Project Knowledge Management

How to evaluate project knowledge, and Project Knowledge Management performance
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“Experience: that most brutal of teachers.

But you learn, my God do you learn.”

(C. S Lewis)

Thesis, 15 hp: INFORMATION LOGISTICS MANAGEMENT

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Preface

Every one of us uses knowledge on daily bases. We remember things, i.a. names and birthdays. We know how to do things, and where to find information that we have forgotten. At the end of the day, we manage knowledge.

When we come together in an organisation, with common goals, and the pressure to compete on the market, we encounter a new level of managing knowledge; in a company, there are others that need our knowledge and, we need to acquire knowledge from others. In larger organisations, new knowledge arise everyday and everywhere. Knowledge passes through the organisation, and the organisation needs to capture new experiences in order to avoid making same mistakes again, or reinventing the wheel.

The common name for the set of practises that aims to identify, create, capture and reuse insights and experiences embodied in individuals or embedded in the organisation, is Knowledge Management.

This thesis is about Knowledge Management, and studies how a large project organisation captures experiences in projects, and the experience that is captured. It is the final examination paper within the program Information logistic management at CIL, Ljungby.

I would like to thank the contact persons at the case company for giving me the confidence to examine their project closure documents, and family and friends that have been supportive throughout the process. A special thank goes to May Wismén for believing in the thesis, and pushing me forward in times when I was lost.

Enjoy...

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Abstract

Project Knowledge Management and more specifically how organisations capture experiences gained in projects, is a critical topic in order to compete in the knowledge economy. Little attention has been given the catchphrase lessons learned practices as a research area. The purpose of the thesis is therefore to analyse the framework for the project closure phase through a Knowledge Management perspective. The purpose is also to evaluate how new knowledge, captured by project closure documents, can be identified and measured.

To fulfil the purpose, the project closure phase and project closure documents within the project model Practical Project Steering are studied. Through a document study, the framework that the project model gives, and the project closure documents is analysed. The project closure documents are also examined regarding the experiences they capture. This is done by developing an instrument for identifying and measuring new knowledge.

Through the study, it can be established that the project closure phase provides for a link between Knowledge Management and Project Management. It has an important contribution to Knowledge Management since it mitigates the risk of not transferring knowledge to the organisational memory. The use of predefined knowledge domains supports structure, and systemisation in the production of the documents, as well as in the compilation and dissemination of useful knowledge.

New knowledge within the project closure phase can be identified and measured by dividing the documents into isolated pieces of information and using developed criteria to identify, and thereby quantify new knowledge. The instrument is highly reliable since it is ensured that the division of information does not result in any decontextualisation, and since the criteria used are very stable, and still acknowledge the dynamics of knowledge as well as the knowledge context.

By using the measurements on empirical data, problems that are important to acknowledge are identified. There is an uneven distribution of knowledge types acquired by the project closure documents, regardless of their importance; resulting in loss of important knowledge. The difficulty to formalise important knowledge, results in failing to transfer knowledge to an external organisational memory. The difficulty to distribute knowledge sufficiently, results in re-invention of the wheel, and the same mistakes being made twice or more.
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1 Introduction

This chapter starts with a background (section 1.1) that describes the importance of knowledge in order to be competitive. After the background, the problematisation (section 1.2) identifies the search area, which results in the thesis' purpose (section 1.3). Then, the knowledge perspective in the thesis is explained (section 1.4), followed by a brief description of the case company (section 1.5). The chapter ends with an explanation of how to read the thesis (section 1.6), and the disposition (section 1.6).

1.1 Background

During the 90’s the importance of knowledge was recognised, and literature began to argue for the similarity between knowledge and other resources. Chase (1997) described a situation where knowledge, as an input to production, became as valuable as the product itself. Competitiveness became dependent on the ability to harness knowledge. Fong (2003) argues that knowledge as a resource, distinguishes from traditional resources, (e.g. land, labour, and machinery), because it is, unlike other factors for production, intangible, and residing within individuals. Consequently, knowledge may be more difficult to identify and make use of, and may easily be lost.

In a survey in Journal of Knowledge Management, 31 percent of those working in knowledge-intensive organisations described their organisation as ineffective in controlling knowledge. As much as 80 percent of the respondents reported costly mistakes due to ‘employees who did not know how to interpret and use available information’ or the ‘same errors or mistakes were made twice or more’ (Chase, 1997). The failure to capture, and reuse knowledge, leads to the risk of “reinventing the wheel”, wasted activity, and reduced performance (Kamara, Anumba, & Carillo, 2002), and this inability seem to pertain today (Ramaprasad & Prakash, 2009).

The modern organisation needs to be reactive and flexible in order to be innovative and solve interdisciplinary tasks. The ability to acquire new knowledge is a factor for success in order to accomplish this and stay in the market. This is more evident in a project organisation (Disterer, 2002), and organising by projects is therefore on a strong increase, since it is acknowledged for its intensive learning form (Disterer, 2002; Obaide, 2008).

In projects, team members continuously experience new issues, which often are solved by new solutions (Obaide, 2008). Disterer (2002) state that competencies built up during projects must remain in the organisation. However, most companies are not able to evaluate projects and gain experience, and the result of not reviewing projects is that actions and decisions that have caused problems and/or insufficiency may be repeated.

Traditional project management have developed tools and methods for effective planning, organising, directing and controlling projects. Little time and effort have however been made in the area of project evaluation and learning from projects (Obaide, 2008). Project Knowledge Management is important in order to be proactive and make timely decisions, which have a positive impact on all aspects of project performance, i.e. quality, time and cost (Brookes, Morton, Dainty, & Burns, 2006). Even though knowledge is important, little research regarding Knowledge Management challenges in temporary organisations, e.g. project organisation, has been done (Frey, Lindner, Müller, & Wald, 2009).

1.2 Problematisation

Tonnquist's (2006) generic model divides projects into four sequential phases: pre-study, planning, execution, and closure. An important aspect of project closure is to capture experiences, and help organisations to develop knowledge, and thereby make the facilitation of projects
easier (Tonnquist, 2006). Obaide (2008) means that the sharing of knowledge is a good strategy in order to reduce time and cost involved in the creation of individual experiences.

One argument for harnessing and reusing knowledge is that it can help to identify problems and take measures for improvements at an earlier stage in the project. This ability is important since cost of changes in a project increases as time goes by (Engvall, 2009). Engvall (2009) refers to a project organisation that has been able to decrease the lead-time and cost by half, and still double the quality by systematically transferring knowledge from closed projects to the initial stages of new projects.

Practical Project Steering, the project model used by the case company, constitutes of eight phases where the last is project closure. One objective is to gather experience in order to increase the knowledge base. Tonnquist (2006) stresses the importance of producing project closure documents, which should be used internally in developing the project organisation.

The systematic knowledge acquisition, that the production of project closure documents de facto is, produces a great amount of knowledge. In an organisational perspective, it is important to have an understanding of the acquired knowledge in order to enable an effective transferral back to the organisation. The question is; what do the project closure documents consist of, and is there anything of value in them? Is it even experience, or knowledge, that is captured, or is it just a waste of time?

Knowledge Management is about making the most out of knowledge in the organisation (Kamara et al., 2002), and activities in the project closure phase, aim to support management of knowledge in the organisation. It is however not a given that these activities support management of knowledge. Even though the main idea of this thesis is to analyse the experience captured in project closure documents, it is important to also examine the context in which the documents are produced. The framework that the project model gives, have direct influence of the quality and production of project closure documents.

1.3 Purpose

The above gives that it is important to gain understanding about the project closure phase and how it affects the managing of knowledge. It is also of interest to gain understanding of the project closure documents and the experiences that they capture, which leads to the purpose:

The purpose is to analyse the framework for the project closure phase through a Knowledge Management perspective. The purpose is also to evaluate how new knowledge, captured by project closure documents, can be identified and measured.

To fulfil the purpose, the project closure phase and project closure documents within Practical Project Steering are studied. The purpose is operationalised into the following research questions:

- How does the project closure phase contribute to Knowledge Management?
- How can new knowledge within project closure documents be identified and measured?

The questions are operationalised into sub-questions. This is done in order to give a comprehensive picture of the project closure phase, and to develop the theory used in order to fulfil the purpose. To facilitate the sub-questions, three study streams are used in the thesis. This is further explained in Disposition (section 1.6), and How to Read the Streams (section 1.7).
1.4 Knowledge Perspective

There are several perspectives of knowledge: knowledge vis-à-vis data and information; an object; a process; and, as a capability. Dependent on the perspective you have, it gives different implications for Knowledge Management (Alavi & Leidner, 2001).

This thesis does not focus on different knowledge perspectives, and does not take a stand regarding which is most correct. It does however treat, because of the purpose’s nature, knowledge as an object. Alavi and Leidner (2001) state that in the 'object perspective’, knowledge is regarded as an entity that can be stored and manipulated.

1.5 Case Company

*Since knowledge is a competitive advantage, the case company wants to be anonymous. The description of the case company does therefore only include, for the thesis, absolute necessary information.*

The case company is a service organisation that develops and maintains IT solutions for their customers. It is a matrix organisation, with functional departments interconnected through business processes. It uses projects as a working method regarding much of its developments, especially when it comes to new solutions and organisational changes.

The project results are transferred and implemented in the customer’s organisations. Responsibility for maintenance and support remains in the organisation, but not organised by projects; the base organisation take responsibility for maintenance and support.

1.6 Disposition

The thesis’ disposition can be divided into three blocks (depicted in Figure 1.6-1). The first block is common for the whole thesis, and constitutes of the chapters Introduction (chapter 1), Theoretical Framework (chapter 2), and Research Methodology (chapter 3).

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<tr>
<th>Chapter 1: Introduction</th>
<th>Chapter 2: Theoretical Framework</th>
<th>Chapter 3: Research Methodology</th>
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<td>Chapter 4: PPS vs. Knowledge Management</td>
<td>Chapter 5: The Final reports: Theory vs. Practice</td>
<td>Chapter 6: Experiences in the Final reports</td>
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<td>Section 4.1: Study design</td>
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Figure 1.6-1 Disposition

The second block contains the study streams, explained in section 1.7. The streams are Practical Project Steering vs. Knowledge Management (chapter 4), The Final reports: Theory vs. Practice (chapter 5), and Experiences in the Final reports (chapter 6).

The final block sums up the streams and is common for the whole thesis. It begins with the chapter Summarised Discussion (chapter 7). The summarised discussion, based on the results of the thesis streams, aims to answer the research question (identified in section 1.3). This is followed by the chapters Conclusions (chapter 8), and Implications (chapter 9).
To support the understanding, concepts and acronyms central for the thesis are explained in Appendix A. Three other appendixes are used, and explained when referred.

1.7 How to Read the Streams

The theoretical framework gives account for different areas of Knowledge Management, which correspond to the thesis’ sub-questions, found in Knowledge Management Cycles (section 2.2), Knowledge Sharing and Lessons Learned (section 2.3), and The Knowledge Object Level (section 2.4). Since the sub-questions analyse the project closure phase in different levels, the thesis is divided into study streams. The streams are depicted in Figure 1.7-1, and explained below.

First stream: PPS vs. Knowledge Management

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Second stream: The Final reports: Theory vs. Practice

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Third stream: Experiences in the Final reports

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Figure 1.7-1 How to read the thesis

The figure describes the construction of the thesis. Each stream begins with the theoretical framework and sub-question, then the empirical data is analysed and discussed. The implications from Q3 and Q5 are then used in the second and third stream.

The reason for dividing the thesis into study streams is that they differ from each other regarding study design, empirical data, and analysis. The thesis can be read from beginning to end, but it is strongly recommended to follow one of the streams when reading.

The first stream (chapter 4) compares the project closure phase with theories of Knowledge Management. This is done from three viewpoints: as a part of the general Knowledge Management; as a tool for knowledge sharing; and, concerning what type of knowledge can be captured.. The findings are then used in the other two streams.

The second stream (chapter 5) analyses the actual outcome of the project closure phase, i.e. the final reports, and compares the document with guidelines found in the PPS Handbook, as well as theories regarding knowledge sharing. This means that the stream combines results and implications concerning the project closure documents as a tool for knowledge sharing, found in previous stream (chapter 4), with authentic documents, and thereby gives account for whether the authentic documents meet the objectives stipulated in the PPS Handbook. The findings give implication for the next study stream.

The third stream (chapter 6) looks deeper into the final reports, and analyses the experience gathered through these authentic documents. This is done by developing criteria for identifying knowledge, and categorise the empirical data. This means that the stream combines results and implications found in the two previous streams.
2 Theoretical Framework

The chapter starts with a review of the concept Knowledge Management (section 2.1), followed by the two levels of the concept: Knowledge Management Level (sections 2.2 and 2.3) and Knowledge Object Level (section 2.4).

2.1 Knowledge Management

This section briefly describes the concept Knowledge Management (section 2.1.1) and gives account for definitions of the concept (section 2.1.2). It continues with a description of Project Knowledge Management (section 2.1.3), and ends with a classification of Knowledge Management Levels (section 2.1.4).

2.1.1 Knowledge Management, the Concept

Knowledge Management (KM) is one of the foremost strategic directions being investigated and adopted by corporations today. It has similarities to a holy grail that is yet to be obtained, since it promises better decision-making, faster turnaround times, improved organisational communication, and higher levels of cooperation and interaction among personnel (Schwartz, Divitini, & Brasethvik, 2000).

The concept refers to the development of methods, tools, techniques, and routines from which an organisation can acquire, develop, measure, distribute and provide for their intellectual capital (Wiig et al., 1997; Kamara et al., 2002). The concept incorporates a set of processes for identifying, capturing, developing, distributing, and reusing knowledge within an organisation in order to obtain organisational goals (Obaide, 2008).

Kankanhalli and Tan (2004) state that the ultimate aim of KM is to help organisations avoid reinventing the wheel, and leveraging cumulative organisational knowledge for better decision making. This includes transferring best practices from one part of the organisation to another, codifying individual knowledge, and protecting the organisation from knowledge-loss because of employee turnover.

2.1.2 Knowledge Management Definitions

KM includes a broad spectrum of activities, which has led to several definitions. Spek and Spijkervet’s (1997, referred to in Schwartz et al., 2000) definition of KM that focuses on:

[...] knowledge as a crucial production factor and consists of activities that aim at optimal use and development of knowledge, now and in the future. KM determines which knowledge, where, in which form and at which point of time, should be available within an organization, company or network of institutions. It employs a broad spectrum of techniques and instruments to improve the performance of knowledge operations and the learning capabilities of a system. (Spek and Spijkervet, referred to in Schwartz et al., 2000, pp. 2-3)

Kamara et al. (2002) refers to the concept as:

[...] the organisational optimisation of knowledge to achieve, enhanced performance, increased value, competitive advantage, and return on investment, through the use of various tools, processes, methods and techniques. (Kamara et al., 2002, p. 206)

According to Turban et al. (2006), KM is:

[...] a process that helps organizations identify, select, organize, disseminate, and transfer important information and expertise that are part of the organization’s memory and that typically reside within the organization in an unstructured manner. [...] Knowledge management initiatives focus on identifying knowledge, explicating it in such a way that it can be shared in a formal manner, and leveraging its value through reuse. (Turban et al., 2006, pp. 367-368)
Common for the definitions are that KM fosters knowledge through activities that enhance and share experiences systematically with the purpose to add value to an organisation, company or institution.

2.1.3 Project Knowledge Management

Frey et al. (2009) mean that KM is a success factor for effective project performance, and describes the concept Project Knowledge Management. Project Knowledge Management is defined as:

Project knowledge management is knowledge management in project situations and thus, the link between principles of knowledge management and project management. (Frey et al. 2009, p. 1)

Increasing Importance of Project Knowledge Management

The increasing complexity in projects because of the increased need for technical and relational interfaces, gives knowledge and knowledge-sharing greater importance. To manage the complexity and increase the efficiency, projects have to embrace knowledge from the daily work routines, as well as from former projects (Obaide, 2008).

Organisations and companies have a great base for learning within the project environment, but they have difficulties to pass the learning on. After completing a project, documents get stored in some folders, without retaining the essential for further use (ibid.). Obaide (2008) say that at the best, the different team members keep the knowledge that they personally gained during the project, which they may use in the future.

In project-oriented organisations, there is a growing importance of capturing and sharing knowledge and experience. Sharing of knowledge and experience is a way to increase the performance through reducing time and cost in the creation of individual experiences. This means that the effective sharing of existing knowledge makes the team members more competent (ibid.).

Obstacles regarding Project Knowledge Management

Hong-bing and Lei (2007) mean that because of the difference between projects; it is difficult to develop a generic strategy adjusted for all project organisations, or even in all projects. The authors list a set of obstacles that often occurs regarding project knowledge:

- Much knowledge, of necessity, resides in the minds of the individuals working within the domain
- The intent behind decisions is often not recorded or documented
- People responsible for collecting and achieving project data may not necessarily understand the specific needs of the actor who will use it
- The data is usually not managed while it is created but is instead captured and achieved at the end of the construction stage. People who have knowledge about the project are likely to have left for another project by this time – their input is not captured
- Lessons learned are not well organised and are buried in details. It is difficult to compile and disseminate useful knowledge to other projects

Benefits of Project Knowledge Management

There are several benefits when incorporating Project Knowledge Management in project- and knowledge-intensive organisation. The most convincing may be potential cost savings, but there are others (Frey et al., 2009), summarised on the next page:
• Increased efficiency and reduced risk by making use of the experience and knowledge gained in earlier projects.
• Continuous learning process throughout the overall project work, in contrast to a solely improvement during a single project life cycle, allows to revise and develop the processes applied as well as the created products constantly, including the prevention of repeated mistakes.
• Continuous improvement is also main goal in terms of methods and standards related to project management.
• Another aim is the favourable staffing of projects. This goes beyond the optimal allocation of available resources and implies the staffing of projects along competences and expert knowledge of project workers.
• Not least, the identification and fostering of innovation was stated to be an important goal. Here, especially the advantages of interdisciplinary project teams could be used to foster innovative approaches.

2.1.4 Two Levels of Knowledge Management

Wiig et al. (1997) define two levels of KM. The first level is the Knowledge Management Level (KML), and constitutes of management activities. The second level, Knowledge Object Level (KOL) is the subject of activities in the KOL.

The KML is however, not isolated from its subsidiary level; KOL often initiates the activities in KML (ibid.). This is depicted in Figure 2.1-1. Just as KM, the Knowledge Management Level, and the Knowledge Object Level are defined by several authors.

![Figure 2.1-1 Aspects of Knowledge Management](image)

The description of the Knowledge Management Level is divided into two sections. The first section describes two Knowledge Management Cycles (section 2.2), and the second describes knowledge sharing and lessons learned practices (sections 2.3). The reason for keeping these apart is that the theories are used to answer separate sub-questions. The chapter continuous with a description of the Knowledge Object Level (section 2.4) that will explain what knowledge is, and how it can be categorised. These three sections begin with a separate problematisation where the sub-questions are identified.
2.2 Knowledge Management Cycles

This section starts by a problematisation that leads to the sub-question (section 2.2.1). Then it explains why the specific theories are selected (section 2.2.2); followed by a review of the theories in question (sections 2.2.3 to 2.2.5).

2.2.1 Problematisation and Research question

As described in the problematisation (section 1.2), experiences captured in project closure documents are dependent on the context in which they are produced. Wiig et al. (1997) mean that the two levels of KM are dependent on and influence each other. An organisation can consequently not solely rely on the activities in the project closure phase in their KM.

In addition, theories regarding KMC implies it is not enough, only partly provide for objectives in the cycles; the whole cycles must be present in order to manage knowledge sufficiently. Otherwise, there will be a break in the cycle, and subsequently, knowledge may not be organised in a proper way, or distributed as intended (ibid.).

This means that although the KM is perfect in the project closure phase, the effort made becomes meaningless, if the organisation do not support the whole cycle. It is therefore interesting to examine how the activities contribute to the overall objectives of KMC. To examine this, following sub-question is formulated:

Q1: What capabilities can the project closure phase contribute to within the Knowledge Management Cycle?

To answer this sub-question, theories regarding Knowledge Management Cycles are used.

2.2.2 Selection of Theories

As stated before (section 2.1.4), several definitions of the KOL are found in the literature. Central in the KOL level is the KMC. This section describes two KMC, which will be used when analysing the project closure phase. The purpose is to identify which objectives that the project closure phase meets. It gives implications concerning objectives the case company have to provide for besides project closure activities.

The purpose of using two different models is to give a more nuanced picture. The theories emphasises different aspects of KM, and will therefore, together, give a more complete view of the project closure phase’s contribution to the KM. The models are, in the literature, described in an information technology perspective. Alavi and Leidner (2001) suggest a framework consisting of four sets of knowledge processes, creation, storage & retrieval, transfer, and application (section 2.2.3). Schwartz et al. (2000) suggest a model adjusted to virtual organisations, consisting of three tenets: acquire, organise and distribute (section 2.2.4).

The model suggested by Alavi and Leidner (2001) incorporates the SECI model – Nonaka’s (1994) theory of knowledge the creation modes socialisation, externalisation, combination and internalisation. This theory is central in the model suggested by Alavi and Leidner (2001), and therefore further explained in this section (section 2.2.5).

2.2.3 Four Processes of Knowledge Management

Alavi and Leidner (2001) describe a framework for the functionality of KM, constituted by four processes: creation, storage & retrieval, transfer, and application. These KM processes are explained in following sections.

Knowledge Creation

Knowledge is created in the interaction between people and systems. In individuals, knowledge is created through cognitive processes, i.a. reflection and learning. Groups
create knowledge through interaction and collaboration when solving a problem (Alavi & Tiwana, 2003). The model explains organisational knowledge creation through a continual interaction between tacit and explicit knowledge, where a growing spiral flow of knowledge moves through individuals, groups, and the organisation (Alavi & Leidner, 2001).

The SECI model (see section 2.2.5) describes modes of knowledge creation (Nonaka, Toyama, & Konno, 2000). The modes are not isolated; they are on the contrary deeply intertwined. Each mode relies on, contributes to, and benefits from the others (Alavi & Leidner, 2001).

**Knowledge Storage & Retrieval**

Studies show that while organisations learn and generate knowledge, knowledge gets lost when it is not secured. The process knowledge storage & retrieval refers to the development of functional organisational memory, where knowledge is stored and accessible. There are two types of organisational memories: internal and external. Internal memory refers to knowledge that resides within individuals or groups, i.e. the individual’s capabilities and organisation culture. External memory constitutes of codified and explicit knowledge typical for the specific organisation, found in documents, i.a. working descriptions and procedures (ibid.).

The process storage & retrieval represents three key activities: determine knowledge content of the memory; determine sources and specify the need for gathering knowledge; and develop the external memory as well as determine how the content shall be available (ibid.).

**Knowledge Transfer**

Knowledge transfer refers to transmitting knowledge from the place where it is stored to the situation where it is used, and vice versa. The concept itself is quite simple; the practical application is harder to manage (ibid.). Huber (1991, reproduced in Alavi & Tiwana, 2003) state that this is a consequence of organisations do not know which knowledge it has and have therefore created insufficient systems for knowledge locating and transferral.

There are three types of transferral: between individuals; between individuals and storage media; and, between different knowledge storage medium. The second type refers to both cases when individuals acquire knowledge from a storage media, and when individuals stores knowledge in a storage media (Alavi & Tiwana, 2003).

**Knowledge Application**

Knowledge application refers to the use of knowledge to create value. It is a complex cognitive process, where problem solution and decisions are supported by pre-acquired knowledge and cognitive processes (ibid.). In simple terms, people are dependent on both the organisation’s capability to distribute proper knowledge to the working context, and their own cognitive capability to transform it to and use it in the given context.

**2.2.4 The AOD Model**

Schwartz et al. (2000) present a model for KM in the Internet era. The model constitutes of the three steps acquire, organise and distribute (AOD). These KM steps are explained in the following sections.

**Acquire**

Acquire refers to how knowledge is acquired and stored by the organisation. The process starts when knowledge is asked for and gathered. Organisations can acquire knowledge both internal and external. The activities within the process is summarised in the acronym GIVE: gather, inquire, validate/verify, and encode (ibid.).
Gather refers to collecting knowledge found in individuals, documents or in IS. Knowledge of individuals can be gathered through communication channels. In order to capture knowledge that exists in documents and in IS, the organisation must have the capability to registrated knowledge in a shared memory (Schwartz et al., 2000).

Inquiry initiates gathering of knowledge, and can be manual or automatic. Manual inquiry is triggered by users requesting certain knowledge, while automatic inquiry is programmed into the organisation and continuously supplies users with new relevant knowledge (ibid.).

Validate/verify is performed since it is not a given that gathered knowledge is relevant or of proper quality. The more knowledge there is in the system, and the more decentralised the management of knowledge are, the risk for inaccuracy increases (ibid.).

Encode makes it possible to store and reuse the knowledge. There is a trade-off between flexibility when formulating the knowledge, and a fixed structure needed in order to make it possible to manage the knowledge (ibid.). The challenge is to encode knowledge properly and store it in a structured and manageable format, and still leave the essence intact (Davenport & Prusak, 2000). Concepts and data must be encoded in order to fit in the information structure, and if it does not, the risk for redundancy increases, which makes it more difficult to acquire knowledge when needed (Axelsson & Goldkuhl, 1998).

Organise

Organising refers to how acquired knowledge is structured and made available, in order to be of value for the organisation. The activities are summarised in the acronym PARC: profile, associate, rank and classify (Schwartz et al., 2000).

Profiling is performed in order to facilitate the contextualisation by using meta-knowledge. In order to function as a long-term memory, knowledge must be given a context. Associate knowledge refers to building up relationships with other objects. The dependence can be with other relevant knowledge objects, but also with a specific individual. The later is a direct result of the profiling. Classification of knowledge refers to dependency to other knowledge objects, which can be compared to profiling that refers to dependency to a specific context. Ranking of knowledge involves getting the most relevant knowledge to be presented first, and is especially important when the amount of knowledge increases (ibid.).

Distribute

Distribution is the process where knowledge comes in use, and refers to the capability to supply for right knowledge in the right time to the right person. The activities are summarised in the acronym AID: awareness, identification and delivery (ibid.).

Awareness is not an IT issue. Individuals cannot build awareness by themselves; it has to be triggered. The responsibility for triggering awareness is often located in managerial levels. The awareness is important, since it is the first step in using the knowledge (ibid.).

Identification of relevant knowledge requires that the knowledge is organised and structured in a proper manner, and that the interaction between users and IS is satisfying. The user's knowledge about the system is important, but the system must also have contextual information about the users. Systems with user specific information are more effective in presenting relevant knowledge for a specific user/user group (ibid.).

Delivery of knowledge is a precondition for using the knowledge. Tools, i.a. intranet and e-mail, are effective in disseminate knowledge throughout the organisation (ibid.).
2.2.5 Knowledge Creation

Nonaka’s (1994) SECI model constitutes of the modes, socialisation, externalisation, combination and internalisation (see Figure 2.2-1). The modes are a dynamic process where knowledge continuously moves between the modes and is explicated, merged, internalises and incorporated, and explicated again. Knowledge generation is described as a spiral which diameter increases and knowledge is then accumulated within an organisation or individual.

![Knowledge conversion modes (SECI Model)](image)

The figure describes the modes of knowledge creation (Nonaka, 1994).

Socialisation

The first conversion mode is socialisation, where tacit knowledge is shared through interaction between individuals. Tacit knowledge is difficult to formalise due to difficulties to share each other’s thinking processes. Tacit knowledge is therefore hard to transmit (Nonaka, 1994). Socialisation takes place when individuals share their experiences and creates a common unarticulated beliefs or embodied skills (Nonaka et al., 2000). In organisations, socialisation is found when employees learn a craft through observation, imitation and practice, i.a. on-the-job training (Nonaka, 1994).

Externalisation

Externalisation refers to the process where tacit knowledge is articulated into explicit (Nonaka, 1994). Tacit knowledge that is shared among a group is crystallised into concepts, diagrams, metaphors and analogies (Nonaka et al., 2000). In the process, tacit knowledge is explicated and formalised in order to be easier to transmit.

