Aalto University
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Mediation of Accumulated Knowledge Inside IS Programs

Information Systems Science

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ABSTRACT

Objectives of the Study

The purpose of this study is to build a model of how knowledge can be transferred within IS programs. More specifically, it seeks to identify how knowledge accumulated in an IS project can be mediated to another project in the same program.

Academic background and methodology

The study builds upon theories from the fields of organizational learning and organizational knowledge creation. In order to study the phenomenon in preferred depth, the research was executed as a single-case study via triangulation. The study analyzes the learning and knowledge transfer between two consecutive projects from a case company's master data management program. In addition to the ways the organization pursued knowledge transfer, the study seeks to identify how the accumulated knowledge in the prior project is observable in the subsequent one. Being a case study, the theory formulation was done simultaneously with the observations. The model utilized in the study was built upon the 4Is framework by Zollo and Winter (2002).

Findings and conclusions

The study results in a framework describing unidirectional inter-project knowledge mediation in programs. It consists of two projects, both having separate individual and group level learning stocks and a shared organizational level learning stock. While the individual level is capable of harnessing and transferring only tacit and the organizational level only explicit knowledge, the group learning stock is able to mediate both and serves as a platform for knowledge conversion (tacit to explicit or vice versa). The study states that in addition to the current trend of studying explicit knowledge codification, research on organizational knowledge transfer should acknowledge the existence of two other knowledge mediation methods: reflection and allocation. The study identified all the theorized streams for knowledge transfer with the case company – except for the mediation of purely tacit knowledge on group level.

Keywords

Organizational learning; Organizational knowledge creation; Organizational learning, knowledge and capabilities; OLKC; Information Systems, Knowledge transfer; Program learning; Communities of Practice, Master Data Management; MDM

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ABSTRAKTI

Tutkimuksen tavoitteet

Tutkielman tavoitteena on rakentaa malli siitä, kuinka osaamista voidaan välittää informaatiojärjestelmäohjelmien sisällä. Sen tarkoituksena on tutkia kuinka ohjelman yhdessä projektissa karttunutta tietoa voidaan siirtää ohjelman toisiin projekteihin.

Kirjallisuuskatsaus ja metodologia

Tutkimus käyttää pohjanaan teorioita organisaatio-oppimisen sekä organisaation tiedonluonnin aloilta ja se tehtiin useamman metodin single-case study -metodilla. Tutkimuksessa analysoitiin case -yrityksen Master Data Management -ohjelman kahta peräkkäistä projektia. Yrityksen tiedonsiirtohankkeiden lisäksi tutkimuksessa pyrittiin kuvaamaan, miten ensimmäisessä projektissa kartutettu osaaminen näkyi seuraavassa projektissa. Koska kyseessä oli case -tutkimus, tapahtui teorianmuodostus yhtä aikaa havainnoinnin kanssa. Muodostetun mallin pohjana käytettiin Zollon ja Winterin (2002) 4Is –mallia.

Tulokset ja päätelmät

Tutkimuksen tuloksena on malli projektienvälisestä, yhdensuuntaisesta tiedonsiirrosta informaatiojärjestelmäohjelman sisällä. Muodostettu malli koostuu kahdesta projektista, näiden yksilö- ja ryhmätason osaamisvarannoista sekä projektien jakamasta organisaatiotason osaamisvarannosta. Mallissa voi yksilötasolla välittää ainoastaan hiljaista tietoa ja organisaatiotasolla pelkästään eksplisiittistä tietoa, ryhmätason soveltuessa molempien tietotyyppien kommunikointiin. Ryhmätaso toimii myös alustana, jossa hiljaista tietoa voidaan muuntaa eksplisiittiseksi ja eksplisiittistä tietoa hiljaiseksi. Tutkielma väittää, että tutkittaessa tietotaidon siirtoa organisaatiossa tutkijan tulisi nykytrendin vastaisesti tiedostaa kodifioinnin lisäksi myös muiden siirtometodien olemassaolo. Esimerkiksi tutkielman tunnistamien allokaation ja reflektoinnin huomioonottaminen parantaa kokonaiskuvan saamista osaamisensiirrosta. Tutkimus pystyi case -yrityksellä todentamaan kaikkia teoriasta muodostettuja osaamisenvälityskanavia yhtä lukuun ottamatta. Hiljaisen tiedon siirtymistä ryhmätasolla ei tutkimuksessa voitu tyhjentävästi todentaa.

Avainsanat

Organisaatio-oppiminen, organisaation tiedonluonti, OLKC, informaationjärjestelmät, osaamisensiirto, oppiminen ohjelmissa, käytäntöyhteisö, Master Data Management, MDM

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1. INTRODUCTION

1.1. Background and motivation

In a world where new information systems (IS) concepts sprout at a thickening phase organizations are forced to continuously adapt new technology and fine-tune their behavior in order to retain their competitive edge. There seems to be an understanding that with many of these concepts the adaptation is best carried out in small steps (Beasty, 2008; Ilieva et al., 2004; Kniberg, 2007; Livermore, 2008; Murphy et al., 2005; Smith and McKeen, 2008). This way the organization may with each step learn about the implemented solution and use this accumulated knowledge when engaging the latter steps. The approach helps the organization to become more efficient with each implementation step – assuming it has established a functioning process for knowledge transfer. The iterative implementation also enables deliverance short-term results – and hence helps to establish a buy-in to a long-term IS initiative (Murphy et al., 2005; Smith and McKeen, 2008). While the literature has successfully examined these small steps occurring inside projects with agile development (e.g. Andreescu and Mircea, 2008; Ilieva et al., 2004; Kniberg, 2007), the scope of this paper focuses on the small steps in an IS program – the steps being of the program's projects.

The academic literature has not yet seen a generally accepted theory of how the learned knowledge is, and should, be transferred between these steps. Instead, we have seen a vast base of research aiming at the separate parts of this knowledge transfer; e.g. the forming of project post-mortem documents (e.g. Newell et al., 2003, 2006; Schindler and Eppler, 2003; Swan et al., 2010; Williams, 2004), what these documents should include (e.g. Newell et al., 2006; Prencipe and Tell, 2001; Schindler and Eppler, 2003; Swan et al., 2010), how the accumulated knowledge may be mediated through mentoring (e.g. Bryant, 2005) and how ITC can be used as an intermediary in knowledge transfer between the organization's projects (e.g. Nonaka et al., 1996; Newell et al., 2006). Nearly all of the mentioned studies also focus solely on the transfer of

explicit knowledge – mostly ignoring the tacit knowledge hidden in individual and group domains.

In this Thesis, we try to identify how an organization communicates the lessons learned inside an IS program. More precisely, how the accumulated knowledge is transferred inside a program from a project to another. The question is approached from a theory base provided by the field of organizational learning, knowledge and capabilities (OLKC).

We find the formulated theory providing an important missing piece for the OLKC literature since modern organizations are becoming more and more project-oriented (Turner and Keegan, 2001) and the knowledge interchange between projects hence requires comprehensive study. Also the accelerating phase an organization engages new IS initiatives, requires it to efficiently manage the programs and projects aiming at their implementation. Here, the inter-project communication is in a crucial role.

The study aims at forming a framework through a single-case study of an organization's master data management (MDM) program. A master data management program was chosen, since the relatively novel concept lacks a formalized theory of implementation (Cleven and Wortmann, 2010; Sammon et al., 2010; Smith and McKeen, 2008). With studying how the case organization altered its approach to the initiative in their following MDM project based on the problems it faced in its first one, we have a possibility to observe the formulation of organizational best practices through inter-project knowledge transfer. We hope these best practices could also help further studies in forming a theory of the optimal approach to MDM implementation.

1.2. Research questions

The purpose of this Thesis is to examine how organizations learn during their IS initiatives and, especially, how can the accumulated knowledge be transferred from one project to another. These projects are assumed to be a part of a larger systematically managed long-term program

aimed at establishing information systems that are used throughout the organization. This paper does not try to establish best practices or general rules for how an IS initiative should be implemented, but to form a base for a framework of the possible means of knowledge transfer between a program's projects. The research is carried out as a single-case study on an organization's master data management program. The method is selected in order to examine the knowledge accumulation and transfer in desired depth.

This Thesis seeks to answer the following three questions:

- With interrelated IS projects, how can the lessons learned in previous projects be transferred to subsequent ones
- How did the case company transfer the knowledge learnt from one project to another in its MDM program?
- How can the knowledge accumulated in the previous MDM project be observed in the case company's current MDM project?

The first question aims at forming a general framework for intra-organizational inter-project knowledge transfer within a program. The second question examines how did the case company commit the transfer described in the previous question in practice. As this paper presumes learning to be observable from an actor's actions (as described in detail in Section 2.1.1), the third question seeks to identify how can the mediated knowledge be observed from the consecutive project; i.e. did the company successfully transfer knowledge or not.

This paper begins with a literature review in Chapter 2 that first establishes some of the base assumptions used in regard to organizational learning. After the assumptions, the chapter discusses methods of learning and introduces two central theories used in the field that is currently referred to as 'organizational learning knowledge and capabilities'. The chapter ends with a section discussing organizational knowledge transfer in current literature. The presented theories will be used in forming a framework of knowledge transfer between a program's

projects in Chapter 3. The fourth chapter is dedicated to presenting the selected methodology, the case company and their master data management program. Organizational learning at the case company is then analyzed with the framework in Chapter 5. Finally, the sixth chapter includes discussion about the research's findings, its managerial implications, conclusions and limitations.

2. LITERATURE REVIEW

2.1. Base assumptions

During most of its existence, the field of organizational learning has been struggling with lack of a commonly accepted, consistent theory (Crossan et al., 1999, 2011; Easterby-Smith et al., 2000; Li et al., 2009; Schilling and Kluge, 2009; Vera, 2009). Not until 2004 was an initiative made by Mark Easterby-Smith that brought together the fields of organizational learning and organizational knowledge generation; now studied under the umbrella term 'organizational learning, knowledge and capabilities' (OLKC) (Crossan et al., 2011, p. 453). Today, most of the researchers view the earlier separate fields as complementary branches of the same field of research (e.g. Crossan et al., 2011; Easterby-Smith, 1997; Li et al., 2009; Vera, 2009). On the whole, the separate branches examine the same phenomenon with differing points-of-view and focus areas. As a collection of theories from the earlier separate fields, there is currently some debate whether these branches would need a unifying base theory (a trunk) (Crossan et al., 2011) or not (Easterby-Smith et al., 2000; Vera, 2009).

Since the traditional fragmentation of the field, OLKC has been labeled by the need for thoroughly presenting all the basic assumptions a study deals with (Easterby-Smith et al., 2000). Though basic practice in all academic research, the listing has been vital in OLKC because the absence of a commonly accepted theory base and multiple widely used, conflicting, presumptions. Hence, the first section in this chapter is dedicated in listing the presumptions made in this study with detail.

2.1.1. Assumptions on learning

The literature is unanimous that organizations themselves – not being conscious beings, but social constructs – aren't capable of leaning. This capability is possessed by the individuals who form the organization. Because of this observation, some academics have claimed organizational

learning being nothing more than the sum of its individuals' knowledge (Easterby-Smith et al., 2000). In this Thesis, we follow the opposite view – along with the majority of modern OLKC literature. We justify our assumptions with the remark that some of the individuals' accumulated knowledge is incorporated into an organization's guidelines and practices. Hence it stays with the organization regardless of the individuals related to the learning process. This phenomenon is discussed in depth in Section 2.3.4.

The field of OLKC has also witnessed some disagreement of whether learning requires appropriate action or not (Easterby-Smith et al., 2000; Fiol and Lyles, 1985). Here, this paper will lean on the work of Argyris (1999) and Argyris and Schön (1978) when stating that learning may occur when an actor notices a match or mismatch in the outcome of one's actions and the intended result. With this logic learning is strongly related to action. We can also justify the approach with the argument that deducing and inventing for an idea requires a different set of heuristics and design than discovering and inventing for an outcome (Argyris, 1980, 1999).

2.1.2. Ontological dimension – the actors in organizational learning

Throughout the fields of organizational learning and organizational knowledge creation it has been emphasized that the theories being used are valid on three ontological dimensions – on individual, group and organizational levels (e.g. Argyris, 1976; Crossan et al., 1999; Nonaka, 1994; Prencipe and Tell, 2001). A more recent trend in the field is adding a fourth, inter-organizational dimension to the study (e.g. Nonaka and Takeuchi, 1995; Knoppen et al., 2011). However, it has been argued that studies in the field typically emphasize one or two of these dimensions with the expense of the others – or disregard the relationships between the dimensions (Crossan et al., 2011).

In this paper, we put our focus on the intra-organizational learning between projects in a program. Hereby, the ontological dimensions of individual, group and organization are recognized. We do not claim that inter-organizational learning does not happen in the studied phenomenon. Quite

the opposite, we find this quite likely. Especially with ICT programs in larger organizations external consultants are typically sought with the sole purpose of sharing their expertize on the subject. It can therefore be deducted that inter-organizational learning lies, in fact, in the hearth of these kinds of programs. The fourth dimension is omitted in order to more thoroughly focus on the intra-organizational knowledge creation and transfer, and to keep the scope of the study suitable for a Master's Thesis.

2.1.3. Epistemological dimension – the nature of knowledge

In this paper, we follow the common practice of seeing knowledge divided into two distinct subcategories: tacit and explicit knowledge. These types are not viewed as competing, but rather they are seen to complement each other in various ways. As presented by Cook and Brown (1999) we recognize that both of the two types are able to harness knowledge that the other is incapable of possessing.

Especially the theory of organizational knowledge creation relies heavily on the commonly accepted division between tacit and explicit knowledge. As the name suggests, tacit knowledge is something its possessor is incapable of explaining. Tacit knowledge is knowledge of action or a worldview. For instance, there are far fewer people capable of explaining thoroughly how they are able to ride a bicycle than ones skilled in the art of bicycle riding. Another example would be a top-manager's decision about an organization's upcoming strategy based on a 'hunch'. In both cases, the actors do not act at random, but based on previous experience. In turn, tacit knowledge can be divided into two subtypes that are shortly discussed in Section 2.4.1.

It is without question that explicit knowledge's strength lies in the ease it can be communicated further – as it can be thoroughly explained and documented. It represents the part of an actor's knowledge than can be (more or less) exhaustively expressed. It has been argued that the Western field of organizational learning has often put more emphasis on explicit knowledge (Cook and Brown, 1999; Nonaka and Takeuchi, 1995). In the worldview where an aware

individual deducts objective knowledge the subjective nature of tacit knowledge has represented a hindrance. Much of the work on organizational learning (e.g. Argyris, 1976; Argyris and Schön, 1978; Crossan et al., 1999; Daft and Weick, 1984, 1984; Prencipe and Tell, 2001; Zollo and Winter, 2002) regards tacit knowledge as something, which needs to be converted explicit.

