. Examples of questions that were raised during this work include:

“What is a leg ulcer type? Venous ulcers are one type. Pressure ulcer is one type of leg ulcer if it is under the knee. What more types are there?”
“Classification of leg ulcers from the perspective of the repository: Ulcers under the knee or more organizational, i.e. where to be treated? How do the users think?”

“Who are the users? When do they call? Is it when the diagnosis is done or not?”

“What is a diagnosis? Who can do it?”

“What can we presuppose about the users? “

This work resulted in a Knowledge map, in which more knowledge areas were covered than those that could be identified by the EKLär project. We prioritized on the basis of the preparation phase, i.e., the needs of the nurses in home health, and primary care, what knowledge the nurses and doctor wanted to teach to them, and the project goal. This concluded in a decision to start with “New leg ulcers”.

“Information that helps me to know what to ask the patient and what I can decide about.” (a nurse in home health care, interviewed in the pre-study, described what she wants to find in the knowledge repository)

This decision concluded the first meeting that focused on the Knowledge map. The following two project meetings, which focused on New leg ulcers, continued with finalizing the Knowledge map. The completed Knowledge map is a compromise between the identified needs in the preparation phase and what the hospital staff regards to be the most important knowledge to be shared with regard to what they believe people in the other units need to be taught. After each of these first three project meetings different versions of the Knowledge map, together with the notes of the meeting, were sent to the participants.

In the work of developing the Knowledge map, the importance of meaning the same thing when using concepts was obvious. For example, how to use the concept, diagnosis? In the beginning this concept was used both when a nurse did an appraisal as well as when a doctor did it. The discussion concluded with a decision that a nurse in primary care does a preliminary appraisal, but it is the doctor who makes the formal diagnosis. Problems in communication lead to difficulties (Browne and Ramesh, 2002). Saiedian and Dale (1999) highlight that communication is one of the most common problems that hinder the identification/definition of the user’s need(s).

The Knowledge map shows what knowledge to store in the repository. On this basis, the work of implementing the repository proceeded, that is, finding knowledge to store, and deciding how to package and store it. For this
work, organizational patterns, as prescribed by the EKP approach (Persson and Stirna, 2002), were used as a tool. This part of the implementation comprised discussing where identified knowledge exists and how it is created. Questions such as the following were raised:

“Where can we find documents relevant for the project?” and “What do other hospitals do?” (asked by nurses in project meetings in EKLär)

These questions triggered a review of existing external knowledge. Thus, between the project meetings, the nurses reviewed existing material, which resulted in a document titled: “Where are texts we need for EKLär?”. This initial approach is supported by Gore and Gore (1999). Re-using already stored relevant information is a success factor; there is no time to “re-invent the wheel”. Another important issue associated with the completion of the Knowledge map was the discussion concerning how the nurses and doctors wanted to teach the nurses in primary care and Home health care about treating a patient with “New leg ulcer”. This debate revealed the nurses’ and doctors’ own experience based knowledge about leg ulcers, which was also an important input when implementing the repository. Examples of two concrete issues that were discussed are:

“What do we want to be done before a patient comes to the hospital?” and “When do we want a nurse to contact the hospital?” (asked by nurses in project meetings during EKLär).

When we prepared for maintenance in the EKLär case, work focused on updating; identifying when, where and how in daily work processes newly created knowledge most likely arises. In comparison to implementing the repository, the type of knowledge and where to find it differs when preparing for maintenance. During implementation of the repository, external knowledge stored, for example, in documents and on the Internet, and internal knowledge in the form of experience based knowledge, owned by the nurses and doctors in the project group, were in focus, but during maintenance preparation our focus was more on knowledge embedded in daily work processes and activities. Organizational knowledge about when in the process and where in the organization to find different types of knowledge is a SF. In the EKLär case, when we prepared for maintenance, the author of this thesis was more active compared to earlier in the project. Hence, in order to enhance the observations’ possibilities, we began to tape the meetings (see the description of the case in Section 5.2.1). The knowledge repository is only as good as it is today, so it must be kept updated, correct and relevant. The guidance that we developed aims to cover the daily working life, where knowledge, created in specific knowledge generating activities as well as business processes, is included. Massey et al (2005) discuss the need to iden-
tify key leverage points for achieving business results and knowledge vision. Knowing where to find knowledge is a SF. In the EKLär case we talk about “capture points”. Also this work started with modelling in the same way as when implementing the repository. The participants were asked to write down when/where in their daily work some sort of knowledge exchange occurred, in order to identify activities in the daily routines that are likely to produce new knowledge to be incorporated in the repository.