Combination

Combination involves the use of social processes where different bodies of explicit knowledge held by individuals are combined. In the process, existing information and knowledge get sorted, added, recategorised and recontextualised. The reconfiguration of the explicit knowledge leads to new explicit knowledge (Nonaka, 1994).

Internalisation

Internalisation is the process where explicit knowledge is converted to tacit, which have similarities with traditional learning (ibid.). Explicit knowledge formalised in text or video facilitates the internalisation process. Knowledge is transmitted when employees learn work tasks through written job specifications. Internalisation also takes place when employees acquire explicit knowledge in situation where a scenario is simulated, and where they should use their theoretical knowledge to solve a given problem (Nonaka et al., 2000).
2.3 Knowledge Sharing and Lessons Learned

If the last section aims to explain the framework for KM, used when analysing how the project closure phase fits in the KMC, this section will be used to examine the project closure documents more specifically. The section starts by describing the problem that leads to the sub-questions (section 2.3.1). It continues with explaining why the specific theories are selected (section 2.3.2); followed by a review of the theories in question (sections 2.3.3 to 2.3.4).

2.3.1 Problematisation and Research question

Interaction between individuals is of great importance when developing new ideas. Even though ideas are formed in the minds of individuals, interaction contributes to amplifications in the knowledge creation process (Nonaka, 1994). Improved quality and higher productivity is a positive consequence of experience sharing. Learning and experiences of others is one possibility to increase the knowledge base (Obaide, 2008).

The activities in the project closure phase aims to support knowledge sharing by holding closing seminars and producing project closure documents, i.e. final reports. The method used does affect the outcome of these activities (Wiig et al., 1997). This means that although the case company have an intention to make the most out of experiences gained throughout the projects, they can fail if the activities do not incorporate important elements for knowledge sharing (Huber, 1991, referred to in Alavi and Tiwana, 2003).

It is therefore interesting to gain knowledge about how the project closure phase activities contributes to knowledge sharing, which has lead to the following question:

Q: How does the project closure phase contribute to knowledge sharing?

Knowledge acquisition can however, only be obtained if adequate social and organisational tools support it. In simple terms, if the individuals are not motivated, or the organisational culture do not promote knowledge sharing, every effort made will fail (Chase, 1997; Schwartz et al., 2000; Kamara et al., 2002). KM requires therefore, according to Kamara et al. (2002) an appropriate infrastructure, infostructure, and inoculture.

The project model provides the organisation with a framework, but the employees must perform the activities according to the project model, in order to make knowledge sharing take place in a coherent manner. This means that even though it can be established, through an analysis of the activities, what the project closure phase can contribute to, it is not a given that this is practiced throughout the organisation.

It is therefore interesting to examine the outcome of these activities by comparing the actual outcome with the sought after, i.e. compare the authentic project closure documents with the procedures and guiding routines stipulated by the project model handbook.

The above question is therefore split in two. The first analyses how the project closure phase within the project model incorporates knowledge sharing in working routines and procedures. The second analyses the actual outcome, i.e. final reports, regarding how they correspond to the aspects of knowledge sharing. This gives information regarding if the project model is implemented properly.

Q2: How does the closure phase incorporate aspects of knowledge sharing in procedures and guidelines?

Q3: How do the authentic final reports correspond to theories of lessons learned?

To answer these sub-questions, theories regarding knowledge sharing and lessons learned practices are used.
2.3.2 Selection of Theories

The idea is to describe how knowledge sharing is incorporated in the project model’s guidelines and routines in the project closure phase. Most theories regarding knowledge sharing are however either too general or too specific to be useful to answer the questions in hand.

By too general means that they describe knowledge sharing too vaguely and indistinct, and give insufficient information as a base for the analysis. By too specific means that they describe a specific aspect of knowledge sharing meticulous and precise, and can therefore not be used to analyse both activities in the project closure phase.

Although most theories are too general, general models can be useful. Ramaprasad and Prakash (2009) suggest a model for categorising knowledge sharing methods (section 2.3.3). Since the project closure phase incorporates two, in nature, different activities, this model is used to clear out the differences. This differentiation is important, since it will give implications further down in the line, i.e. regarding the experience captured.

Project closure documents bare similarities with the use of lessons learned. One objective of the project closure phase is to summarise the projects’ experiences, and transfer it for further use in the organisation, which, according to Kotnour (2000), is the very aim of lessons learned. The final reports are however not the exact same thing as a lessons learned since the documents give account for more aspects than just experiences. The model can however be used to analyse the project closure documents through aspects and elements of lessons learned (section 2.3.4).

2.3.3 Knowledge Sharing Methods

Ramaprasad and Prakash (2009) systemise different sharing methods, and state that knowledge in project organisations normally is shared orally or in writing. Knowledge-sharing methods are categorised by the dichotomies oral-written, and formal-informal (Figure 2.3-1).

<table>
<thead>
<tr>
<th>Informal</th>
<th>Written-Informal: Text messages, Written notes and comments, Memos, Sketches</th>
<th>Written-Formal: Written reports and policies, White papers, Power Points, Slogans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral-Informal: Conversation, Phone calls, Informal meetings and comments</td>
<td>Oral-Formal: Oral reports, Formal meetings, Interviews, Stories, Slogans</td>
<td></td>
</tr>
<tr>
<td>Oral-Formal: Oral reports, Formal meetings, Interviews, Stories, Slogans</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The taxonomy gives that knowledge-sharing methods are divided into the quadrants (Ramaprasad & Prakash, 2009):

- The oral-informal quadrant represents the methods that probably are the most frequently used in projects.
- Written-informal methods are a category, which is becoming increasingly popular due to digital communication media.
- Oral-formal are important in order to structure and transfer knowledge to a larger audience than the typical case of oral-informal. When structuring the knowledge, it is likely to be codified and validated in the interaction with larger groups.
- Written-formal methods are seen as the ultimate repository of knowledge. These methods have the best potential of reaching the largest number of receivers.
There are benefits and disadvantages associated with movements along the dimensions. *Informal* and *oral* are more nuanced, and these nuances can be lost when the knowledge sharing becomes *written* or *formal*. This is an outcome of knowledge needs to be codified when it moves to more *formal* and *written* methods (Ramaprasad & Prakash, 2009).

*Oral* and *informal* methods are generally quicker, but at the same time less good in spotting errors, or making the knowledge accessible. Documenting everything on the other hand increases the bureaucracy. *Written* and *formal* methods are more appropriate for core knowledge that has to be validated and accessible by everyone (ibid.).

### 2.3.4 Conceptual Model of Organisational Learning Practices

Kotnour (2000) presents a conceptual model, which describes how *organisational learning practices* relate to *learning outcomes*. The *organisational learning practices* are a set of actions that creates, assimilates, disseminate and applies knowledge across the organisation. The conceptual model (depicted in Figure 2.3-2) is further explained in the following sections.

**Organisational Learning Practices**

**Project Learning Practices**
- Intra project learning
- Inter project learning
- Learning support

**Lessons Learned Production Practices**
- Produce
- When: Opportunity, Regular, End
- What about: Minor problems, Met expectations, Major problems
- Know what about: Compare to plan, Remember
- What to include: Plan, Result, Problems, Well

**Learning Outcome**
- Knowledge
- Project performance

Figure 2.3-2 Conceptual Organisational Learning Model

*Project Learning Practices* is used to create and share experiences in a project and take place in two cycles. Learning support refers to the project manager’s willingness to share knowledge with other project. *Lessons Learned Producing Practices* is used to create and share *lessons learned* throughout a project. *Learning Outcomes* is the result of *project learning practices* and *lessons learned producing practices* put together (Kotnour, 2000).

**Project Learning Practices**

Kotnour (2000) identifies to types of knowledge sharing in project organisations: *inter- and intra-project learning*.

*Inter-project learning* refers to the combining and sharing of lessons learned across the organisation in order to apply knowledge in new situations and create knowledge. This can take place both virtual by use of information technology, and among employee groups that share what they learned internal and external to the organisation. *Inter-project learning* is of great importance in order to develop the knowledge base, and is closely related to *intra- and production of lessons learned* (ibid.).

*Intra-project learning* refers to creation and sharing of knowledge in a project. Learning often takes place when team members collaborate and discusses different actions to take when completing a given task or trying to solve problems that occur during the project (ibid.).
Learning support is of importance for project members and organisations in order to learn through inter-, and intra-project learning and lessons learned. Data and information collection throughout projects supports learning by making it possible to compare actual data with estimated, and thereby identifies deviations. An open and honest organisational culture supports the learning process, and willingness to address mistakes, and share experiences of both success and failures, increases the organisation's ability to learn (Kotnour, 2000).

**Lessons Learned Producing Practices**

*Lessons learned production* is a method within PKM, used for acquiring knowledge that arises during the project. The input is new knowledge, and the output is *lessons learned document*. *Lessons learned* is a catchphrase that describes what has been learned from experience, and is a tool for learning. It aims to overcome the organisational learning and knowledge-sharing barriers, and plays two roles in the PKM environment (ibid.).

First, the process of producing a *lesson learned* provides an opportunity for the project team members to think about their performance and gain full understanding of project results. The *lessons learned* activity aims to identify actions as bad or good, and procedures for overcoming or achieving those actions, and should describe what actions to take or avoid in similar situations in the future (ibid.). Obaide (2008) mean that both good and bad practices are important to ensure improved project outcome.

Secondly, *lesson learned* is a method to document the above experiences and insights, and share them with others (Kotnour, 2000). The production of *lessons learned* is described along four dimensions: *when*, *what about*, *how know*, and *what is included*.

**The first dimension: when**

The first dimension – *when* – is described by three values: throughout the project as the opportunity arise; throughout the project at regular meetings; and at the end of the project. There are problems associated with performing *lessons learned activities* in the end of the project life cycle, because of that the projects members biases influence the dimension *what about* of the *lesson learned*. *Lessons learned activities* in the end of the project increases the probability to only capturing the most recent events, or the events that caused the most problems (ibid.).

**The second dimension: what about**

Second dimension – *what about* – describes what *lesson learned* is and is characterised by: *tasks with minor problems*, *tasks that met expectations*, and *tasks that had major problems* (ibid.).

**The third dimension: how know**

The third dimension – *how know* – refers to how managers know what the *lesson learned* should be produced about, and is divided into two actions: *comparing actual performance to the plan*, and to *remember which tasks to create lesson learned about throughout the project* (ibid.).

**The fourth dimension: what is included**

The fourth dimension – *what is included* – defines what the project manager describes in a *lesson learned*, and contains the parts: *original plan*, *result*, *problem/task that went well* (ibid.).
2.4 The Knowledge Object Level

The above sections have given the contextual framework for the project closure phase, and explained circumstances that affect knowledge sharing. This section will look into the actual experience gathered by final reports, and starts by describing the problem that leads to the sub-questions (section 2.4.1). It continues with explaining why the specific theories are selected (section 2.4.2); followed by a review of the theories in question (sections 2.4.3 to 2.4.10).

2.4.1 Problematisation and Research question

As stated in the initial problematisation (section 1.2), it is vital to know what knowledge the organisation has, in order to enable an effective knowledge transferral. Huber (1991, reproduced in Alavi & Tiwana, 2003) state that organisations create insufficient systems for knowledge locating and transferral as a consequence of the fact that they do not know what type of knowledge the organisation possess, and thereby not know what for they create these systems.

Moreover, the knowledge captured, must have substantial value, or else the effort made will become useless. Knowledge is contextual (Nonaka, 1994), and it can thereby be impossible to estimate the value of the knowledge without understanding the context. It is therefore not fruitful to in this study, determine the value of the knowledge – this is up to the case company to decide.

This study can however, describe the knowledge captured by the project closure documents, which has lead to the following question:

Q: What knowledge is found in project closure documents?

Equally important as gaining understanding of the knowledge final report captures, is to gain an understanding of the knowledge the instrument does not capture. In organisations, there is a need to require access to knowledge that others have (Schwartz et al., 2000; Davenport & Prusak, 2000). Knowledge is present in all forms, and it is therefore hard to capture all knowledge that is developed (Davenport & Prusak, 2000). This truth have to be acknowledge by everybody that work with KM, and the hope of being able to capture every knowledge in an organisation may have disastrous results (Schwartz et al., 2000).

In simple terms, it is not a given that project closure documents capture all types of knowledge that it theoretically can. It is therefore of great interest to make a difference between what types of knowledge the documents theoretical can capture, and the types knowledge the project closure documents capture in reality.

In addition, it is not a given that the project closure phase capture knowledge, i.e. even though the project team according to the guidelines are advised to write down experience that may be valuable for projects to come, it is not a given that everything written in these project closure documents could be regarded as knowledge. The above question is therefore split in two separate sub-questions:

Q4: What knowledge types can project closure documents theoretical capture?

Q5: What do authentic project closure documents provide for in practice?

To answer these sub-questions theories regarding knowledge and knowledge taxonomies are used.
2.4.2 Selection of Theories

The quest for a definition of knowledge is known since the classical Greek era (Alavi & Leidner, 2001; Nonaka, 1994), and pursue for a classification system (taxonomy) is as old as Plato and Aristotle (Blumentritt & Johnston, 1999). A traditional distinction identifies three types of knowledge: knowledge of things and objects; knowledge of how to do things; and knowledge of statements and propositions (ibid.).

Emergence of the knowledge economy made the traditional distinction obsolete, since it is both imprecise and difficult to operationalise (ibid.). The developments of theories are influenced by the distinctions among different taxonomies. Furthermore, taxonomies can serve as an input when designing KM-systems by addressing the need for support that acknowledges the nature of different types of knowledge (Alavi & Leidner, 2001).

Theories represent different ways to classify and characterise knowledge. The argument for using different approaches when analysing knowledge, is that it “is a multifaceted concept with multilayered meaning” (Nonaka, 1994). Instead of a single point of view, the analysis of knowledge benefits by using several perspectives (Alavi & Leidner, 2001).

The most common explanation of knowledge, found in most textbooks on the subject, is the hierarchical view of data, information and knowledge (section 2.4.4). This breakdown of the concept, can however not be used when categorising knowledge since all knowledge resides in one category, i.e. knowledge. The taxonomy is however used in this thesis in order to establish what is regarded as knowledge and what is not.

Another common taxonomy is the division into tacit and explicit knowledge (section 2.4.5). This categorisation is as useless as the hierarchical division into data, information, and knowledge, when it comes to categorising knowledge found in project closure documents. This because the fact that tacit knowledge not can be formalised in written form (Nonaka et al., 2000), which is required in order to explicate the knowledge in a document.

The taxonomy is nevertheless important, since it provides for basic preconditions for knowledge types that are possible to capture. There are however several other ways to categorise knowledge. In following sections it will be explained how knowledge can be divided into different knowledge types, i.e. knowledge taxonomies.

Following taxonomies are used in the analysis: a sociological taxonomy (section 2.4.6); the contingent knowledge taxonomy (section 2.4.7); a taxonomy that divides knowledge into knowledge of information and contextual knowledge (section 2.4.8); the pragmatic approach of knowledge classification (section 2.4.9); and, a problem focused taxonomy (section 2.4.10). The section starts however, by describing what experience is about, since the experiences is in focus in this thesis (section 2.4.3).

2.4.3 Experiences

Since experiences are central in the thesis, it is important to understand what it is. This section will explain the meaning of the concept experience, and the elements of the experience.

Meaning of Experience

The word experience derives from Latin experiential, which means act of trying, and according to the Merriam-Webster Online Dictionary (2009), it have the following meanings:

1. a) Direct observation of or participation in events as a basis of knowledge, b) The fact or state of having been affected by or gained knowledge through direct observation or participation.
2. a) Practical knowledge, skill, or practice derived from direct observation or participation in events or in a particular activity, b) The length of such participation

3. a) The conscious events that make up an individual life, b) The events that make up the conscious past of a community or nation or humankind generally

4. Something personally encountered, undergone, or lived through

5. The act or process of directly perceiving events or reality

Cooper (2009) means that experience are units of knowledge that are beneficial for the organisation. It is associated with increased effectiveness, better performance, increased value of information provided, and a support for maintaining organisational capacity in times of change. Bohn (1994, referred to in Kotnour, 2000) means that “Learning is the process by which knowledge is created out of experience and the path by which improvements take place”. Kotnour (2000) adds that there must be a set of processes in place in order to support learning among the team members.

Learning occurs when people reflect on their experiences, and provides opportunities to increase knowledge, and the ability to apply knowledge in new areas. Reflection refers to identifications of patterns, and integration of new understanding into existing knowledge structure (Cooper, 2009). An organisation ought to continuously ensuring that it learns from experiences. In addition, members of the organisation create knowledge by being engaged in learning experiences (Kotnour, 2000). By sharing acquired experiences, the knowledge base improves, leading to improved quality and productivity (Obaide, 2008).

**Elements of experience**

Cooper (2009) studied how team members refer to experiences, and found that experience compounds of three elements, i.e. source of experience, nature of experience, and relevance.

While the source indicate “who” had the experience, and nature indicate “what” the experience was, relevance addressed “why” this experience was important and applicable. (Cooper, 2009)

Source of experience indicates who originally had the experience. It is often in first third person, but can also be objects, pieces of equipment, or other projects (ibid.).

Nature of the experience refers to the experience itself. It can be experience from problem encountered presented as warnings of future problems, approaches used successfully in the past, e.g. cause-effects relationships or measures of performance. Experiences can be divided into the subject areas people/relationships, processes, products, and politics (ibid.).

Relevance is information about the current situation and is often used to motivate actions and constitutes of components that describes how closely current situation matches the past, how likely previous condition may reoccur, and how time-critical it is to act (ibid.).

**2.4.4 Hierarchical view of Data, Information, and Knowledge**

Knowledge is neither data nor information, but closely related to the two concepts (Davenport & Prusak, 2000). Data, information and knowledge are three levels of data, where data is the lowest (Davenport & Prusak, 2000; Turban et al., 2006). Kamara et al (2002) states that the distinction between the knowledge levels is unhelpful when categorise knowledge, since these concepts are more of a continuum. When categorising knowledge, it is more important to acknowledge the organisational context.
Data

Data refers to an elementary description of objects, phenomenon, activities or transactions. Data can be numerals, letters, figures, sounds and/or pictures (Turban et al., 2006), and Collins (1993) adds that data is facts without a meaning.

By itself, data lacks aim and relevance, and cannot say anything about a phenomenon’s purpose or context. All companies and organisations are dependent on data that normally is organised and structured in information systems (Davenport & Prusak, 2000).

Information

Information is organised data, with a purpose and relevance for the receiver. The receiver interprets the data and draws conclusions (Turban et al., 2006). Data turn into information when people or computers add value or context (Davenport & Prusak, 2000), and becomes equipped with relevance and purpose (Collins, 1993). Davenport and Prusak (2000) describes five methods to add value to data, and thereby transform it into information:

- **Contextualisation**: The specific context where data is created is known
- **Categorisation**: Key concepts and specific units of measurement are known
- **Calculation**: Data is statistical or mathematical computerised
- **Correction**: Faults in the data are corrected
- **Condensation**: Data is summarised

Knowledge

Knowledge consists of data and information that is organised in order to act as an intermediary of understanding, experiences and accumulated learning when it is used in a given context (Turban et al., 2006). Knowledge embodies cognition, insight and learning activities (Collins, 1993).

Knowledge is neither absolute nor simple; it is a mixture of several elements. It is a dynamic process, created in interaction between individuals and organisations (Davenport & Prusak, 2000; Nonaka et al., 2000; Turban et al., 2006). Davenport and Prusak (2000) describes four methods to add value to information, and transform it into knowledge:

- **Comparison**: Is information from one situation comparable with other situations?
- **Consequence**: What conclusion can be made when information is the base for decisions?
- **Connection**: How do the knowledge relate to other knowledge?
- **Conversation**: What do other people think about the information?

This means that knowledge without context is information, but can become knowledge when it is interpreted by individuals, and anchored in a context (Nonaka et al., 2000). Knowledge is not isolated objects; it is interdependent (Schwartz et al., 2000). Nonaka et al. (2000) state that the synthesis of different knowledge objects results in new knowledge creation, explained in the SECI model (section 2.2.5).

2.4.5 Explicit and Tacit

Knowledge is often divided into the dimensions *explicit* and *tacit knowledge*. Turban et al. (2006) state that while *explicit knowledge* is more volatile and thereby more difficult to retain, *tacit knowledge* is more difficult to acquire and understand, but easier to remember.
Explicit knowledge can be expressed in formal systematic language and constitutes of data, specifications or manuals (Nonaka et al., 2000). This type of knowledge is articulated, codified and communicated in symbols and natural language (Alavi & Leidner, 2001). It is normally easy to manage, transfer and store (Nonaka et al., 2000). Nonaka (1994) mean that this type of knowledge, that can be expressed in words and numbers, only represent the tip of the iceberg of the entire base of possible knowledge; the rest is tacit.

Tacit knowledge is highly individual and informal. It is made up by subjective understanding, intuition and hunches (Nonaka et al., 2000). Nonaka (1994) mean that tacit knowledge is comprised of both cognitive and technical elements. The cognitive element constitutes of the individual’s mental maps, beliefs, and viewpoints, while the technical element refers to concrete expertise and skills applied to a specific context (Alavi & Leidner, 2001). Tacit knowledge is difficult to formulate verbally, because it is dependent of insight of a given case, routines, ideal, value or feeling. It is also harder to transfer because it requires simultaneous processing by the recipient (Nonaka et al., 2000).

2.4.6 Sociological Taxonomy

Collins’ (1993) taxonomy adopted a sociological approach adjusted for artificial intelligence, and divided knowledge into four categories. The taxonomy makes a clear distinction between codified and non-codified knowledge. The four kinds of knowledge are:

- **Symbol-type knowledge.** Can be transferred without loss in codified form by intermediaries, i.a. CDs or books
- **Embodied knowledge.** Refers to knowledge held within the human body. This knowledge is internalised and therefore hard to communicate
- **Embrained knowledge.** Refers to knowledge held within the human brain, i.e. cognitive abilities that are related to the physical structure of the brain
- **Encultured knowledge.** Dependent on the social group for its existence. This type of knowledge is contextual, and influences speak and behaviour.

2.4.7 Contingent Knowledge Taxonomy

Fleck (1997) means that knowledge embodied in the working context is neglected in other taxonomies. This form of knowledge is crucial and has an under-appreciated role in the development of technology and innovation. Knowledge types are not distinct, and expertise knowledge involves a mixture of several knowledge components:

- **Formal knowledge.** Refers to theories, formulae etc., usually available in written or diagrammatic forms, i.a. CDs or books
- **Instrumentalities.** Refers to knowledge embodied in the use of tools and instruments
- **Informal knowledge.** Refers to rules of thumb, and tricks of trade
- **Contingent knowledge.** Knowledge embodied in the specific context. This type is acquired through on the-spot training
- **Tacit knowledge.** Embodied in people, i.e. rooted in practice and experience
- **Meta-knowledge.** Embodied in the organisation, i.e. general cultural and philosophical assumption, e.g. values, strategic goals etc

Formal knowledge can be extensively formalised and codified, and is acquired through formal education. Formal knowledge can often be in a specific knowledge base, i.e. area of expertise. Interpretation of this information into knowledge requires a human that can access and mobilise the meaning (ibid.).
Instrumentalities is knowledge that is incorporated in a tool or instrument. The use of it requires other components (informal, tacit or contingent). It is acquired through demonstration and practice. Instrumentalities cannot solely persist without any human interaction; it is dependent on experts taking responsibility for set-up, and maintenance (Fleck, 1997).

Informal knowledge is important in expertise, because it provides information about practical tasks of both formal knowledge and instrumentality. It can be articulated in verbal forms, or explicated in text, and learnt through interaction within a specific context (ibid.).

Contingent knowledge is often included in informal or tacit. This type is distributed, trivial and very specific to the context. Compared with informal, it is unplanned and less systematic. It is dependent on the context, and often becomes valueless when it is moved from its context (ibid.).

Tacit knowledge in this taxonomy, involves a subtle level of understanding, and is often difficult to communicate through language. This type is acquired through apprenticeship and training (ibid.).

Meta-knowledge is about values and assumption within the specific organisation. It is important for all areas of expertise, since it gives an understanding of structural principles and strategies of the organisation. This type is acquired through socialisation (ibid.).

2.4.8 Knowledge of Information and Contextual Knowledge

Millar, Demaid and Quintas (1997) criticise Collins’ approach for its limitation. Instead, they suggest a classification that enables a focus on the difference between knowledge of information, and contextual knowledge. This distinction is important since the difference have impact on the construction of technology interchange and learning. Millar et al (1997) divides knowledge into five categories:

- Catalogue knowledge: (know-what): Knowledge of information
- Explanatory knowledge: (know-why): Knowledge of information
- Process knowledge: (know-how): Contextual knowledge
- Social knowledge: (know-who): Contextual knowledge
- Experiential knowledge: (what was): Contextual knowledge

The two first categories (catalogue and explanatory) are symbolic in nature, and can be regarded as knowledge of information. This implies that these are easy to transfer. The three other categories (process, social, and experiential) are what Collins (1993) refers to as encultured knowledge, and therefore bound to their contexts, and as a consequent of that, more difficult to transfer. Millar et al. (1997) groups them together as contextual knowledge.

Contextual knowledge needs to be decontextualised in order to be transmitted formally. The consequence of transforming the knowledge is that it loses its specific character (ibid.).

2.4.9 Pragmatic Approach of Classification

The pragmatic approach to classification attempts to identify types of knowledge that is useful for an organisation. Knowledge in the pragmatic approach includes for example, knowledge about customers, products, processes, and competitors (Alavi & Leidner, 2001). This can be explicated in best practices, know how, rules, policies, and models; architectures, technology and business frameworks; project experiences; and tools used for implementing processes, i.a. checklists and surveys (ibid.).
In a project environment, knowledge that is transferred between projects can be referred to as expert knowledge, procedural knowledge, and experience knowledge (Frey et al., 2009).

### 2.4.10 Problem Focused Taxonomy

Ramaprasad and Prakash (2009) suggest a domain specific taxonomy of knowledge types, adjusted to project knowledge. The knowledge categories are sequential and circular, from problem recognition to problem prevention, with a feedback loop from prevention to recognition. As a sequential circle, the knowledge types can represent a repetitive learning cycle in the project organisation. It is however not an unbending sequence; jumps between the knowledge types may occur (ibid.). The five categories in this taxonomy are:

- **Problem recognition**: Used to identify problems as early and correct as possible, e.g. what are the symptoms of potential delays in testing?
- **Problem formulation**: Used when formulating problems promptly, categorise, and characterise it, e.g. is the delay in testing a capacity problem in the testing environment, or is it a consequence of unsatisfactory use cases, or a combination?
- **Problem analysis**: Knowledge for analysing pros and cons of alternative solution of a problem, e.g. what are the alternatives if the use cases are unsatisfactory, and what are the costs, benefits, and risks of the alternatives?
- **Problem solution**: Knowledge used when selecting the best solution among options, e.g. what is the best choice if cost is the most important aspect of the project?
- **Problem prevention**: Knowledge for preventing occurrence of similar problems in the future, e.g. which measurements of improvements should be taken in order to avoid delays in testing due to unsatisfactory use-cases in projects to come?

Since the taxonomy focuses on problems, there is a need for establishing to what problem refers. Goldkuhl and Röstlinger (1988) mean that a problem can be both positive and negative, and state that a problem is the difference between how something should be and how it is perceived for the moment.
3 Research Methodology

This chapter describes the research approach (section 3.1) and a general description of the study design common for all of the study streams (section 3.2). This is followed by a discussion concerning validity (section 3.3), and reliability (section 3.4). The chapter ends with methodological problems that have occurred during the process (section 3.5).

3.1 Research approach

This section begins with explaining the epistemological approach – and why this approach is preferable (section 3.1.1). The section continues with a description of the methodological approach (section 3.1.2).

3.1.1 Positivistic Approach

There is no objective truth of what knowledge is (Nonaka, 1994); it is highly dependent on its context (Turban et al., 2006). This gives that knowledge is highly interpretable, and even though there are several definitions of knowledge, none gives account for knowledge as a concept that is independent of individuals or their interpretation of it. The thesis does however not focus on the interpretation of the phenomena studied.