As with many theoretical elements, it is necessary to recognize that one can only rarely observe communication that is purely tacit and explicit. In reality it is nearly impossible to fully distinct these types of knowledge from each other, since explicit communication nearly always includes tacit elements and vice versa (Tsoukas, 1996). However, the author claims that the concepts provide a useful framework for observing the general nature of knowledge itself, its creation and communication. The distinction has rooted itself as one of the rare basic assumptions in the field of OLKC and used by the majority of the researchers on the field (e.g. Cook and Brown, 1999; Crossan et al., 1999; Levitt and March, 1988; Nonaka and Takeuchi, 1995; Prencipe and Tell, 2001). Therefore, it is stated that when exploring the nature of the elements in communications, overlooking these slight imperfections does not affect the robustness of the general framework formed in Chapter 3.

The first section of this chapter introduced the base assumptions that are used in the study. Before presenting the two theories that form the basis of the framework built in Chapter 3, we discuss the separate methods of learning that are commonly used in the field of organizational learning. The next chapter presents two broad categories learning can be divided into based on its nature.

2.2. Exploration and exploitation

It is common to the field of organizational learning to distinguish different types of learning from each other. Typically, this categorization results in two separate classes, or processes, of learning. In the course of history, these classes have gained several manifestations with various differing

definitions. Division has been made e.g. between single- and double-loop learning (Argyris, 1976), trial-and-error experimentation and organizational search (Levitt and March, 1988), first- and second-order learning (Lant and Mezias, 1992), Learning I and Learning II (Bateson, 1972, pp. 279 – 308), exploitation and exploration (March, 1991) and incremental and radical learning (Miner and Mezias, 1996). As Edmondson (2002) stated, when examining these divisions we notice that, while unquestionably concerned with different presumptions, these categorizations ultimately define similar distinctions of the nature of organizational learning. Therefore, in this text no difference is made between these various divisions. In this paper, all the manifestations are regarded analogous to exploration and exploitation. In this section, we shortly introduce two popular distinctions between the types of learning. In addition to the exploration – exploitation model the single-loop – double-loop division is discussed in order to provide a more comprehensive view to the subject.

2.2.1. Exploitation and single-loop learning

The distinction between single- and double-loop learning was originally spurred from the work of Argyris (1976) and rooted to the academic community by the groundbreaking publication by Argyris and Schön (1978). Argyris (1999, p. 68) defined single-loop learning to occur 'wherever an error is detected and corrected without questioning or altering the underlying values of the system'. In single-loop learning one enhances his or her capabilities through improving routines. The context of the occurrence, the so-called governing variables, is regarded as fixed with the actor not having the possibility or interest to alter it.

From the other division, exploitation has several linkages to single-loop learning. As the name suggests, the term describes a phenomenon where knowledge acquired earlier is exploited in some way in current action (Crossan et al., 1999). It can be considered as solving the problem by choosing the solution from the currently available options. Exploitation does not mean the learner just blindly following the already accumulated knowledge, but learning how to efficiently

utilize the gathered knowledge resources (March, 1991). March (1991, p. 71) defined exploitation to include 'includes such things as refinement, choice, production, efficiency, selection, implementation, execution'.

2.2.2. Exploration and double-loop learning

In double-loop learning the change happens primarily in the context of action. According to Argyris (1999, p. 68), double-loop learning occurs 'when mismatches are corrected by first examining and altering the governing variables and then actions'. It is characterized by questioning the environmental restrictions to the situation, developing new capabilities and reframing routines. The solution to an occurred problem is sought primarily through altering existing practices and creating new routines. Unlike single-loop learning, double-loop learning typically requires the empowerment of the learners as well as open discussion and feedback to and from the participating actors (Argyris, 1976).

With the exploitation – exploration division, the latter can be seen analogous to double-loop learning. Where exploitation includes choosing the solution between the existing options, exploration consists of searching for new ones. Compared with exploiting the currently known, exploration can be seen as a more unsure process where the outcome is – at least to an extent – unknown. March (1991, p. 71) defined exploration to include 'things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation'.

2.2.3. Assumptions and shortcomings

The original work of Argyris (1976) assumed tension between single-loop and double-loop learning. Similar tension is usually also assumed between exploration and exploitation (e.g. Crossan et al., 1999; March, 1991). However, the models assume the tension for different reasons.

Argyris' article aimed chiefly at pointing out the defects that maintain a single-loop learning lock-in in organizations, and thus prevents them from engaging the preferred double-loop learning. The original idea was to point out that single-loop learning occurred in a situation where the badly managed workforce, for one reason or another, could not (or didn't want to) get their opinions and suggestions heard and thus refrain from participating in the organizational learning process (Argyris, 1976, 1977). Later, however, the theory has more often been used in separating the two learning processes from another without presuming and discussing the possible tension between the learning processes (e.g. Easterby-Smith et al., 2000; Tosey et al., 2012).

In the division between exploration and exploitation, the organization's limited resources introduce the tension. With limited stocks of time, money and workforce allocating to one type of learning is away from the other (Crossan et al., 1999). Hence, an actor has to prioritize between the two learning mechanisms.

As pointed out e.g. by Easterby-Smith et al. (2000) when defining learning events with the simplistic single-loop – double-loop axis the result may vary depending on the perspective of examination. What may seem to be double-loop learning from an individual's point of view may appear single-loop on an organizational level. Pleading to this defect Huber (1991) has suggested that there is no actual distinction with the levels of learning.

This problem can also be identified with the exploration – exploitation model. For instance, in a situation where a project group explores a novel concept it might learn something that is new to them – but already known by another group in the organization. From the organization's viewpoint no new knowledge has been gathered. However, instead of abandoning the theories as Huber (1991) suggested, this shortcoming is circumvented through examining the phenomenon from a fixed viewpoint – the viewpoint in this study being the organizational level.

While the literature discussing the single-loop – double-loop distinction commonly stresses the supremacy of double-loop learning (e.g. Argyris, 1967, 1976, 1977), we emphasize with the

other distinction that both exploitation and exploration are needed in order an organization to be successful (Fiol and Lyles, 1985; March, 1991). While an entity focusing too much on exploitation might drop out in the forever-ongoing competition between organizations, one fully dedicated to exploration misses the chance to harvest the fruits of their labor (March, 1991). In a project environment, not exploiting what the others have discovered could lead to a situation where the 'wheel is reinvented' at the beginning of each project.

In this section, we defined a distinction between two separate but complementary types of learning – exploration and exploitation – and described their characteristics with the help of a similar division between single-loop and double-loop learning. The interplay between exploration and exploitation and how they affect organizational learning is further discussed in Section 2.3.5 where they are used to describe feed-forward and feedback loops in the 4Is model.

In order to thoroughly analyze the process of organizational learning and transferring, simply classifying the types of its occurrence is nowhere near sufficient in building a robust model. Hence, in the following two sections we introduce two popular models regarding how learning occurs in organizations.

2.3. The 4Is model

The popular 4Is model by Crossan et al. introduces a multi-leveled view to organizational learning. In the framework, four psychological and social processes: intuiting, interpretation, integration and industrialization are mapped against the tree ontological dimensions: individual, group and organization. Crossan et al. (1999) recognized learning as a dynamic process. Hence, the learned knowledge flows through the organizational levels via feed-forward and feedback mechanisms, that are respectively analogous to the concepts of exploration and exploitation.

At the core of the model lie four processes of intuiting, interpretation, integration and industrialization. According to the framework, these processes occur only on certain levels on organizational learning. A summary of these processes, their level of occurrence and outcomes can be observed in Table 2-1.

Table 2-1 Building blocks of the 4Is framework

Level	Process	Inputs / Outcomes
Individual	Intuiting	Experiences Images Metaphors
Group	Interpreting	Language Cognitive map Conversation / dialogue
	Integrating	Shared understandings Mutual adjustment Interactive systems
Organization	Institutionalizing	Routine Diagnostic systems Rules and Procedures

Source: (Crossan et al., 1999)

The 4Is framework was furthered by Bontis et al. (2002). They integrated it with the fields of intellectual capital and knowledge management by providing clear definitions to the concepts and their relations to organizational learning. The authors defined intellectual capital as 'representing the 'stock' of knowledge that exists in an organization at a particular point in time … what has been learned in a cognitive sense' and knowledge management as 'managing this stock of knowledge in a firm as it flows over time' (Bontis et al., 2002, p. 440). Furthermore, Bontis et al. (2002, p. 440) claim that the term 'organizational learning' 'broadens the discussion to incorporate behaviors as well as knowledge and provides a means to understand how the

'stocks' change (flow) over time'. Hereby, the 4Is model can be seen consisting from three learning stocks (one for each ontological dimension) and four mediating processes through which the knowledge flows from one stock to another. The dynamics of the 4Is framework can be observed in Figure 2-1. The following sub-sections explain the parts of the model in more detail.

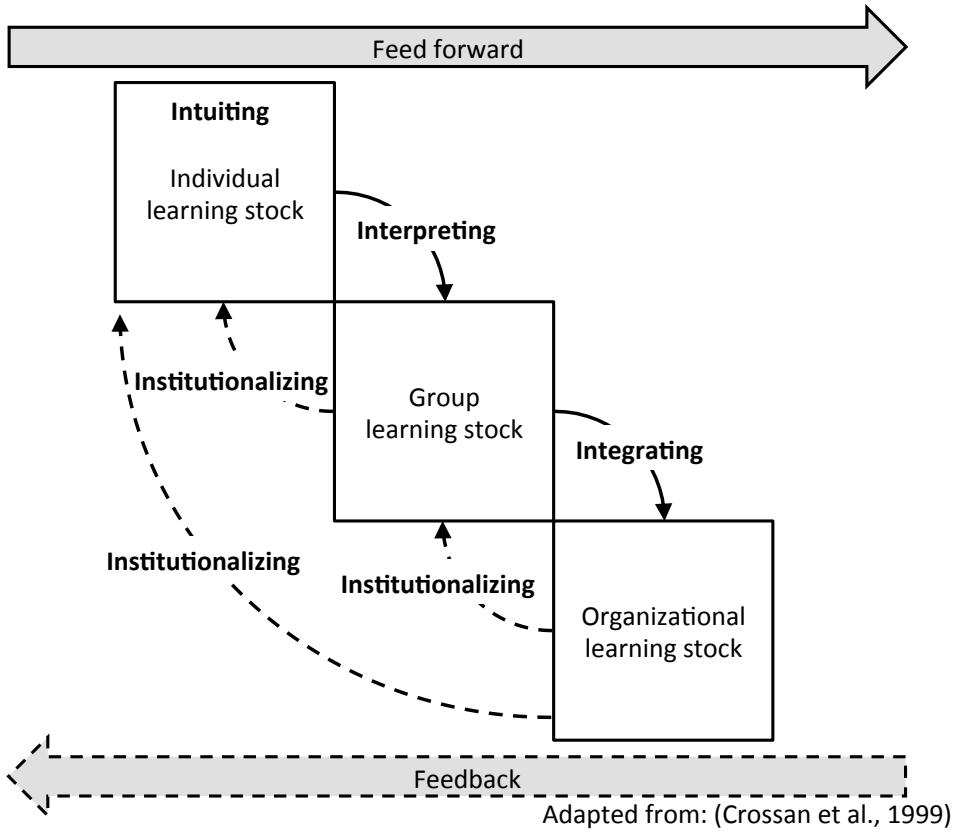


Figure 2-1 The 4Is framework as a dynamic process

2.3.1. Intuiting

Intuiting is a subconscious tacit process necessary to initiate organizational learning and happens only at individual level (Mintzberg, 1998, p. 212). According to Crossan et al. (1999) the process can be explained through expert and entrepreneurial views. The expert view describes tacit pattern recognition. Based on earlier accumulated knowledge the actor is able to (unconsciously)

recall experiences from the past through identifying patterns resembling the current decision and derive a feasible way of action. The entrepreneurial view on intuiting is based on novel insights and innovation. In both of the situations, the individual responsible for intuiting is not likely to be capable of explaining either the process that led to the insight or the insight itself. This is due to the tacit nature of the process and the knowledge acquired through it (Bontis et al., 2002; Crossan et al., 1999; Nonaka, 1994; Nonaka and Takeuchi, 1995; Vera, 2009). Srivastva and Barrett (1988, p. 36) assimilate the situation to one where a child is unable to tell his mother that his foot is asleep, since he doesn't have the needed vocabulary to express the feeling. Many scholars (e.g. Crossan et al., 1999; Nonaka, 1991; Nonaka and Takeuchi, 1995; Srivastva and Barrett, 1988) claim metaphors being the only effective way of communicating such knowledge. In Srivastva's and Barrett's example the child communicates through saying 'it feels like there are stars hitting my foot'.

2.3.2. Interpreting

The interpretation process happens on both individual and group levels and it contributes to the equivalent learning stocks. Here the conscious elements are drawn from the unconscious knowledge through reflection and shared between the communicators. A shared language for communicating these elements is starting to be formed. Again, metaphors play a crucial role in the initial forming of language. They act as 'a framework for selecting, naming and framing characteristics of an object or experience by asserting similarity with a different seemingly unrelated object or experience' (Srivastva and Barrett, 1988, p. 35). Through interpreting we develop a cognitive map of the domains we operate in (Huff, 1990). However, this process is far from objective. The human perception is surprisingly selective and the interpreting is highly dependent from the operating environment and the domain of the interpreter. We have a tendency to observe more clearly the occurrences that support or are strongly against our own and our domain's attitudes (Heemstra and Kusters, 2004). Neither are these observations objective, but affected by our attitudes.

2.3.3. Integrating

Mintzberg (1998, p. 212) defined that the integration process 'follows to change collective understanding at the group level and bridges to the level of the whole organization'. Where the interpreting boils down to developing ways of communicating the earlier tacit ideas, the integrating phase focuses on 'sharing of individual interpretations to develop a common understanding' (Bontis et al., 2002, p. 443). This phenomenon occurs on both group and organizational levels.

The evolution of a shared language enables the actors to create shared meanings and practices across groups and societies. The shared meanings, in turn, may cause the actors mutually adjust their actions. In other words, the process makes coherent, collective actions a possibility. Crossan et al. (1999) discuss shared meanings as a language's ability to preserve knowledge. They also pinpoint the importance of dialogue in evolving and refreshing this shared understanding. The language works like a two-edged sword. It can be viewed as the social fabric retaining the learned mutual knowledge, but with insufficient dialogue it may also be a factor hindering the adaption of new ideas and visions in the group or organization.

2.3.4. Institutionalizing

Finally the last of the four organizational learning processes, institutionalizing, focuses on embedding what is learned into the organization's systems, structures and routines. Quite intuitively, this is a process occurring mainly on the organizational level. The organizational learning stock corresponds to the concept of organizational memory defined by Huber (1991). The institutionalized knowledge stays within the organization even if the individuals or groups working for the organization would not (Crossan et al., 1999). As mentioned in Section 2.1.1, it is assumed here that this feature makes an organization more than just a sum of its parts.