Project leader: “When and where in your enterprise is knowledge created that has to be managed and potentially incorporated in the repository?”

This was quite difficult, but after some debate concerning what triggers a discussion and where input comes from, the nurses were asked to first write down inputs from outside and then from inside the organization. They noted aspects such as patient contacts, education, courses, coffee breaks, rounds, and so on. These notes were put on a plastic sheet and arranged according to whether the source was internal, for example, coffee breaks, new material purchase, and rounds, or external, for example, conferences, study visits, and contacts with relatives. Since many notes included capture points which belonged to both groups, for example, mail and education, we changed the approach and instead grouped the notes according to whether they stemmed from ordinary organizational processes or specific knowledge generating activities. This also indicates that the concept of “capture points”, as it was used in the EKLär case, both includes activities, in which the knowledge has been created, and different signals indicating that knowledge, which should potentially be incorporated in the repository, has been created. We also saw that a knowledge generating activity can have more than one signal, and one signal type can belong to more than one knowledge generating activity. For example, knowledge, gained in an education course, can be discussed during a coffee break, and both education and coffee breaks were identified as capture points. This was not a problem in the EKLär case after we changed the approach and grouped the “capture points” according to whether they stemmed from ordinary processes or not. The work proceeded and the concept “capture points” was used throughout the project. A part of the document including capture points can be found in Figure 14:2.

Thereafter, each capture point was ranked according to type of influence on the repository. The following three groups were used:

1. Formally required e.g. by laws and contracts, direct influence on the content of the repository, urgent
2. Less formal as e.g. complementary information from a material supplier or knowledge obtained on an education day, direct influence on the content of the repository, urgent to less urgent
3. Weak, indirect influence on the content of the repository

Starting with capture points belonging to group 1 or 2, we continued to deliberate and characterize each of the points discussed, and identified aspects such as, for example, who is responsible, who participates, which tools are used, and who should evaluate for correctness. This was a valuable contribution and a transition to the evaluate activity. We return to this work when describing success factors that influence the evaluate activity. The next step was to obtain management commitment to change the work role description in such a way that work roles belonging to the identify or evaluate activities explicitly include this task. Having identified roles in the organization that are responsible for these activities, or parts of them, is a SF.

Davenport and Prusak (1998) discuss the need of multiple channels for knowledge transfer, where a repository is one channel. We argue that from the perspective of identifying knowledge, multiple channels of inputs to the repository are a success factor, because knowledge is created and/or identified in different situations, at different times and by different people. In the EKLär case, capture points, in the form of different activities in which knowledge was created, as well as different signals, indicating that this has happened, were identified and discussed. These included, for example, received mail, telephone calls to the leg ulcer reception, new material purchases, education days, different types of meetings, testing something a nurse heard about, and so on. These capture points, regardless of whether they were a source or a signal, stemmed from different channels. We believe that using the concept “capture points”, which was not limited to only signal or source, enhanced identifying different kinds of channels, because in some cases the channel had a clearer signal and in others the source was easier to observe. However, for a project leader it is important to be conscious of the difference between “source” and “signal”, because this is a necessary division in forthcoming work when discussing what issues are important to define for each capture point, if newly created knowledge is to be identified, evaluated and passed on to the next process.