The first part of the purpose – to analyse the framework for the project closure phase through a Knowledge Management perspective – aims to analyse the project model framework. This is given by the PPS handbook, which is to be regarded as an objective description of the model, since it stipulates a procedures and routines everybody are required to acknowledge. In view of the fact that the thesis is about the framework given by the handbook, it is not interesting to investigate how people in the organisation perceive the project model.

The second part of the purpose – to evaluate how new knowledge, captured by project closure documents, can be identified and measure – aims to identify and measure knowledge within project closure documents. In order to make this possible, the knowledge object perspective is applied (see section 1.4), since it enables the treatment of knowledge as an object that can be stored as an entity apart from its context. The aim is not to determine in what extent the knowledge adds value to the organisation, this is up to the case company to decide. Instead, it focuses on how to identify knowledge independent of the organisation in which it resides.

The above gives that a positivistic approach is used, since it, according to Jacobsen (2002), is preferable when the purpose is to give account for an objective reality. A neutral approach is desirable since the purpose is to analyse the project model framework and to identify knowledge independent of its context. This can only be done by excluding local adjustments and individual interpretation of the phenomenon in focus.

3.1.2 Qualitative Approach

As stated before, the purpose is to analyse the project model framework for project closure documents in order to describe the tool, and to identify knowledge captured by these documents. This will be done by exploring the framework by applying a KM perspective. Since the purpose in nature is explorative, and the fact that, according to Frey et al. (2009), little research has been made regarding the topic, a qualitative approach is chosen.

Jacobsen (2002) state that a qualitative method is preferable when the purpose is to comprehensively describing a phenomenon, the possible outcome is unpredictable due to insufficient beforehand information, and, when the study involves several variables. This is the case in this study.
The first part of the purpose – to analyse the framework for the project closure phase through a Knowledge Management perspective – is to fully penetrating the framework through a KM perspective. Since the project model derives from experience and not theoretical models (TietoEnator, 2006a), the outcome of applying models within the KM tenet is difficult to predict. Finally, in order to give an overall picture of the framework, several factors must be taken into consideration.

The second part of the purpose – to evaluate how knowledge, captured by project closure documents, can be identified and measure – cannot be fulfilled by solely using a qualitative approach. In order to identify and measure knowledge captured by the project closure documents, there is a need to operationalise and quantify the knowledge in the documents. The methodological approach will therefore be qualitative with quantitative elements. This means that even if the approach is to interpret and analyse the phenomena qualitative, quantitative measures are necessary in order to describe in what extent a phenomena occurs.

3.2 Study Design

This section describes how the study in general is performed. It described the development of the theoretical framework (section 3.2.1), how the case company is selected (section 3.2.2), the method used (section 3.2.3), and a brief introduction of the data collection (section 3.2.4). A more thorough description regarding the study design is given in each streams chapter (chapter 4, 5, and 6).

3.2.1 Building the Theoretical Framework

In order to build a relevant theoretical framework, scientific articles were used. The literature study focused on KM and knowledge. When searching for scientific articles, ELIN and Google Scholar were primarily used. The following words were used in order to find relevant literature: knowledge management, project knowledge management, lessons learned, project, and knowledge sharing. The search word lessons learned turned later on to be inadequate, since the articles found described lessons that had been learned, and not lessons learned practices.

The search resulted in a set of articles. These articles served as input for further information search, by using relevant references to find additional articles. This process was iterative, and resulted in several additional searches as long as the building of the theoretical framework was in progress.

The final selection of theories to include in the theoretical framework is explained in the theoretical framework used to answer the sub-questions (sections 2.2.1, 2.3.1 and, 2.4.1).

3.2.2 Selection of Case Company

A set of four selection criteria was formulated in order to secure that it would be possible to realise this study at the chosen case company. These criteria are explained below.

The first criterion was that the case company uses a project model that incorporates the production of project closure documents that among other things give account for experience encountered. This criterion was met; the case company uses Practical Project Steering, which incorporates the production of final reports. These reports include a chapter called Experience feedback, which sums up the experience encountered.

The second criterion is related to the original purpose, which was to explore the possibility to track knowledge development by analysing project closure documents. Therefore, it was of great importance to choose a case company that used the same project method the last couple of years. This criterion was met, but the original purpose has changed.
The third criterion was that the case company should be considered a project organisation, where the projects were of great importance, and quite many. This criterion was met; the case company sees the vast amount of projects as very important in order to succeed.

The fourth criterion was that the case company should be considered a knowledge intensive organisation, where knowledge creation and sharing were of great importance. This criterion was met; the case company is dependent of their intellectual capital, and that it develops in order to meet future needs.

3.2.3 Document Study

The purpose of this thesis is to study the framework for the project closure phase that is given by the project model, and the experience that is captured in project closure documents.

The first phenomenon, i.e. the framework for the project closure phase, is defined in the PPS Handbook available at the case company. Because the framework is of interest in the thesis, the handbook is considered the best available data source. The reason for not performing an interview series is that it, according to Jacobsen (2002), would result in data of how the individuals interpret a phenomena, in this case the framework.

The second phenomenon that the thesis aims to analyse is the experiences in the project closure documents. As for the framework, an interview series would result in data that involves individuals’ interpretations.

Given that, it is not how individuals perceive the project closure phase or the project closure documents; a document study is preferable. Jacobsen (2002) mean that a document study is to be regarded as a study of secondary data. In this study however, the PPS Handbook and the project closure documents are the primary data.

Jacobsen (2002) states there are a limitation in the data due to the context in which it has been collected, when studying documents. This means that data in documents often is customised for specific needs and context.

This can be problematic if the researcher has quite different needs than the original intention of the data acquisition. In this thesis, the purpose is to explore the PPS Handbook and the project closure documents as they are. The data in the documents, and the possible customisation, do therefore not have a negative impact of the study’s result.

In addition, due to the purpose of this thesis – to analyse the framework for the project closure phase through a Knowledge Management perspective and to evaluate how knowledge, captured by project closure documents, can be identified and measure – objectiveness, without individuals’ interpretations, is sought after. Jacobsen (2002) mean that one benefit of using a document study is that documents are objective. In the documents, it is possible to find exactly what is decided – word by word.

3.2.4 Empirical data collection

When addressing the experiences within project closure documents with the contact persons at the case company, they had recently put up a database of their final reports. The database contained 31 documents, produced between the years 2004 and 2009. These documents were collected in August 2009. The PPS Handbook was acquired at the same time.
3.3 Validity

Validity refers to the fact that the empirical data must be valid and relevant for the study. It can be divided into the sub-categories internal and external validity (Jacobsen, 2002).

Since the purpose is to analyse the theoretical framework that the project model PPS give, and describe the experiences the final report captures, the documents in hand provides for the most relevant and true information. No other data source can be seen as more valid than the very handbook that describes the project model and the very documents that is produced at the case company. The data sources give account for exact the empirical data that is sought after given the purpose and the research questions. The internal validity is therefore very high.

The project closure phase in PPS has similar objectives as the generic project model described by Tonnquist (2006). This means that the result is applicable in project models in general, i.e. project models that incorporate closing seminars and production of project closure documents in the project closure phase. This means that the result is generalisable, and thereby is the external validity high.

It could be said that the analysis is partial based on the categories found in the PPS Handbook, and that the result therefore is biased. The thesis is however not about analysing the truthfulness of the PPS taxonomy. Instead, the PPS taxonomy is used as one of several possible taxonomies in order to measure the knowledge output in the project closure phase.

The two taxonomies used in the analysis have a pragmatic approach concerning knowledge categorisation (TietoEnator, 2006a; Cooper, 2009), i.e. they are adjusted to their contexts. This means there are other taxonomies that may be more suitable for other contexts. The measurements of knowledge in this thesis are not dependent on the taxonomies used, and are fully applicable for other ways to classify knowledge. The measurements are therefore transferable to other contexts, and therefore the external validity is very high as well.

3.4 Reliability

Reliability refers to the fact that the empirical data must be reliable and trustworthy, and that the study measures the components or elements that it intends to (Jacobsen, 2002).

The document study is based on the best available data regarding the PPS framework, and the project closure documents. Since the study, does not involve any individuals, i.a interviews, observations, or surveys, there is no risk for distortion of the empirical data acquired from the case company. The only criticism is that the case company only could provide for thirty-one documents, and that these documents could differ from documents in general. This does however not affect the trustworthiness of the result, since the measurements are applicable for all types of project closure documents that give account for new knowledge.

The experience captured in the project closure documents, is captured in order to provide for new knowledge. This corresponds very well with the purpose of the thesis, to examine experience captured by these documents. There are insufficiencies concerning how the new knowledge is formalised in the documents. This does however not affect the result negatively since it lies in the thesis purpose to analyse and measure these insufficiencies.

The examination and analysis of the empirical data have been performed iteratively in order to ensure that the process is performed consequently throughout the study. This means that it always been possible to go back to the sources, i.e. the PPS Handbook and the project
closure documents, in order to guarantee compliances between the result and the empirical data acquired. This gives that the result of the thesis is very reliable.

### 3.5 Methodological problems

Of the documents acquired only ten out of thirty-one included the chapter *Experience feedback*. This resulted in an empirical result that is based on fewer documents than intended. These documents did however include a lot more experiences that initially expected. The empirical data describing experience and knowledge encountered span over a couple of years and categories, and therefore gives a comprehensive picture of knowledge acquired.

All different kinds of categorisations involved interpretation of the experience content. This was managed through performing every categorisation twice or more. To avoid bias, the result from previous categorisations was hidden. During the categorisation, notes were continuously taken in order to pinpoint the knowledge type. This means that any biases and distortions in the process were avoided.

No categorisations were performed simultaneously, because knowledge types in different taxonomies can bare similarities. To avoid incorrect categorisation, these taxonomies needed to be kept apart, e.g. Cooper’s (2009) *processes* and *process* from the taxonomy described by Millar et al. (1997) do not refer to the exact same type of knowledge.

Two out of four taxonomy categorisations involved too much interpretation in order to determine in what knowledge type the experiences should be categorised. If pursuing results of these categorisations, would most certainly involve great amount of bias. The taxonomies were therefore abounded.
This part represents the first of the thesis three streams. The stream is based on empirical findings in the PPS Handbook used at the case company. The section starts with a description of the streams study design (section 4.1) followed by the empirical result (section 4.2) and the discussion (section 4.3). The section finishes with the concluding result (section 4.4) and implications (section 4.5).

This part aims to describe the empirical result from the study that is used to answer the sub-questions (defined in sections 2.2.1, 2.3.1, and 2.4.1):

Q1: What capabilities can the project closure phase contribute to within the Knowledge Management Cycle?

Q2: How does the closure phase incorporate aspects of knowledge sharing in procedures and guidelines?

Q4: What knowledge types can project closure documents theoretically capture?

4.1 Study design

The section describes the selection (section 4.1.1) and the analysis of empirical data (section 4.1.2). The empirical data is then presented in section 4.2, and discussed in section 4.3.

4.1.1 Selection of Empirical data

The handbook constitutes of a binder that contains several exchangeable sections. Each section describes a specific concept in the project model. The sections relevant to obtain the purpose, describes either an overview of PPS, or the project closure phase in details. In order to give the reader an understanding of the context of the project closure phase, a brief description of the project model is presented, i.e. general information about the model, how projects are defined in the model, and the sequential decision points in the model.

4.1.2 Analysis of the Empirical data

PPS handbook is complete and easy to understand. There was consequently no need to further analyse and concentrate it to any particular extent. The information found in Empirical result (section 4.2), does therefore not differ significantly from the information given in the handbook. Additionally, no further manipulation of the empirical findings that has changed the meaning of the information has taken place.

The description of the project closure phase, including closing seminar, production of final report, the final report, and final report templates, are described as they are described in the handbook. Theories regarding KMC and knowledge sharing have been used when selecting relevant data. This has been done by screening the handbook for words or expressions that bear similarities with concept found in the theoretical framework (sections 2.2 and 2.3).

4.2 Empirical result

This section describes empirical data collected from the PPS handbook. It gives general information about the project model (section 4.2.1), and account for the different Decision Points in PPS (section 4.2.2). The chapter focuses on the project closure phase (section 4.2.3), and the key-activities (section 4.2.4), i.e. the closing seminar and the production of final report. The section ends with a description of the different final reports templates used in PPS (section 4.2.5).

4.2.1 General Information about PPS

According to the PPS Handbook (TietoEnator, 2006a), PPS is practical and well proven, preventive and correcting, and takes care of relationships. The project model contributes to
result oriented work that is more effective, satisfied and secure customers, and satisfied and secure staff. To adopt PPS means situational adaptation to ensure the customer benefit and the profitability of the individual project, as well as that all deviations must be motivated and documented. The handbook starts with following introduction to the project model:

PPS is a working method for actively planning and managing projects. The method is based more on experience gained in completed projects, rather than theoretical models. The purpose of PPS, initially and during the project is to continuously check the benefit and quality.

PPS provides support for thought processes and helps you by means of practical checklists and templates. PPS is independent of the type of result the project produces and the production model used. PPS indicates no specific operation to produce the result.

One of the basic ideas of PPS is to work with clear and agreed objectives. Another is to be prepared when problem arise. The central concepts are personal commitment, openness and trust. Each member of the project staff acknowledges their role and ensures that all actions lead towards the common objective.

The project is initiated by the project owner produces a project directive. The project manager performs the preparation work and documents the result in the project plan. With this as a starting point, the project work progresses in a controlled manner towards objective, making corrective decisions if required at defined decision points. In PPS we (sic!) eight different types of decision points are described.

During the execution of the project we regularly report by means of project status reports. We document all decisions in, for example, steering group minutes. (TietoEnator, 2006a, p. 2)

4.2.2 Decision Points in PPS

PPS constitutes of eight Decision Points (DP). The purpose of these is to grant for a structured decision-making process in the project. The DPs provide an agreed and controllable sequence, and an opportunity to check off benefits and results of the project (TietoEnator, 2006b). The eight DPs and their main objectives are displayed in Table 4.2-1.

<table>
<thead>
<tr>
<th>Decision Point</th>
<th>Main objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP1</td>
<td>Preparation starts. Responsibility and budget agreed as far as DP2/DP3</td>
</tr>
<tr>
<td>DP2</td>
<td>Preparation continues or is interrupted. Possible revision of budget and preconditions</td>
</tr>
<tr>
<td>DP3</td>
<td>Preparation concluded. Project plan, requirement description and solution description agreed.</td>
</tr>
<tr>
<td>DP4</td>
<td>Execution starts (based on decision at DP3). Working method, budget, schedule and risk agreed for the whole commitment.</td>
</tr>
<tr>
<td>DP5</td>
<td>Execution continues, changes, or is interrupted, based on: monitoring, project and risk analysis; verification of partial result or result; or requirement dialogue, new or changed preconditions.</td>
</tr>
<tr>
<td>DP6</td>
<td>Delivery or partial delivery</td>
</tr>
<tr>
<td>DP7</td>
<td>Transfer of responsibilities</td>
</tr>
<tr>
<td>DP8</td>
<td>Project closure</td>
</tr>
</tbody>
</table>

Table 4.2-1 Decision Points and their main objectives
The table gives account for decision points and the main objectives (TietoEnator, 2006a).

At each DP, there is a basis for decision-making produced by the project management. The steering group meets and decides whether the project should continue or not, and the project management is given the authority required to implement decisions made (ibid.).

4.2.3 Project closure phase in PPS

At DP7, the project has delivered and transferred the agreed result, and the execution of the project is finished. The remaining activity is to conclude the project by holding a closing
In DP8, the main decision is to conclude the project, and there should be an agreement regarding “concluding the project and closing the project account”. The bases for decision are minutes from delivery and transferral meetings, final report, and list of filed documents. The handbook points out that it is important to remember to “make your experiences available to other projects” (ibid.). The checklist for DP8 is as follows:

- Project owner: Is there a plan to get feedback on the effects/benefits?
- Project owner: Is there a surplus on the project budget?
- Project manager: Have all resources been phased out? Staff? Equipment? Rooms?
- Project manager: Has all the project documentation been filed?
- Project manager: Has the closing seminar been held?
- Project manager: Have the steering group’s and the staff’s experiences been collected?
- Project manager: Has the final report been written?
- Together: Have we agreed where the final report and project documentation will be archived?

4.2.4 Closing seminar and Final report

Following information is found in the PPS handbook regarding the project closure phase, i.e. closing seminar and final report.

When the project has delivered and transferred the agreed results, the execution of the project is finished. Now it remains to conclude the project. During conclusion, the project held a closing seminar and produce a final report. Holding the closing seminar gives a clear signal that the project is finished. Everybody who has been involved in the project

- knows that the project is finished
- learn how it has succeeded
- takes part in other people’s experiences from the project
- has a chance to contribute their own experiences

Holding a closing seminar is a good way of exchanging experiences within the project organisation. Every project brings new experiences and, in order to preserve them for the benefit of future projects, they must be summarized and documented.

Properly documented experiences provide good pre-conditions for future projects. These experiences, together with an overall description of how the project developed and how it met its objectives, are collected in a final report. The base organisation is responsible for ensuring that the final report is made available in an agreed manner to other and new projects (TietoEnator, 2006c).

Closing seminar

The closing seminar takes place between DP7 and DP8, and the purpose is to ensure that everybody knows that the project is finished and how well it has succeeded. The basis should exist for a final report containing the most valuable experiences, and everybody should know where the final report should be filed (TietoEnator, 2006c).

Participants at the closing seminar should be everybody in the project, plus representatives of the project stakeholders. If possible, people who have left the project in early stages should also participate. The content of the closing seminar is as follow (ibid.):

- Background: short review – the customer, project idea and project objective
- Objective fulfilment: delivery dates; costs; and quality
• What is remaining: remaining closure activities; who does what; continued work and organisation form
• Exchange of experiences: organisation, roles and the dividing of responsibility; production models; working methods within the project; co-operation within the project; co-operation with other project, the base organisation and suppliers; equipment and rooms; information distribution; meetings; what was bad?; and what was good?
• Common activity: dinner

Final report

The purpose of the final reports is to summarise achievements of objectives, experiences and recommendation for improved working methods. The handbook states that everybody should contribute to the project’s final report. However, the project manager has responsibility for the production, distribution and filing of the final report. Then, the base organisation has the responsibility for making the final reports available for future needs (TietoEnator, 2006c).

The content of the actual final report is as follow: project background; objective fulfilment; how the project events developed; experiences; the projects and the customer's perceived quality; and references. These experiences, together with an overall description of how the project developed and how it met objectives are collected in a final report. The final reports build on the idea that improvements presumes experiences, and that the document helps the organisation not to re-invent the wheel (ibid.).

4.2.5 Final report templates

PPS uses two different templates for final reports (TietoEnator, 2006e). The templates are MS Word documents, and can easily be downloaded through the intranet.

The first is the template normally used (TietoEnator, 2006d), while the second is used for simple and non-complex projects (TietoEnator, 2006e). Both contain five chapters where Experience feedback is one. Lead text in this chapter state: Write recommendations and suggestions for future projects. The other four chapters are:

• Basic information, which describes the project background and summaries the project
• Achievement of objectives, which describes how the project outcome meets agreed objectives and costs
• Project execution, which describes the course of events within the project, and how well the project followed project schedule and chosen production strategy
• Project and customer-perceived quality, which includes comments from the steering group and project management regarding what has worked well and less well

In the normally used template, the chapter Experience feedback contain fifteen sections, and two are divided into sub-sections. In the template used for simple projects, Experience feedback contains seven sections. The differences in this chapter are displayed in Table 4.2-2.

The sub-headings in the chapter Experience feedback are not described, but self-explanatory. Especially for individuals that have knowledge about the project model. Based on the PPS Handbook, the categories are described in Appendix B.
Final report (normal projects) | Final report (simple projects)
---|---
Project organisation | Project organisation, staffing
Facilities, equipment and rooms | Project schedule, milestones and decision points
Staffing and training | Resource allocation, purchase of result
Project schedule | Production model, requirement dialogue
Decision points, milestones | Meetings, information distribution
Resource allocation | Delivery and transferral
Purchase of result | Risk analysis, risk management
Delivery and transferral | |
Risks | |
Production model: (1) Requirements and solution, (2) Development of results, (3) Verification (test and reviews)
Document management | |
Deviation and change management | |
Quality assurance, project analysis | |
Requirement dialogue | |
Routines: (1) Administrative routines, (2) Meetings, (3) Information distribution, (4) Confidentiality, security, (5) Conclusion |

Table 4.2-2 Sections in the Chapter Experience feedback

The table describes sections in the chapter Experience feedback of the two final report templates that PPS incorporates. The sections Production model and Routines have sub-sections.

4.3 Discussion

This section discusses the three sub-questions that aim to analyse the framework that is given by the project model Practical Project Steering. The first sub-question (Q1) investigates similarities between the project closure phase and KMC. The second sub-question (Q3) discusses how project closure phase activities, i.e. closing seminar and production of project closure documents correspond to theories regarding project knowledge sharing and lessons learned. The third sub-question (Q4) identifies what knowledge types the project closure documents are enable to capture.

Because of the sometimes long and thoroughly discussions, each section is summarised in the end of the specific section. Concluding results are then presented in section 4.4, and implications in section 4.5.

Q1: What capabilities can the project closure phase contribute to within the Knowledge Management Cycle?

Theories used when answering this sub-research question is primarily found in Knowledge Management Cycles (section 2.2). In the theoretical framework, two different KMC are described, referred to as Four Processes of Knowledge Management (section 2.2.3), and the AOD Model (section 2.2.4). The following section will explain how the project closure phase fits in these cycles by answering the research question in the headline. Each theory is briefly recapitalised in the beginning of each section, and the discussion is summarised in the end of this section.

Four Processes of Knowledge Management

The four Knowledge Management Processes are knowledge creation, knowledge storage & retrieval, knowledge transfer, and knowledge application (Alavi & Leidner, 2001).

Knowledge Creation

The closing seminar is an activity that builds on interaction between individuals. Therefore, it is a part of the knowledge creation process, described by Alavi and Leidner (2001). The knowledge creation process implies that knowledge is created through reflection and learning in interaction between individuals when solving a problem (Alavi & Tiwana, 2003). It could be said that the closing seminar not is a situation where problems are solved, but it is an arena
for reflection and learning. During the seminar, participants of the project ought to share their experiences. One aim is to formalise the group’s experiences in the final report, this implicates interaction between the individuals. It has to be said that most of the knowledge creation takes part in earlier phases of the project.

The model incorporates Nonaka’s (1994) different modes of knowledge creation in the knowledge creation process (Alavi & Leidner, 2001). Socialisation take place when individuals share their experiences and creates common unarticulated beliefs (Nonaka et al., 2000), which is similar to the purpose of the closing seminar. The closing seminar is an arena where socialisation is possible. This is however not the prime knowledge creation mode that the closing seminar is about, but a positive side effect.

The prime purpose of the closing seminar is to formalise experiences, and document them in the final report. Formalised knowledge is the same as explicit knowledge, and can be created either by externalisation, or by combination (Nonaka, 1994). There is also a possibility that there exists internalisation during the closing seminar. This is however not the prime knowledge creation mode, but, just as socialisation, a positive side effect.

**Knowledge Storage & Retrieval**

One purpose of holding a closing seminar is to make room for participants and stakeholders to exchange experience. The sum of the experiences are formalised in the final report. The process knowledge storage & retrieval is about ensuring that experience gained remains in the organisational memory (Alavi & Leidner, 2001), which is the aim of the activities.

Knowledge storage & retrieval constitutes of three key activities: determine knowledge content; determine sources and specify the need for gathering; and develop an external memory and make it available for further use (ibid.). During the closing seminar, participants determine which experiences that are important – the knowledge content. The sources are predestined by the project model – participants and stakeholders of the project. The third activity is represented by the production of the final report, where the knowledge content is formalised and made available.

Alavi and Tiwana (2003) describe internal and external organisational memories. The activities in the project closure phase embrace both types. The closing seminar is about sharing experiences between participants and stakeholders. This broadens the internal memory, which according to Alavi and Tiwana (2003) resides in individual’s capabilities and the organisational culture. The final report, on the other hand, is about formialise knowledge in documents, and thereby adding to the external organisational memory.

**Knowledge Transfer**

If knowledge storage & retrieval determines what knowledge to store and gather, knowledge transfer concerns the actual gathering process. The closing seminar and the production of final reports are therefore what Alavi and Leidner (2001) refer to as knowledge transfer.

Three types of storage processes are described: between individuals; between individuals and storage media; and, between different knowledge storage medium (ibid.). The closing seminar is about sharing experiences, and it is therefore an activity to transfer knowledge between individuals. The production of final reports gathers the experiences in a document, and the activity is therefore a way to transfer knowledge from individuals (or the project group) to a storage media.
Knowledge Application

There are no resemblances between the project closure phase and the process knowledge application. Knowledge application is about creating value by using knowledge (Alavi & Leidner, 2001), while the project closure phase is about gathering knowledge that can be used in order to create value in future projects.

The AOD Model

The three steps in the model are Acquire, Organise and Distribute. Acquire includes the activities Gather, Inquire, Validate/Verify, and Encode. Organise includes Profile, Associate, Rank and Classify, and Distribute includes Awareness, Identification and Delivery (Schwartz et al., 2000).

Acquire (Gather, Inquire, Validate/Verify, & Encode)

The purpose of both the closing seminar and the production of final reports are to acquire experience gained, and thereby examples of gather. Gathering of knowledge that resides in individuals can be done through communication channels (ibid.), and the closing seminars are a formal communication channel. The capability to registrated knowledge in a shared memory is important in order to gather knowledge externalised in documents (ibid.), which in this case is the database where the final reports are stored and made available.

The project model requires that every project team holds a closing seminar and produces a final report. This implicates that new experiences are asked for. Inquiry can be done automatically (ibid.), and in the project model, knowledge inquiry is programmed into the working routines, and therefore is the inquiry automatic.

During the closing seminar, the participants collaborate regarding identifying important experiences made. Nonaka (1994) mean that interaction contributes to amplification in the knowledge creation process. Ramaprasad and Prakash (2009) add that formal and written knowledge sharing methods are appropriate when there is a need for validation of the knowledge. Even though it is not explicated, it could be said that validate/verify is a part of the activities. Through the seminar discussion, the quantity and quality of the knowledge increases through amplification, and thereby is validated. It is important to add that this is dependent on the participants’ willingness to contribute to the process.

During the closing seminar, participants share their experiences, and then it is the project manager’s responsibility to formalise them in the final report. Formalising knowledge in order to make it storable and possible to reuse, requires encoding (Schwartz et al., 2000), it is thereby the project manager’s responsibility to encode knowledge. There is a challenge to encode knowledge in a proper manner (Davenport & Prusak, 2000). The encoding is however, supported by predefined templates that includes several knowledge categorise.

Organise (Profiling, Associate, Ranking, & Classification)

It is the project manager’s responsibility to distribute and file the final report, and the base organisation’s responsibility to make it available for further use. How the base organisation should make the reports available, is not regulated in the PPS Handbook. As mentioned above, the final reports are stored, as they are in a database available through the intranet, and not examined any further. This means that the main objective of step organise is fulfilled; knowledge is made available for further use (Schwartz et al., 2000).

Because of the transferral of responsibility, from the project manager to the base organisation, it is not specified how the organisation should perform the activities profiling, associate, ranking, and classification. There are however resemblances in project model.
Final reports ought to include project background, which gives the knowledge context. Profiling is about facilitating contextualisation by the use of meta-knowledge (Schwartz et al., 2000). The project background supports contextualisation, because it gives the knowledge a context. It could be discussed if it fulfils the criteria for meta-knowledge. This is however not a part of the thesis.

There are no similarities in the model with neither associate nor ranking. These activities are related to make the most out of the total knowledge base (ibid.). The responsibility for this can therefore not be placed in the specific projects. This is also true for classification, but because of the predestined knowledge categorise in the final report templates, it could be said that the project model supports classification. Final reports thereby meet the objective of classification, i.e. dependencies to other knowledge objects in the same category (ibid.).