Compared with the other learning stocks the organizational learning stock is relatively static (Bontis et al., 2002; Crossan et al., 1999). The underlying business structures, processes and systems are not easily formed and thus, rarely changed. In a way, the institutionalized knowledge represents constancy in a volatile business environment. Crossan et al. (1999) describe the need for institutionalization with an example on how the process behaves in a new organization. First, the company has no organizational memory and the shared learning is of ad hoc nature on group level; i.e. no institutionalization of knowledge is present. As the organization grows and its processes become of more routine nature, its employees tend to develop patterns of action in fulfilling their goals. In order to efficiently manage its actions the organization seeks to identify these patterns in order to freeze and share them among other employers. 'Institutionalization is a means ... to leverage the learning of the individual members' (Crossan et al., 1999, p. 529). As the organizational memory (i.e. institutionalized organizational best practices) accumulates the need for ad-hoc individual and group learning decreases.

Because of the sluggish nature of institutionalization, it is not uncommon that the organizational units usually act, in fact, quite differently from what is stated in the official guidelines. If a problem occurs with a nonexistent or insufficient official solution, non-canonical action takes effect. The deviance may occur on an individual (Crossan et al., 1999) or a group level (Brown and Duguid, 1991). These unofficial 'communities of practice' are formed in order to decently fulfill its individuals' line of work. Instead of a defect, the forming of communities of practice should be viewed as an asset and, above all, a naturally occurring phenomenon. They are the actors carrying out the institutionalized knowledge and executing the organizational deeds in practice. (Brown and Duguid, 1991)

2.3.5. Feed-forward and feedback loops

Organizational learning is a dynamic process (Crossan et al., 1999). When the organization explores new knowledge, what has already been learned is exploited at the same time. The

concept of the feed-forward mechanism relates to exploration and explains how knowledge arising from individual learning is transferred to the group and organizational levels, and how these levels are affected by this flow of knowledge. The feedback mechanism, on the other hand, explains how the learned knowledge is exploited and how it affects the lower organizational stages.

As discussed in Section 2.2.3, because the organization's resources are limited the 4Is framework presumes a continuous competition for these between the feed-forward and feedback mechanisms – resulting in ongoing tension. Crossan et al. (1999) considered this tension particularly prominent between the interpretation and integration phases in the feed-forward mechanism and between the institutionalization and intuition processes in the feedback loop.

In the former case, the problem spurs from transferring the accumulated knowledge from individual to group level. As discussed earlier in the text, this knowledge is typically of tacit nature and not easily communicated until it has been made explicit (Nonaka et al., 1996). Crossan et al. (1999) point out that the tension between the feed-forward and feedback mechanisms may hinder the understanding and acceptance of novel individual ideas in a group. In the section regarding the interpretation process we mentioned that the existing attitudes in a domain affect the perceptions of its actors. As discussed, we tend to distort our observations to support our already accepted view of the world (Heemstra and Kusters, 2004). Therefore the already integrated and institutionalized models have great potential dominating over new ones.

With the second area of increased tension, the interaction between institutionalized and intuited learning in the feedback loop, the cause is more intuitive. The more institutionalized and regulated the environment is, the less there is room for intuiting (Crossan et al., 1999). Institutionalization has a habit of preventing 'creative chaos'; indented disorder that stimulates learning (Nonaka, 1994; Nonaka and Takeuchi, 1995).

2.4. Organizational knowledge creation

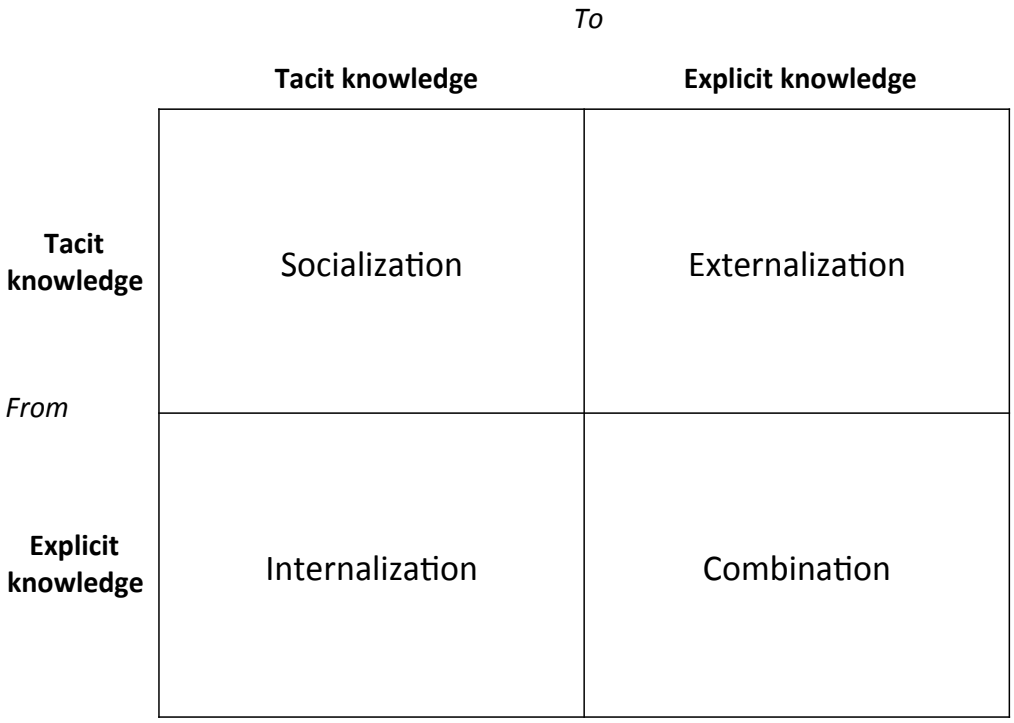
As discussed earlier in the text, the field of OLKC has until lately been labeled by fragmentation. Several branches have fostered under various titles, all focused on exploring – what has in essence been – the same phenomenon from different angles. This chapter discusses the branch of organizational knowledge creation, originally presented by Ikujiro Nonaka (1991).

The theory criticizes the approach the Western academia had taken on organizational learning. According to Nonaka and Takeuchi (1995) it was characteristic of this literature to separate the subject and object – the knower and known. This, in turn leads to a view on organizations as interpretation systems – solely analyzing the external environment and adapting their behavior accordingly. This approach does efficiently explain reactions to problems, but disregards innovation. Organizational knowledge creation approaches the phenomenon from a different perspective. The authors state that organizations are, in addition to their reactive behavior, capable of producing new knowledge through proactive action. This novel knowledge stems from inside the company through its actors reflecting their tacit and explicit knowledge with each other. (Nonaka, 1991; Nonaka and Takeuchi, 1995)

As noted e.g. in the 4Is model, another feature of the Western organizational learning branch is to emphasize the need for converting tacit knowledge explicit and downplay the knowledge conversion to the opposite direction (Nonaka and Takeuchi, 1995). Organizational knowledge creation emphasizes the importance of both explicit and tacit knowledge on all organizational levels. The theory hypnotizes that new knowledge is fostered from the interplay of tacit and explicit knowledge – instead of a sole actor rationalizing. At the heart of the theory is the notion that knowledge is hardly ever transferred unchanged from one entity to another; hence knowledge transfer via social interaction includes – what the authors called – knowledge conversion (Nonaka and Takeuchi, 1995).

From this starting point, four separate types of knowledge conversion can be identified: from tacit knowledge to tacit knowledge, labeled socialization; from tacit knowledge to explicit

knowledge, labeled externalization; from explicit knowledge to tacit knowledge, labeled internalization; from explicit knowledge to explicit knowledge, labeled combination. The types can be observed in Figure 2-2 and are next discussed in more detail.



Source: (Nonaka, 1994)

Figure 2-2 Four models of knowledge conversion

2.4.1. Socialization

Socialization is a process where tacit knowledge is created through shared experiences. Here, tacit knowledge is formed through the actors sharing and combining pieces of their experiences. Tacit knowledge can be divided in to two subcategories: cognitive and technical. (Nonaka et al., 1996) A classic example of the conversion of technical knowledge is an apprenticeship where the apprentice learns the craft from a master through observing and imitating his actions. When transmitting this kind of tacit knowledge, words are not necessarily needed (Nonaka and

Takeuchi, 1995). An example of the conversion of cognitive knowledge would be the earlier discussed communities of practice creating a shared worldview through informal discussions on coffee breaks.

Sharing tacit knowledge efficiently requires face-to-face communication and thus, the process has limited ability to benefit from the usage of information technology (Nonaka et al., 1996). Though, there are exceptions; e.g. the typically unofficial open source code communities formed and maintained via the Internet seem to be able to create and share their tacit worldview among their individuals. They are typically held together by a shared vision of creating free and open software for everyone in the world to benefit from (Kuk and Davies, 2011).

2.4.2. Externalization

Externalization is the process of transforming tacit knowledge explicit and articulating it. Along with internalization, they form the main source of innovation since they both require interplay between the two knowledge types and hence, a substantial amount of knowledge conversion (Nonaka, 1991). This process was described in detail in sections 2.3.1 – 2.3.3 that described the learning flow from intuition to interpretation with the analogy of creating a new language; starting from tacit concepts and ending in an explicitly accepted verbal representation. As mentioned in these sections, also Nonaka and Takeuchi (1995) stressed the importance of metaphors in this form of knowledge conversion.

As a more unconventional example of externalization, Nonaka and Takeuchi (1995) presented a successful custom in Japanese organization culture to spur innovation. The top-level managers in Japanese organizations are known to sometimes purposefully set ambiguous goals. The idea is that the actors assigned to implement these goals would develop multiple interpretations of it, which would lead to a healthy conflict. This, in turn, would be followed by the team externalizing the best of parts of the tacit knowledge from its individuals and thus, induce innovation.

2.4.3. Combination

In combination, explicit knowledge from different sources is combined into a systematic whole in order to form a new explicit representation of an issue. The created concept is usually studied with existing explicit knowledge in order to give it a tangible meaning (Nonaka, 1994). As the prime source of novel knowledge is defined to be in the interaction between tacit and explicit knowledge, in a typical case of combination (e.g. in formal education in schools) new knowledge is not necessary crated (Nonaka, 1991). Though, this is possible e.g. via the 'reconfiguration of existing information through sorting, adding, combining and categorizing of explicit knowledge (as conducted in computer databases)' (Nonaka and Takeuchi, 1995, p. 67)

2.4.4. Internalization

'Internalization is a process of embodying explicit knowledge into tacit knowledge' (Nonaka and Takeuchi, 1995, p. 69). In one of our examples about socialization, the communities of practice created a shared worldview in their discussions on coffee breaks. It is likely that in addition to the tacit worldview, some explicit knowledge would have been transferred, converted and added to the tacit knowledge base of the actors in such a situation. For example, Orr (1996) described how the copier repair technicians in an organization enhanced their understanding about their line of work through sharing 'war stories' of noteworthy problems that had occurred on the job. Being explicit knowledge, these 'war stories' helped the receiver to 're-experience' the situation and add the learned lessons to his or her tacit knowledge base.

Another way of internalization is experimenting a concept in practice (Nonaka and Takeuchi, 1995). Let us consider an example on learning how to drive a bicycle. Presumably, the learner has gotten some explicit knowledge from someone more skilled in the talent; e.g. how to maintain one's balance. However, in order to truly internalize the concept on bicycle riding, one

must test it in practice. Internalization can also occur without 're-experiencing' or testing, if the receiver solely understands the essence of a piece of explicit knowledge in a way that changes his or her mindset (Nonaka and Takeuchi, 1995). As an example, in order to avoid moose related accidents, it is emphasized in Finnish driving schools that if a driver sees a moose crossing the road it should always be dodged on the backside. This is usually repeated enough times that the desired action should come automatically from the driver, even with no actual prior experience on the subject.

2.4.5. Spiral of organizational knowledge creation

On their own, none of the processes of knowledge conversion are particularly efficient in creating useful, novel organizational knowledge. For instance, as discussed in the 4Is model, without first converting tacit knowledge explicit its communication throughout the organization can turn out to be quite challenging. On the other hand, without a decent tacit knowledge base – created through socialization – this process of externalization cannot be expected to yield to especially satisfying results. The power of the knowledge conversion processes lies in their mutual relationships.

As with the 4Is framework, the theory of organizational knowledge creation also assumes innovating to be a dynamic process. Organizational knowledge creation may start from whichever knowledge conversion process and, like in the 4Is framework, it is often hard to exhaustively observe where one of these processes ends and the other begins (Nonaka et al., 1996). A typical starting point for knowledge creation is individuals starting to build up teams – or 'fields of interaction'– where tacit knowledge is exchanged and levered through socialization (Nonaka et al., 1996). Through dialogue, tacit knowledge is communicated explicit and externalization occurs. Here, concepts are created to better understand and communicate the knowledge.

Next the team seeks to justify these concepts for themselves, each other and the rest of the organization. They work to fit the new ideas to the existing knowledge base in order to establish a more concrete and defined expression of them. This yields to the process of combination. As the concepts are specified they are materialized into archetypes, prototypes of new products, processes or mental models. As the archetypes are tested in action knowledge is internalized. In time, the internalized knowledge with tacit practice will lead to new teams, or 'fields' to be formed leading, again, to socialization. Hence, organizational knowledge creation is a never ending process (Nonaka and Takeuchi, 1995). As an organization continuously builds upon its previous knowledge base the knowledge creation process takes a form of a spiral when mapped on the four methods of knowledge conversion; as seen in Figure 2-3.