A capture point can be described as a situation when knowledge is exchanged between employees. Discussions in the EKLär case concerning capture points highlight different types of knowledge in different types of processes and activities. This, and how we in the EKLär case worked when we prepared for maintenance, are further discussed when we describe the relationships between different types of input to the repository, daily work and different types of knowledge (Chapter 20). The discussion also highlights the importance of enabling input from the users, because such an input is a valuable trigger for identifying potential knowledge to be incorporated in the repository. Concerning this, the observations in the evaluation phase of the EKLär case show the importance of how this is supported by IT. The
observations also reveals the importance of how the content is structured. For example, information regarding the main purpose, guiding the nurses in their preliminary appraisal before identifying leg ulcer type, is easy to find, while other information requires more user experience of the repository, its structure and content (see Section 5.2.1). Hung et al (2005) rank knowledge structure and IT as two of the most important factors.

Another important aspect that the EKLär case revealed was the importance of identifying capture points that do not trigger inputs to the repository. For example, in the EKLär case, formal short documents describing a standardized way of treating patients in a specific situation do not trigger inputs to the repository, because they concern other activities which, for example, should be performed in the hospital after the patient has arrived. In a way, this is a result of the evaluate activity, and the iterative element is hence obvious. With regard to its importance for the identify activity and because the literature does not, in our experience, explicitly mention this in relation to the identify activity, we decided to put the success factor that concerns identifying capture points which do not trigger inputs to the repository in this group.
Appendix C:
A description of what data influence our work aiming to identify Key Success Factors for
the evaluate activity as well as how we analyzed the data

In the EKLär case we explicitly discussed “How do we evaluate knowledge
and what do we relate it to?” Storing everything results in information over-
flow and problems finding the required knowledge.

“It’s difficult to make people remember that they don’t need to store every-
thing.” as the professional expert put it.

In EKLär, different people, that is, from different work professions, per-
formed the evaluation. The person who did the evaluation depended on the
perspective from which the knowledge was evaluated. The nurses evaluated
whether the knowledge was relevant with respect to what knowledge they
wanted to share through the repository. In this situation, the knowledge goal
in the form of the Knowledge map was an important tool against which to
evaluate. Furthermore, doctors evaluated if the packaged knowledge was
correct, and signed each chunk of knowledge as an indication of quality as-
surance. This division of tasks in the evaluate activity was the main reason
why we determined that performing both a relevance and a correctness
evaluation is a SF. Regardless of the kind of evaluation, it must be system-
ized and the evaluation task must be included in work role descriptions if it
is to be performed regularly. This is another SF. Further analysis shows that
the literature supports both types of evaluation, but the difference is not as
clear in the studied literature. In the following we discuss each type of
evaluation separately:

Evaluate with respect to relevance:
If knowledge is to be incorporated in the repository, it must be in line with
the purpose of the repository. This is a SF. As Davenport and Prusak (1998)
put it: What business goals should the codified knowledge serve? The impor-
tance of the knowledge vision is well stated in the literature (e.g. Remus and
Schub, 2003; Wong and Aspinwall, 2004; Blodgood and Salisbury, 2001) as
well as in this thesis. In the EKLär case, the importance of the knowledge goal, in the form of the Knowledge map, for the evaluate activity was revealed. One perspective of the knowledge goal is the intended users. In EKLär, it was initially sometimes difficult to maintain focus on the end users in question. When this occurred, some of the nurses interrupted and commented on it. The users’ needs, discovered in the preparation phase of the EKLär case, are a valuable contribution to the knowledge goal. Important aspects for the users include treatment material and, in order to identify leg ulcer type and for leg ulcer descriptions, images for comparison. Thus, one valuable evaluate criterion in the beginning, and a SF, was that the first version of the prototype must include these, otherwise there was a great risk that the first impression would be negative. Some illustrative quotations from the preparation phase about the material follow:

“Material costs a lot of money… Good if the repository contains information about material and what material, bought by different purchasers, is equivalent. Even dressing techniques are good to find information about, sometimes you can not do it as the instruction says.” … “Are we allowed changing bandage material?” … “New bandage, and alternative products” (from the interviews in the pre study).