**Distribution (Awareness, Identification, & Delivery)**

Distribution is about make the knowledge come in use in the organisation (ibid.). The transferral of knowledge in the project closure phase is not primarily to make the knowledge used by the organisation, but still, a precondition for this. There are not similarities found in the project model’s project closure phase and the activities awareness, identification, and delivery.

**Summary**

The contributions of the project closure phase to the different KMC, discussed above, are graphical summarised in Figure 4.3-1.

<table>
<thead>
<tr>
<th>Knowledge Creation:</th>
<th>Aquire:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socialisation</td>
<td>Gather ........................................ Yes</td>
</tr>
<tr>
<td>Externalisation</td>
<td>Inquire .................................... Yes</td>
</tr>
<tr>
<td>Combination</td>
<td>Validate/verify .................. Enabled</td>
</tr>
<tr>
<td>Internalisation</td>
<td>Encode ................................. Enabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge Storage &amp; Retrieval:</th>
<th>Organise:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal memory</td>
<td>Profiling ....................... Yes</td>
</tr>
<tr>
<td>External memory</td>
<td>Association ........................</td>
</tr>
<tr>
<td></td>
<td>Ranking ...........................</td>
</tr>
<tr>
<td></td>
<td>Classification ................  Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge Transfer:</th>
<th>Distribute:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between individuals</td>
<td>Awareness ........................</td>
</tr>
<tr>
<td>Between individuals &amp; storage media</td>
<td>Identification .................</td>
</tr>
<tr>
<td>Between storage medium</td>
<td>Delivery ..........................</td>
</tr>
</tbody>
</table>

**Figure 4.3-1 Contributions to the Knowledge Management Cycle**

a) The figure describes how the project closure phase meets objectives in the Four Processes of Knowledge Management, described by Alavi & Leidner (2001).

b) The figure describes how the project closure phase meets objectives in the AOD model, described by Schwartz et al. (2000).

*Yes* means that the objective is met and that this is mandatory. *Enabled* means that it is possible to meet the specific objective, however not mandatory.

As seen in Figure 4.3-1, the project closure phase does not solely reside in one process or activity. Instead, it spans over several, and often the objectives are only to some extent met, e.g. two of three knowledge transfer aspects are incorporated in the project closure phase (Figure 4.3-1a), and only two of four activities within organise (Figure 4.3-1b).
The difference between objective met and objective enabled, can be seen as academic hair-splitting, there is an important difference though. Objective met means there are substantial findings in the project model that makes it mandatory to fulfil the objective. Objective enabled, on the other hand, means there are no contradiction in fulfil the objective and the project model framework, although it is not mandatory, or just a side effect. For example, the closing seminar is about together formalise experiences in the final report, and thereby create knowledge through either Externalisation or Combination; the positive side effect is that interaction also can create knowledge through Socialisation.

The project closure phase does not totally correspond to any of the cycle. This has the consequence that the case company need to implement other activities that ensures that the other objectives are met. This is however not addressed in this thesis.

Q2: How does the closure phase incorporate aspects of knowledge sharing in procedures and guidelines?

Theories used when answering this sub-question is primarily found in Knowledge Sharing and Lessons Learned (section 2.3). In the theoretical framework, organisational learning practices is divided into project learning activities and the lessons learned producing practices. This section does however start with clearing out what knowledge sharing method the project closure phase de facto is. The discussion is summarised in the end of this section.

The knowledge sharing method in the project closure phase

The project closure phase at the case company constitutes of the closing seminar and the production of the final report. Both are important in order to achieve knowledge sharing.

The closing seminar is what Ramaprasad and Prakash (2009) refer to as an oral-formal knowledge sharing method, while the final report is a written-formal method. This does not mean that oral-informal and written-informal knowledge sharing methods are not in use, but they are not regulated by the project model framework, and therefore not addressed in this thesis. The type of knowledge sharing of the project closure phase de facto is. The discussion is summarised in the end of this section.

Project Learning Practices

Out of a knowledge sharing perspective, the project closure phase has two purposes. The first is to share experiences within the project, which Kotnour (2000) refers to as intra-project learning. The other is to capture experiences in order to enable knowledge sharing with projects to come, which is referred to as inter-project learning (Kotnour, 2000). Both types of learning aim to overcome knowledge-sharing barriers in the project-oriented organisation, and this is the very aim of lessons learned practices (ibid.).

Intra-project learning takes place during closing seminars, while production of final reports primarily supports inter-project learning. There are however elements of intra-project learning in the production of final reports, due to collaboration, which means that the intra-project learning supports the inter-project learning. Final report templates are a support, as it helps the project team to document their experiences in a structured manner, without reinventing the wheel – the ultimate aim of KM according to Kankanhalli and Tan (2004).

This means that the project closure phase’s activities support both intra- and inter-project learning. Here, the artefacts final report templates are a learning support because it helps the project group when formulating experiences for inter-project learning. The templates also function as a support for intra-project learning, since the project team member are obligated to share experiences in order to write the document.
Lessons Learned Producing Practices

Lessons learned plays two roles in PKM. The first is to provide an opportunity for project team members to reflect on their project performance, and understand the project result (Kotnour, 2000). This is provided for by holding the closing seminar.

The second is to document experiences (ibid.), which is done in the final report. This means that both the closing seminar and the production of the final report are important activities for the knowledge sharing within the case company. The conceptual model of organisational learning describes four dimensions of lessons learned production (ibid.).

Lessons learned dimension: when

The case company do only perform knowledge-sharing activities in the project end. This means that this phase only correspond to one value of the dimension when.

When refers to the time in the project cycle experiences are captured (ibid.), and the fact that the project model does not incorporate lessons learned production at times opportunity arises, or throughout the project during regular meetings, can have the consequence that the organisation fails to capture important experiences. This gives that the quality in the lessons learned production is dependent on the closing seminar participants’ ability to remember their experience made.

An advantage is that everybody, even those who have left the project in early stages, should be part of the closing seminar. It could be assumed that the group’s ability to remember important experiences increases if everybody involved are able to participate at the seminar.

Lessons learned dimension: what about

Closing seminars and final reports are to include good as well as bad practices. Another important issue during the closing seminar is that it includes objective fulfilment. This correspond to the dimension what about, that describes what lesson learned ought to include (ibid.). In the dimension, the author makes a distinction between tasks with minor problems and tasks with major problems. This distinction is not made in the PPS handbook.

Lessons learned dimension: how know

Throughout the project, at the Decision Points, the project’s progress is continuously monitored. This gives information that in the end can be used to compare the actual performance to the plan. This is the first type of action in the dimension how know (ibid.), and is included in the final report in the chapter Achievement of objectives. The other task in the dimension is to remember which tasks to create lessons learned about (ibid.). This task is not addressed in the PPS handbook, but it could be said that the closing seminar supports the project manager to remember important experiences made.

Lessons learned dimension: what is included

The documents, according to the template and the PPS handbook, is to include how well the project followed original schedule, achievement of objectives, and good and bad experiences. The final reports therefore correspond very well to the lessons learned practices in Kotnour’s (2000) fourth dimension what is included.

Summary

Closing seminars are what Ramaprasad and Prakash (2009) refer to as oral-formal knowledge-sharing method, while final reports are written-formal. The project closure phase supports both intra- and inter-project learning by the use of closing seminar and final reports. The closing seminar is
primarily a support for intra-project learning, while the production of final reports primarily supports inter-project learning. The final report template is a support for inter-project learning.

Kotnour (2000) state that lessons learned plays two roles in Project Knowledge Management and the project closure phase activities embrace both, as it provides for an opportunity to reflect on the project performance, and documents the experiences in a final report.

The production of final reports embraces all five dimensions of lessons learned production identified by Kotnour (2000). The consequence of only performing this activity in the end of the project is that important experiences are missed. There is however, a benefit because of the fact that everybody involved in the project ought to participate. The productions of final reports thereby correspond very well to theories regarding what about lessons learned documents should be.

Q4: What knowledge types can project closure documents theoretical capture?

Theories used when answering the sub-question is primarily found in The Knowledge Object Level (section 2.4). Although it is established that tacit knowledge cannot be captured in explicated form, the section starts with a discussion regarding what closing seminars and project closure documents put together can bring about. Taxonomies used in this section are found in section 2.4.6 to 2.4.10. The discussion is summarised in the end of this section.

Explicit & Tacit knowledge

As discussed earlier, the closing seminar enables knowledge creation through socialisation and internalisation. These knowledge creation modes are about creating tacit knowledge (Nonaka, 1994). Tacit knowledge can however not be formalised and explicated (Nonaka et al., 2000), which has the consequence that it only can be stored within individuals, i.e. the internal memory (Alavi & Leidner, 2001).

The project closure phase does however also incorporate knowledge creation through externalisation and combination. These knowledge creation modes are about creation explicit knowledge (Nonaka, 1994), which can be expressed in formal language (Nonaka et al., 2000), and thereby formalised and explicated. Explicit knowledge can be stored both in individuals, and in documents, i.e. the internal respectively external memory (Alavi & Leidner, 2001).

This means that tacit knowledge only can be capture and stored in the internal memory at the closing seminar, while explicit knowledge can be captured and stored in both the internal memory, the closing seminar, and in an external memory, the final report.

Because of the closing seminar main purpose is to produce explicit knowledge and then formalise it in the final report, following discussion will concentrate on explicit knowledge that can be documented.

Sociological Taxonomy

Embodied is held within the human body, while embrained knowledge in the brain (Collins, 1993). This makes these types of knowledge difficult to communicate, if even possible. The consequence is that they cannot be formalised within the final report, and thereby not be captured in the organisations external memory.

Encultured refers to contextual knowledge in the social group (ibid.). It is possible, or even likely that this type of knowledge is captured in the final reports. Collins (1993) means that the encultured knowledge affects how people behave and speak which even could affect how
Encultured knowledge is thereby partial tacit, and partial explicit, only the explicit part can be captured though.

Symbol-type is transferrable without loss in codified form (Collins, 1993), making it not only able to capture by final reports, but possible to capture without any significant loss in quality.

**Contingent Knowledge Taxonomy**

*Formal knowledge* is explicated in theories and formulae (Fleck, 1997), and bear thereby similarities with what Nonaka (1994) refer to as explicit knowledge. This type of knowledge can therefore be captured in final reports.

*Instrumentalities* resides in the use of tools and instruments (ibid.), and bear thereby similarities to what Collins (1993) refer to as *embedded knowledge*. As for the embedded knowledge, instrumentalities cannot be captured in the final report.

*Informal knowledge* refers knowledge, i.a. rules of thumb and tricks of trade (Fleck, 1997), which can be explicated in manuals and guidebooks. This type of knowledge can thereby be captured and codified in the final report. *Informal knowledge* can also help to understand instrumentalities (ibid.), which makes it important to capture in order to make the most out of instrumentalities that cannot be captured.

*Contingent knowledge* is specific for a given context, in which it also is embodied (ibid.); it can be knowledge that is only relevant for a specific task. The context dependency gives that it can be difficult to approximate if the contingent knowledge is valuable or not, if you do not have enough knowledge about the context. The final report is however about capturing experiences in a specific context, this means that contingent knowledge can be captured.

*Tacit knowledge* cannot be formalised or codified in documents (ibid.), and can thereby not be captured by final reports.

*Meta-knowledge* is acquired through socialisation (ibid.), which means that it cannot be captured by the final report.

**Knowledge of Information and Contextual Knowledge**

*Knowledge of information* is symbolic in nature (Millar et al., 1997), which can be compared to what Nonaka (1994) describe as explicit knowledge. Both catalogue and explanatory knowledge are thereby easy to capture by the final report.

*Contextual knowledge* is bound to the context (Millar et al., 1997). It is however, not the same as what Nonaka (1994) refer to as tacit knowledge. Contextual knowledge, i.e. process, social and experiential knowledge, can on the contrary be transmitted formally, but it requires according to Millar et al. (1997) decontextualisation. The downside is that the knowledge loses its specific character in the process (Millar et al., 1997), and these types of knowledge captured in the final report will thereby have lower quality, but they are still possible to capture.

Of the contextual knowledge types, experiential knowledge is especially interesting when discussing experience captured, since it derives from empirical observations (ibid.), hence the name. This has to be acknowledged when categorising the experiences.

**Pragmatic Approach of Classification**

The pragmatic approach to knowledge classification focuses on the specific organisation, and knowledge it may find important (Alavi & Leidner, 2001). Because of the fact that the
knowledge types in the pragmatic approach not are specified, it cannot be told whether they can be explicated in final reports or not.

There are however other pragmatic taxonomies that are specified. At the case company, the final report templates include such a classification. The pragmatic classification of knowledge in the final report is found in Table 4.2-2 (see p. 32). Another pragmatic taxonomy is described by Cooper (2009). Subject areas of experiences, is a classification that has a pragmatic approach. Because of the fact that these areas derives from a study of how project team members refers to experience, it is given that these can be formalised and expressed. Cooper’s (2009) subject areas can therefore be formalised in the final reports.

Problem focused Taxonomy

The problem-focused taxonomy, suggested by Ramaprasad and Prakash (2009), bears similarities to what Alavi and Leidner (2001) refers to as a pragmatic classification. The taxonomy are anchored to project knowledge, and focuses on how to manage problems (Ramaprasad & Prakash, 2009), which is the aim of the project; Disterer (2002) states that projects aim to solve innovative and interdisciplinary tasks, i.e. manage and solve problems.

Ramaprasad and Prakash (2009) do not embrace theories about what Nonaka (1994) refer to as tacit and explicit knowledge in their taxonomy. It is not possible to isolate the knowledge types as either tacit or explicit, and consequently must the suggested knowledge types be regarded as partial tacit and partial explicit.

For instance, problem recognition is about identifying problems as early and correct as possible (Ramaprasad & Prakash, 2009). Explicit knowledge can be supportive because it helps to recognise problems because it can provide the project with information regarding common problems that often occurs.

The project can however not solely rely on knowledge regarding what problems commonly occur; it also has to be able to identify other problems. This can involve tricks of trade, or a gut feeling, since what can be a problem in one project may be the solution in another. This is also true for other knowledge types in this taxonomy, and because of the partial explicit nature, all knowledge types can be partly captured by the final report.

Summary

Knowledge types final reports can capture are shown in Table 4.3-1 (see p. 41). Alavi & Leidner’s (2001) pragmatic taxonomy do not specify knowledge types, and is therefore not included. This is also true for Cooper’s (2009) subject areas of experiences.

Even though Nonaka’s (1994) taxonomy only constitutes of two knowledge types, it is of great importance when analysing the other taxonomies. Collins (1993) and Fleck (1997) both embrace the idea of knowledge as either tacit or explicit, and therefore suggests taxonomies where knowledge types are either tacit or explicit.

It can be argued that enculturated knowledge (Collins, 1993), cannot be fully captured by final reports; enculturated knowledge does however, affect both what is captured, and how the final report is formulated. It is questionable to include the knowledge type among those that are possible to capture, hence the star (*).

In the taxonomies suggested by Millar et al. (1997) and Ramaprasad & Prakash (2009), every knowledge type is possible to capture. Both taxonomies incorporate however, knowledge types that cannot be totally captured.
Millar et al. (1997) mean that process, social, and experiential knowledge can be captured, even though they are tacit. They do however decrease in quality in the transformation process, hence the double star (**)..

Ramaprasad & Prakash’s (2009) taxonomy differs from the other taxonomies because it has a pragmatic approach. The consequence is that the knowledge types are all partial tacit and partial explicit. Only the explicit part can be captured though.

<table>
<thead>
<tr>
<th>Theory</th>
<th>Not possible to capture</th>
<th>Possible to capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonaka (1994)</td>
<td>Tacit</td>
<td>Explicit</td>
</tr>
<tr>
<td>Collins (1993)</td>
<td>Embodied &amp; Embraided</td>
<td>Encultured* &amp; Symbol-type</td>
</tr>
<tr>
<td>Fleck (1997)</td>
<td>Instrumentalities, Tacit &amp; Meta-knowledge</td>
<td>Formal, Informal &amp; Contingent</td>
</tr>
</tbody>
</table>

Table 4.3-1 Table summary of knowledge taxonomies
The table describes what types of knowledge in respective taxonomy that is possible to capture by final reports. The pragmatic approach of knowledge taxonomy (Alavi & Leidner, 2001), is left out in the table, because it do not specify any knowledge types.
* Knowledge types that are only partial possible to capture
** Knowledge types that decreases in quality when captured in final reports

4.4 Concluding result
This section gives account for the concluding result of the three sub-research questions within this stream (Q1, Q2, and Q4).

Q1: What capabilities can the project closure phase contribute to within the Knowledge Management Cycle?

☞ The project closure phase meets some, but not all, objectives in the Knowledge Management Cycles, but the met objectives is distributed over several processes/steps and the project closure phase can therefore not be placed in a specific process/step

☞ The project closure phase’s contribution to the Four Processes of KM is that it...

... is an arena for learning and reflection through interaction between individuals, where knowledge is created primarily through externalisation and combination

... develops and adds knowledge to both the internal and external organisational memory

... transfers knowledge between individuals, as well as from individuals to a storage media

... does however not create value by using knowledge

☞ The project closure phase’s contribution to the AOD model is that it...

... acquires knowledge by inquire and gather experiences, which may become validated/verified in the interaction between individuals and encoded in the templates predefined knowledge categories

... makes experiences available for further use, but does not organise the knowledge, even though the templates can support this in some extent

... does however not make knowledge come in use in the organisation
Q2: How does the closure phase incorporate aspects of knowledge sharing in procedures and guidelines?

- The project closure phase incorporates knowledge sharing since it...
  - provide for oral-formal, during closing seminars, and written-formal knowledge sharing, in the production of project closure documents
  - provide for both intra- and inter-project learning, where intra-project learning as well as final report templates are learning support for inter-project learning

- The production of project closure documents is a lessons learned practice since it...
  - can be described by using the lessons learned dimension; it does not incorporate all aspects of the dimensions though
  - may however fail to acquire important experiences since the final reports are produced in the end and not throughout the whole project

Q4: What knowledge types can project closure documents theoretical capture?

- The project closure documents can theoretically capture...
  - explicit knowledge; tacit knowledge must undergo externalisation in order to be captured
  - symbol-type knowledge without loss in quality, as well as the explicit part of the encultured knowledge
  - formal, informal, and contingent knowledge without loss in quality
  - catalogue and explanatory knowledge without loss in quality; as well as decontextualised process, social and experiential knowledge
  - capture all types of subject areas of experiences
  - the explicit part of the five knowledge categories; the tacit part must undergo externalisation in order to be captured

4.5 Implications

The final reports within the project model PPS correspond very well to theories regarding lessons learned production. This will be acknowledged, and based on the above result and discussion, the actual final reports will be examined and analysed regarding whether they incorporate this or not (Q3 chapter 5). The lessons learned dimension: how know differ from the other three since it describes supportive elements. This means it may be impossible to see evidence of this dimension in the actual documents, even if these activities take place.

Because of the limitation to capture all types of knowledge in the taxonomies suggested by Collins (1993), and Fleck (1997), these will not be used when analysing the final reports. The knowledge captured in the final reports will be analysed using the taxonomies suggested by Millar et al. (1997), and Ramaprasad and Prakash (2009). The subject areas of experiences identified by Cooper (2009), will be used as a pragmatic taxonomy, and will be part of the analysis. The experience within the actual final reports will be examined and categorised according to these taxonomies (Q5 chapter 6).
5 The Final reports: Theory vs. Practice

This part represents the second of the thesis three streams. The stream is based on the actual final reports acquired from the case company. The section starts with a description of the streams study design (section 5.1) followed by the empirical result (section 5.2) and the discussion (section 5.3). The section finishes with the conclusions (section 5.4) and implications (section 5.5).

This part aims to describe the empirical result from the study that is used to answer the sub-question (defined in section 2.3.1):

*Q3: How do the authentic final reports correspond to theories of lessons learned?*

5.1 Study design

The section describes the selection (section 5.1.1) and the analysis of empirical data (section 5.1.2). The empirical data is then presented in section 5.2, and discussed in section 5.3.

5.1.1 Selection of Empirical data

From the *final report* database at the case company, thirty-one *final reports* were acquired from projects closed between 2004 and 2009. The distribution over time, with number of projects in parenthesis, is 2004 (3), 2005 (1), 2006 (8), 2007 (9), 2008 (4), and 2009 (6). All these documents were acquired in order to answer the present sub-question.

Since the case company recently had collected and organised these documents in a database, it is not analysed why the database only contains thirty-one *final reports*. It is not beneficial to call to account for this situation, since the case company is in the initial stage of this work.

By studying the routines for *lessons learned production*, (Q2 section 5.3, p. 37) elements that correspond to the four dimensions of *lessons learned production* (section 2.3.4) are mapped out. In order to gain knowledge regarding if it is a benefit or a disadvantage, these factors will be further analysed in order to explain how it affects the outcome.

5.1.2 Analysis of the Empirical data

The *final report* content is analysed regarding if they meet the objectives for being a *lessons learned document* described by literature (section 2.3) and the result of Q2 (section 5.3). This because it is not a given that they do so, even if the PPS framework stipulates they should, i.e. the implementation of routines and working methods may be insufficient.

The empirical data found in the authentic *project closure documents* in hand, is analysed through categorisation according to the *lessons learned dimensions*. This means that the empirical data is systemised in the categories *when*, *what about*, *how know*, and *what is included*.

When executing the analysis, it became clear that some *final reports* acquired, did not correspond to the template suggested by the *PPS Handbook*. This is acknowledged in the empirical presentation (section 5.2).
5.2 Empirical result

This section describes empirical data collected from the actual final reports. It starts with a description of the final report’s use of templates (section 5.2.1) and continues with describing the document content systemized according to the four dimensions of lessons learned practices: when (section 5.2.2); what about (section 5.2.3); how know (section 5.2.4); and, what is included (section 5.2.5). Each dimension is briefly described in its specific section.

5.2.1 Use of template

As described (section 4.2.5), two templates are suggested by the project model handbook: template for normal and simple projects. By comparing the headlines on level one for the whole document, and level two in chapter Experience feedback, it is determined which template the document is based on.

Of the thirty-one documents, ten are based on templates suggested by the project model. Seven of these are based on the template for normal projects, and three based on the template for simple projects. Two of the documents based on the normal template, uses other level two headlines than suggested by the PPS Handbook.

This means that twenty-one of the projects used another template, not sanctioned by the PPS Handbook. Why these documents divert from the framework given by the project model is not addressed in this thesis, but acknowledged.

Each document is between eleven and forty pages, dependent on the extent of the project. In general, final reports based on the normal template are longer than those based on the simple template are. The documents based on a template other then suggested by the project model handbook, are somewhere in between.

When adding the information of production date, there are tendencies of a movement regarding the use of templates (Table 5.2-1). Except for year 2004, the relative number of final reports based on the PPS templates increases.

<table>
<thead>
<tr>
<th>Year</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPS template</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Other template</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Percentage of PPS</td>
<td>33.3 %</td>
<td>0.0 %</td>
<td>12.5 %</td>
<td>22.2 %</td>
<td>50.0 %</td>
<td>66.7 %</td>
<td>32.2 %</td>
</tr>
</tbody>
</table>

Table 5.2-1 Use of template per year

The template describes the frequency per year and used template. It does also present the percentage rate for final reports based on the PPS template per year.

Since the final reports are based on either sanctioned or unsanctioned templates, following sections describes the two groups separately when it is called for (sections 5.2.2 to 5.2.5).

5.2.2 Lessons learned dimension: when

The dimension when refers to when in the project life cycle the production of lessons learned documents take place as opportunities arise, at regular meetings, or at the end (Kotnour, 2000). There is no clear difference between final reports based on PPS template and documents based on another template.

The final reports are produced at the end of the project lifecycle. Most documents include revision history that gives information about when the document were initiated and updated. A predominate part of the documents were produced in a period of one month or less. A few took longer time to write (6 months at the most).
A majority of these final reports are not based on templates given by the project model handbook (explained in section 5.2.1). It is however not possible to determine whether the extended time for production of the document is intentional or not.

5.2.3 Lessons learned dimension: what about

The dimension what about refers to the nature of the lesson learned itself: minor problems, met expectations, or major problems (Kotnour, 2000). There is a difference between final reports based on PPS template and documents based on another template.

Final reports based on PPS templates

Of the final reports, based on the PPS template, eight out of ten documents do not clearly state tasks that went well, or tasks with minor or major problems. Two of the documents use sub-headings that make this distinction. The sub-headings used are Worked well – highly recommended, and Didn’t work too well – should be improved before next project.

This means that a predominant part of final reports based on PPS templates do not incorporate a distinction regarding the tasks outcome. This does however not mean that the final reports do not give account for tasks that went well or had minor or major problems. By examining the content of the chapter Experience feedback, all the three types of experience are found.

Final reports based on another template

Of the final reports based on another template, seventeen out of twenty-one clearly state tasks that went well and tasks with problems. They do however not distinguish minor problems from major problems. As for the documents based on PPS template that do distinguish tasks that went well from tasks with problems, the documents use the sub-headings Worked well – highly recommended, and Didn’t work too well – should be improved before next project.

Four out of twenty-one documents do not use these sub-headings when giving account for experiences. They do however give account for all three types of experiences.

5.2.4 Lessons learned dimension: how know

The dimension how know refers to the supportive actions for identifying what about (previous dimension): compare performance with the plan, or remember important lessons learned (Kotnour, 2000). There is no clear difference between final reports based on PPS template and documents based on another template.

All documents include achievement of objectives, both objectives met and objectives that are not met. Some of the document do also include key-figures regarding budget costs and forecasts. The detail level of the information varies a lot. There is however, no significant difference regarding the extent of information that is dependent on the template used.

5.2.5 Lessons learned dimension: what is included

The dimension what is included refers to the content of the actual lessons learned document: original plan, result, problems, and tasks that went well (Kotnour, 2000). There is a difference between final reports based on PPS template and documents based on another template.

All documents include a project background description in the Introduction chapter. The extent of this description varies a lot, from three rows to three pages. This does however not affect the ability to understand the problem the project intends to solve.
Final reports based on PPS templates

The content of the actual final report is as follow: Background, Achievement of objectives, Project execution, Experience feedback, and Project and customer-perceived quality. The content of these chapters correspond to what is stipulated in the PPS handbook (see section 4.2.5) where Basic information refers to the chapter Background.

Final reports based on other template

The structure of the documents not based on sanctioned templates, constitutes in general of the chapters Introduction, Project summary, Project follow-up, Quality perceived by project stakeholders, and Conclusion.

Project Follow-up describes in details the context (constraints, requirements, pre-requisites, assumptions, and limitations), project priorities, and key figures (schedule, hours, costs, project deliverables and approval). This, in general includes deviation from original plan, and comments of deviations.

Although these documents do not include a chapter called Experience feedback, there are experiences in these documents. The chapter Conclusion does include headlines, i.a. Three positive experiences, Three negative experiences, and Recommendations. In addition does the chapter Quality perceived by project stakeholders show resemblance to chapter Experience feedback in the final report template found in the PPS Handbook. The chapter includes experiences and recommendations for future projects.

Even though there are similarities in the two chapters, there is a difference. While the purpose of Experience feedback is to “Write recommendations and suggestions for future projects”, the purpose of Quality perceived by project stakeholders is gather individual experiences from stakeholders. This can be illustrated by the following quotation found in the introduction of one Quality perceived by project stakeholders:

The below comments has been gathered either through mail answers or by “yellow notes workshop”. The comments are listed as is. Please note that a single comment represents a person’s view which not necessary is, but can be, a common view from the population of the stakeholder group.

5.3 Discussion

This section discusses the sub-question that aim to analyse the authentic project closure documents.

Q3: How do the authentic final reports correspond to theories of lessons learned?

Theories used when answering this sub-question is primarily found in Knowledge Sharing and Lessons Learned (section 2.3). In the theoretical framework, organisational learning practices is divided into project learning activities and the lessons learned producing practices. Since the sub-question focuses on the final reports, theories that correspond to this are used. The discussion does also acknowledge relevant information in previous chapter (chapter 4), i.e. result, discussion, concluding result, and implications that derives from Q2, and focuses on lessons learned documents.