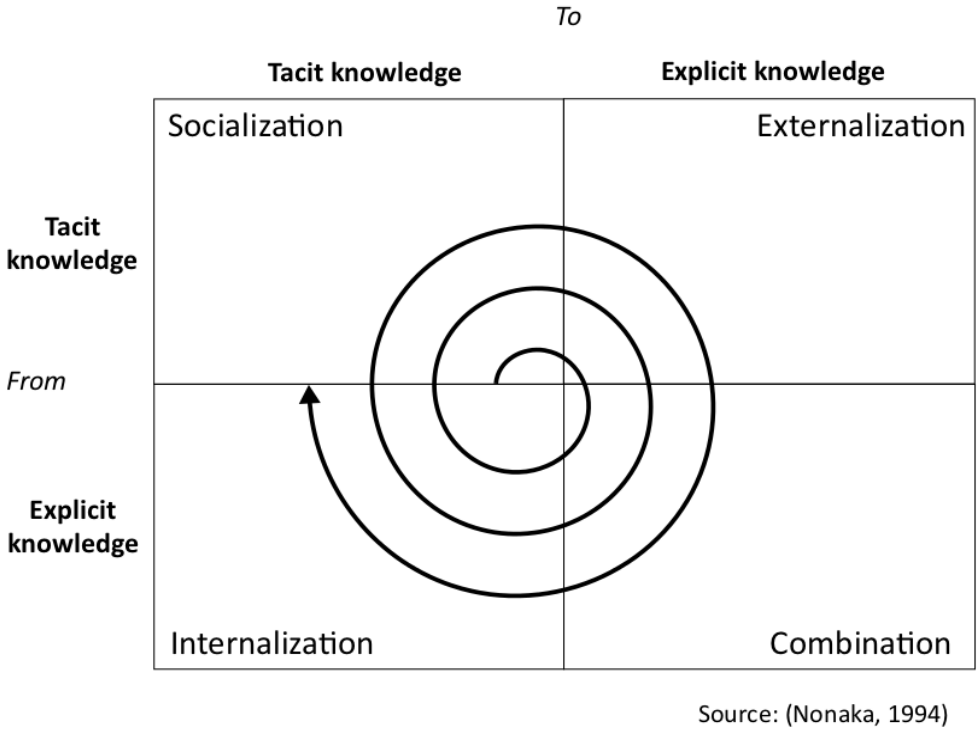


Figure 2-3 Knowledge spiral

As mentioned in Section 2.1.1, even though organizational memory is more than the sum of its parts, organizations themselves are – in a strict sense – unable to create new knowledge. This is an attribute of individuals. Organizations are, however, needed to mobilize the individuals' tacit knowledge. When examined from an ontological viewpoint, the interaction between tacit and explicit knowledge becomes larger in scale as the 'spiral of knowledge creation' moves to higher ontological levels in the organization. This can be viewed in Figure 2-4, which can be interpreted as being Figure 2-3 viewed from the side. (Nonaka, 1994; Nonaka and Takeuchi, 1995)

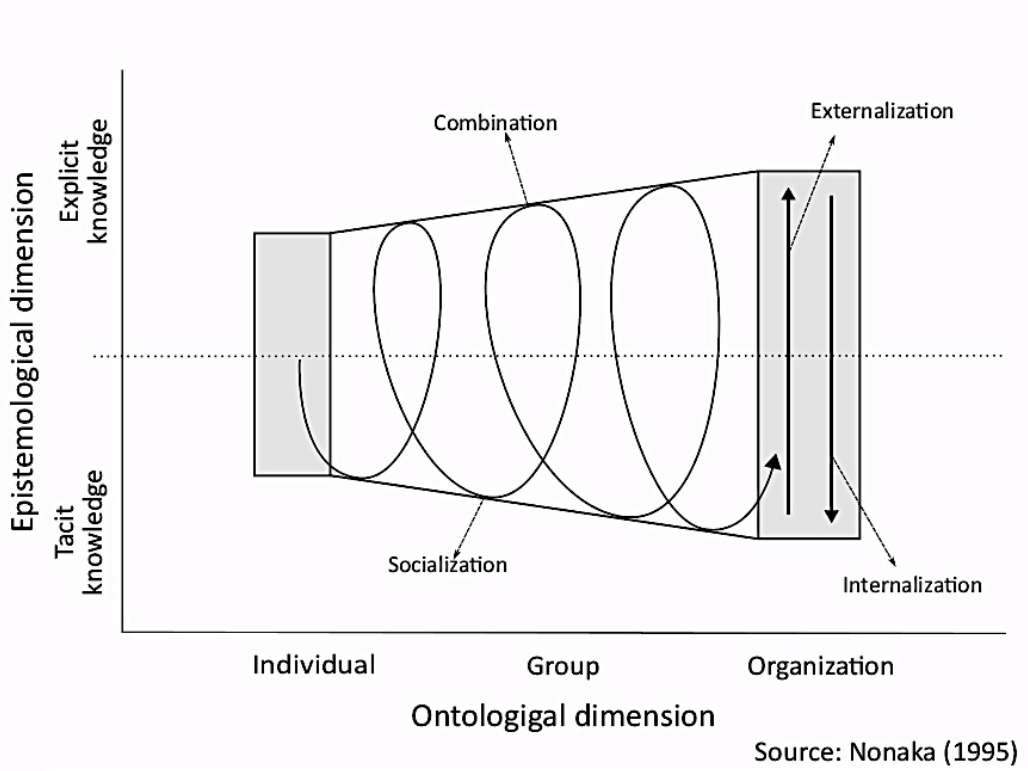


Figure 2-4 Spiral of organizational knowledge creation

2.5. Organizational knowledge transfer in current literature

Thus far, the presented theories have primarily discussed the mediation of knowledge from one ontological dimension to another. As the goal of this paper is to examine the transfer of accumulated knowledge between projects in a program, this chapter is dedicated to presenting theories that are related in inter-project knowledge transfer.

In this paper, programs are understood as 'A group of related projects, subprograms, and program activities that are managed in a coordinated way to obtain benefits not available from managing them individually' (Project Management Institute, 2013, p. 4). This means that the projects in a program may be occurring simultaneously, consequently or both of the former. Schindler and Eppler (2003) state that knowledge transfer should not solely be a task limited to the end of the project, but the accumulated knowledge should be examined throughout the project's course. When examining these features together, we see no reason why the knowledge transfer between projects could not occur while both of the projects are in action.

Unlike with the literature regarding the organizational learning process, the studies of knowledge transfer between projects have not yet established a shared theory base. Though this is not due lack of literature on the subject. Especially the process of forming project post-mortems is comprehensively described in the academia (e.g. Newell et al., 2003, 2006; Schindler and Eppler, 2003; Swan et al., 2010; Williams, 2004). Also e.g. the usage of ITC as an intermediary of inter-project learning is well covered (e.g. Nonaka et al., 1996; Newell et al., 2006). The field has also established some commonly accepted presumptions on what is and should be documented on the post-mortems (e.g. Newell et al., 2006; Prencipe and Tell, 2001; Schindler and Eppler, 2003; Swan et al., 2010) and how should the identified best practices be implemented in another project (e.g. Newell et al., 2003).

This section first introduces the learning mechanisms defined by Zollo and Winter (2002) and explains how they may be used in studying knowledge transfer. It then briefly introduces literature regarding mentoring in organizations. Finally, two separate views of the nature of

knowledge in current literature are discussed in order to define how they affect our approach to knowledge transfer.

2.5.1. Learning mechanisms in knowledge transfer

In their acknowledged article Zollo and Winter (2002) examine mechanisms through which organizations can create dynamic capabilities and operating routines. The writers identify three learning mechanisms that contribute to an organization's operating routines directly, or indirectly – through adding to organization's dynamic capabilities – which in turn affect the routines. These mechanisms comprise experience accumulation, knowledge articulation and knowledge codification. In essence, as the 4Is framework, the model from Zollo and Winter (2002) discusses how organizational learning becomes institutionalized (Swan et al., 2010). The mechanisms are presented here since they expand our understanding on how learning is communicated in the process towards institutionalization.

In the model, experience accumulation is related to organizational routines and 'learning by doing' (Zollo and Winter, 2002). This learning mechanism is similar to the intuiting process described in Section 2.3.1 and primarily regards the accumulation of tacit knowledge. Since the acquired knowledge is, by definition, possessed by the individual and not communicated further, transferring it from e.g. from one project to another requires assigning the individual possessing the knowledge to the other project – or the individual articulating the knowledge (Prencipe and Tell, 2001), which leads us to the second learning mechanism provided by the model.

Zollo and Winter argue that reflecting is a crucial part in organizational learning and the development of dynamic capabilities. Typically, individuals express, challenge, improve and prune each other's ideas in groups and create, what Zollo and Winter called, 'collective competence'. Compared with the 4Is model the mechanisms of knowledge articulation can be seen to occur in the interpreting and integrating processes that were presented in Sections 2.3.2 and 2.3.3 respectively. Hereby, both tacit and explicit knowledge are present at this phenomenon.

The highest mechanism of organizational learning in the model is knowledge codification. According to Zollo and Winter (2002, p. 342), it is as 'step beyond knowledge articulation. The latter is required to achieve the former, while the opposite is obviously not true'. Compared with the mere articulation, knowledge codification requires its authors to clearly explain the logic behind their deduction. Therefore codified knowledge represents a relatively pure form of explicit knowledge. This usually requires a great deal more reflecting and clarification of the subject and its related terms. Thereby, in addition to its capability of transferring knowledge, knowledge codification can be seen as an efficient way to crystalize the accumulated knowledge to its possessors. In the 4Is framework, the codification process can be observed to occur in integrating and institutionalization steps.

In the light of the model, three ways of knowledge transfer can be identified, each playing a crucial part in the learning process itself (Prencipe and Tell, 2001; Swan et al., 2010). The methods of knowledge transfer are here notated as allocation of individuals, articulation and codification. These mechanisms are further discussed forming the framework for inter-project knowledge transfer presented in Chapter 3. Though its potential, the usage of the model presented above has been limited in terms of studying knowledge transfer – the most notable cases including articles by Prencipe and Tell (2001) and Swan et al. (2010).

Prencipe and Tell (2001) used the learning mechanisms to form a framework on how organizations foster inter-project learning. In their 3x3 matrix the authors introduce how an organization may encourage the transfer of knowledge across the projects' boundaries with the three learning mechanisms on three ontological levels. The matrix is used in identifying organizations' learning landscapes (i.e. knowledge management strategies). Prencipe and Tell provide some examples of the mechanisms that may foster the transfer, but express little attention in describing where and how the actual meditated learning happens.

The article by Swan et al. (2010), in turn, focused on examining the exploitation and effectiveness of the knowledge transfer mechanisms. They ended up in an interesting observation that strong evidence of effectiveness was observed with knowledge accumulation, while the

other, ‘higher level’, learning mechanisms where typically shunned upon by the groups and individuals. Alligning with a large base of literature (e.g. Kotnour, 2000; Newell et al., 2003, 2006; Schindler and Eppler, 2003; Schulz, 2008; Williams, 2004) Swan et al. argue that the organizational tools for knowledge transfer, utilizing these higher level learning mechanisms (such as project post-mortems or knowledge management databases), are used primarily in a tokenistic way without an actual intention to utilize the accumulated organizational knowledge.

2.5.2. Mentoring as a method of knowledge transfer

Mentoring is another field of research that examines knowledge transfer in organizations. With this domain, the focus of the literature has slowly shifted from the traditional mentor–protégé relationship to study other possible roles of mentoring (Eby, 1997). In her study Eby (1997) identified several manifestations of mentoring in organizational context, of which four are discussed here for the use of the research.

In intra-team mentoring the members of a team mentor each other, similarly to the knowledge exchange discussed in the 4Is model and the theory of organizational knowledge creation. In inter-team mentoring members of separate teams consult each other. The two last manifestations discussed are the traditional mentor–protégé mentoring and peer-mentoring. Bryant (2005) has argued that both of these methods are able to deliver the same benefits. Mentoring has strong analogies to the phenomena of socialization and externalization in the theory of organizational knowledge creation – the knowledge exchanged especially in peer mentoring being mostly of tacit nature (Bryant, 2005). Surprisingly, despite the intuitive analogy relatively little research has been done in the junction between the two theories.

2.5.3. Knowledge as possession and practice

In addition to the split into tacit and explicit knowledge the existence of OLKC has witnessed two major assumptions of the nature of knowledge. Newell et al (2006) discussed the views as 'knowledge as possession' and 'knowledge as practice'. The prior discusses knowledge as a possessed capability that can be externalized and transferred between individuals, groups or organizations. The latter sees knowledge as 'situated in social and organizational practices and relationships' (Newell et al., 2006, p. 168). With this aspect organizational learning can be viewed as building social constructions of reality. According to this view, knowledge cannot easily be externalized or codified.

A good example of the 'knowledge as practice' view is the phenomenon of communities of practice discussed shortly along institutionalization in Section 2.3.4. It occurs when a group forms a shared understanding about the non-canonical practices required to enable the efficient working of its individuals, i.e. the 'way we do things around here'. As primarily a social construct, especially the tacit group level knowledge cannot be transferred as the 'knowledge as possession view' suggests. Therefore, if a manager wants to transfer the accumulated, tacit, group level knowledge from one project to another, at least a part of the original group has to be allocated to the new project. With the group's accumulated explicit knowledge and the knowledge possessed only by individuals the 'knowledge as possession' view can be applied more easily.

The 'knowledge as practice' view can also be interpreted as supporting the claims that the codified inter-project transfer should be more focused on transferring process rather than product information. Several authors (Kotnour, 2000; Newell et al., 2003, 2006; Schindler and Eppler, 2003; Schulz, 2008; Swan et al., 2010; Williams, 2004) have argued that the project post-mortems have been focusing only on the codification of the outcomes of the project rather than the project itself. Hence, instead of valuable knowledge, the organization is left with a detailed report on what they acquired through the project rather than the actual lessons they learned during the course of action. Especially Newell et al. (2003, 2006) have claimed that the

knowledge gathered from a project cannot usually be exploited as such in future projects, but the most efficient way of transferring the codified learned capabilities is to document the processes that lead to the learning. According to the authors, presenting the logical steps that led to the development of practices will efficiently transfer the core of the accumulated knowledge to the following projects. Hence, the post-mortems do not act as ready containers of knowledge (as suggested by the 'knowledge as possession' view), but guidelines to be interpreted as the situation permits to form the most suitable practice (that is more consistent with the 'knowledge as practice' view).

3. FORMING A FRAMEWORK FOR KNOWLEDGE TRANSFER

This chapter consists of two sections, both aiming at forming a sound framework for analyzing knowledge transfer between a program's projects. Building on the literature review, the first section seeks to establish a unified view of the organizational learning process through studying the 4Is framework and theory of organizational knowledge creation and their presumptions. The second part seeks to build the model further. It seeks to form a hypothesized framework of knowledge mediation from a project to another by studying the possible cases of knowledge interchange between the projects' learning stocks. The chapter ends up with a framework that is used in the latter chapters for analyzing the studied knowledge accumulation and knowledge transfer between two master data management projects in a case company.

One may notice that the forming of a framework in the second section seeks to directly answer the first research question: *with interrelated IS projects, how can the lessons learned in previous projects be transferred to subsequent ones?* The question seeks to map out possible streams of knowledge mediation between projects that are supported by current academic research. The other two research questions are more empirical by nature and are examined through the formed framework in the latter chapters of this Master's Thesis.

3.1. Tacit and explicit knowledge in the 4Is model

Before building a framework of how the learning occurred in one project can be moved to another, the relationship between the organizational knowledge creation theory and the 4Is framework is discussed. More precisely, this section discusses the knowledge transfer processes of the 4Is framework with the terms presented by the theory of organizational knowledge

creation. This is done in order to shed light on the types of knowledge present in each phase of the 4Is' steps.

As mentioned earlier, individuals are the essential source of new knowledge. Hence, the first step in organizational knowledge creation typically relies on individuals in an organization sharing their tacit knowledge through socialization – and hence contributing to the organization's individual level learning stock. When individuals work together, they do not only transfer but also create novel and unique tacit knowledge. Hence, it is claimed here that the concept of socialization plays a significant role in intuiting.

As mentioned in Section 2.3.2, tacit knowledge is made explicit through groups forming a shared language in the interpretation phase. In the terms of organizational knowledge creation, the tacit knowledge is externalized. The phase contributes to the group's explicit knowledge base. Here, we deviate from the assumptions of the 4Is model and state groups having another significant function in organizational knowledge creation. Though tacit knowledge can be externalized on the group level, we claim groups being able to possess tacit knowledge themselves – and to gain it from, and share it with its members through socialization. In addition to the theory of organizational knowledge creation (Nonaka, 1991; Nonaka and Takeuchi, 1995) the notion also gains support from the school claiming organizational knowledge being in total a social construct (Newell et al., 2006) as discussed in Section 2.5.3. A prime example of tacit, shared mental models is a worldview that has guided a group into successful decisions in the past.