And some about the pictures:

“Pictures to compare with would be good in the repository.” … “Good with pictures of different types of leg ulcers because when a leg ulcer is to be described it would be possible to relate to a picture.” (from the interviews in the pre study)

Pictures enhance storing knowledge with regard to the tacit dimension as it is described by Polyani (1983).

The EKLär project aims to disseminate knowledge of a generic nature; not knowledge concerning a specific patient. This implies that legal aspects do not influence whether the identified knowledge can be stored or not. In other projects, legal aspects could be a crucial evaluation criterion and it is therefore a SF. If legislation prohibits storing a specific type of information, the current knowledge is not relevant for the repository. Another important evaluation criterion, and a SF, is what Carlsson (2001) calls protection, both from value erosion and from imitation by competitors. The latter was not topical in the EKLär case, because it was a project in the health care area. Legal aspects can be regarded another protection perspective (Aggestam and Backlund, 2007). An IT-supported knowledge repository provides knowledge that is already captured (Chua and Lam, 2005). Thus we must capture new knowledge, i.e., an important evaluation criterion concerns what is already stored in the repository. When new knowledge is to be stored, it can
result in already stored knowledge being deleted or updated. An example from the EKLär case is when new treatment material is purchased every third year. This also constitutes an example of a capture point which was ranked number one with regard to type of influence on the repository.

**Evaluate with regard to correctness:**
A SF with regard to stored knowledge concerns its correctness. In the EKLär case, doctors evaluated identified knowledge with regard to correctness. This requires that the knowledge is documented, “packaged” in some way. Identified knowledge, after some initial packaging, may need to return to the capture process; thus revealing an iterative element.

“We do the [packaging, i.e. includes information in the patterns] job and then present it to the medically responsible person who can say ‘yes’ or ‘no’. If everything is ok, he/she signs his/her name underneath…” (nurse in the project team)

In the EKLär case, the EKP approach (Persson and Stirna, 2002) was used for packaging. After checking, the “knowledge chunk”, including comments about how to update or, if everything was correct, the doctor’s signature and date, was returned to the nurses. Considering that people judge information on the basis of who provides it (Davenport and Prusak, 1998), this also contributed to credibility. An example of a checked and accepted pattern can be found in Section 5.2.1.

“Is there any person who can quality assure all patterns or is it that way that some patterns are so complex that more than one person is needed? Do we need a doctor for doing this? Is it a role or a person who should do this job?” (nurse in the project team)

A pattern in the EKP approach should not be so complex that more than one person is needed to check correctness. However, the knowledge area is complex, and thus different persons need to check different patterns. From the perspective of credibility, it is important that a person who the users have faith in does this evaluation. This is a SF. The main target group is nurses in primary, and home health care who know and have faith in the individual doctors working with leg ulcers at the hospital. Therefore, we decided that the person rather than the role was important, and, as a consequence, each doctor put his/her name on the patterns. The observations performed in the evaluation phase revealed that this was a wrong decision, and we complemented with the role.
“I wonder who this is… The role increases trustworthiness” … “I want to know who this person is.” (from two of the observations in the evaluation phase)

The users of the developed repository in the EKLär case, primary care and nurses in the municipality, belong to the group that Markus (2001) identifies as “Shared work practitioners”. According to Markus (2001), this group selects available knowledge documents, among other things, based on the reputation of the person who contributes the document. It is also important with regard to political processes that some sort of management is committed to the current knowledge, which in the EKLär case was the doctors. It is important to realize that individuals can act rationally in order to reach personal objectives, but not everyone acts in a rational manner in order to reach common objectives (Bastöe and Dahl, 1996). Political processes between different stakeholders must be managed (Chua and Lam, 2005), and authority is one among many forms of power (Bolman and Deal, 1997). In the area of health care, doctors have authority.