Final report templates

Very few of the final report acquired are based on the template found in the PPS Handbook. This indicates that the project model, more specifically, the final report routines, are not properly implemented. Nevertheless, the relative number increases every year, which demonstrate the accomplishment of the implementation process – slowly, slowly.
The most crucial consequence of this, from this thesis point of view, is the difference regarding experiences. While the PPS template includes an isolated chapter of experiences, the final reports based on another template do not.

They do provide for experiences, especially within the chapter Quality perceived by project stakeholders. There is however an important difference. As written in one of these documents, the experiences are individual and do not give account for the project team member put together. Nonaka (1994) means that knowledge increases when people collaborate, consequently does these document include experiences with a lower validity.

Kotnour (2000) adds that the intra-project learning affects the inter-project learning positively. This means that if the people that share their experiences while producing the final report, the final report will become more beneficial for the organisation. The sanctioned templates are therefore better in providing support for knowledge sharing through inter-project learning at the case company than the unsanctioned template.

**Lessons learned dimension: when**

The final reports are produced at the end of the project life cycle. Regarding documents produced during a longer period, up to six months, it is impossible to establish exact where in the project life cycle the documents are produced. Even if that is the case, it means that the final reports follows the working methods regarding the lessons learned dimension of when (ibid.) stipulated within the PPS Handbook.

**Lessons learned dimension: what about**

As concluded in previous chapter (Q2 section 4.3, p. 37) does the PPS template not distinguish tasks with minor or major problems, from tasks that went well. On the contrary to what the project model PPS suggests, a majority of the final reports do incorporate this distinction when describing experiences. A predominant part of these is not based on the suggested PPS templates. It is important to acknowledge that even if the distinction is not made, all aspect of this dimension is visible, but you have to know what to look for.

This means that the final reports follows the working methods regarding the lessons learned dimension of what about (Kotnour, 2000) stipulated by the PPS Handbook. It does also mean that this dimension is more evident in final reports based on a template other than suggested.

**Lessons learned dimension: how know**

It is impossible to establish the activities in the lessons learned dimension of how know (ibid.) from this empirical data. Since it may be impossible to see evidence of this dimension in the actual documents, even if these activities take place (see Q2, section 4.3, p. 37). There is however clear indications that comparisons between actual performance and the plan have taken place, but as for the previous dimension, you have to know what to look for.

**Lessons learned dimension: what is included**

All ten of the final reports based on the PPS template follow the template described by the PPS Handbook (see section 4.2.5). This means that they correspond to the fourth lessons learned dimension of what is included (ibid.). This is also true for the final reports based on another template, even if the content is organised differently.

The documents do however vary in detail level, but the reason for this cannot be deduced from anything in particular. The most plausible reasons are the project itself, i.e. complex projects need more details in order to be described.
Summary

Few of the acquired final reports are based on templates found in the PPS Handbook. The most important difference is the working method for explicate the experience, i.e. collaboration at a seminar, or individual opinions.

Even though the documents not are based on sanctioned templates, they do incorporate all elements stipulated by the PPS Handbook. It can also be established that the documents include all dimension of lessons learned that, except for one since they:

- Are produced solely at the end of the project (when)
- Include minor and major problems, as well as tasks that went well even these types not always are distinguished from each other (what about)
- Cannot clearly give account for the activities used to remember what to include (how know)
- Include all elements for being a lessons learned (what is included)

5.4 Concluding result

The section presents concluding results of the sub-questions in this stream (Q3).

Q3: How do the authentic final reports correspond to theories of lessons learned?

- The authentic project closure documents are based on final report templates, although very few of them are based on templates the project model suggests
- The authentic project closure documents based on templates the project model suggests...:
  ... involve oral-formal knowledge sharing in the production, while documents based on other templates do not
  ... comply very well to how the project model suggests different aspects of the lessons learned dimensions should be met, and thereby fulfil objectives of lessons learned practice
- The authentic project closure documents are better in distinguishing good practices from bad than the project model suggests, especially documents based on template other than suggested by the project model

5.5 Implications

Previous discussion (section 5.3) means that a predominate part of the final reports acquired, do not explicitly include a chapter of experiences, even though all include experiences. Given that, the following sub-question (Q5) purpose is to describe the experience captured by the project closure phase given by the framework PPS, the above have the consequence that only one third of the final reports fulfil the requirement of the remaining study.

Although these documents are disqualified for being a part of the next research question, it is interesting to further examining them in order to establish the impact on the ability to capture experiences. Because of this, the study includes a comparison between the two chapters (Experience feedback and Quality perceived by project stakeholders) in order to investigate whether the content of the unsanctioned template based documents fulfil same objectives as the sanctioned or not.
6 Experiences in the Final reports

This part represents the third and final of the thesis three streams. The stream is based on the empirical findings within final reports chapters Experience feedback and Quality perceived by project stakeholders. The section starts with a description of the streams study design (section 6.1) followed by the empirical result (section 6.2) and the discussion (section 6.3). The section finishes with the conclusions (section 6.4) and implications.

This part aims to describe the empirical result from the study that is used to answer the sub-question (defined in section 2.4.1):

Q5: What do authentic project closure documents provide for in practice?

Since the analysis is based on actual experiences found in final reports, some experiences are used to exemplify the line of thought; these examples are referred to as exhibits. A complete list of the exhibit is found in Appendix D.

6.1 Study design

This section describes the selection of empirical data (section 6.1.1). It continuous with describing how the text in the final report is divided into Information Objects (section 6.1.2), how it is determined what Information Objects is regarded as a Knowledge Object (section 6.1.3), and gives account for the identification process (section 6.1.4). Following sections give account for method used when categorising the objects according to taxonomies (section 6.1.5), description of χ² tests (section 6.1.6), and the analysing tools used during the process (section 6.1.7). The empirical data is then presented in section 6.2, and discussed in section 6.3.

6.1.1 Selection of Empirical data

Thirty-one final reports were acquired from the case company. Ten met the requirement for this study, i.e. based on a PPS template (see section 5.3, p. 46). These ten documents were therefore selected for this study. One implication (section 5.5) was to examine whether the content of documents not based on PPS template fulfil same objectives as the documents that is. Of the twenty-one remaining documents, five were randomly selected.

To describe the experience captured by final reports, the experiences need to be identified and analysed in order to establish if it is knowledge or not. This is important since the purpose of collecting the experiences is to acquire new knowledge for further use.

The approach is that everything written in the chapter Experience feedback derives from an intention to communicate knowledge of importance. This does however not mean that it is formulated in a sense that the knowledge can be properly communicated.

6.1.2 Division into Information Objects

The first step was to divide the text in the final reports into text objects – Information Objects (IO). Each IO describes a coherent situation or a phenomenon. The paragraph division in the documents corresponded most of the times to a single coherent experience. Sometimes however, there was a need to split paragraphs since they gave account for two or more different experiences. An IO can constitute of one or more information components, if these components refer to the same experience.

It is important to remember that the division into IO can result in a decontextualisation of the knowledge since knowledge, according to Nonaka et al. (2000), is anchored in the context. Because of this, the next steps were performed with an awareness of the context,
i.e. the specific projects. In the study the final report and specifically the project background provides for the context.

6.1.3 Determination of Knowledge Objects

The second step was to identify which of the IO that could be regarded as knowledge. Cooper (2009) state that experiences are units of knowledge. There is a difference between information and knowledge (Davenport & Prusak, 2000; Nonaka et al., 2000; Turban et al., 2006), and therefore there is a need to separate the knowledge from the pure information. The IO that is regarded as knowledge is in the thesis called Knowledge Objects (KO).

To determine which of the IO that are regarded as KO, criteria are needed. Three criteria is developed and explained below. It is important to point out that all objects are regarded as IO even if they may be a KO.

Criterion 1: Two components of information

Davenport and Prusak (2000) describes four methods to transform information into knowledge: comparison, consequence, connection, and conversation. This means that in order for the IO to be a KO, they must include an element of one of the four; otherwise, it is just pure information. This criterion focuses on the first three methods of transformation. The fourth, conversation, is used and explained in the second criterion.

Comparison, consequence, and connection imply there must be more than one component in the IO in order to be a KO, i.e. there cannot be a comparison, consequence or connection between a single situation, or phenomenon. This leads to the first criterion:

• A Knowledge Object must include at least two components of information.

The criterion is illustrated by the following two examples:

Exhibit 1: Everyone in the [case company] group was very committed.
Exhibit 2: All involved did their best and were committed to the goal. [Consulting firm] felt supported from the [case company] team and it helped them gaining the comfort level while working.

Exhibit 1 does only involve one component of information (everyone was committed). It is not possible to compare the commitment with other situations. The consequence of the commitment is not illustrated. The commitment is not connected to anything in particular. Exhibit 1 is thereby disqualified as a KO.

Exhibit 2 involves two components (felt supported and gained comfort and commitment to goal). The exhibit clearly stipulates connection between actions of the case company and the comfort level at the consulting firm, i.e. the consequence of the support was increased comfort level and commitment to the goal. Therefore, does Exhibit 2 meet the criterion and is qualified as a KO.

Criterion 2: Relationship between components

In lessons learned production it is important to include problems as well as and tasks that went well (Kotnour, 2000). Went well refers to both tasks that met expectations, and tasks that exceeded expectations. Cooper (2009) mean that it is the nature of experiences to describe a cause-effect relationship of performances.

Conversation is about how people/groups perceive information (Davenport & Prusak, 2000). Conversation thereby establishes the nature of the relationship between the components, i.e.
how the relationship is perceived. The establishment of the relationship is central in lessons learned production, since it gives information regarding whether the comparison, consequence, or connection have positive or negative impact. This leads to the second criterion:

- A Knowledge Object must include at least two elements of comparison, consequence, connection, or conversation, where conversation is one.

IO that did not include an element of conversation, sub-headings i.a. Worked well – highly recommended, and Didn’t work too well – should be improved before next project, gave a clue. The criterion is illustrated by the following two examples:

**Exhibit 3:** We have during the assignment and project time worked in close co-operation with the line organisation especially through the [name] network members. Accountable towards the project for line organisation deliveries have functional HR managers been. They have also then together with other network members and local HR colleagues been responsible for implementing the deliveries from the project in respective function.

**Exhibit 4:** We had an early team outing in the beginning of the [project which] helped a lot to improve the team bonding. After that we had a few more team building activities. All this helped the communication and honesty in the group and reduced misunderstandings.

Exhibit 3 involves several information components, and thereby meets the first criterion. It does however not include any element that describes the relationship between the components. Exhibit 3 is thereby disqualified as a KO. In this case could an element of conversation for instance stipulate whether it worked out fine to assign the HR managers the responsibility for local implementation, or not.

Exhibit 4 also involves several information components, but it also include relationship between them (team outing and team building activities lead to team bonding, which lead to better communication). Thereby does Exhibit 4 meet the criterion and is qualified as a KO.

**Criterion 3: Uniqueness and surprise**

When performing the identification of KO, it became clear that some objects that met the above criterion did not provide for valuable knowledge. Cooper (2009) means that experience are beneficial for the organisation, since it has positive effects. It cannot be established whether the original experience that initiated the formalised and explicated experience is beneficial for the organisation or not. It can be a result of loss of nuances, which according to Ramaprasad and Prakash (2009) is one consequence when knowledge sharing becomes codified in formal-written form. This means that there is a need for a third criterion.

The purpose of capturing experiences is to develop new knowledge (Cooper, 2009), and increase the knowledge base (Kotnour, 2000). It is somewhat tricky to, as an outsider with limited contextual knowledge, decide whether an experience adds new knowledge to the organisational knowledge base or not. Although the purpose is to capture and share new knowledge, a KO cannot be regarded as too self-evident and obvious, or too general or specific. Cooper (2009) means that relevance is an important element of experiences.

To develop the third criterion, inspiration is taken from the project triangle. Tonnquist (2006) state that the project steering parameters (product quality, time, and resources) are interconnected, i.e. a change in one of the parameters in the project triangle will result in a change in another. In simple terms, increased product quality requires either more time or more resources spent. This means that it can be foreseen that a decrease in scope results in a decrease in needed time or resources. This leads to the third criterion:
A Knowledge Object must involve an element of uniqueness or surprise.

The criterion is illustrated by the following two examples:

**Exhibit 5:** Up to project DP3 meant a lot of planning work for Project manager. There should have been more time after DP3 (breathing space) to plan the [project activity].

**Exhibit 6:** The [project activity] plan was too tight, no room for unplanned events like illnesses.

Exhibit 5 involves several information components (first criterion), and elements specified in the second criterion: consequence (lot of planning lead to more time for planning needed), and conversation (the wish for more time implies dissatisfaction). It does however not involve an element of uniqueness or surprise, since more time most certain increases the quality of planning. Moreover, it is not explained why there should be more time [...] to plan in this specific project. Because of this, it is impossible to tell what the experience is. It could be activities, new to the company, which made them particularly difficult to plan. It could be less time than normal to plan the activities. On the other hand, it could be a way to cover your back. Exhibit 5 is thereby disqualified as a KO.

Exhibit 6 is quite similar as Exhibit 5, but it does express why the activity is time critical (illness). The 'uniqueness' points out what the experience is about, and explains why the experience is important to remember. In simple terms, the experience gives account for how to use the intrinsic knowledge in future projects.

### 6.1.4 Identification process

The identification of KO is performed three times independent of each other, i.e. there has been at least one week apart, and the result from the previous identification, were hidden during the execution. The third time was performed after writing this section in order to secure the coherency. This way to perform the identification process ensured that each object was classified in the same way.

There is a systematic hierarchy of the criteria. This mean to be able to involve an element of uniqueness, there must be an element specified in the second criterion, which requires at least two components of information. Consequently, there is no need to analyse IO that have been disqualified by a previous criterion.

In cases where there was discrepancy between the rounds of identification, the conflicting objects where analysed once again. A predominate part of these cases concerned the third criterion, and though it can be seen as contextual in some extent, it was decided to give the benefit of the doubt when it was difficult to determine whether the criterion were met or not. The identification process is depicted in Figure 6.1-1.

![Identification of Knowledge Objects](image-url)

**Figure 6.1-1** Identification of Knowledge Objects

After establishing which IO that is KO, some of the IO that did not meet the criteria was further controlled in order to ensure that the reason for not being a KO is a result of the division into IO (section 6.1.2), i.e. decontextualisation of the knowledge. By going back to the documents, it could be established if the knowledge was dependent on additional information surrounding the paragraph in the document. This was not the case for a predominate part of the objects.
6.1.5 Categorisation according to Taxonomies

In previous discussion, regarding taxonomies (section 4.3, p. 38), knowledge types that are possible to capture by final reports are identified. Based on this, three taxonomies are selected for analysing the experience captured: Knowledge of Information and Contextual Knowledge (Millar et al., 1997), Problem focused Taxonomy (Ramaprasad & Prakash, 2009), and one pragmatic taxonomy – Experience Subject areas (Cooper, 2009). These three are selected because every knowledge type within these taxonomies is theoretically possible to capture by final reports (see section 4.4: Q4, and 4.5).

The taxonomies are briefly described in the literature, and there are no exact criteria in hand for the categorisations. This means that the decisive factor for each knowledge type needs to be developed. The decisive factor is based on information given in the literature, but in order to make it applicable in this study, the empirical data acquired from the final reports is acknowledged in the development of the categorisation.

In addition to the three taxonomies above, the taxonomy provided by the project model is used. This taxonomy found in the final report template for normal projects, consists of fifteen main categories (Table 4.2-2, p. 32).

To investigate whether certain knowledge types are more difficult to formulate as knowledge than others, every IO in Experience feedback is analysed. This means that IO that is not regarded as KO is included in the categorisation process.

The development of the categorisation is performed at the same time as the categorisation. Each IO is analysed regarding in which knowledge category it resides. Some IO involved several elements that could be put in different categories. These objects were further examined in order to determine the most central decisive factor.

The categorisations were performed twice in order to secure a coherent labelling of the IO. The categorisations were performed independent of each other, i.e. there was a time gap of one week between the categorisations, and the result from the first categorisation was hidden when the second was performed. The categorisation where performed independent of whether it was a KO or not, i.e. this information was hidden during the process. This put together decreased the probability of bias.

6.1.6 $\chi^2$ test

To test if differences in the data are a result of randomness, $\chi^2$ tests are performed. $\chi^2$ test compares the actual frequency, with the expected frequency, and clarifies if the difference is a coincidence or statistical proven to be true. Three sets of $\chi^2$ tests are performed:

- Comparison between the two templates chapters (section 6.2.1, p. 57)
- Comparison between Cooper’s (2009) subject areas (section 6.2.5, p. 61)
- Comparison between PPS categories (section 6.2.6, p. 63)

One requirement for doing this test is that at least 80 percent of the theoretical frequencies exceed the value five. The relation is statistically secured on a significance level 5 percent, if the p-value is less than 0.05 (Wahlgren, 2005).

6.1.7 Analysing tools

Microsoft Access is used in order to organise and systemise the data acquired from the final reports. The database used for input of meta-data, and the categorisations.
Microsoft Excel is used in order to test statistical significance, and other types of data computing, i.a. calculating percentage rate and mean value.

6.2 Empirical result

The section describes empirical data collected from the final report chapters Experience feedback and Quality perceived by project stakeholders. It describes and presents the division into Information Objects, the determining of Knowledge Objects (section 6.2.1) and the categorisation according the selected taxonomies (section 6.2.2 to 6.2.6). The section concludes with cross-examining the taxonomies (section 6.2.7), which summarises the result.

6.2.1 Information or Knowledge Object

Final reports are analysed in order to divide the text into Information Objects, and establish whether they are Knowledge Objects or not. The result is described statistically in Table 6.2-1 (p. 57) and Table 6.2-2 (p. 58).

Division into Information Objects

The division into IO resulted in a total number of 717 IO – 406 in the chapter Experience feedback, and 311 in Quality perceived by project stakeholders.

The mean value of number of IO per project is 47.8 – 40.6 in Experience feedback, and 62.2 in Quality perceived by project stakeholders. There is a variance in number of IO in the individual projects, the range is 78 respectively 127 for the two chapters. It can be seen that final reports based on the simple template, give account for less IO than those based on the normal template.

Determination of Knowledge Objects

By using criteria (section 6.1.3), each IO is analysed in order to determine whether it is a KO or not. The criteria are:

- A Knowledge Object must include at least two components of information.
- A Knowledge Object must include at least two elements of comparison, consequence, connection, or conversation, where conversation is one.
- A Knowledge Object must involve an element of uniqueness or surprise

Criterion 1: Two components of information

The first criterion is met by 521 of the 717 IO – 358 in Experience feedback and 163 in Quality perceived by project stakeholders. IO disqualified by this criterion is predominately constructed by one single sentence, i.a.:

Exhibit 7: Good to meet users, other groups, visit [office] etc.
Exhibit 8: The schedule with sessions was thoroughly planned.
Exhibit 9: Back-up planning could have been better.
Exhibit 10: [Test1], [test2] and [test3] worked very well.
Exhibit 11: We have lately forward all Competence Management material/info to Line Managers via HR.
Exhibit 12: Planning for documentation work was missing.
Exhibit 13: Some administrative documents like meeting schedules, contact lists, absence schedules etc, were kept.
These IO can mainly be divided into three categories: statements regarding how activities or situations are perceived (Exhibit 7 to Exhibit 10); retrospective status reports of activities (Exhibit 11 to Exhibit 13); and images, e.g. organisational charts and Gantt charts.

The statements regarding how activities or situations are perceived is important because they give account for whether the activity worked out fine or not. These examples (Exhibit 7 to Exhibit 10) do however not provide for information regarding why it worked out fine. In order to be useful for projects a head there have to be information regarding, for instance, in what aspect the back-up planning could have been better (Exhibit 9).

The retrospective status reports do only provide for what has been. The information is not valuable since it lacks information regarding either why this statement is of interest, or the possible consequences of the status. It is therefore impossible to figure out how to apply the experience in a new setting.

The images included in the final reports are similar to the retrospective status reports since they give account for what has been. They give information regarding how the project is planned or organised, but by itself, it does not provide for information useful for other projects.

**Criterion 2: Relationship between components**

The second criterion is met by 430 of the 521 IO that met the first criterion – 299 in Experience feedback and 131 in Quality perceived by project stakeholders. IO disqualified by this criterion often excludes an element of conversation. Following exhibits are disqualified as KO according to the second criterion:

Exhibit 14: The specification was sent out Oct 23 asking to receive feedback latest Oct 26. No feedback was received. It was finalised Oct 31.

Exhibit 15: During phase 2 migrations a follow the sun approach has been used. The migrations were performed during CET night time and carried out by co-workers from another region, who were working remotely during normal office hours.

Exhibit 16: The rollout was done in six steps; one migration per each [name] region, i.e. per database. On a high level business and [department] planned the rollout together. Details, such as checklists and education packages were developed, and coordinated by the [department] – and business rollout coordinators, who further reported in the Project Management Team meetings.

Exhibit 17: Outcome – [Test]: The users were responsible for the planning and test execution, and the [project] provided with test environments, test data, and support.

Exhibit 18: Project manager got a lot of support and help from [department + role + name].

Exhibit 19: A total of 5 [meetings] and regular project meetings have been held in order to secure the time plan and working routines for [project].

Exhibit 20: The methodology used is based on facilitated workshops where workflows and information models are created in order to get a common understandable view.

These IO can mainly be divided into three categories: descriptions of sequential chains of events (Exhibit 14 to Exhibit 16); specifications of responsibilities and supportive resources (Exhibit 17 and Exhibit 18); and motives to perform activities (Exhibit 19 and Exhibit 20).

The sequential chains of events can be important, but as piece of new knowledge, they do not provide for valuable information regarding if they met expectations or not. For instance, Exhibit 14 could be either positive or negative. Positive if feedback was unnecessary because everything was perfect, and negative if people neglected to give feedback even though they had important feedback to give.
The specifications of responsibilities and supportive resources are also important. The exhibits do however not give account for whether the organisation of the responsibilities, or the supportive resources was a positive for the project or not. This information is crucial for projects to come if they should embrace the experience in their project.

The motives to perform activities could also be important, since they give account for why certain activities are executed. The examples does however not provide for information whether it was a good thing to do or not. This could be done by adding information regarding the outcome of the activities.

**Criterion 3: Uniqueness and surprise**

The third criterion is met by 299 of the 430 IO that met the second criterion – 215 in Experience feedback and 84 in Quality perceived by project stakeholders. IO disqualified by this criterion excludes an element of uniqueness and surprise, and is therefore too general or obvious. Following exhibits are disqualified as KO according to the third criterion:

- Exhibit 21: A small dedicated team can achieve a lot!
- Exhibit 22: Transition leader doing a brave job keeping all the juggling balls up in the air even in stormy weather.
- Exhibit 23: Two risk workshops were performed and helped mitigate risks.
- Exhibit 24: It was estimated that the project required 11,688 hours effort and would be completed by 2007-10-01. Actual figures show a total of 6,188 hours. Changes in scope have certainly helped to stay within the budget. Hours planned for development and support for local solutions has not been used. The number of consultants active in the project has been limited, separate initial functions has been combined in one single source.
- Exhibit 25: We have had some legal challenges in one office that now has been solved.
- Exhibit 26: A project review was done in spring 2007. Unfortunately, its existence and its results were unknown until May 2009.
- Exhibit 27: [Case Company] should consider if we want to spend a bit more money and time on the [activity] and get an even better result. The [consulting firm] people would get more time for reflection and documentation and the plan wouldn’t be as vulnerable to unexpected events.
- Exhibit 28: Inform all [support functions] and other stakeholders on future changes in an early phase of the project as soon as possible.

These IO can mainly be divided into following categories: motivators, i.e. pat on the shoulder (Exhibit 21 and Exhibit 22); predictable consequences (Exhibit 23 and Exhibit 24); unspecified causes of actions (Exhibit 25 and Exhibit 26); and general demands, e.g. more time, more resources, or earlier starts of activities (Exhibit 27 to Exhibit 28).

The motivators are important in order to encourage the project team to keep up the good work in future projects. These examples do however not provide for knowledge useful for others regarding how to achieve better results in projects.

The predictable consequences give account for the expected, and do consequently not provide for anything unique. For instance, the purpose of risk workshops is always to mitigate risks (Exhibit 23), and if more time is allocated in this activity, the outcome naturally becomes better. This can therefore not be regarded as new knowledge.

The unspecified causes of actions do not give account for how the result is achieved. For instance, Exhibit 25 does not include what type of legal challenge the project encountered or even how this was approach in order to solve the problems. The information would be important if the experience should be useful for other projects with similar problems.
The general demands are universal in some extent, since the statements are applicable in all kinds of projects and situations. For instance, there is nothing unique about the fact that more money and time increases the quality of the outcome (Exhibit 27). Consequently, these experiences do not add value to future projects, since they describe circumstances projects always have to acknowledge.

**Descriptive data of Knowledge Objects**

Out of all IO in both chapters, 41.7 percent met the criteria for being KO (Table 6.2-1). There is however, a difference between the two types of chapters. Of the IO in Experience feedback, 53.0 percent met the criteria for being KO, while 27.0 percent of the objects in Quality perceived by project stakeholders did the same (Δ 26.0 percentage points).

<table>
<thead>
<tr>
<th>Project</th>
<th>Chapter in Final Report</th>
<th>IO</th>
<th>KO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Both chapters</td>
<td>717</td>
<td>299 (41.7 %)</td>
</tr>
<tr>
<td>All</td>
<td>Experience feedback</td>
<td>406</td>
<td>215 (53.0 %)</td>
</tr>
<tr>
<td>3</td>
<td>Experience feedback</td>
<td>40</td>
<td>18 (45.0 %)</td>
</tr>
<tr>
<td>4</td>
<td>Experience feedback (simple template)</td>
<td>17</td>
<td>10 (58.8 %)</td>
</tr>
<tr>
<td>5</td>
<td>Experience feedback</td>
<td>91</td>
<td>79 (86.8 %)</td>
</tr>
<tr>
<td>8</td>
<td>Experience feedback</td>
<td>69</td>
<td>35 (50.7 %)</td>
</tr>
<tr>
<td>10</td>
<td>Experience feedback (simple template)</td>
<td>13</td>
<td>2 (15.4 %)</td>
</tr>
<tr>
<td>18</td>
<td>Experience feedback (simple template)</td>
<td>19</td>
<td>5 (26.3 %)</td>
</tr>
<tr>
<td>20</td>
<td>Experience feedback</td>
<td>90</td>
<td>27 (30.0 %)</td>
</tr>
<tr>
<td>21</td>
<td>Experience feedback</td>
<td>23</td>
<td>8 (34.8 %)</td>
</tr>
<tr>
<td>27</td>
<td>Experience feedback (*)</td>
<td>13</td>
<td>6 (46.2 %)</td>
</tr>
<tr>
<td>31</td>
<td>Experience feedback (*)</td>
<td>31</td>
<td>25 (80.6 %)</td>
</tr>
<tr>
<td>All</td>
<td>Quality perceived by project stakeholders</td>
<td>311</td>
<td>84 (27.0 %)</td>
</tr>
<tr>
<td>7</td>
<td>Quality perceived by project stakeholders</td>
<td>76</td>
<td>33 (43.4 %)</td>
</tr>
<tr>
<td>9</td>
<td>Quality perceived by project stakeholders</td>
<td>61</td>
<td>15 (24.6 %)</td>
</tr>
<tr>
<td>26</td>
<td>Quality perceived by project stakeholders</td>
<td>23</td>
<td>7 (30.4 %)</td>
</tr>
<tr>
<td>28</td>
<td>Quality perceived by project stakeholders</td>
<td>139</td>
<td>21 (15.1 %)</td>
</tr>
<tr>
<td>29</td>
<td>Quality perceived by project stakeholders</td>
<td>12</td>
<td>8 (66.7 %)</td>
</tr>
</tbody>
</table>

Table 6.2-1 Information and Knowledge Objects per project

The table describes number of Information Objects and Knowledge Objects per project. Knowledge Objects is presented in actual frequency and as percentage of Information Objects. Total number of Information Objects and Knowledge Objects per chapter, Experience feedback and Quality perceived by project stakeholders, is also displayed.