The 4Is' integration phase consists of creating a shared understanding from the several interpretations of a matter. The explicit externalized conversions of a tacit idea are shared and combined for building a greater common understanding of the matter. We see the integration process to have a strong connection to the process of combination.

In Section 2.3.5, we discussed how the feedback loops were used to transform the learned knowledge back to the lower ontological levels via institutionalization. With the pure 4Is model the knowledge is explicit until internalized by the individual. Between the organizational and

individual stocks the group level learning stock combines the explicitly stated best practices. As we assume tacit knowledge existing also on the group level, our framework should allow the explicit knowledge being internalized into a group's tacit knowledge base and further socialized to the individual.

In order to highlight the differences between the assumptions of the 4Is model and our own deduction, we present these in two separate figures. Figure 3-1 presents the 4Is model with the original assumptions – and with organizational knowledge creation theory's concepts. Figure 3-2, in turn, presents the same model with the assumption of group level tacit knowledge.

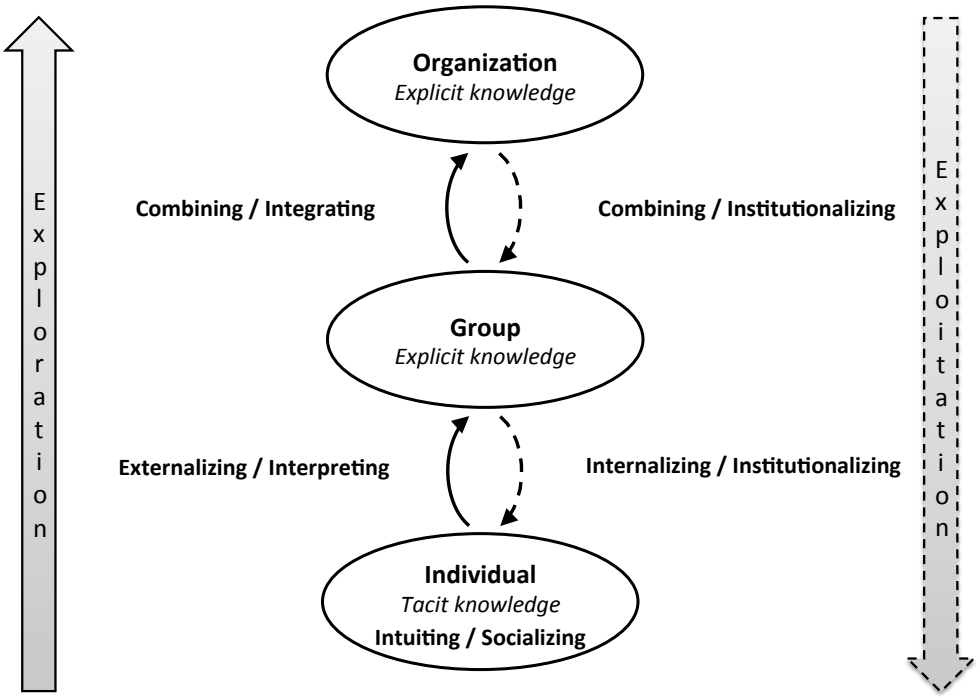


Figure 3-1 The 4Is framework explained through the terms of organizational knowledge creation theory

When we observe Figure 3-2, we notice the different roles both tacit and explicit knowledge play in organizational knowledge creation. Both of the figures in this section also emphasize the important role groups have in organizational learning, as in them occurs the crucial interplay between tacit and explicit knowledge in an organization's exploration and exploitation. This

paper does not intend to downplay the role of the other ontological levels. On the contrary, we would like to emphasize that like with tacit and explicit knowledge, all the levels serve a distinct yet equally important role in organizational learning, none of which are complete without the others.

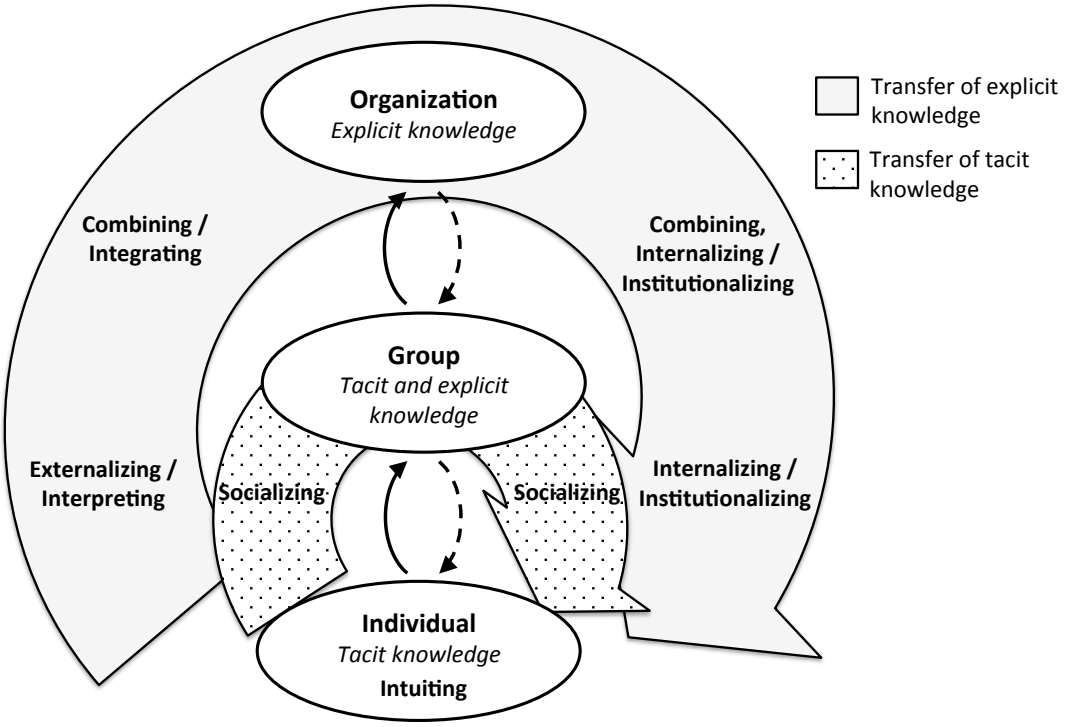


Figure 3-2 Organizational knowledge transfer between ontological levels

Where the 4Is framework assumes tacit knowledge dominating the individual domain and only explicit knowledge existing on group and organizational levels Nonaka and Takeuchi (1995) presented that both tacit and explicit knowledge are present on each of the ontological levels. The model presented in Figure 3-2 lies in the between of the two extremes, assuming tacit knowledge existing on both individual and group levels and explicit knowledge on group and organizational levels. The reason for assuming tacit knowledge in groups was discussed previously in this section. With the organizational level, we state that the tacit knowledge

claimed to exist in an organization is embedded in some, if not all, of its groups. As a purely legal entity, we see an organization unable to possess tacit knowledge. When assuming that no explicit knowledge exist on the individual level, we want to highlight that externalization and interpreting are activities that require two or more people to commit. This assumption is discussed in detail in the next section.

3.2. Hypothesized framework

The framework we are about to form in this section theorizes knowledge transfer between two projects in an organization's IS program. More precisely, the model describes the possible ways of transferring accumulated knowledge from the learning stocks of Project 1 to the learning stocks of Project 2 (entitled P1 and P2 respectively). This unidirectional approach is taken in order to keep the formed framework simple. As briefly discussed at the beginning of Section 2.5, we see no reason why knowledge transfer could not occur between two active projects – the knowledge transfer likely being bidirectional in the described situation. The framework is intended to be easily generalizable into describing such a situation.

Before discussing the framework on a more specific level some definitions are presented in order to avoid possible confusion; namely, what is meant with the terms 'group' and 'group level learning stock' in this paper. The entity entitled as group in organizational learning theory differs greatly from the similarly named concept used when discussing project groups. While a project group is a formally defined entity, the organizational learning theory views groups as domains where individuals bring forth and reflect their ideas. With the latter definition, a group can consist of any formal or informal union of individuals inside or outside the project's boundaries. Also, within a project an individual can be a part of numerous groups composed around different subjects, all concerned with the same project. Therefore, we will define a project's group level learning stock as a union of the gathered knowledge possessed in the various groups formed around the projects' actions. Following this logic, the word 'group' refers to any formal or

informal union of people related to this action – not the project group as an entity. Hence, the reader should be aware that the terms ‘project group’ and ‘project’s group’ refer to completely different entities.

3.2.1. Knowledge transfer on individual level

As presented earlier in the text, learning initially starts from the minds of individuals. Regardless of the phenomenon that sparked the intuiting, the new knowledge lies tacit in the individuals’ heads until spoken. If we follow the 4Is framework and Zollo’s and Winter’s learning mechanisms in the strictest sense, articulating the learned knowledge can be considered as a group level activity, since the fruitful reflection of ideas needs a group of two or more persons. In reality, individuals are capable of reflecting ideas by themselves and we do not claim that an individual is incapable of producing explicit knowledge. However, we like to point out that this explicit knowledge is in itself quite useless, unless shared with others.

Tacit knowledge may not be articulated in a similar matter as explicit knowledge but is spread by different means. Since we in this text have taken the presumption that learning is observable from action, the transfer of tacit knowledge is possible through imitation without verbal communication of any kind (for more about socialization, see Section 2.4.1). Especially with the transfer of technical tacit knowledge the role of conscious reflection between individuals may be a lot smaller. Since, according to Nonaka et al. (1996), the transfer of tacit knowledge requires the actors being in one another’s presence its transfer from one project to another may prove to be problematic. In the light of this notion, we may sum up the methods for transferring tacit knowledge between projects from the individual learning stock in two categories:

- *Transferring workforce*, where individuals with the tacit knowledge are allocated to another project. The possessed tacit knowledge becomes a part of the project’s individual learning stock. It may remain in the individual’s head or be transferred to other of the project’s individuals through socialization.

- *Reflection,* where the individuals with the tacit knowledge are not officially allocated to the other project but take the role of mentor, which the individuals in the other project may consult when needed. Here the individual providing consultation contributes to the other project's group learning stock. The individuals from different projects may also interact outside the projects' boundaries and share e.g. their tacit worldviews with one another.

In our hypothesized framework, only tacit knowledge is transferred on the individual level between projects – this requiring the allocation of the individual possessing the knowledge to the desired project. Reflection, i.e. socialization and externalization, occurs in groups. Here, we would like to like to remind the reader that this paper regards any formal or informal union of people related to the project's actions a group. By this definition, a situation where members of Project 2 and the former Project 1 discussing an issue that occurred in Project 2 during their coffee break can be seen as a part of Project 2's group level learning stock. The knowledge transfer mechanisms between projects on an individual level may be observed in Figure 3-3.

As seen from Figure 3-3, there are two options how the tacit knowledge formed by individuals in P1 becomes transferred from P1's individual learning stock (I_{P1}) for the purposes of P2. First, the individual possessing the piece of tacit knowledge can be allocated from P1 to P2. This way the tacit knowledge becomes a part of P2's individual learning stock (I_{P2}) and may be externalized or socialized in the normal organizational learning process to be added to P2's group level learning stock (G_{P2}).

Another way of mediation is transferring the accumulated knowledge directly from P1's individual level learning stock (I_{P1}) to P2's group learning stock (G_{P2}) via externalization (explicit knowledge) or socialization (tacit knowledge) – or simultaneously both. Next we'll examine two possible scenarios utilizing the phenomenon. First, it is possible for an individual from P1 to mentor a group or groups in P2. This way the individual may externalize some of his or her tacit knowledge for G_{P2} to support the needs of P2. With the terms of Zollo and Winter the individual from I_{P1} reflects his or her ideas with a subset of G_{P2}. As proposed earlier, individuals

may also interact outside the official project groups e.g. in a third project or during brakes. Also this method utilizes reflection and is here referred to as inter-project socialization. When the knowledge is communicated to G_{P2}, it may be communicated to the project's other individuals through internalization (in case of explicit knowledge) or socialization (in case of tacit knowledge).

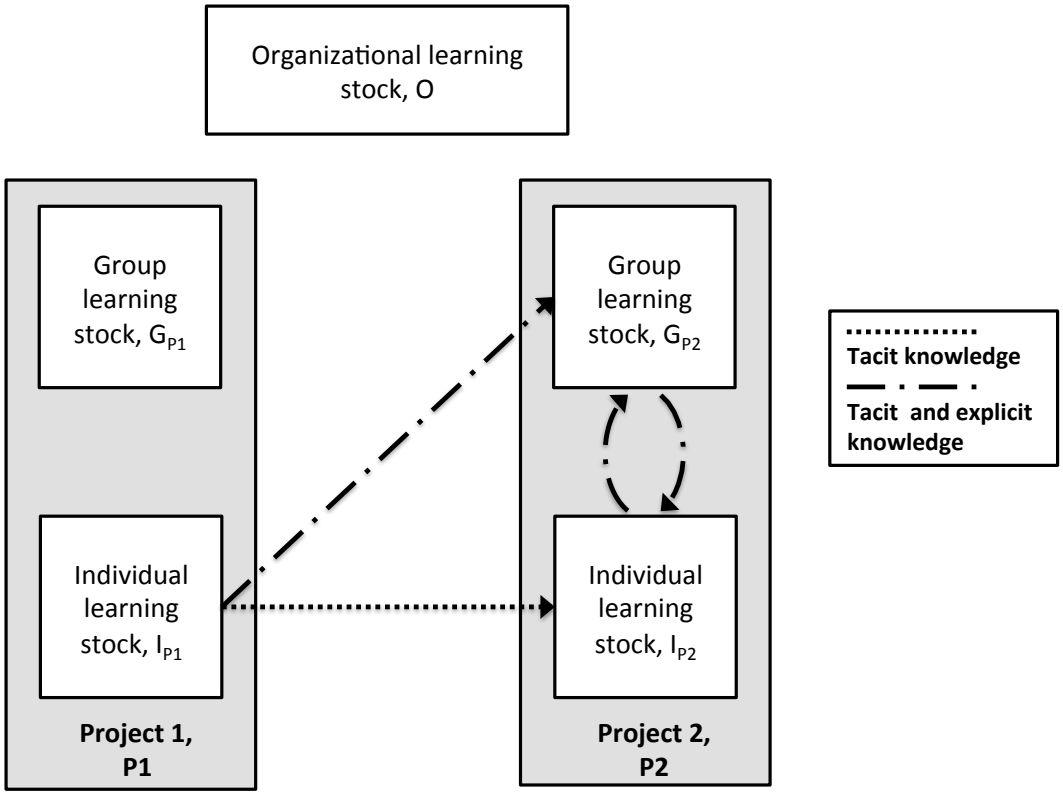


Figure 3-3 Knowledge transfer between projects on individual level

When reflected with the knowledge transfer methods presented in Section 2.5.1, it may be deducted that knowledge transfer on and from the individual level utilizes the two lower-level transfer methods (allocation and reflection) from the three-step model. We recognize that individuals are also fully capable of writing down their possessed knowledge. However, these kinds of documents are normally reviewed, or their content is otherwise affected by other

individuals (e.g. Zollo and Winter required reflection to precede codification), so we consider codification to be a group level activity.

3.2.2. Knowledge transfer on group level

As stated in Section 3.1, a great deal of the interplay between tacit and explicit knowledge happens on the group level. Groups provide the critical platform for individuals to reflect and polish their ideas and capabilities, while simultaneously sharing them for the benefit of others.

While reflection plays a crucial role in organizational learning between the individual and organizational learning stocks, groups may also reflect their ideas with other groups, as mentioned in Section 2.5.2 when discussing inter-team mentoring. It is not uncommon for a starting project's group to consult another projects' groups in order to accumulate tacit and explicit knowledge. An individual may also be sent to work to a group to internalize some of the group's learning stock's accumulated knowledge, or get an insight of 'their way of doing things', and afterwards transfer this tacit knowledge e.g. to another project.

As with the individual level, tacit knowledge can be transferred from a project to another by allocating the project's informal groups, or communities of practice, to the other project. The question, how big of a part of the community of practice has to be transferred in order to transfer the tacit knowledge preserved in the social fabric is a complicated one and highly dependent from the situation at hand. It is beyond the scope of this paper to study this highly interesting phenomenon.

Perhaps the most discussed method of knowledge transfer between groups in the academia is project post-mortems. Regardless of whether describing the outcome or the project itself, the post-mortems are emblematically explicit and represent the highest level of knowledge transfer in the model derived from Zollo and Winter (2002) – knowledge codification. While its benefits have been questioned by various researchers (see Section 2.5.1) project post-mortems are an

important and highly utilized tool in many organizations and therefore an important part of the hypothesized model. The knowledge transfer mechanisms between projects on group level are summarized in Figure 3-4.

In Figure 3-4, three arrows are added between the group level learning stocks to represent different types of exchange of knowledge between the groups in P1 and P2. In the direct communication between project's learning stocks (G_{P1} and G_{P2}) both tacit and explicit knowledge are transmitted while the groups reflect each other's ideas. Naturally, this action is usually bidirectional. As stated earlier in this chapter, the framework focuses only on unidirectional knowledge transfer in order to keep the model simple.

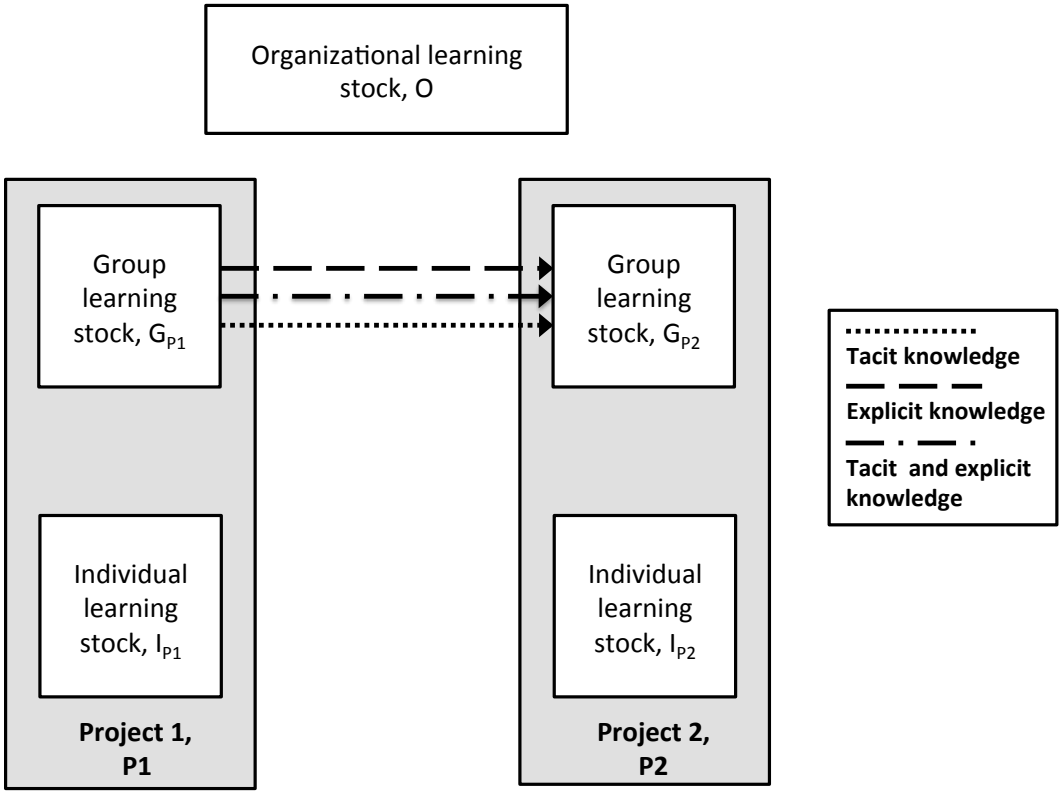


Figure 3-4 Knowledge transfer between projects on group level

With the post-mortems the communication is usually more indirect because the official project group in P1 typically creates the paper for all of the possible project groups in the organization to utilize. Here, the communication is purely explicit and codified. When transferring communities of practice, the tacit knowledge codified in a group's social fabric is transferred with the group from G_{P1} to G_{P2}. Based on what has been presented above we claim that knowledge transfer between project's group learning stocks can utilize all the knowledge transfer methods deduced in Section 2.5.1: allocation, reflection and codification.

The mentioned case, where an individual is sent from P2 to P1 in order to acquire tacit knowledge can be seen as a special case of the allocation of individuals as described in Figure 3-3. Since its addition would not add any functionality to the model, it is therefore omitted from the framework.

3.2.3. Knowledge transfer on organizational level

When examining knowledge transfer on an organizational level, the observer notices the situation being explained by the 4Is model without the need for further deductions. In the model a procedure of a certain group is integrated into the organization's structure and the acquired knowledge is then institutionalized into other groups' and individuals' routines. In other words, the activity has become a part of the organizational memory. In the same way, the outcome or performance of a project may affect the organization's guidelines. As with the 4Is model, we claim these changes to be quite rare and usually pretty small in scale in well-established organizations and routine projects.

In order to be efficiently distributed and diffused, organizational memory consists of codified knowledge and is thereby a form of explicit knowledge. The tacit part of the routines is commonly formed and upheld on the group level by the communities of practice (Brown and Duguid, 1991; Crossan et al., 1999). The inter-project knowledge transfer via the organizational learning stock may be observed in Figure 3-5.

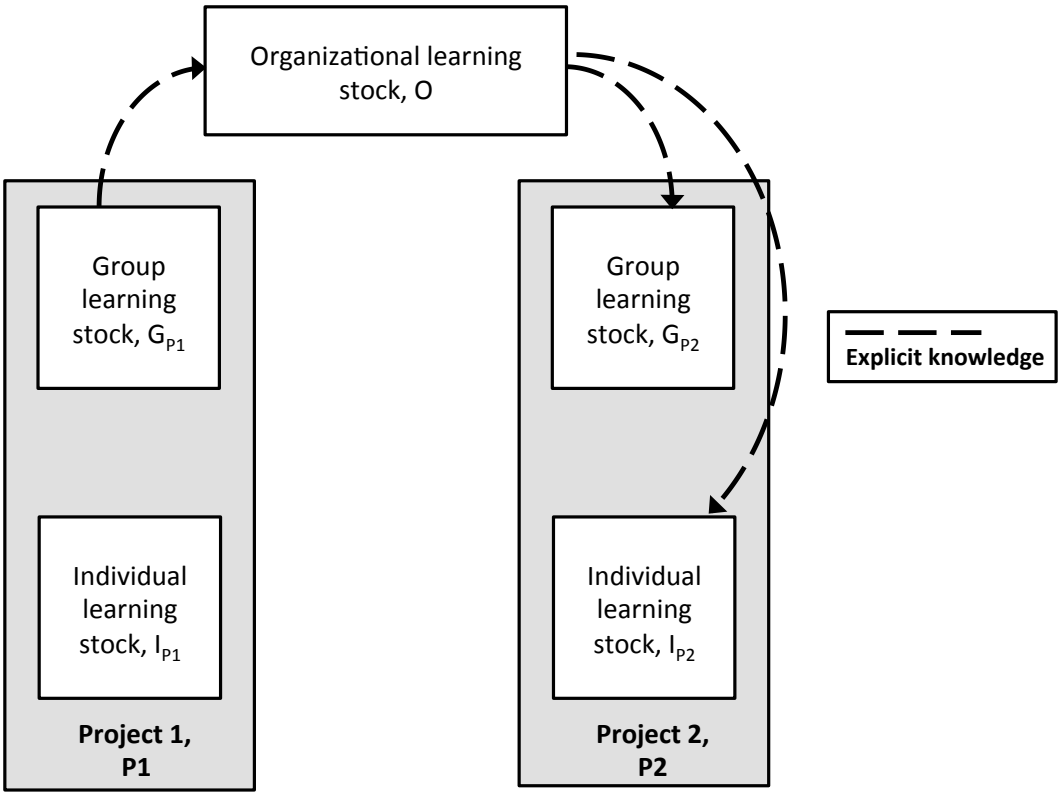


Figure 3-5 Knowledge transfer between projects on organizational level

The more a project or program differs from the well-known organizational routines the smaller is the actor's organizational learning stock regarding the subject. In Section 2.3.4, we discussed an example where a smallish, novel company grew beyond the point where its day-to-day affairs can be efficiently managed with ad-hoc individual and group level interaction. In this situation, the company started to seek and freeze functioning working patterns in order to maintain and maximize its efficiency. As the organization had accumulated best practices to its organizational memory, the search for new functioning patterns became smaller in scale as the company already had functioning working patterns on the majority of occasions. We claim that the same logic applies to programs regarding fields that are unfamiliar to the organization. As they start with little institutionalized knowledge, the projects tend to be more explorative in an attempt to seek and freeze the optimal ways of action. As the program matures its new projects are more and

more affected by previously gathered institutionalized knowledge and the occurred learning tends to be more exploitative.

3.2.4. The framework

When observing the knowledge transfer methods presented above as one entity, we believe we have created a relatively robust framework for inter-project knowledge transfer. The framework for knowledge transfer between a program's projects can be seen in Figure 3-6. As one may observe, Figure 3-6 is not just the previous figures from this section put together. It also includes the different methods for knowledge transfer that were discussed in the preceding sections. From the model, we may again notice the pivoting significance of groups in organizational knowledge transfer between projects – being the only ontological level where communicating knowledge further is possible with all the identified methods. The model also emphasizes the fact that organizational learning and communicating the acquired knowledge are intertwined processes that cannot be truly separated from each other.

As mentioned earlier in the chapter, the framework presented in Figure 3-6 has two purposes in this paper. First, it is meant to be a tool through which the knowledge transfer in the case company is analyzed in Chapter 5. Second, it seeks to directly answer the Thesis' first research question: *with interrelated IS projects, how can the lessons learned in previous projects be transferred to subsequent ones?* Being purely theoretical, the first question seeks to identify possible ways of inter-project knowledge mediation supported by current literature – as does the framework.

With its robust base in previous literature, we believe that we have created a generally applying framework for studying inter-project knowledge transfer. We, however, do not claim to have identified all of the possible streams for knowledge mediation. We hope that framework could serve as an opening to more comprehensive studies of inter-project knowledge transfer – where

the non-codified methods of knowledge transfer are equally acknowledged. We discuss the possible implications of the framework further in Chapter 6.

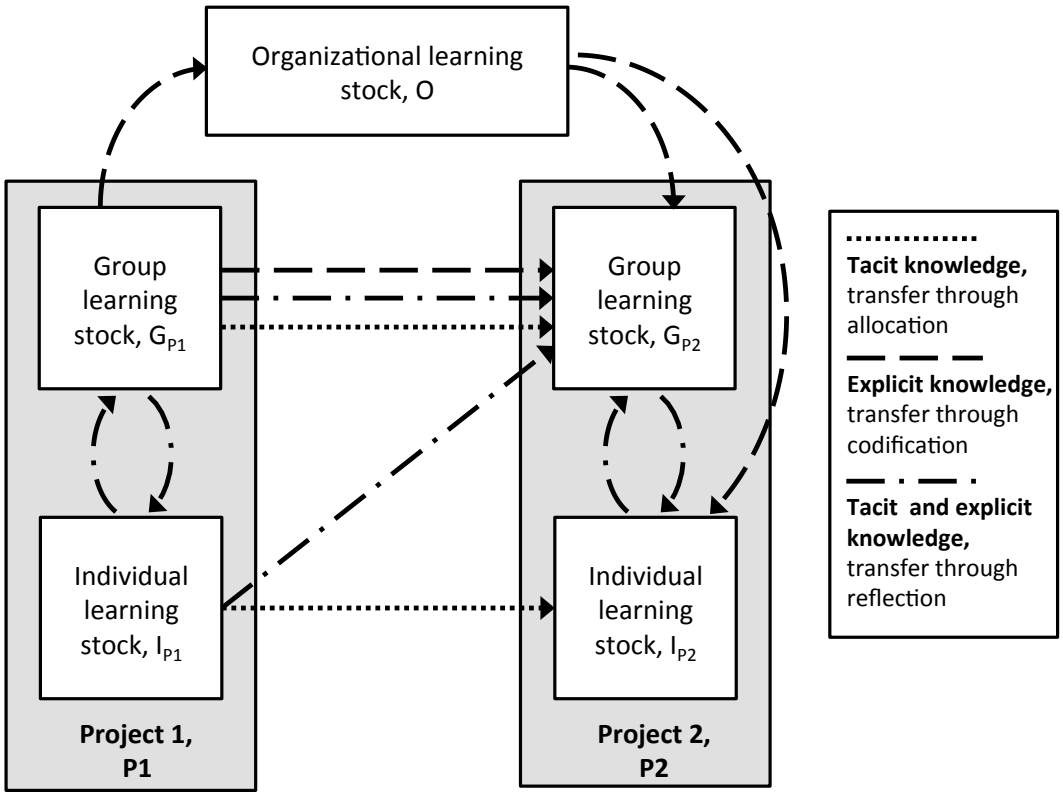


Figure 3-6 Knowledge transfer between projects

In the following sections, the formed framework is used to study knowledge mediation in the case-company's master data management program's two projects. First, we present the selected research methodology, the case company and its master data management initiative in in Chapter 4. Then, the knowledge transfer is analyzed through the framework – separately on each of the three ontological levels – in Chapter 5. Chapter 6 is dedicated for discussion, managerial implications, conclusions and the limitations and recommendations of the research.