The final reports produced for projects 4, 10 and 18, used the simple template. The final reports for project 27 and 31 (*) are based on templates suggested by PPS Handbook, but differs regarding the sub-headings in the chapter Experience feedback.

To establish whether the difference is a result of randomness or not, a $\chi^2$ test is performed. This is done for the result of the aggregation per chapter type. The expected value is calculated by using the mean value of KO for both chapters (41.7 percent).

The test resulted in a p-value of 0.0000042 for Experience feedback, and 0.00000015 for Quality perceived by project stakeholders. It can thereby be established, on a significance level of 0.1 percent, that the percentage rate of KO is dependent on the type of chapter and not a result of randomness. The dependency is extremely strong.
There is however, a great variance between the projects. As seen in Table 6.2-1, only 15.4 percent of the IO in project 10, is KO, while 58.8 percent in project 4 (∆ 43.4 percentage points). These projects give account for IO below mean value (13 respectively 17 IO), but the difference is also seen in projects with IO above mean value. Project 5 and 20, with 91 respectively 90 IO, have a percentage rate of 86.8 and 30.0 (∆ 56.8 percentage points).

There is a difference regarding why the IO is disqualified as a KO (see Table 6.2-2). IO in the chapter Quality perceived by project stakeholders, almost half (47.6 percent) of the IO is disqualified by the first criterion, compared to one tenth of the IO in Experience feedback (11.8 percent).

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Total</th>
<th>PPS template</th>
<th>Other template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1: Two components of information</td>
<td>27.3 %</td>
<td>11.8 %</td>
<td>47.6 %</td>
</tr>
<tr>
<td>Criterion 2: Relationship</td>
<td>12.7 %</td>
<td>14.5 %</td>
<td>10.3 %</td>
</tr>
<tr>
<td>Criterion 3: Uniqueness and surprise</td>
<td>18.3 %</td>
<td>20.7 %</td>
<td>15.1 %</td>
</tr>
<tr>
<td>Remaining KO</td>
<td>41.7 %</td>
<td>53.0 %</td>
<td>27.0 %</td>
</tr>
</tbody>
</table>

Table 6.2-2 Table of disqualified by criteria

The table describes statistics of why IO is disqualified for being KO, criterion per criterion.

6.2.2 Categorisation of Knowledge Objects

Previously it is determined that three of the taxonomies will be used when analysing the KO. The categorisation found in the PPS Handbook, is selected as an additional taxonomy. The IO and KO included in following analysis are gathered from the chapter Experience feedback. IO in Quality perceived by project stakeholders are excluded since the purpose of this thesis focuses on the framework given by the project model in use, and because of the fact that this chapter have a lower percentage rate of KO.

6.2.3 Knowledge of Information and Contextual Knowledge

The taxonomy suggested by Millar et al. (1997) constitutes of knowledge of information (i.e. catalogue and explanatory knowledge), and contextual knowledge (i.e. process, social and experiential knowledge).

The intention was to first establishing in which main category each IO resided, and then categorise them into the sub-categories. Already in the beginning of this categorisation, it became obvious that it could not be done. There are two reasons for this.

The first reason is the devaluation of contextual knowledge when it is transformed into formal written language. Even though it previously is established (section 4.3, p. 39) it is possible to capture contextual knowledge, there are severe difficulties to tell these decontextualised experience objects apart from the categories in knowledge of information.

The second reason is that all experience objects could be regarded as experiential knowledge since they derive from experiences, i.e. practical empirical observations. This means that even though it is obvious that the object is a piece of catalogue knowledge, it cannot be ignored that it is acquired through experience.

Since there were difficulties in telling knowledge of information and contextual knowledge apart, and that all IO could be regarded as experiential, this categorisation was abounded.
6.2.4 Problem-focused Taxonomy


The intention was to establish in what problem-area the case company can benefit by the experience provided, and thereby categorise the IO. The analysis was performed with the following statement: If you embrace this knowledge, the project organisation will become better in [recognise/formulate/analyse/find a solution to/preventing] a problem.

A predominate part of the IO could be categorised in multiple categories. This is illustrated by the following examples:

Exhibit 29: [Role + name] already had experience from the [previous project] which was a big advantage in the planning of this project.

Exhibit 30: Steering group not visible enough: Some members of the project group were unaware of who actually made decisions regarding their work. Recommendation: Openly and regularly communicate who sits in the steering group and all decisions that are made.

Exhibit 31: The [facilities] have been good to work in. During the rollout the project allocated a conference room for the many daily meetings.

Exhibit 32: In the early days of the project at least one risk workshop was conducted. Unfortunately, many of the identified risks were not acted upon, and became reality.

Exhibit 29 provides for the solution of having experienced people in the planning of the project. Even though it is not explicated, the underlying problem of not having experience when planning a project is that the planning can be wrongly performed. To mitigate this, experience can provide for insights of problem recognition and analysis. Finally, the solution may reduce the risk of insufficient planning; the solution thereby becomes a method of prevention. In simple terms, the example can be ascribed three different categories: problem recognition, analyse, and preventing.

Exhibit 30 describes the problem of invisibility of the steering group, and provides the organisation with a solution. The solution may prevent problems from occurring again, and if not, the description of the problem can help the organisation to formulate a problem that they seem to have. The example can once again be ascribed three different categories: formulate problem, solution and preventing.

Exhibit 31 does not provide for a problem, since there is no gap between current situation and wanted situation. Consequently can the example not be ascribed any category.

Exhibit 32 provides for knowledge that risk workshops are relevant since they can identify risks that occur. The workshop can therefore be seen as an activity to recognise future problems, and if they are recognised, they can be prevented. It is therefore a solution for recognising and preventing risks, two different categories.

Since a great majority of the IO are regarded as conflicting knowledge types, i.e. they could be categorised as several knowledge types, this approach was abounded.
6.2.5 Subject areas of Experiences

The descriptions of the subject areas are not total comprehensive since they are based on the data found in the final reports. This means that there may occur IO in other documents that are not analysed, which these subject area descriptions cannot provide any guidance regarding labelling.

The categories of the taxonomy

This section gives account for the four knowledge types within the taxonomy described by Cooper (2009). The section ends with a description of conflicting knowledge types.

People/relationship

People/relationship is about people or groups, and their relationships. Experiences regarding how working methods affect individuals focus on the individual. These experiences are therefore labelled as *people/relationship*. The category does also include how different work streams within the same project relate to each other, as well as between different projects and companies. The subject area is exemplified by the KO in Exhibit 33 to Exhibit 35.

Exhibit 33: Choose the “right” project (and network) members, those who have energy and competence. To be able to plan and deliver in time they also need to have enough time/hours to spend in the project. Both network and project members contributed a lot.

Exhibit 34: Server developers worked very well together, but it was not so easy between client/server due to knowledge between is specialized.

Exhibit 35: Diverse business project team: The project team was diverse considering background and nationality. This gave valuable input. Recommendation: encourage diverse recruitment in the project team.

Processes

Processes is about chains of events, working methods, and supportive tools and activities, e.g. risk management, project planning, project execution, and test activities. Almost all IO involves elements describing processes, working methods or activities, but these elements are not in focus every times. In those cases, the process can often be seen as the contextual information needed in order to understand the experience. The subject area is exemplified by Exhibit 36 to Exhibit 38:

Exhibit 36: The tools and templates are quite “simple” documents and instructions. To be able to handle all the material in the future and follow up on results we need an IT tool to support the project outcome.

Exhibit 37: Domain driven design is more structured and efficient (gives nomenclature, concepts). Recommendation: Involve business in Domain driven design so the whole project is using a common nomenclature.

Exhibit 38: The test manager came in to the project a bit too late. Recommendation: Test manager should be in the project from the start.

Products

Products is about the project outcome. Since the final reports give account for both internal and external projects, it cannot be said that this subject area is about a physical product or an artefact. Deliverable for an internal project can be an outsourcing activity, or changes in the common way of working, consequently does the subject area have a broader definition of what a product is.

In this thesis, it includes all deliverables including IO about things that affect the actual project outcome, when it is in focus, e.g. changes of scope and requirements, training of end-users, or handbooks. The subject area is exemplified by Exhibit 39 to Exhibit 41:
Exhibit 39: End user training: Training was not targeted accurately with experienced [software] users being bored and inexperienced users being left behind. Recommendation: Ensure that training material is targeted towards the actual audience, splitting specialisms if required.

Exhibit 40: Developer’s handbooks were created as part of the handover and are considered very valuable by receivers.

Exhibit 41: [Project outcome] will be a very important task for [upper management] to continue focusing on. [Artefact name] first step is to identify future needs.

Politics

The subject area politics is about how the project relate to both steering decisions taken outside the project team’s control, and the groups, or people, which have the decision mandate to take these decisions. This category also includes leading and steering through changes of attitude, as well as cultural clashes and attitudes within and between project teams. The subject area is exemplified by Exhibit 42 to Exhibit 44:

Exhibit 42: The time plan was quite tight. One main reason for that was the time plan from the origin assignment but also to be able to follow [other department’s] year cycle. It has through the project been a hard balance between deliveries of [project outcome] material and keeping up the “good enough” quality.

Exhibit 43: The lack of resources for practical work and [project] not prioritized on the agenda affected the time of the deliveries which were delayed. It also delayed the start up date of e.g. creation of the competence catalogue since we needed to have all competence profiles/maps for [department] specific job titles ready before.

Exhibit 44: Information transfer: The Project has had problems sharing information between the project members as there was a tendency of taking on, or holding on too strongly to, own responsibilities and/or knowledge [further description].

Conflicting subject areas

A predominate part of the IO that involves elements of several subject areas involve the areas people/relationship and processes. This is a consequence of the fact that people have roles, and these roles are part of processes. These IO are handled by determining the most central element of the experience and let that element decide the category.

KO about resource allocation can for instance be categorised as both people/relationship, and processes. When the resource is central, i.e. the resource have proper experience, or there is no adequate resource available, it is categorised as people/relationship. When the process is central, i.e. description of the actual resource allocation process, or recommendations to recruit a resource as early as possible, it is categorised as processes.

The above can be illustrated by Exhibit 33 and Exhibit 38. Both KO are about resource allocation, but while Exhibit 33 is about the right resources, Exhibit 38 is about resources at the right time. This means that Exhibit 33 focuses on the resource and is thereby an example of people/relationship. Exhibit 38 does on the contrary focus on the actual resource allocation, and since resource allocation is a working method, this is an example of processes.

Descriptive data of the categorisation

The result from the categorisation is presented in Table 6.2-3 (next page) and described below. A majority of the IO fall within the subject area processes (58.6 percent). The next largest subject area is people/relationship (20.4 percent), followed by the in extent almost equal subject areas products (10.8 percent), and politics (10.1 percent).
<table>
<thead>
<tr>
<th>Subject area</th>
<th>IO</th>
<th>KO</th>
<th>KO/IO (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>People/Relationship</td>
<td>83 (20.4 %)</td>
<td>52 (24.2 %)</td>
<td>62.7 %</td>
<td>0.1797</td>
</tr>
<tr>
<td>Processes</td>
<td>238 (58.6 %)</td>
<td>120 (55.8 %)</td>
<td>50.4 %</td>
<td>0.4332</td>
</tr>
<tr>
<td>Products</td>
<td>44 (10.8 %)</td>
<td>17 (7.9 %)</td>
<td>38.6 %</td>
<td>0.0570</td>
</tr>
<tr>
<td>Politics</td>
<td>41 (10.1 %)</td>
<td>26 (12.1 %)</td>
<td>63.4 %</td>
<td>0.1797</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>215</td>
<td>53.0 %</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.2-3 Experience subject area categorisation
The table describes the frequency of IO and KO distributed over the four subject areas suggested by Cooper (2009). The percentage of total number of IO and KO are included in parenthesis in each column. KO/IO represents the percentage rate of KO for each subject area. $\chi^2$ tests resulted in the p-values presented in the right column.

The distribution of KO has the same proportions. A majority of the KO fall within the subject area processes (55.8 percent), followed by people/relationship (24.2 percent), politics (12.1 percent), and products (7.9 percent). All percentage rates of KO fall into the range of $\Delta 4$ percentage points compared to IO per subject area.

There is a variance in percentage rate of KO in each individual subject. Of the IO within politics, 63.4 percent is KO, followed by 62.7 percent within people/relationship. This can be compared to processes where only half of the IO are KO (50.4 percent), and just above a third of the IO within products (38.6 percent). The differences can however not be established on an adequate significance level through a $\chi^2$ test. In the test, the mean value for all IO (53.0 percent) is used as the expected value.

6.2.6 Taxonomy found in PPS
The last taxonomy is found in the project model in use. As described (in section 4.2.5, Table 4.2-2) the number of categories is depending on the template that is used. The template for normal projects divide the experience into fifteen main categories (sub-headings on level two), while the simple template uses seven.

This taxonomy differs from the above taxonomies. It is not explicitly said that it is a knowledge-taxonomy. It is however, a predefined categorisation of experiences acquired throughout the project. Each category is not explicitly defined, at least not in the project model handbook used for this study. The categories is however self-explanatory, and the categorisation is supported by the third aspect. The IO are already categorised according to this taxonomy, i.e. each sub-heading on level two is regarded as a separate category.

Selection of empirical data
In this categorisation, final reports based on the normal template are used. The reason is that a majority of the reports that include Experience feedback are based on this template. Since this template is the one that most often is used, it is more valuable to examine these documents than documents based on a less used template. Moreover, the five final reports based on the normal template give account for 313 of the 406 IO in the Experience feedback chapters – almost four fifths.

Re-categorisation
Although the documents are based on the same template, there are differences regarding sub-headings used. There are 35 different sub-headings/categories in the material (described in Appendix C). In order to perform the analysis according to the taxonomy suggested by the template, a re-categorisation is done.
Some sub-headings/categories bear similarities to the ones suggested by the templates. For instance does the categories ‘Document’, ‘Quality assurance’, ‘[Case company] process: Resource allocation’, and ‘Risk handling’ resemble the sanctioned categories ‘Document management’, ‘Quality assurance, Project analysis’, ‘Resource allocation’ and ‘Risks’. After re-categorising objects found in the four un-sanctioned categories, 45 of the 313 IO remained to be recategorised. These IO is re-categorised by analysing the content.

The categories of the taxonomy

Since there are fifteen different categories of this taxonomy, and since each category is explained in Appendix B, there is no reason to describe them once again in this chapter. Instead, each category description in the appendix is exemplified with exhibits.

Descriptive data of PPS categories

The result of the categorisation is presented in Table 6.2-4, and described below. Most of the IO fall within the category Production model (37.7 percent). The next largest categories are Project organisation, and Staffing and training (9.3 percent), followed by Routines (6.7 percent), Delivery and transferral (5.8 percent) and Resource allocation (5.4 percent). The other nine categories are represented by less than 5.0 percent of the IO each.

<table>
<thead>
<tr>
<th>PPS Category</th>
<th>IO</th>
<th>KO</th>
<th>KO/IO %</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision points, milestones</td>
<td>6 (1.9 %)</td>
<td>3 (1.8 %)</td>
<td>50.0%</td>
<td>N/A</td>
</tr>
<tr>
<td>Delivery and transferral</td>
<td>18 (5.8 %)</td>
<td>7 (4.2 %)</td>
<td>38.9%</td>
<td>0.218611</td>
</tr>
<tr>
<td>Deviation and change management</td>
<td>6 (1.9 %)</td>
<td>2 (1.2 %)</td>
<td>33.3%</td>
<td>N/A</td>
</tr>
<tr>
<td>Document management</td>
<td>8 (2.6 %)</td>
<td>3 (1.8 %)</td>
<td>37.5%</td>
<td>N/A</td>
</tr>
<tr>
<td>Facilities, equipment and rooms</td>
<td>10 (3.2 %)</td>
<td>9 (5.4 %)</td>
<td>90.0%</td>
<td>0.020185*</td>
</tr>
<tr>
<td>Production model</td>
<td>118 (37.7 %)</td>
<td>66 (39.5 %)</td>
<td>55.9%</td>
<td>0.574623</td>
</tr>
<tr>
<td>Project organisation</td>
<td>29 (9.3 %)</td>
<td>16 (9.6 %)</td>
<td>55.2%</td>
<td>0.844435</td>
</tr>
<tr>
<td>Project schedule</td>
<td>15 (4.8 %)</td>
<td>6 (3.6 %)</td>
<td>40.0%</td>
<td>0.299838</td>
</tr>
<tr>
<td>Purchase of result</td>
<td>12 (3.8 %)</td>
<td>4 (2.4 %)</td>
<td>33.3%</td>
<td>N/A</td>
</tr>
<tr>
<td>Quality assurance, project analysis</td>
<td>8 (2.6 %)</td>
<td>4 (2.4 %)</td>
<td>50.0%</td>
<td>N/A</td>
</tr>
<tr>
<td>Requirement dialogue</td>
<td>8 (2.6 %)</td>
<td>6 (3.6 %)</td>
<td>75.0%</td>
<td>0.219743</td>
</tr>
<tr>
<td>Resource allocation</td>
<td>17 (5.4 %)</td>
<td>9 (5.4 %)</td>
<td>52.9%</td>
<td>0.97274</td>
</tr>
<tr>
<td>Risks</td>
<td>8 (2.6 %)</td>
<td>3 (1.8 %)</td>
<td>37.5%</td>
<td>N/A</td>
</tr>
<tr>
<td>Routines</td>
<td>21 (6.7 %)</td>
<td>7 (4.2 %)</td>
<td>33.3%</td>
<td>0.065897</td>
</tr>
<tr>
<td>Staffing and training</td>
<td>29 (9.3 %)</td>
<td>22 (13.2 %)</td>
<td>75.9%</td>
<td>0.015116*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>313</td>
<td>167</td>
<td>53.4%</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.2-4 PPS categories categorisation

The table describes the frequency of IO and KO distributed over the fifteen PPS categories. The percentage of total number of IO and KO are included in parenthesis in each column. KO/IO represents the percentage rate of KO for each category. 

χ² tests resulted in p-values presented in the right column. Categories that do not meet the requirement of a value that exceeds five for more than twenty percent of the frequencies are marked with N/A. * refers to differences that are significant on a level of 5%.

The distribution of KO is almost similar as the distribution of IO. The three largest categories are the same: Production model (39.5 percent), Staffing and training (13.2 percent), Project organisation (9.6 percent). These are followed by Resource allocation, and Facilities, equipment and rooms (5.4 percent). The other ten categories are represented by less than 5.0 percent of the KO each.
There is a variance regarding percentage rate of KO in each individual category. Of the IO within Facilities, equipment and rooms, 90.0 percent are KO, followed by approximately three quarters of the IO within Staffing and training, and Requirement dialogue. Except for these three categories, only two more categories have a percentage rate higher than mean value (53.4 percent): Production model (55.9 percent) and Project organisation (55.2 percent).

Of the ten categories with a percentage rate below mean value, Deviation and change management, Purchase of result, and Routines have the lowest rate – only one third of the IO within these categories are KO. These are followed by Document management, and Risks (37.5 percent), and Delivery and transferral (38.9 percent), Project schedule (40.0 percent), Decision points, milestones and Quality assurance, project analysis (50.0 percent), and Resource allocation (52.9 percent).

As seen, the range is between 33.3 and 90.0 percent regarding the percentage rate of KO. To test whether the differences is a result of randomness or not, $\chi^2$ tests are performed. In the test, the mean value (53.4 percent) is used when calculating the expected value.

Since the test requires that twenty percent of the frequencies exceeds a value of five, the test could not be performed for the categories Decision points, milestones, Deviation and change management, Document management, Quality assurance, project analysis, and Risks.

Through the tests, it can be established that the higher percentage rate of KO in the categories Facilities, equipment and rooms, and Staffing and training is not a result of randomness. The p-values for these categories are below 0.05, which means that the differences are established on a significance level of 5 percent.

### 6.2.7 Cross-examination of Two Taxonomies

Experiences in the final reports based on template for normal projects are summarised by combining the two taxonomies, Cooper’s (2009) experience subject areas and PPS categories (Table 6.2-5, p. 65). Since each category is described by five statistics, the table is very complex. The table is therefore described graphically in Figure 6.2-1.

![Figure 6.2-1](image)

The figure describes the different statistical elements found in each cell of Table 6.2-5. This example represents the cross-combined category project model-processes.

### No representation

Of the sixty cross-combined categories, seventeen do not include any IO. None of these involves the subject area processes. Of the categories based on experience subject area, product can be entailed a almost half of these cross-combined categories (8), while people/relationship and politics stand for approximately one quarter each (5 respectively 4).Of the PPS based categories, three out of four within Project schedule and Risks include no IO.

### Percentage rate of Information Objects

Mean value regarding percentage rate of IO is 6.0 percent. Only Production model-processes (25.9 percent) and Production model-products (6.1 percent) exceed the mean value. Of the
other, Project schedule-processes (4.8 percent), and Staffing and training-people/relationship (4.5 percent) are nearest the mean value.

<table>
<thead>
<tr>
<th>Category</th>
<th>People</th>
<th>Processes</th>
<th>Products</th>
<th>Politics</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision points, milestones</td>
<td>2 / 2 / 100.0 % (0.6 % / 1.2 %)</td>
<td>3 / 0 / 0.0 % (1.0 % / 0.0 %)</td>
<td>1 / 1 / 100.0 % (0.3 % / 0.6 %)</td>
<td>6 / 3 / 50.0 % (1.9 % / 1.8 %)</td>
<td></td>
</tr>
<tr>
<td>Delivery and transferal</td>
<td>1 / 0 / 0.0 % (0.3 % / 0.0 %)</td>
<td>9 / 4 / 44.4 % (2.9 % / 2.4 %)</td>
<td>7 / 2 / 28.6 % (2.2 % / 1.2 %)</td>
<td>18 / 7 / 38.9 % (5.8 % / 4.2 %)</td>
<td></td>
</tr>
<tr>
<td>Deviation and change management</td>
<td>4 / 1 / 25.0 % (1.3 % / 0.6 %)</td>
<td>2 / 1 / 50.0 % (0.6 % / 0.0 %)</td>
<td></td>
<td>6 / 2 / 33.3 % (1.9 % / 1.2 %)</td>
<td></td>
</tr>
<tr>
<td>Document management</td>
<td>1 / 1 / 100.0 % (0.3 % / 0.6 %)</td>
<td>6 / 2 / 33.3 % (1.9 % / 1.2 %)</td>
<td>1 / 0 / 0.0 % (0.3 % / 0.0 %)</td>
<td>8 / 3 / 37.5 % (2.6 % / 1.8 %)</td>
<td></td>
</tr>
<tr>
<td>Facilities, equipment and rooms</td>
<td>5 / 5 / 100.0 % (1.6 % / 3.0 %)</td>
<td>5 / 4 / 80.0 % (1.6 % / 2.4 %)</td>
<td></td>
<td>10 / 9 / 90.0 % (3.2 % / 5.4 %)</td>
<td></td>
</tr>
<tr>
<td>Production model</td>
<td>12 / 8 / 66.7 % (3.8 % / 4.8 %)</td>
<td>81 / 43 / 55.1 % (25.9 % / 25.7 %)</td>
<td>19 / 9 / 47.4 % (6.1 % / 5.4 %)</td>
<td>118 / 66 / 55.9 % (37.7 % / 39.5 %)</td>
<td></td>
</tr>
<tr>
<td>Project organisation</td>
<td>9 / 4 / 44.4 % (2.9 % / 2.4 %)</td>
<td>6 / 1 / 16.7 % (1.9 % / 0.6 %)</td>
<td>2 / 2 / 100.0 % (0.6 % / 1.2 %)</td>
<td>29 / 16 / 55.2 % (9.3 % / 9.6 %)</td>
<td></td>
</tr>
<tr>
<td>Project schedule</td>
<td>15 / 6 / 40.0 % (4.8 % / 3.6 %)</td>
<td></td>
<td></td>
<td>15 / 6 / 40.0 % (4.8 % / 3.6 %)</td>
<td></td>
</tr>
<tr>
<td>Purchase of result</td>
<td>3 / 0 / 0.0 % (1.0 % / 0.0 %)</td>
<td>6 / 4 / 66.7 % (1.9 % / 2.4 %)</td>
<td>2 / 0 / 0.0 % (0.6 % / 0.0 %)</td>
<td>12 / 4 / 33.3 % (3.8 % / 2.4 %)</td>
<td></td>
</tr>
<tr>
<td>Quality assurance, project analysis</td>
<td>7 / 4 / 57.1 % (2.2 % / 2.4 %)</td>
<td></td>
<td>1 / 0 / 0.0 % (0.3 % / 0.0 %)</td>
<td>8 / 4 / 50.0 % (2.6 % / 2.4 %)</td>
<td></td>
</tr>
<tr>
<td>Requirement dialogue</td>
<td>2 / 1 / 50.0 % (0.6 % / 0.6 %)</td>
<td>5 / 5 / 100.0 % (1.6 % / 3.0 %)</td>
<td>1 / 0 / 0.0 % (0.3 % / 0.0 %)</td>
<td>8 / 6 / 75.0 % (2.6 % / 3.6 %)</td>
<td></td>
</tr>
<tr>
<td>Resource allocation</td>
<td>6 / 2 / 33.3 % (1.9 % / 1.2 %)</td>
<td>8 / 5 / 62.5 % (2.6 % / 3.0 %)</td>
<td>3 / 2 / 66.7 % (1.0 % / 1.2 %)</td>
<td>17 / 9 / 52.9 % (5.4 % / 5.4 %)</td>
<td></td>
</tr>
<tr>
<td>Risks</td>
<td>8 / 3 / 37.5 % (2.6 % / 1.8 %)</td>
<td></td>
<td></td>
<td>8 / 3 / 37.5 % (2.6 % / 1.8 %)</td>
<td></td>
</tr>
<tr>
<td>Routines</td>
<td>8 / 3 / 37.5 % (2.6 % / 1.8 %)</td>
<td>11 / 4 / 36.4 % (3.5 % / 2.4 %)</td>
<td>1 / 0 / 0.0 % (0.3 % / 0.0 %)</td>
<td>21 / 7 / 33.3 % (6.7 % / 4.2 %)</td>
<td></td>
</tr>
<tr>
<td>Staffing and training</td>
<td>14 / 10 / 71.4 % (4.5 % / 6.0 %)</td>
<td>12 / 9 / 75.0 % (3.8 % / 5.4 %)</td>
<td>3 / 3 / 100.0 % (1.0 % / 1.8 %)</td>
<td>29 / 22 / 75.9 % (9.3 % / 13.2 %)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63 / 36 / 57.1 % (20.1 % / 21.6 %)</td>
<td>186 / 95 / 51.1 % (59.4 % / 56.9 %)</td>
<td>33 / 13 / 39.4 % (10.5 % / 7.8 %)</td>
<td>313 / 167 / 53.4 % (100.0 % / 100.0 %)</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.2-5  Cross-examination of PPS' and Cooper's taxonomies

The table describes how Cooper's (2009) knowledge categories (table-head) are distributed over the categories found in PPS template for normal projects (left column).

### Percentage rate of Knowledge Objects

Mean value regarding percentage rate of KO is 6.0 percent. Only Production model-processes exceeds the mean value (25.7 percent), while Staffing and training-people/relationship equals it. Of the remaining thirteen, three exceed a percentage rate of 5 percent. These are Production model-products, Project organisation-politics, and Staffing and training-processes (5.4 percent each).

### Percentage rate of Knowledge Objects divided by Information Objects

Mean value regarding percentage rate of KO divided by IO is 53.4 percent. Seven cross-combined categorise have a percentage rate of 100.0 percent: Decision points, milestones-

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1. Which can be compared to 53.0 percent for all final reports based on PPS templates.
people/relationships; Decision points, milestones-politics; Delivery and transferral-politics; Document management-people/relationships; Facilities, equipment and room-people/relationships; Production model-politics; Requirement dialogue-processes; and, Staffing and training-politics. None of these represents more than 1.9 percent of the IO, and none is found in the subject area products.

Except from these, eight cross-combined categories exceed mean value: Facilities, equipment and rooms-processes (80.0 percent); Staffing and training-processes (75.0 percent); Staffing and training (71.4 percent); Production model-people/relationships, Purchase of result-processes, and Resource allocation-politics (66.7 percent); and, Resource allocation-processes (62.5 percent). None of these represents more than 4.8 percent of the IO. None resides in the subject area products.

6.3 Discussion

This section discusses the sub-question that aim to analyse the experiences found in final reports. The discussion is categorised into five subject-areas.

Q5: What do authentic project closure documents provide for in practice?

The discussion is divided into the subject-areas theories of knowledge, taxonomies, more than knowledge captured, different templates, and experience captured.

Different templates

Quality perceived by project stakeholders captures a larger amount of IO than Experience feedback does. The latter is however better in capturing knowledge, i.e. almost twice as much, and statistically proven. Nonaka (1994) mean that interaction between individuals amplifies the knowledge, and this is the only visible explanation of this difference.

Everybody in the project team contributes to and collaborates regarding the content of Experience feedback, while Quality perceived by project stakeholders give account for individuals perceptions. This means that, during the closing seminars, there is what Ramaprasad and Prakash (2009) refer to as, an oral-formal sharing of knowledge. During the seminars, knowledge gets codified and validated in the interaction between team members, hence the higher percentage rate of knowledge.

More than knowledge captured

The final reports captures more than knowledge. Approximately half of the material the chapter Experience feedback give account for is regarded as pure information. This is not the same as half of the material being valueless even if it is not knowledge. Experience chapter seems to be a chapter where project members, except for gained knowledge, express what they think and feel – i.a. motivators and self-appreciation for good work performance.

There is however misconceptions regarding this chapter. Projects seem to think that they need to provide for as much experiences as possible. This result in information that not is useful for other projects in the future, for instance do several final reports include organisation charts, or other basic descriptions of the project. This information is only applicable in the very project, if it is not commented, which often is not the case.

There is a huge variance between the projects regarding the relative number and amount of knowledge. This cannot be addressed to any specific circumstance.
**Taxonomies**

Of the four taxonomies that theoretical is applicable in categorising knowledge, only two turned out to work in practice. The two taxonomies derived from theoretical reasoning did not work, i.e. taxonomies of Millar et al. (1997) and Ramaprasad and Prakash (2009), while the two based on experiences did, i.e. Cooper’s (2009), based on empirical research and the category provided by *PPS Handbook*, did work.

This does not mean that the taxonomies are useless. For instance does the taxonomy suggested by Ramaprasad and Prakash (2009) involve important aspects and implications that could be used within the continual project learning process, since it focuses on the basics of projects, i.e. to solve problems.

**Experience captured**

The distribution of knowledge regarding knowledge types are misallocated for the both taxonomies used in the categorisation, i.e. Cooper’s (2009) subject areas and *PPS Handbook* categories. *Processes* and *production model* stand for half of the knowledge in respectively taxonomy categorisation, and cross-combined for one quarter. The over-representation of *production model-processes* can however not be explained by the theoretical framework.

All other categories within the taxonomy suggested by Cooper (2009), the PPS taxonomy, and the cross-combined categories fall below the mean values. It cannot be told through this document study, whether the skewed result is a consequence of the fact that the distribution of experiences is misallocated, or if the categories are unequal in proportion of what they embrace.

**6.4 Concluding result**

The section presents the concluding result of the sub-questions in this stream (Q5).

**Q5: What do authentic project closure documents provide for in practice?**

- The authentic project closure documents that in the production involve oral-formal knowledge sharing give account for less experiences, but, due to codification and validation, are the experiences formulated as knowledge in a higher extent than in documents that do not involve oral-formal knowledge sharing
- The authentic project closure documents, besides knowledge, provide for information useless for the organisation, but may be valuable for the project team to express, i.a. motivators and self-appreciation for good work performance
- There is a difference between categorisation according to taxonomies that are theoretically possible, and practically possible to perform; only pragmatic taxonomies that derive from experiences have been possible to use when categorising knowledge
- The authentic project closure documents give account for, over the categorise unevenly distributed knowledge, where a predominant part of the knowledge is found in the cross-combined category production model-processes
7 Summarised Discussion

This chapter summarises the three streams of the thesis by answering the research questions defined in section 1.3. The discussion is summarised in the end of this chapter.

7.1 How does the project closure phase contribute to Knowledge Management?

This question will be answered by discussing the how the project closure phase provides a link between Knowledge Management and Project Management, the project closure phase supports organisations in overcoming obstacles regarding project knowledge, and the benefits of incorporating the Knowledge Management activities in the Project Management.

Knowledge and Project Management

From a Knowledge Management perspective, the aim of the project closure phase is to provide for new knowledge. This is established through previous analysis; the project closure documents include new knowledge, according to Tonnquist (2006), an important aspect of the phase. The outcome of the Project Management thereby becomes the input to Knowledge Management.

Through the analysis of the project model, it can also be established that the activities within the project closure phase, i.e. closing seminar and production of project closure documents, are a set of Project Knowledge Management activities. The aim of these activities corresponds to the definition of Project Knowledge Management, established by Frey et al. (2009), as they provide for “the link between [...] Knowledge Management and Project Management”. This, since the activities is incorporated in the Project Management in order to (partly) fulfil the objectives in the Knowledge Management. Consequently, Project Knowledge Management practices are Knowledge Management practices in a project context.

Partly refers to the fact that the project closure phase does not embrace all objectives of the Knowledge Management Level defined by Wiig et al. (1997), since it does not completely match neither Alavi and Leidner’s (2001) four processes of knowledge management, nor the AOD model defined by Schwartz et al. (2000). The project closure phase only partly provides for objectives of the Knowledge Management processes, or steps.

Although this study looks into two specific activities, the above most certainly applies for other kinds of tools and activities used in organisations as well. It has to be acknowledged that Knowledge Management tools and methods are very broad, since they span over several parts of the Knowledge Management Cycle. Consequently, different tools and activities will surely overlap each other; thus neither the tools/activities nor the processes/steps can be seen as isolated artefacts when studying Knowledge Management.

This does not mean that the studied activities are insufficient. All descriptions of the concept are very clear about this. Spek and Spijkervet (1997, referred to in Schwartz et al., 2000) state that Knowledge Management employs a broad spectrum of techniques and instruments, Kamara et al. (2002) talks about the use of various tools, processes, methods and techniques, and, Obaide (2008) means that the concept incorporates a set of processes. Common for all of the descriptions, is that they all stipulate the use of several measurements to accomplish the goal of Knowledge Management, and in this case, the project closure phase is one.
Overcoming Obstacles regarding Project Knowledge

The project closure phase, as a tool for Knowledge Management, does support the organisation in overcoming obstacles that, according to Hong-bing and Lei (2007), often occurs in project organisations.

Knowledge kept by the individuals

One difficulty is that new knowledge that derives from experiences, are kept by the individual, or the project team, that encountered the experience (Hong-bing & Lei, 2007; Obaide, 2008), and not transferred to, what Alavi and Leidner (2001) refer to, the external organisational memory. The interplay between the activities within the project closure phase mitigates the risk of omitting this transferral of knowledge, since the project team is obliged to address recommendations and suggestions for future projects during the closing seminar, and formalise the knowledge in the final report. The project closure documents, thereby becomes an intermediary of knowledge from the internal memory to the external.

However, the activities cannot ensure that every bit of new knowledge is captured, seeing as it is impossible to externalise all types of knowledge. One of the foremost knowledge types referred to as difficult to formalise, is tacit knowledge (Nonaka, 1994), since it is made up of subjective understanding, intuition and hunches (Nonaka et al., 2000). There are suchlike knowledge types in other taxonomies. These types, bound to their context, are difficult to transfer (Collins, 1993). Millar et al. (1997) mean that they are transferrable, but adds that they lose its specific character in the process. Ramaprasad and Prakash (2009) add that knowledge in general becomes less nuanced when the knowledge sharing becomes more written and formal, which is the case in the project closure documents.

Due to the different preconditions of the knowledge types, it is hard to capture all knowledge developed (Davenport & Prusak, 2000), which can explain why the project closure documents include information that does not fulfil the criteria for being knowledge, and the skewity in the distribution over the different knowledge types. This is however not the same as the activities are ill performed.

The hope of being able to capture every knowledge in a organisation may on the contrary have disastrous results (Schwartz et al., 2000). One negative aspect of documenting everything is that it increases the bureaucray (Ramaprasad & Prakash, 2009). Consequently it may be more benificial to exclude experiences that cannot be formalised in a proper manner from the project closure documents, and find better tools that can provide for the knowledge sharing concerning this knowledge. This is preferrably managed through observation or on-the-job training, which generates knowledge through socialisation (Nonaka, 1994).

Responsibility

Another common obstacle has to do with those responsible for collecting the knowledge. The responsible for this is not necessarily the actor who will re-use the knowledge (Hong-bing & Lei, 2007), and therefore important knowledge may get lost due to insufficient understanding of the importance of the specific knowledge. The closing seminar makes it more plausible to overcome this risk, since it involves representatives of the knowledge users, i.e. the team members are also involved in projects to come.

Retrospective knowledge acquisition

The project closure phase does however not provide for solutions in support of every obstacle regarding project knowledge. Hong-bing and Lei (2007) mean that knowledge is usually not
managed while it is created; instead, it is captured at the end of the project. This problem remains in organisations that uses PPS, since no more than one of the values in the lessons learned dimension when is included.

Neglecting to perform lessons learned practices throughout a project, increases the probability of only capturing the most recent experiences (Kotnour, 2000), especially since project members, who have knowledge about the project, often have left for another project at this time (Hong-bing & Lei, 2007). PPS does however mitigate this risk by saying that everybody, including those who left the project in an earlier stage, ought to participate in the closing seminar.

**Lessons learned buried in details**

Another difficulty has to do with the organisation and composition of the lessons learned documents. These documents are usually buried in details and not organised in a proper manner (Hong-bing & Lei, 2007). The organisation of these documents is not addressed in this thesis since this work is in its initial state at the case company. The composition can however be examined. This can be scrutinised in three levels: object level, document level, and dossier level.

Of these, the object level is the most crucial since the consequence of not ensuring a suitable level of details jeopardises the very aim of Knowledge Management. Failing to accomplish an externalisation of the experience in a proper level of details, leads to no new knowledge acquired through the project closure documents. The result would be resources wasted on an activity with no input into the Knowledge Management Cycle.

Regarding the two other levels, the dossier level is slightly more important. It has to be acknowledged that the document level has an impact on the dossier level, but it is the dossier, i.e. the documents put together, that composes the acquired knowledge, upon which the organisation should act.

**Object level**

On the object level, i.e. individual experiences, it can be established that the experiences the documents give account for are not buried in details. The study shows, on the contrary, that the experiences in most of the cases are insufficiently described, since less than half of the Information Objects are regarded as Knowledge Objects. This means that not only the issue of too many details proposed by Hong-Bing and Lei (2007), leads to difficulty to compile and disseminate useful knowledge; the opposite has the same negative impact.

**Documents level**

There are two aspects concerning the document level. The first aspect has to do with the amount of knowledge. Schwartz et al. (2000) mean that the more knowledge there is in a system, the greater the risk for inaccuracy. In this case, it means that the more experiences the project provide, the greater the risk that it becomes difficult to identify important knowledge. It is shown through the empirical study that each document in the project closure phase produces great amounts of information, approximately 48 pieces of information each. Even though it was possible to identify the knowledge, it was difficult, and one reason, besides the level of details explained above, was the amount of data.

The second aspect is that the documents are based on templates that use predefined knowledge domains, which supports both the project team who produces the document, and the reader. The headlines in the template make it easier to know what kind of
experiences to write about, as well as where to write them. Consequently, the use of templates with predefined knowledge domains support organisations in overcoming the obstacle addressed by Hong-bing and Lei (2007), since it makes it easier to disseminate useful knowledge, because it is sorted in a beforehand known structure.

These two aspects are the same as for the dossier level, but on a much larger scale. On the dossier level, one additional aspect is important to acknowledge.

**Dossier level**

Although it is established that the predefined knowledge domains in the templates have a positive impact regarding compilation and dissemination of useful knowledge, the use of templates have a negative impact. The use of several different templates, however, made the analysis complicated, since they systemised information differently. This is more obvious for project closure documents based on another template than suggested by PPS Handbook, but also true for the two templates found in the PPS framework.

The use of different templates has a negative outcome that is invisible for the project teams, but tangible in the next step of the process. The consequence is that the synergy effect of working in a structured and cohesive way is lost, which is one of the problems encountered when examining the experiences.

**Benefits of Project Knowledge Management**

Previous section describes how the project closure phase supports the organisation in overcoming common obstacles that often occurs regarding knowledge. Overcoming these obstacles is however, not the only benefits of Project Knowledge Management. Frey et al. (2009) describes several other benefits of incorporating Project Knowledge Management in knowledge intensive project organisations.

**Increased efficiency**

Frey et al. (2009) state that the increased efficiency is a consequence of making use of experience gained in earlier projects. However, it cannot be proven that the project closure phase by itself increases the efficiency in the organisation, but it is not the primary goal of the activities. Nevertheless, these activities are a precondition for increasing the efficiency, since they result in new knowledge.

In order to accomplish the increased efficiency, this acquired knowledge must be transferred back into the organisation where it can be re-used. This involves other tools and methods that resides in another part of the Knowledge Management Cycle, i.e. knowledge transfer, and application (Alavi & Leidner, 2001), or distribute (Schwartz et al., 2000).

This means that organisations cannot solely rely on the project closure phase alone in their Project Knowledge Management, since the phase only connects with one part of the Knowledge Management Cycle. There is a need for loopback of the acquired knowledge to the initial stages of other projects in order to avoid reinventing the wheel. By neglecting to loopback the knowledge, the project closure phase becomes a wasted activity\(^2\), which according to Kamara et al. (2002) is a consequence of not performing these kinds of activities, i.e. the activity for avoiding wasted activities thereby becomes one.

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\(^2\) Seen from a Knowledge Management point of view.
**Continuous learning process & Continuous improvements**

*Project Knowledge Management* is also beneficial for accomplishing a continuous learning process, and continuous improvements of methods and standards of the *Project Management* (Frey et al., 2009). These benefits are closely related to increased efficiency explained above since it is the continuous learning process that enables increased efficiency through accumulating gained experience in the organisation. As for the increased efficiency, the continuous learning process requires loopback of acquired knowledge.

**Resource allocation**

There is however, benefits the *project closure phase* cannot bring about. It cannot support the organisation in resource allocation. This benefit derives from resource and competence management, where the organisation, by mapping out employees’ competences and expertise, optimises the resource allocation to projects (Frey et al. 2009). This is not addressed in the *project closure phase*.

**Identification and fostering of innovation**

Identification and fostering of innovation is another benefit of *Project Knowledge Management* (Frey et al., 2009). Two factors can support the organisation in achieving this benefit. The first is interconnected to the acquisition of new experience and knowledge, which the *project closure phase* provides for. It is through the gathering of knowledge the organisation can identify emerging innovations. The second factor is interconnected to the resource allocation, which the *project closure phase*, as described above, does not include.

### 7.2 How can new knowledge within project closure documents be identified and measured?

In order to identify and measure knowledge in project closure documents, there is a need to isolate the knowledge and make the quantitative. This is done by dividing the text in the documents into *Information Objects* and then determines, by use of criteria, whether it is knowledge or not. Since the *project closure phase*, is about producing new knowledge, this is taken into consideration when establishing the criteria. The following sections discuss the division into *Information Objects*, the knowledge criteria, and Measurements of knowledge.

**Division into Information Objects**

The use of the knowledge object perspective allows a division of the *project closure documents* into pieces of information (Alavi & Leidner, 2001). This is essential in order to enable a quantitative measurement of the document content, since the object perspective, according to Alavi and Leidner (2001), permits manipulation of knowledge in order to build and manage the knowledge stock; other knowledge perspectives do not permit this.

The division into isolated objects can result in loss of knowledge, since knowledge, according to Nonaka et al. (2000) is dependent on its context. This means that knowledge, in the process of dividing the text into *Information Objects*, is put in jeopardy since it is subject to decontextualisation.

By going back to the source, i.e. the *project closure documents*, it was analysed whether the division into *Information Objects* had resulted in a decontextualisation with the consequence that the objects were disqualified as *Knowledge Objects*, or not. This was however never the case, and it can therefore be established that the knowledge object perspective is applicable in studies like this, since experience in *project closure documents* can be treated as objects.
It also means that any decontextualisation resulting in the object no longer being regarded as knowledge, due to decreased quality, has taken place in the production of the project closure documents, or at an earlier stage. This is however not a part of the purpose to analyse.

Knowledge Criteria

Theories regarding knowledge are not fully applicable in a study that aims to identify knowledge since they are developed with different intentions. It was therefore a need for further developing the criteria. The criteria are a mix of theories from the tenets Knowledge Management, and Project management. In this development, theories of Davenport and Prusak (2000), Kotnour (2000) and Cooper (2009), have been especially important.

Criterion 1: Two components of information

The first criterion – a Knowledge Object must include at least two components of information – is based on Davenport and Prusak’s (2000) theory of transforming information into knowledge. Davenport and Prusak (2000) describe four methods of transforming information into knowledge, which implies that knowledge cannot constitute of one piece of information alone. The consequence of using this as a criterion was that one fourth of the objects in the project closure documents were disqualified as being knowledge.

Since this criterion is very basic, it is also easy to use. It did therefore, never cause any doubts regarding whether an object met the criterion or not, which makes it highly reliable and stable in identifying knowledge.

Criterion 2: Relationship between components

The second criterion – a Knowledge Object must include an element of comparison, consequence, connection, or conversation – derives from the transformation processes described by Davenport and Prusak (2000). These transformation processes established a relationship between the information components in the objects. This element is important since two pieces of information is not the same thing as knowledge.

It did however not turn the objects into useful knowledge, since it did not describe whether the relationship was a good thing or not. This meant that the criterion was not enough to identify project knowledge. For example, this decisive factor alone resulted in objects that stated that A had a consequence for B, but not whether this impact on B was desirable or not. Consequently, an organisation does not know the outcome of performing A in a project. This means that the theories of Davenport and Prusak (2000) alone cannot provide for a criterion for project knowledge since it does not incorporate an element that describes the nature of the relationship in a way that makes the knowledge useful for an organisation.

By including theories of lessons learned practices and experiences, the relationship criterion could be further developed. Kotnour (2000) stresses the importance of pointing out both good and bad practices, and Cooper (2009) means that it is in the nature of the experience to give account for a cause-effect relationship of performance. By combining these ideas and adding Davenport and Prusak’s (2000) transformation process conversation, the knowledge becomes useful. The criterion thereby includes a descriptive element of how the relationship between information components was perceived.

This criterion – a Knowledge Object must include at least two elements of comparison, consequence, connection, or conversation, where conversation is one – was more complicated to develop than to use. It may seem a complicated criterion, but it is simply about stating whether the relationship is good or bad.
Criterion 3: Uniqueness and surprise

The above criteria do however not include the most important part, the element of surprise. Knowledge Management and Project Knowledge Management in particular, are about gaining knowledge from new experiences in order to be innovative and solve interdisciplinary tasks (Disterer, 2002). This means that this criterion is of great importance when identifying project knowledge in project closure documents, since it applies a qualitative requirement on the knowledge, i.e. the knowledge must be new.

By using the third criterion – a Knowledge Object must involve an element of uniqueness or surprise – new knowledge is distinguished from old. This is important since Knowledge Management is about avoiding to reinvent the wheel (Kankanahalli & Tan, 2004), and to mitigate costly mistakes due to same errors or mistakes performed twice or more (Chase, 1997). Both reinventing the wheel, and performing mistakes more than once, is a result of not making use of new knowledge derived from previous experiences.

This criterion incorporates Nonaka’s (1994) idea of knowledge as a process. It adds an including aspect, where Cooper’s (2009) cause-effects relationships of experience is brought to a higher level, and connected to the organisational knowledge base. This means that the criterion includes a need to convey an un-foretold truth, i.e. uniqueness or surprise.

The above gives that new knowledge is contextual. New knowledge can therefore not be identified without understanding what knowledge the organisation already posses, i.e. the knowledge base. A knowledge base is however not static, it develops as long as knowledge is added. Nonaka (1994) describes knowledge generation as a spiral which diameter continuously increases. The third criterion includes this idea, and applies a dynamic element.

The use of the criterion can be compared to making a mind map of information components where the lines connect the different components and describes the relationship. For every new component, the mind map needs to be scrutinised in order to ensure that it does not already include the element. If the component is already included, there is no need to include it one more time. The same goes for knowledge.

In the study, the third criterion is used in its most simple form. This because the case company’s actual knowledge base is not included in the study. Instead, Tonnquist’s (2006) project triangle is used as the knowledge base. It does not affect the criterion’s importance, or its ability to identify new knowledge. To use the criterion requires a status of the knowledge base, and in the study, the project triangle is regarded as the current status.

The criterion is of great importance since it: ensures that the aim of capturing experiences is fulfilled, i.e. to develop new knowledge (Cooper, 2009), and increase the knowledge base (Kotnour, 2000); takes the dynamic elements of knowledge in consideration, described by Nonaka (1994); and, anchors knowledge in the organisational context, i.e. the knowledge base. Using the criterion requires great knowledge about the knowledge base, which makes it more difficult to use than the previous two criteria.
Measurements of Knowledge

The identification, determination, and categorisation of knowledge are ultimately about measuring the performance of the project closure phase, more specifically the project closure documents. By itself, it does not provide for any solutions for improving project performance, but it results in a basis for strategic decision. Following sections give account for the different measures the method can provide for and why these are important.

Measurement of amount of new knowledge acquired

This is the most basic measure and gives account for the quantity of acquired knowledge. As stated before, Nonaka (1994) describes knowledge generation as a spiral which diameter increases when the quality and quantity of the knowledge does. This measure describes the increased diameter regarding the quantity, and is important because it gives a clear indication whether the project closure phase provide for a sufficient amount of knowledge or not. There are different aspects regarding what ‘a sufficient amount of knowledge’ is; it could be either too little or too much new knowledge.

Too little new knowledge means that the cost to acquire the new knowledge exceeds the value that is gained by re-using it. This could be a result of an organisational culture that does not promote knowledge sharing (Chase, 1997; Schwartz et al., 2000; Kamara et al., 2002), or insufficiency in the processes that aims to support the learning activities (Kotnour, 2000).

Too much on the other hand, means that the project closure documents provide for more knowledge than the organisation can manage. Schwartz et al. (2000) state that too much knowledge in a system, leads to inaccuracy. It is shown in the study that the difficulty to identify important knowledge increases as the quantity does. This means that there is a trade-off between quantity and quality. Moreover, it is shown through the study that it is quite time consuming. This gives that not only the quality of the knowledge decreases; it also takes longer time to identify the knowledge. Consequently, too much included in the project closure documents may result in too much time needed to identify important knowledge. If it is too time consuming, the cost may exceed the value that is gained.

Measurement of insufficient description of new knowledge

The instrument also measures the reason why some experiences the project closure documents give account for not are regarded as being knowledge. The three criteria address different aspects of what knowledge is. The failure to meet the different criterion has different meaning, and consequently implies different measure for improvements. It is therefore important to establish why the experience is disqualified as knowledge before implementing solutions with the purpose to increase the ability to properly describing experiences as knowledge.

Criterion 1: Two components of information

Failing to meet the first criterion – a Knowledge Object must include at least two components of information – means that the project teams describes their encountered experiences very briefly, often with a single sentence. This type of failure could be a result of difficulties to formalise the experience, especially if the experience concerns tacit knowledge since it is difficult to formulate verbally (Nonaka et al., 2000).

Criterion 2: Relationship between components

Failing to meet the second criterion – a Knowledge Object must include at least two elements of comparison, consequence, connection, or conversation, where conversation is one – means that the
experiences encountered are described in more details than in the case above, but still not sufficient. Failure to meet this criterion often involves insufficient description of the cause-effect relationship regarding whether it is good or bad.

Both types of failures above could be the result of an organisational culture that does not motivate the project team to allocate necessary time and effort in order to describe the experiences properly (Chase, 1997; Schwartz et al., 2000; Kamara et al., 2002). Another reason is that experiences are captured in the end of the project (Hong-bing & Lei, 2007), since the ability to remember all details of a specific situation diminishes over time (Kotnour, 2000). It could also be a consequence of little understanding of the actors needs concerning the knowledge in the acquisition process (Hong-bing & Lei, 2007).

Criterion 3: Uniqueness and surprise

Failing to meet the third criterion – a Knowledge Object must involve an element of uniqueness or surprise – means that the knowledge, as it is formulated in the project closure document, not is regarded as new to the organisation. There are two reasons for failing to meet this criterion: due to insufficient description, and due to insufficient distribution of knowledge.

The reasons for insufficient description of the experiences encountered are the same as for failing to meet the previous two criteria, and explained above.

Insufficient distribution of knowledge has different explanations though. If knowledge keeps appearing in project closure documents, it implies that the distribution of the knowledge throughout the organisation is insufficiently performed. This measurement is important since it can be an indication of a break in the Knowledge Management Cycle. The Knowledge Management Level thereby affects the Knowledge Object Level, which supports the theory of Knowledge Management levels suggested by Wiig et al. (1997). This is however not included in this thesis, since the purpose is about knowledge acquisition and not distribution.

Measurement of knowledge types acquired

The categorisation of knowledge gives a comprehensive picture of the experience acquired, and provides for measurements regarding knowledge types the project closure documents provide for. This measurement involves same measurements as described above, but now divided according to the taxonomy used.

This means, experiences described by project closure documents are aggregated on a category level instead of a level that give account for all experiences. Aggregation on a category level, gives information regarding if certain types of knowledge are harder to formalise, more complicated to disseminate, or difficult to acknowledge in the projects. The categorisation thereby refines the measurements described above.

Alavi and Leidner (2001) mean that knowledge categorisation can be beneficially performed by using several different knowledge taxonomies. Using two different knowledge taxonomies when categorising the knowledge resulted in a very nuanced picture of the acquired knowledge; instead of four or fifteen categories, the cross-combination of taxonomies resulted in sixty different categories. This gave a very comprehensive description of project knowledge documents.

The categorisation is important since it gives information regarding what knowledge categories there are problems concerning acquisition or dissemination, which increases the probability to select the most suitable measure for improvement. It is however not in the thesis purpose to analyse distribution methods for different knowledge types.
7.3 Summary

To summarise the discussion it can be said that the activities within the project closure phase are tools for Project Knowledge Management, since they provide for a link between Project Management and Knowledge Management. The activities do not meet all objectives of the Knowledge Management Level, which is to be regarded as normal for these kinds of tools.

The interplay between the activities within the project closure phase mitigates the risk of neglecting to transfer of knowledge to an external memory, since the project team is obliged to address recommendations and suggestions for future projects during the closing seminar, and formalise the knowledge in the final report.

Important knowledge may get lost due to insufficient understanding of the importance of the specific knowledge. The closing seminar makes it more plausible to overcome this risk, since it involves representatives of the knowledge users, i.e. the team members are also involved in projects to come.

The project closure phase does only capture knowledge in the end of the project, which can mean that experience encountered in an early stage of the project is neglected. The project model mitigates this risk by saying that everybody, including those who left the project in an earlier stage, ought to participate in the closing seminar.

There are however problems to compile and disseminate useful knowledge. Experiences are often described with insufficient level of details, and the amount of experience described makes it difficult to identify useful knowledge. The project closure phase does not mitigate this.

The project closure phase supports the organisation in achieving some, but not all, benefits of Project Knowledge Management. This because there are no tool that can solely meet all objectives of Knowledge Management and thereby overcome all obstacles regarding project knowledge, or achieving all benefits of Project Knowledge Management.

The experiences gained in the project closure phase can support the organisation in increasing the efficiency through a continuous learning process, and continuous improvements. This requires that there are methods in place that loopback the acquired knowledge to the organisation where the knowledge can be re-used.

The experiences in the project closure phase can be identified and measured quantitative by dividing the text into isolated pieces of information. By using the established criteria it can be determined if these pieces of information give account for new knowledge or not. This means that the criterion incorporates the existing knowledge base in the determination process, i.e. new knowledge means that it is not a part of the existing knowledge base yet.