4. METHODOLOGY AND CASE COMPANY

4.1. Research methodology

In order to study the mediation of learning with the framework formed in the previous chapter the research was conducted as a single-case study that utilized a triangulation of three qualitative data collection methods. We claim that the chosen research method was the most suitable for capturing the nuances of knowledge sharing in the preferred depth. The first section of this chapter is divided into two subsections – the prior justifying the selected single-case study approach and the latter discussing the chosen data collection methods. After these, the case company and their master data management (MDM) program are presented briefly in Section 4.2.

4.1.1. Single-case study approach

The current literature seems to be in unison that a case study is a feasible approach if the matter under observation fills certain conditions. First, the research questions should seek answers to questions of 'how?' or 'why?'. Second, the researcher's possibility to control the inspected behavior should be low. Third, the study should focus on contemporary events, enabling direct observations. (Gerring, 2007; Yin, 2003) As may be noted from Section 1.2, all the three research questions do fill the requirements set for the case study approach. Though, the author attended a feasibility study project at the case company, as discussed in more detail in the following sub-section, he did not have any influence worth mentioning to the course of the project in general – therefore filling the second condition. During the time this paper was written, the case company planed and started the execution of its customer master data management project, which was the unit of analysis where the transfer of accumulated knowledge was identified. Therefore, we state the study filling also the third condition. Based on what has been described above, we argue that engaging the phenomenon with a case study approach was justified.

According to Yin (Yin, 2003, pp. 39 – 46) a single-case approach is an appropriate strategy if the studied case is typical or representative of a general instance. With several companies all over the world starting IS initiatives from a relatively similar starting point as the case company with its master data management process, the research can be seen as one. However, the method was mainly chosen since the explorative nature of the study. When approaching the previously uncharted territory of studying inter-project knowledge transfer on a general level, we wanted to acquire as deep an understanding of the subject as possible for a Master's Thesis. For instance, Gerring (2007) has stated that a single-case study may be an optimal method for this sort of explorative study since applying multiple cases has the potential to make the researcher's observations on each individual case more superficial. When limited by the scope of a Master's Thesis, we state this would have happened, had we added another case to the study.

Since the chosen approach, the study does not aim at a formalized theory but to demonstrate how inter-project knowledge transfer can be carried out in an organization striving with the implementation of a new IS solution. As stated in Section 3.2.4 when introducing the framework, we do not claim to have identified all the possible methods of inter-project knowledge transfer. A more comprehensive study of the framework is left for future publications – where this case might serve as a separate experiment, arguing either in favor or against a more formalized theory.

A single-case study should focus on several units of analysis, on analysis of a single unit during multiple points of time – or optimally, on analysis of multiple units during multiple points of time (Gerring, 2007). The study focused on analyzing knowledge transmission between a case company's program's two projects – hence the case includes two units of analysis. It was limited to a single point of time – after the completion of the first project and during the feasibility study of the second one. As explained with the research questions in Section 1.2, the study focuses on how the lessons learned in the previous project are transferred and observable in the preliminary processes of the second project. The case company and the MDM program are presented in more detail in Section 4.2.

As characteristic of a case study (Cunningham, 1997; Gerring, 2007; Järvinen, 2004, pp. 73 – 79) the study was started without a formed theory or a framework, with only guidelines on what the researcher is about to observe. The literature for the framework was searched and selected as the researcher got more insight to the studied phenomenon. This kind of a simultaneous execution of analysis and theory building is considered to be the strength of the case study method since it usually results in empirically applicable methods (Yin, 2003).

4.1.2. Evidence collection methods

Another attribute characteristic of a case study is to approach the examined matter simultaneously from various angles e.g. via observation, interviews and analysis of documents (Cunningham, 1997; Gerring, 2007). Where some publications claim a set of methods for collecting evidence possible (e.g. (Cunningham, 1997; Yin, 2003, pp. 83–108)) others have argued that a 'case study is not a methodological choice but a choice of what is to be studied' (Stake, 2005, p. 443) – hence allowing the researcher to utilize whichever method he or she finds most suitable.

In this study we chose to utilize three of the six possible approaches for evidence collection identified by Yin (2003, pp. 83–108): participant-observation, interviews and document analysis. All of the selected methods aimed at answering the two more empirical research questions and providing the researcher with insight to choose proper theories for answering the first, theoretical, research question that aimed at framework formulation. I.e. the methods genuinely analyzed the same phenomenon from different viewpoints instead of being three separate studies with their own research questions.

This kind of multi-method approach, where all the selected methods aim to answer the same research questions, has been entitled triangulation (Denzin, 1970, 2012; Flick, 2007; Hirsjärvi, 1980, pp. 27–37; Yin, 2003, pp. 83–108). The term was originally formulated to describe the phenomenon in the groundbreaking work of Campbell and Fiske (1959). Triangulation has been

seen as enhancing the depth and credibility of a qualitative research as the studied phenomenon is analyzed from multiple points-of-view (Denzin, 1970, 2012; Flick, 2007; Yin, 2003). More recently the term has been broadened to address similar multi-method analyses utilizing both qualitative and quantitative methods (Denzin, 2012). As the reader may observe in this sub-section, this study utilized solely qualitative methods. The selected methods for evidence gathering were engaged sequentially between February 2014 and August 2014, as can be seen from Figure 4-1.

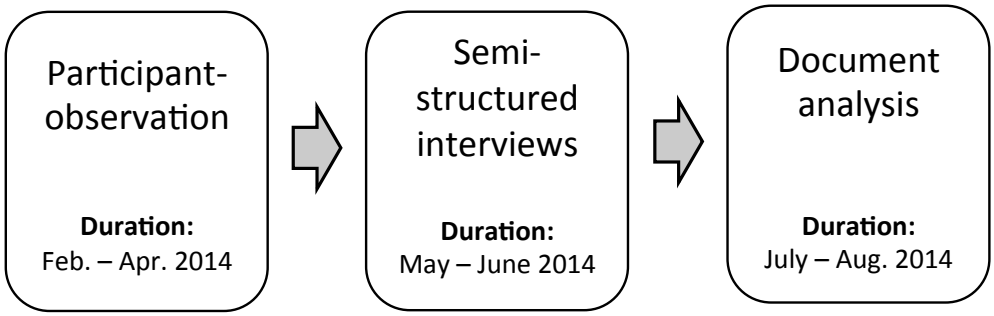


Figure 4-1 Design for evidence collection

The evidence gathering started with the researcher participating in a feasibility study project at the case company – hence taking the role of a participant-observer. The participant-observer method has been acknowledged from its ability to provide an 'inside view' of the studied entity. Through participation, the observer may in depth perceive the actions and culture of the studied organization instead of just observing them. The challenges of the selected method stem from the subjectivity of the researcher. There is e.g. a possibility of he or she acquiring the biases of the studied group through socialization. (Becker, 1958; Yin, 2003, pp. 83–108) This study tried to minimize the effects of subjectivity through the triangulation approach. The paper sought to ensure quality through requiring that the evidence found via participant-observation should be supported by the two other methods – that required more passive attendance from the researcher.

The participant-observation phase took place between February 2014 and April 2014. During the evidence gathering, the researcher participated in the case company's customer master data management project's feasibility study by creating business case calculations – and presenting them in the project's weekly status meetings to the rest of the project group. The aim of the method was to observe the organizational culture, accumulation and transfer of knowledge at the organization and how this knowledge could be observed from the project's employees' actions. The selected method differed from action research in that sense that the researcher's job description in the case company did not aim to contribute to any of the attributes under study – and the rest of the project group did not, at this phase, collaborate on the research. Where in action research the group under study is seen actively participating in it, the employees in the organization in the selected approach served primarily as subjects of observation.

The participant-observation phase was followed by semi-structured interviews with the case company's master data management program's key influencers. The semi-structured interviews were performed with the program's program manager and vendor and customer domains' MDM project's project managers. The interviews took place between April 2014 and June 2014. A more detailed schedule of the interviews can be viewed in Table 4-1. The interview form is presented in Appendix 1. Following Wengraf (2001) the research questions were divided into smaller 'theory questions'. The interview then sought to answer these theory questions through several, mainly open-ended, interview questions. The interview form in Appendix 1 lists the initial interview questions that are meant to arouse and maintain conversation. In addition, the researcher presented various follow-up questions based on the interviewee's answers. As common to semi-structured interviews (Hirsjärvi, 1980; Wengraf, 2001) these questions differed greatly depending on the interviewee.

The final evidence collection phase focused on analyzing the documents the case organization used in knowledge transfer. The case company generously contributed to the study through providing the researcher with access to the majority of the documented material it used in its efforts to transfer the accumulated knowledge from the previous project to the subsequent one.

The documented data transfer methods were compared to the results of the previous phases in order to form robust answers to the empirical research questions.

Table 4-1 Interview schedule

Interviewee title	Interview date
Project Manager, Vendor Master Data Management Project	May 12, 2014
Program Manager, Master Data Management Program	June 3, 2014
Project Manager, Customer Master Data Management Project	June 4, 2014

4.2. The case company and their MDM program

The case company is a multinational paper, pulp and timber manufacturer that has its headquarters in one of the Nordic countries. At the end of 2013, the corporation had production plants in over ten countries and employees in over 40 countries. For the corporation, year 2013 resulted with a turnover of over € 1,900 million and an operating profit around € 300 million. During the first two quarters of the fiscal year 2014 the organization employed over 20,000 people. The organization is also involved, among other things, with low-emission energy production, biofuels and biochemicals.

Master data management is a concept aimed at solving the problem of organizational data being held redundantly in various heterogeneous 'information silos' where no, or little, data is shared between them (Diakhaté, 2010; Haug et al., 2011; Loshin, 2010). The idea is far from new, and

several concepts (e.g. data warehousing and enterprise resource planning (ERP)) have previously promised similar business benefits – and failed to deliver them. Recently, a growing number of representatives from both academia and the business world have started to argue the reason being not in the technical capabilities of the solutions but in organization's incapability to adjust the new technology efficiently to their processes. (Sammon et al., 2010; Smith and McKeen, 2008)

Master data management seeks to overcome this problem through emphasizing the organizational aspects of data management and leaving a certain degree of freedom to the technical execution. As primarily an administrative ideology, master data management is more focused on the content than the form, and broadly defined every initiative striving towards the goal of providing a consistent and unified management of business critical data can be defined as MDM.

At the beginning of the decade, the case company started an initiative that aimed at rationalizing and centralizing the management of the organization's massive master data pool. After the identification of the central master data domains, the initiative took the form of a program containing five consecutive projects. These domains and the intended course of the program may be seen in Figure 4-2.

Figure 4-2 Case company's master data program domains

During the time this Thesis is written, the company had begun executing the second project targeting in establishing a master data management structure to its customer master data domain. The execution of the project was preceded by a feasibility study starting at the end of the vendor domain project in October 2013 and ending at the beginning of May 2014.

The original plan was to implement the whole program as an unbroken stream with all the projects slightly overlapping at one's end and the other's beginning. However, due the difficulties experienced in the implementation of the first project the corporation decided to allocate some time to study what it had learned and could further utilize from it. The implementation of the first domain had namely gone slightly over budget and was completed late from the intended schedule. The timeout was also used to re-evaluate the feasibility and possible scopes of the customer domain project – and deciding the fate of all the remaining projects in the program.

The result of the feasibility study was, in short, to continue with the MDM program. What the organization did in the pre-evaluation phase is closely related to what it learned from the vendor domain project and how it utilized the accumulated knowledge in planning and executing the customer domain project – and hence answered in depth in the next chapter.

At the end of this chapter, we like to point out the differences of the two inter-related projects discussed above. Due to differences in organizational culture, the vendor domain was far more centralized in the terms of IT architecture and management before starting the project– the customer side consisting of more independent units and heterogeneous software. The prior project did also include building a shared platform, on which all the master data management software from all domains are meant to be established. Despite these differences, our analysis was quite efficient in identifying knowledge accumulated in the vendor domain project and mediated to the subsequent project – as the reader may notice while reading the next chapter.

5. ORGANIZATIONAL LEARNING AT THE CASE COMPANY'S MDM PROGRAM

In this section, we analyze the knowledge accumulation and transfer between two projects from the case company's MDM program with the framework formed in Section 3.2. The chapter is divided into three sections, each discussing the knowledge accumulation and transfer on a separate ontological level. Each of the sections tries to identify how the case company transferred the knowledge acquired in the vendor domain project to the subsequent customer domain project and its preliminary phases – and how can the accumulated knowledge be observed in the latter project.

5.1. Individual level

When defining the framework, we identified two separate ways of transferring knowledge from a project's individual learning stock to another project: allocating and reflecting. The layout of this section follows the same division, focusing first on presenting the knowledge mediation via allocation in Section 5.1.1 and then through reflection on Section 5.1.2.

5.1.1. Knowledge transfer through allocation

There was relatively little transfer of tacit knowledge between the projects through allocating project members from one project to the other. In fact, at the project group's level, only two employees working with the customer master data management had been a part of the previous domain project. Both of the projects were divided into two main responsibility areas: business stream and IT stream. From both streams only one worker had been migrated to the subsequent project. On the business stream a change management specialist had remained the same. On the IT side, a systems expert had worked with both projects. According to the interviewees, the main

reason for the lack of the same employees being in both of the projects was that the people working in the prior project were no longer in the organization's service or had their hands full with other responsibilities.

Members not belonging to the project groups' core, but contributing to their actions had remained relatively unchanged. The composition of the steering group, for instance, had remained nearly static. From the eight people steering the customer domain project five were included in the previous project. The same person had also held the post of program manager from the beginning of the vendor domain process to the end of the customer domain's feasibility study. At this point, the original program manager had left for maternity leave (that is considerably longer in northern Europe than e.g. in USA). The steering group's contribution is more carefully studied in Section 5.3 focusing on knowledge transfer on the organizational level.

Interestingly the IT systems specialist present in both domains' projects had been allocated to the vendor domain in the middle of the project with one of his main responsibilities to learn from the domain's activities and transfer the acquired know-how to the customer domain project. It was also intended that the manager of the next possible master data domain, finance, would join the customer project group at a later phase in order to assimilate the project group's tacit knowledge and transfer it forward. These instances indicate that the organization had systematically planned the gathering and transfer of tacit knowledge with employee policy. This supports the notion that not all knowledge can be made explicit and easily communicated forward.

5.1.2. Knowledge transfer through reflection

Especially the people working with customer master data management (CMDM) brought forth the important role that informal communications played in the preliminary processes of the customer master data management project. While there had not yet been many formal meetings between the two projects' members (that are discussed in the next section) on the business stream's side, the project manager and a business process expert from the CMDM project told

they had frequently visited the desks of the members of the completed vendor domain project for consultation. Especially, the project manager of the vendor domain project had taken a role of a mentor for the customer domain project's project team. While the needed members where not in the same physical location, online meeting tools where actively used for communication.

Therefore, an important enabling factor for knowledge transfer was the informal organizational culture typical of Finnish organizations. All the employees of the customer domain project felt comfortable approaching the vendor domain's employees who gladly shared their views on the matter at hand. When interpreting this activity, the vendor and customer domain's employees can be seen forming informal groups varying in shape and size, all targeting in forwarding the customer domain project's agenda. A project member being able to access these groups was viewed as a critical requirement for being able to work in the customer domain project. As one of the customer domain project's members put it 'the problem is to know whom to ask. Luckily, I know all the employees that worked with the vendor project, since I have worked with them in previous projects'.