The instrument provides measurements regarding the amount of knowledge that is acquired, as well as different types of failures to meet the criterion for being new knowledge. Categorisation of the knowledge gives a more comprehensive picture of the situation, and provides for information about if specific problems to formalise or distribute knowledge are associated with different types of knowledge categories. This information is important in order to know what measures of improvements to implement.
8 Conclusions

The chapter gives account for the thesis conclusions. The purpose is to analyse the framework for the project closure phase through a Knowledge Management perspective. The purpose is also to evaluate how new knowledge, captured by project closure documents, can be identified and measured. To fulfil the purpose, the project closure phase and project closure documents within Practical Project Steering are studied. The purpose is operationalised into two research questions. By answering the research questions established in section 1.3 the purpose is fulfilled. The research questions are answered individually.

How does the project closure phase contribute to Knowledge Management?

- The project closure phase contributes to the Knowledge Management work since it...:
  - provides for a link between Knowledge Management and Project Management
  - meets some, but not all, objectives of Knowledge Management; it cannot be used alone in order to accomplish Knowledge Management
  - systematically provides for new knowledge encountered in project organisations

- The project closure phase has an important contribution to the Knowledge Management work since it...:
  - mitigates the risk of not transferring knowledge to the external organisational memory
  - assigns the responsibility for knowledge acquisition to the knowledge users who understand the importance of specific knowledge, thus increasing the quality
  - mitigates the risk of not acquiring important knowledge by including all participants of the project in the production of project closure documents
  - uses predefined knowledge domains, which supports structure and systemisation in the production of the documents, as well as in the compilation and dissemination of useful knowledge

- The project closure phase does not provide for any solutions regarding the fact that...:
  - experiences are described at an insufficient level of detail; approximately half of the specific experiences are described with less detail than necessary in order to make the knowledge understandable
  - the difficulty to identify important knowledge in project closure documents increases with the amount of data to analyse
  - important knowledge may be lost due to performing the activity in the end of the project only
  - the use of different templates for project closure documents affects the compilation and dissemination of useful knowledge negatively; this negative affect is invisible for the project team, but tangible in the next step

- There are strong indications that...:
  - tools, instruments and techniques for Knowledge Management cannot be used by themselves to accomplish Knowledge Management
  - The project closure phase is indirectly beneficial for increased efficiency, a continuous learning process, and continuous improvements, since it provides for new knowledge, but it requires loopback of the knowledge; loopback is not addressed in the project closure phase
How can knowledge within project closure documents be identified and measured?

- New knowledge within the project closure phase can be identified and measured by dividing the documents into isolated pieces of information and using developed criteria to identify, and thereby quantify new knowledge since ...
  - division of information does not result in any decontextualisation
  - the criteria used are highly reliable and stable, and still acknowledge the dynamics of knowledge as well as the knowledge context
- The identification and quantification of new knowledge requires...:
  - applying the knowledge object perspective
  - knowledge about what the existing knowledge base consists of
- The measurements of project closure documents give information about...:
  - the amount of knowledge, and knowledge types the project closure documents captures
  - knowledge and knowledge types that are insufficiently described
  - knowledge and knowledge types that are insufficiently distributed
- By using these measurements, important aspects can be identified, for instance...:
  - there is an uneven distribution of knowledge types acquired by the project closure documents, regardless of their importance; resulting in loss of important knowledge
  - there are difficulties to formalise knowledge at a sufficient level of detail, which results in failure to transfer important knowledge to the external organisational memory
  - there are difficulties to distribute knowledge sufficiently, which results in re-invention of the wheel, and the same mistakes being made twice or more
- There are strong indications that...:
  - there is a trade-off between the quality and quantity of knowledge; the more knowledge the project closure phase provides for, the more difficult it becomes to compile and disseminate useful knowledge
9 Implications

The chapter describes three important implications that derive from the analysis of the project closure documents.

Uneven Distribution of Knowledge Types

The taxonomies that were possible to pursue a categorisation of, gave a comprehensive picture regarding what types of knowledge the project closure documents is able to capture. The categorisation resulted in a skewed distribution over the different categories, and the cross-combination of the taxonomies enhanced this skewed result.

The reason for this cannot be established by this study, since it did not analyse the production of the project closure documents. It would be interesting though to analyse the reason for the established uneven distribution of knowledge types.

Loopback of Knowledge

The categorisation is important since it gives information regarding what knowledge categories there are problems concerning acquisition or dissemination, which increases the probability to select the most suitable measure for improvement.

If knowledge keeps appearing in the project closure documents, it implies that the distribution of the knowledge throughout the organisation is insufficiently performed. This reason for this is however not included in this thesis, since the purpose is about knowledge acquisition and not distribution. It is established that a loopback of knowledge is important in order to complete the Knowledge Management Cycle. Without this loopback, the effort made in the project closure phase becomes wasted.

It is shown in the study that the project closure documents give account for an unevenly distribution of knowledge types. It would be interesting to further analyse these knowledge types, but in a different part of the Knowledge Management Cycle, more specifically in the part where knowledge is distributed and re-used.

Criterion for Valuable Knowledge

The instrument cannot measure any value of the knowledge, besides from that it is new. Knowledge Management is however about adding value to the organisation by developing and re-using acquired knowledge. The project closure phase results in a great amount of knowledge, and even if the measurements in this study can provide for important information, it cannot approximate the value of the knowledge. It would be interesting to develop methods or instruments for this.
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# Appendix A Concepts and Acronyms

The appendix gives account for the most central concepts and acronyms of this thesis. It is not a complete list, since there are a humongous amount of concepts and terms within the KM-lingo.

## Concepts

### Closing seminar
Seminar held at the end of the project, between DP7 and DP8, with the purpose of conclude the project and share experiences.

### Decision points (DP)
Major milestones in the project model, where it is decided whether the project should continuo or not. The project model constitutes of eight different Decision Points.

### Final report
The project closure document in the project model PPS with the purpose to describe project background, scope, and achieved objectives, experiences

### Final report template
Template used when writing final report. The project model uses one normal template, and one template for simple projects.

### Lessons learned
Artefact that give account for experiences made in order to share it with a greater audience

### Project closure phase
The project phase between DP7 and DP8, where the project is concluded. Incorporates closing seminar and final report production

### Project closure documents
Documents produced at the end of a project that gives account for achievements and experiences.

### Taxonomy
Classification system used to organise concepts or objects, in this case experiences

## Acronyms

### AID
Awareness, Identification, and Delivery
Activities of the step Distribute in the AOD model

### AOD
Acquire, Organise, and Distribute
Model in the Knowledge Management Level

### DP
Decision Points
Milestones within PPS where overall decisions are taken

### GIVE
Gather, Inquire, Validate/verify, and Encode
Activities of the step Acquire in the AOD model

### IO
Information Objects
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
</table>
| KM           | Knowledge Management  
Methods, tools, techniques, and routines from which an organisation can acquire, develop, measure, distribute and provide for their intellectual capital |
| KMC          | Knowledge Management Cycle  
Cycle that describes activities or processes within KM |
| KML          | Knowledge Management Level  
Level of KM where the activities reside |
| KO           | Knowledge Objects |
| KOL          | Knowledge Object Level  
Level of KM where the knowledge objects reside |
| PARC         | Profile, Associate, Rank, and Classify  
Activities of the step Organise in the AOD model |
| PKM          | Project Knowledge Management  
Knowledge Management within project organisation |
| PPS          | Practical Project Steering  
Project model used at the case company |
| SECI         | Socialisation, Externalisation, Combination, Internalisation  
Model of knowledge conversion modes |
Appendix B  

PPS categories

This appendix describes the categories in the final report template used for normal projects. Since each category is not explicitly defined in the PPS Handbook, they are described by using information about specific tasks in the handbook. Some of the categories are not mentioned in the handbook. These categories are described by using common sense and the empirical data within each category in the final reports. Each category is exemplified with exhibits.

Decision points, milestones refers to how the projects different decision points and milestones are perceived.

Exhibit 5: Up to project DP3 meant a lot of planning work for Project manager. There should have been more time after DP3 (breathing space) to plan the [project activity].
Exhibit 43: No decision points and milestones: No decision points and milestones were communicated to the project team as a whole. Most of the team were not aware of major milestones. Recommendation: Milestones and decision points must be planned and communicated openly.

Delivery and transferral refers to experiences regarding the delivery and transferral phase, where the project result is transferred to the base organisation (TietoEnator, 2006l).

Exhibit 40: Developer’s handbooks were created as part of the handover and are considered very valuable by receivers.
Exhibit 41: [Project outcome] will be a very important task for [upper management] to continue focusing on. [Artefact name] first step is to identify future needs.

Deviation and change management refers to a controlled adaption of the result to the customer’s present need. It is important for the project to have a routine for modifying agreed results (TietoEnator, 2006g).

Exhibit 46: No clear deviation process existed at the start of the project, causing a somewhat chaotic situation during the [tests] in 2007. But in spring 2008 the defect management process was defined by the project, and applied leading to significantly shorter correction times.
Exhibit 47: Unclear scope: Because the project plan was never approved [...] the scope became unclear. This led to scope creep, e.g. too many sidetracks that lead to inefficiency. While the project initially due to span over a long time period, the surroundings and prerequisites changed and that led to a change of scope. Recommendation: Strive to have short projects. Stop or pause projects which have no approved project plan. (see comment above)

Document management is a support function in the project and aims to ensure that everybody knows what documents are valid, and where these are kept (TietoEnator, 2006h).

Exhibit 12: Planning for documentation work was missing.
Exhibit 36: The tools and templates are quite “simple” documents and instructions. To be able to handle all the material in the future and follow up on results we need an IT tool to support [project outcome].

Facilities, equipment and rooms refers to the acquisition and use of specific facilities, equipment and rooms.

Exhibit 31: The [facilities] have been good to work in. During the rollout the project allocated a conference room for the many daily meetings.
Exhibit 48: The [project team] sat together during requirement analysis with one project room close. This also worked out well even if the room could have been available earlier.

Production model refers to experiences regarding requirements, solutions, and verification of results. This includes specific working methods, testing and reviews.
Exhibit 37: Domain driven design is more structured and efficient (gives nomenclature, concepts). Recommendation: Involve business in Domain driven design so the whole project is using a common nomenclature.

Exhibit 39: End user training: Training was not targeted accurately with experienced [software] users being bored and inexperienced users being left behind. Recommendation: Ensure that training material is targeted towards the actual audience, splitting specialisms if required.

Project schedule refers to experience of the scheduling of the project, and the schedule itself.

Exhibit 8: The schedule with sessions was thoroughly planned.

Exhibit 42: The time plan was quite tight. One main reason for that was the time plan from the origin assignment but also to be able to follow [other department’s] year cycle. It has through the project been a hard balance between deliveries of [project outcome] material and keeping up the “good enough” quality

Project organisation refers experiences regarding the set-up and changes of the organisation (TietoEnator, 2006f).

Exhibit 30: Steering group not visible enough: Some members of the project group were unaware of who actually made decisions regarding their work. Recommendation: Openly and regularly communicate who sits in the steering group and all decisions that are made.

Exhibit 49: There was a gap between the core team and the [external team]; for most of the time the only coordination/communication occurred between the project manager and the [external project] manager.

Purchase of result refers to experience of external vendors, consulting firms and solution that are purchased during the project life cycle.

Exhibit 27: [Case Company] should consider if we want to spend a bit more money and time on the [activity] and get an even better result. The [consulting firm] people would get more time for reflection and documentation and the plan wouldn’t be as vulnerable to unexpected events.

Exhibit 50: Define processes between [case company] and the [vendor]: In several aspects the internal processes at [vendor] were inefficient/ not sufficiently well developed to meet the needs of [case company]. Initially [case company] forced [vendor] to use the process from [case company]. These situations lead to inefficiency and blame game. Recommendation: Define common agreed processes where the parties’ processes were combined and use a QA process and QA tool agreed upon by all involved.

Quality assurance, project analysis refers to activities for assuring quality and analysing the project.

Exhibit 26: A project review was done in spring 2007. Unfortunately, its existence and its results were unknown until May 2009.

Exhibit 51: As a consequence of poor quality the project assigned a part-time resource for quality assurance of changes and corrections. More strict requirements on deliverables, e.g. to always provide a release note, were also applied. Additionally, during 2008 several reviews on selected parts of the code were conducted.

Requirement dialogue refers to continuously having a dialogue regarding the requirements throughout the project (TietoEnator, 2006j).

Exhibit 52: [IT-specialists] project members had a tendency to neglect that different technical solutions have a user impact.

Exhibit 53: Lack of well documented requirements: the project did not do a thorough requirement specification with the [external vendor]. Recommendation: define an “order process” with the vendor and agree on document format.
Resource allocation refers to experiences regarding allocating the resource over time according to the project schedule.

Exhibit 38: The test manager came in to the project a bit too late. Recommendation: Test manager should be in the project from the start.

Exhibit 54: Resource allocation in the project was very difficult. Even if the lead [IT architect] was quickly recruited, the rest of the personnel were tricky.

Risks refer to the work to identifying risks, have alternative courses of action, and identify new possibilities (TietoEnator, 2006k).

Exhibit 23: Two risk workshops were performed and helped mitigate risks.

Exhibit 32: In the early days of the project at least one risk workshop was conducted. Unfortunately, many of the identified risks were not acted upon, and became reality.

Routines refers to specific routines regarding administration, meetings, information distribution, confidentiality, and security (TietoEnator, 2006i).

Exhibit 28: Inform all [support functions] and other stakeholders on future changes in an early phase of the project as soon as possible.

Exhibit 44: Information transfer: The Project has had problems sharing information between the project members as there was a tendency of taking on, or holding on too strongly to, own responsibilities and/ or knowledge [further description].

Staffing and training refers experiences regarding the specific staffing of the project, i.e. who and how this is done, and additional training (TietoEnator, 2006f).

Exhibit 33: Choose the “right” project (and network) members, those who have energy and competence. To be able to plan and deliver in time they also need to have enough time/ hours to spend in the project. Both network and project members contributed a lot.

Exhibit 35: Diverse business project team: The project team was diverse considering background and nationality. This gave valuable input. Recommendation: encourage diverse recruitment in the project team.
Appendix C  Categorisation of Final reports

The table describes sub-headings found in documents based on template for normal projects. The head-lighted sub-headings correspond exactly to the template. No manipulation of this data has been performed, except for censorship with the aim to keep the case company anonymous.

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<td>[working method]/Efficiency</td>
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<tr>
<td>Cooperation [case company] and [consulting firm]</td>
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<td>[Case company] Processes: Human Resource Allocation</td>
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<td>Knowledge transfer</td>
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<td>Quality assurance</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Quality assurance, project analysis</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Requirement dialogue</td>
<td>7</td>
<td>6</td>
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<tr>
<td>Resource allocation</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Result</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Risk handling</td>
<td>2</td>
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</tr>
<tr>
<td>Risks</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Routines</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Sharing knowledge</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Social Events</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Staffing and training</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Staffing/Resource allocation</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Starting with off-shore support [...]; Connectivity problems etc.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>The People</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Too few resources during Service level observation periods</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Too many initiatives at the same time</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Training</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Unclear roles</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Using SCRUM for development</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>313</strong></td>
<td><strong>167</strong></td>
</tr>
</tbody>
</table>
## Appendix D  List of Experience Exhibits

The table gives account for all exhibits used when performing the analysis in the third stream (chapter 1). It shows the exhibit content, and categories according to Cooper’s (2009) subject areas and the categories found in the PPS Handbook. Last column give account for the criterion that disqualifies IO as KO, if that is the case.

<table>
<thead>
<tr>
<th>Exhibit</th>
<th>Cooper</th>
<th>PPS</th>
<th>Not KO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhibit 1: Everyone in the [case company] group was very committed.</td>
<td>People</td>
<td>Staffing and training</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 2: All involved did their best and were committed to the goal. [Consulting firm] felt supported from the [case company] team and it helped them gaining the comfort level while working.</td>
<td>People</td>
<td>Staffing and training</td>
<td></td>
</tr>
<tr>
<td>Exhibit 3: We have during the assignment and project time worked in close cooperation with the line organisation especially through the [name] network members. Accountable towards the project for line organisations deliveries have functional HR managers been. They have also then together with other network members and local HR colleagues been responsible for implementing the deliveries from the project in respective function.</td>
<td>People</td>
<td>Delivery and transferral</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 4: We had an early team outing in the beginning of the [project which] helped a lot to improve the team bonding. After that we had a few more team building activities. All this helped the communication and honesty in the group and reduced misunderstandings.</td>
<td>People</td>
<td>Staffing and training</td>
<td></td>
</tr>
<tr>
<td>Exhibit 5: Up to project DP3 meant a lot of planning work for Project manager. There should have been more time after DP3 (breathing space) to plan the [project activity].</td>
<td>Process</td>
<td>Decision points, milestones</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 6: The [project activity] plan was too tight, no room for unplanned events like illnesses.</td>
<td>Process</td>
<td>Project schedule</td>
<td></td>
</tr>
<tr>
<td>Exhibit 7: Good to meet users, other groups, visit [office] etc.</td>
<td>People</td>
<td>Requirement dialogues</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 8: The schedule with sessions was thoroughly planned.</td>
<td>Process</td>
<td>Project schedule</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 9: Back-up planning could have been better.</td>
<td>Process</td>
<td>Project schedule</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 10: [Test1], [test2] and [test3] worked very well.</td>
<td>Process</td>
<td>Production model</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 11: We have lately forward all Competence Management material/info to Line Managers via HR.</td>
<td>Process</td>
<td>Delivery and transferral</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 12: Planning for documentation work was missing.</td>
<td>Process</td>
<td>Document management</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 13: Some administrative documents like meeting schedules, contact lists, absence schedules etc., were kept.</td>
<td>Process</td>
<td>Routines</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit 14: The specification was sent out Oct 23 asking to receive feedback latest Oct 26. No feedback was received. It was finalised Oct 31.</td>
<td>People</td>
<td>Delivery and transferral</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 15: During phase 2 migrations a follow the sun approach has been used. The migrations were performed during CET night time and carried out by co-workers from another region, who were working remotely during normal office hours.</td>
<td>Process</td>
<td>Production model</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 16: The rollout was done in six steps; one migration per each [name] region, i.e. per database. On a high level business and [department] planned the rollout together. Details, such as checklists and education packages were developed, and coordinated by the [department] – and business rollout coordinators, who further reported in the Project Management Team meetings.</td>
<td>Process</td>
<td>Delivery and transferral</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 17: Outcome – [Test]: The users were responsible for the planning and test execution, and the [project] provided with test environments, test data, and support.</td>
<td>Process</td>
<td>Production model</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 18: Project manager got a lot of support and help from [department + role + name].</td>
<td>People</td>
<td>Staffing and training</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 19: A total of 5 [meetings] and regular project meetings have been held in order to secure the time plan and working routines for [project].</td>
<td>Process</td>
<td>Routines</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 20: The methodology used is based on facilitated workshops where workflows and information models are created in order to get a common understandable view.</td>
<td>Process</td>
<td>Production model</td>
<td>C2</td>
</tr>
<tr>
<td>Exhibit 21: A small dedicated team can achieve a lot!</td>
<td>People</td>
<td>Project organisation</td>
<td>C1</td>
</tr>
<tr>
<td>Exhibit</td>
<td>Cooper</td>
<td>PPS</td>
<td>Not KO</td>
</tr>
<tr>
<td>---------</td>
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</tr>
<tr>
<td>Exhibit 22: Transition leader doing a brave job keeping all the joggling balls up in the air even in stormy weather.</td>
<td>People</td>
<td>Staffing and training</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 23: Two risk workshops were performed and helped mitigate risks.</td>
<td>Process</td>
<td>Risks</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 24: It was estimated that the project required 11,688 hours effort and would be completed by 2007-10-01. Actual figures show a total of 6,188 hours. Changes in scope have certainly helped to stay within the budget. Hours planned for development and support for local solutions has not been used. The number of consultants active in the project has been limited, separate initial functions has been combined in one single source.</td>
<td>Processes</td>
<td>Resource allocation</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 25: We have had some legal challenges in one office that now has been solved.</td>
<td>Politics</td>
<td>Routines</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 26: A project review was done in spring 2007. Unfortunately, its existence and its results were unknown until May 2009.</td>
<td>Process</td>
<td>Quality assurance, Project analysis</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 27: [Case Company] should consider if we want to spend a bit more money and time on the [activity] and get an even better result. The [consulting firm] people would get more time for reflection and documentation and the plan wouldn’t be as vulnerable to unexpected events.</td>
<td>Product</td>
<td>Purchase of result</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 28: Inform all [support functions] and other stakeholders on future changes in an early phase of the project as soon as possible.</td>
<td>Process</td>
<td>Routines</td>
<td>C3</td>
</tr>
<tr>
<td>Exhibit 29: [Role + name] already had experience from the [previous project] which was a big advantage in the planning of this project.</td>
<td>People</td>
<td>Staffing and training</td>
<td></td>
</tr>
<tr>
<td>Exhibit 30: Steering group not visible enough: Some members of the project group were unaware of who actually made decisions regarding their work. Recommendation: Openly and regularly communicate who sits in the steering group and all decisions that are made.</td>
<td>Politics</td>
<td>Project organisation</td>
<td></td>
</tr>
<tr>
<td>Exhibit 31: The [facilities] have been good to work in. During the rollout the project allocated a conference room for the many daily meetings.</td>
<td>People</td>
<td>Facilities, equipment and rooms</td>
<td></td>
</tr>
<tr>
<td>Exhibit 32: In the early days of the project at least one risk workshop was conducted. Unfortunately, many of the identified risks were not acted upon, and became reality.</td>
<td>Process</td>
<td>Risks</td>
<td></td>
</tr>
<tr>
<td>Exhibit 33: Choose the “right” project (and network) members, those who have energy and competence. To be able to plan and deliver in time they also need to have enough time/hours to spend in the project. Both network and project members contributed a lot.</td>
<td>People</td>
<td>Staffing and training</td>
<td></td>
</tr>
<tr>
<td>Exhibit 34: Server developers worked very well together, but it was not so easy between client/server due to knowledge between is specialized.</td>
<td>People</td>
<td>Production model</td>
<td></td>
</tr>
<tr>
<td>Exhibit 35: Diverse business project team: The project team was diverse considering background and nationality. This gave valuable input. Recommendation: encourage diverse recruitment in the project team.</td>
<td>People</td>
<td>Staffing and training</td>
<td></td>
</tr>
<tr>
<td>Exhibit 36: The tools and templates are quite “simple” documents and instructions. To be able to handle all the material in the future and follow up on results we need an IT tool to support [project outcome].</td>
<td>Process</td>
<td>Document management</td>
<td></td>
</tr>
<tr>
<td>Exhibit 37: Domain driven design is more structured and efficient (gives nomenclature, concepts). Recommendation: Involve business in Domain driven design so the whole project is using a common nomenclature.</td>
<td>Process</td>
<td>Production model</td>
<td></td>
</tr>
<tr>
<td>Exhibit 38: The test manager came in to the project a bit too late. Recommendation: Test manager should be in the project from the start.</td>
<td>Process</td>
<td>Resource allocation</td>
<td></td>
</tr>
<tr>
<td>Exhibit 39: End user training: Training was not targeted accurately with experienced [software] users being bored and inexperienced users being left behind. Recommendation: Ensure that training material is targeted towards the actual audience, splitting specialisms if required.</td>
<td>Product</td>
<td>Production model</td>
<td></td>
</tr>
<tr>
<td>Exhibit 40: Developer’s handbooks were created as part of the handover and are considered very valuable by receivers.</td>
<td>Product</td>
<td>Delivery and trans Ferral</td>
<td></td>
</tr>
<tr>
<td>Exhibit 41: [Project outcome] will be a very important task for [upper management] to continue focusing on. [Artefact name] first step is to identify future needs.</td>
<td>Product</td>
<td>Delivery and trans Ferral</td>
<td></td>
</tr>
<tr>
<td>Exhibit 42: The time plan was quite tight. One main reason for that was the time plan from the origin assignment but also to be able to follow [other department’s] year cycle. It has through the project been a hard balance between deliveries of [project outcome] material and keeping up the “good enough” quality.</td>
<td>Politics</td>
<td>Project schedule</td>
<td></td>
</tr>
<tr>
<td>Exhibit</td>
<td>Cooper</td>
<td>PPS</td>
<td>Not KO</td>
</tr>
<tr>
<td>---------</td>
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</tr>
<tr>
<td>Exhibit 43: The lack of resources for practical work and [project] not prioritized on the agenda affected the time of the deliveries which were delayed. It also delayed the start up date of e.g. creation of the competence catalogue since we needed to have all competence profiles/maps for [department] specific job titles ready before.</td>
<td>Politics</td>
<td>Delivery and transferral</td>
<td></td>
</tr>
<tr>
<td>Exhibit 44: Information transfer: The Project has had problems sharing information between the project members as there was a tendency of taking on, or holding on too strongly to, own responsibilities and/or knowledge [further description].</td>
<td>Politics</td>
<td>Routines</td>
<td></td>
</tr>
<tr>
<td>Exhibit 45: No decision points and milestones: No decision points and milestones were communicated to the project team as a whole. Most of the team were not aware of major milestones. Recommendation: Milestones and decision points must be planned and communicated openly.</td>
<td>People</td>
<td>Decision points, milestones</td>
<td></td>
</tr>
<tr>
<td>Exhibit 46: No clear deviation process existed at the start of the project, causing a somewhat chaotic situation during the [tests] in 2007. But in spring 2008 the defect management process was defined by the project, and applied leading to significantly shorter correction times.</td>
<td>Process</td>
<td>Deviation and change management</td>
<td></td>
</tr>
<tr>
<td>Exhibit 47: Unclear scope: Because the project plan was never approved [...] the scope became unclear. This led to scope creep, e.g. too many sidetracks that lead to inefficiency. While the project initially due to span over a long time period, the surroundings and prerequisites changed and that led to a change of scope. Recommendation: Strive to have short projects. Stop or pause projects which have no approved project plan. (see comment above)</td>
<td>Politics</td>
<td>Deviation and change management</td>
<td></td>
</tr>
<tr>
<td>Exhibit 48: The [project team] sat together during requirement analysis with one project room close. This also worked out well even if the room could have been available earlier.</td>
<td>People</td>
<td>Facilities, equipment and rooms</td>
<td></td>
</tr>
<tr>
<td>Exhibit 49: There was a gap between the core team and the [external team]; for most of the time the only coordination/communication occurred between the project manager and the [external project] manager.</td>
<td>People</td>
<td>Project organisation</td>
<td></td>
</tr>
<tr>
<td>Exhibit 50: Define processes between [case company] and the [vendor]: In several aspects the internal processes at [vendor] were inefficient/not sufficiently well developed to meet the needs of [case company]. Initially [case company] forced [vendor] to use the process from [case company]. These situations lead to inefficiency and blame game. Recommendation: Define common agreed processes where the parties’ processes were combined and use a QA process and QA tool agreed upon by all involved.</td>
<td>Process</td>
<td>Purchase of result</td>
<td></td>
</tr>
<tr>
<td>Exhibit 51: As a consequence of poor quality the project assigned a part-time resource for quality assurance of changes and corrections. More strict requirements on deliverables, e.g. to always provide a release note, were also applied. Additionally, during 2008 several reviews on selected parts of the code were conducted.</td>
<td>Process</td>
<td>Quality assurance, Project analysis</td>
<td></td>
</tr>
<tr>
<td>Exhibit 52: [IT-specialists] project members had a tendency to neglect that different technical solutions have a user impact.</td>
<td>People</td>
<td>Requirement dialogue</td>
<td></td>
</tr>
<tr>
<td>Exhibit 53: Lack of well documented requirements: the project did not do a thorough requirement specification with the [external vendor]. Recommendation: define an “order process” with the vendor and agree on document format.</td>
<td>Process</td>
<td>Requirement dialogue</td>
<td></td>
</tr>
<tr>
<td>Exhibit 54: Resource allocation in the project was very difficult. Even if the lead [IT architect] was quickly recruited, the rest of the personnel were tricky.</td>
<td>People</td>
<td>Resource allocation</td>
<td></td>
</tr>
</tbody>
</table>