Traditionally, the literature has seen communities of practice being built in order to carry out routinized tasks (e.g. Brown and Duguid, 1991). The informal groups formed around transferring knowledge from one project to another, however, possess all the core functionalities defined for the concept: they are essentially unofficial groups formed to decently fulfill its individuals' line of work. In these communities of practice, the individuals from the previous project could transfer their tacit knowledge and externalize their explicit knowledge to the employees working with the customer domain project.

The phenomenon of communities of practice acting as a medium for knowledge transfer is not unknown to the literature. The notion has been used to e.g. explain learning through socialization (e.g. MacDougall and Riley, 2010) and the making of post-mortem reviews (Dingsøyr, 2005). However, the usage of communities of practice in knowledge transfer in organizations has been underutilized and the concept has not received the proper attention from the academia (Stapleton et al., 2005)

While discussing the definition of a group in Section 3.2.2, we introduced the project's group learning stock as 'an union of the gathered knowledge of the various groups formed around the projects' actions' and a group as 'any formal or informal union of people related to this action'. As the informal groups discussed above aim primarily at forwarding the customer domain's actions, it can be seen as a part of the customer domain project's group level learning stock. Therefore, the phenomenon of forming communities of practice for transmitting knowledge describes how individuals from the vendor project communicate their knowledge to the subsequent process through socialization and externalization.

Important factors enabling the formation of these kinds of communities of practice were the relatively centralized location of the workers and their enthusiasm in utilizing online communication tools. In addition to the more traditional emails, the domain projects' members used conference calls via the instant messaging client Microsoft Lync ® on a daily basis.

While the informal exchange of knowledge between the projects was vivid on the business stream, the interchange was more limited on the IT stream's side. A critical reason for the lack of informal communication was the vendor domain's employees being unavailable to communicate due other projects taking all of their time or no longer being in the organization's service. The reader should also keep in mind, that the MDM platform the domains rely upon was already constructed in the vendor domain project, making the customer domain project less technical by nature. Hence, the IT stream itself held fewer employees in the customer domain project compared with the previous one.

5.2. Group level

When forming the framework, we identified three ways through which accumulated knowledge can be transferred from one project's group learning stock to another's. With the case company, we observed two of these methods being utilized: reflection and codification. As the reader will

notice in this section, the two processes were tightly intertwined. Hence, we decided to discuss the phenomena together instead of dividing them into separate sections like we did with individual learning. As mentioned, we did not find knowledge transfer through allocation on the group level. The theorized phenomenon is closely related to the concept of communities of practice and presumably requires more employees to be transferred between the projects.

The previous section mentioned how the inter-project knowledge transfer with the IT stream provided problematic since the employee turnover in the area. The circumstances made it impossible to mediate knowledge between the projects through mentoring or communities of practice. To overcome the problem, the case company had had initiatives to formally transfer the lessons learned from the previous stream to the subsequent one. Before the vendor master data management (VMDM) project's and the program's IT leads had left the company, they where assigned to a three-day workshop with the CMDM project's IT lead. The primary goal of the workshop was to – through reflection – pass on the tacit and external knowledge acquired during the vendor domain project.

While a big part of the mentoring occurred in the informal communications with the business streams, the employees also put a lot of weight on the importance of the formal meetings. During the time the semi-structured interviews were held, the business streams had held two official meetings aiming at knowledge transfer. The groups had already scheduled a third date for formal knowledge exchange and were planning to arrange such meetings throughout the CMDM project. At the heart of these gatherings were the end reports from the vendor domain project. The agenda of the meetings was to ensure that the customer domain's project group understood these reports, and it consisted of this group making questions and remarks about the documents. The end reports were also edited on the basis of the feedback the customer domain project group had given in the meetings.

Here, we find an efficient example of how to ensure that the post-mortems of a project are actually utilized in the following initiatives. By bringing the two parties together and letting the sequential project group to provide direct feedback on the codified documents, the case company

could ensure that the VMDM group's post-mortem did not just list the outcomes of the project – but truly advantageous information from which the customer project team could learn from. For reasons like this, it has been recommended that people meant to utilize the accumulated knowledge should participate the post-mortem reviews by e.g. Collison and Parcell (2003). In the meetings, the documents had evolved to describe the lessons learned on a more detailed level than initially – with an increasing focus on the vendor project's processes instead of the outcomes. This was in turn stated to be a more efficient method of transferring best practices in Section 2.5.3.

A majority of the explicit knowledge transferred to the organizational learning stock of the customer domain project were fine-grained technicalities. The accumulation of knowledge could be observed e.g. in the shared or similar naming practices and business rules for data entities between the two domains.

The customer domain project group also learned from the vendor team's experiences that it needed to thoroughly define the IT architecture for the MDM solution already in the pre-evaluation phase of the project. The vendor team had namely underestimated the complexity of the task and run in to trouble when struggling with the definitions on a tight schedule. The vendor team had also experienced problems with the design of the functional specifications of the procured software where, according to them, they had left too many points open. At the end of the pre-evaluation study, the customer domain was well prepared for this challenge as well.

The vendor team also stressed that more time and resources should be allocated to the supplier co-ordination and defining the roles and responsibilities when implementing hardware and software. During the time this paper was written, the case company was just starting with the actual customer domain project. Hence, we cannot comprehensively say how efficiently the specifics of these pieces of accumulated knowledge were transferred on to the customer domain project. However, in the observations and interviews the employees of the customer domain made it clear that considerable effort was put on the matters discussed.

5.3. Organizational level

It was hypothesized in Section 3.2.3 (discussing the framework on organizational level) that programs covering areas that are previously unexplored by the company tend to be more explorative in nature – at least when starting off. This would lead to a relatively larger amount of knowledge to be institutionalized near the beginning of the program. As the program matures, its latter projects take a more exploitative approach. As the case company had not previously managed its master data with a dedicated set of tools, the MDM program fills the requirements of the uncharted territory. The more explorative approach was also clearly observable from the organization's actions. According to the former program manager, the vendor domain project was, in a way, seen as a pilot to map out the possibilities the MDM ideology could provide to the company.

According to the framework, knowledge transfer through the organizational learning stock is carried out purely with codification. In this section, we discuss how the knowledge accumulated in the vendor domain project was transferred to the subsequent project through codifying it as organizational guidelines. In the following sub-sections, we present four large areas where the institutionalized knowledge could be observed: the scope and form of the project, the project group's composition, the scale of the feasibility study preceding the project and the existence of overlapping projects in the domain.

5.3.1. Project structure

The accumulated knowledge is perhaps most visible in the differences between the scopes and methods of execution with the two projects. When the vendor domain project was presented to the steering group, it had a fixed scope and the decision was made between engaging and dropping the proposal. Also, the prior project was planned according to the traditional 'waterfall'

model. Here the different steps of the project are nailed down in the beginning and sequentially followed as the project 'flows' through the steps like a waterfall.

With the customer domain, the company had approached the definition of the scope from a different angle. In order to comprehensively understand and communicate its needs it had formed a 4 x 3 matrix to map out the desired scope. On the matrix's vertical axis, the MDM concept had been divided into four main areas, which are described in Table 5-1. The horizontal axis consisted of three priority classes, describing how critical the needed scope was to the organization and the desired functionality. The skeleton of the scope matrix can be seen in Table 5-2. In the table, the grey cells represent the detailed descriptions of possible widths of each scope area. However, as further analyzing them would fall outside the scope of this study their detailed descriptions are omitted from this Thesis.

Table 5-1 Case company's customer master data management scope areas

Scope area	Definition
Data Model	Data structure, i.e. what attributes are implemented in customer master data domain. *E.g. general vs. business specific.*
Data maintenance processes	What data maintenance processes should be doable with the tools. *E.g. general data maintenance, mass modification or customer self service*
Data Quality	The depth and variety of data validations. *E.g. current vs. external company hierarchy validation*
Data distribution	Customer master data domain's architecture. I.e. how the data is distributed from the MDM platform to other systems. *E.g. From MDM to main ERPs vs. from MDM to all of the corporation's ERPs*

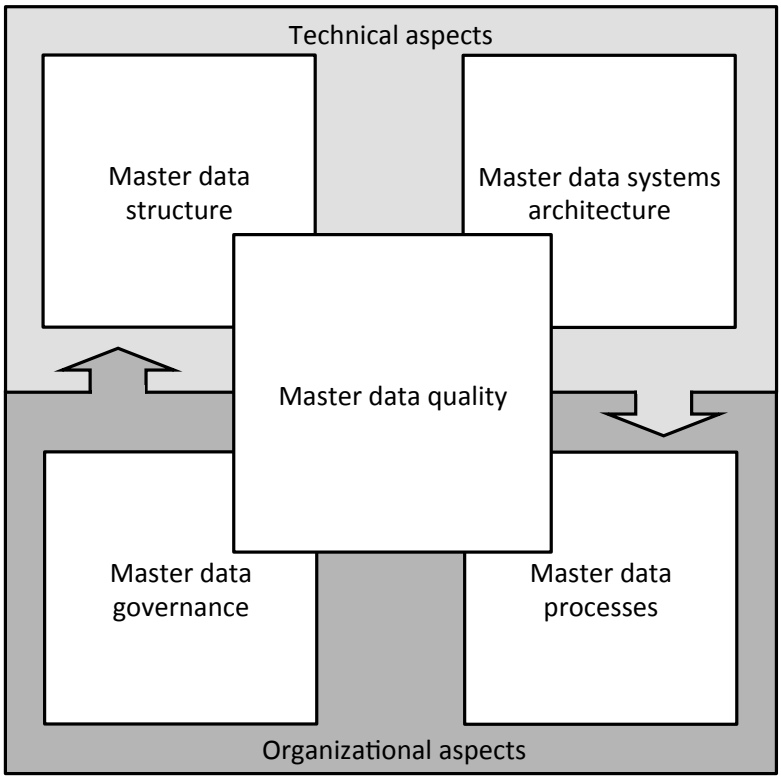
Interestingly, from the matrix's four domains all were analogous to one of the five domains defined by Cleven and Wortmann (2010) in their ground braking conference paper, presented in Figure 5-1. The most intuitive analogy can be found in the domain of master data quality that is similarly named in both models. By their contents, the case company's 'data model' does refer to Cleven's and Wortmann's 'data structure', 'data maintenance processes' to 'master data processes' and 'data distribution' to 'master data systems architecture'. According to the interviewees, the fifth domain of master data governance was omitted from the matrix since its composition was seen fully dependent from the other domains' structures.

Table 5-2 Case company's customer master data management's possible scopes

	Must have	Good to have	Nice to have
Data Model			
Data maintenance processes			
Data Quality			
Data distribution			

Another noticeable difference between the projects was that, instead of the design being locked before the implementation, the customer domain project was meant to take a more agile approach to its implementation. In agile development, the phases of a project are not considered sequential or locked after a certain point of time. The project is designed, implemented and verified in small iterative cycles. After each of these cycles, the customer is able to give feedback on their results and possibly alter his or her requirements for the project. This way the customer

gets a more concrete picture of the project and how each of its building blocks affects its outcome (for a much more detailed description of agile software development, see e.g. Kniberg (2007)).



Source: (Cleven and Wortmann, 2010)

Figure 5-1 Core elements of master data management

When asking about the observed differences, employees confirmed the actions being a result of organizational learning. The discussed scope matrix was introduced to reduce the possibility of the so-called 'scope creep' phenomenon. When planning the vendor domain, the company had a great number of features on the table that would have been 'nice to have' in the implemented solution. This led to problems with prioritizing the crucial features needed to establish the core functionality of the MDM solution. This, in turn, played a part in delaying the project. The agility was incorporated to the customer domain project since the difficulties the organization

witnessed in the management of the vendor project. First, the project suffered from the solution provider's lack of business expertise in the area of master data management. This resulted in the provider being unable to guide the case company in their search for defining the required core functionalities. A second reason for the urge for agile development was that implementing new processes and technology while simultaneously managing the old ones provided to be quite challenging. The stepwise approach would provide the company with leeway when implementing the change.

Both the approaches in customer domain project's scope and method gain support from the literature. As already stated before, the different areas in the scope matrix gain support from the article by Cleven and Wortmann (2010). Also the agile project execution is recommended by e.g. Ilieva et al. (2004), Murphy et al. (2005) and Smith and McKeen (2008). One could say that the difficulties endured in the prior project got the case company to take a more academic approach to the concept.

5.3.2. Project group's composition

It has already been mentioned earlier that the vendor domain project included building of a master data platform, which is meant be shared between all the implemented domains. The planning and realization of the platform naturally reflects the project group's composition. However, there are differences between the two project groups that cannot be explained through the building of the platform – but are interpreted as a result of the previous project accumulating to the organizational learning stock.

At the beginning of the MDM program, it was planned that the projects would not have a separate IT lead, but the task would have been taken care of by the program IT manager. It was soon realized that the presence of a program level lead was not sufficient enough to efficiently manage the day-to-day affairs of the project and a separate position of a project IT lead was

established. All the interviewees and documents were consistent that the future MDM projects at the organization would have a separate IT lead – the learned lesson had become institutionalized.

The organization had also learned another valuable lesson considering a project group's composition in master data management initiatives. In the vendor project, the workload of a business process expert was constantly over-allocated. In many instances, she also had multiple of her tasks on the project's critical path. Being the only business process expert assigned to the project, she alone possessed the accumulated knowledge of her line of work – had she e.g. become ill would the process have been further delayed. Because of this risky arrangement observed in the vendor project, the customer domain project and all of the forthcoming projects include at least two process experts. This is done in order to avoid bottlenecks and ensuring that the accumulated tacit knowledge is usable by the project group at all times.

As mentioned in Section 5.1.1, the case company had planned that the future project manager of the next master data domain project would join the customer domain project group. We, however, do not see this as a result of learning occurred in the vendor domain project since similar initiatives were made already when transferring knowledge between the vendor and customer projects.

5.3.3. Scale of feasibility study

Another notable difference between the two projects is the scale of the preparatory measures taken before the project. At the beginning of the program, the feasibility of all of the domains was mapped out in a common study. As mentioned earlier, the initial idea was that the projects would slightly overlap in execution and the feasibility study made at the beginning of the program was deemed to be enough for each project. However, because of the setbacks incurred in the first project, the program steering group decided to take a time-out to the intended flow of the program in order to thoroughly reevaluate their approach to the projects. As a result, it was decided that all the following projects would have a separate and thorough feasibility study in

order to more precisely map out the pros and cons of their implementation. The steering group has also stated the possibility of some of the domains left unimplemented for the time being, if not worthwhile.

This can be seen as an example of organizational knowledge accumulation. It also demonstrates the role of the first project as a pathfinder. With one master data project under their belt, the case company had a lot more experience in defining the actions required to execute another domain project – and to estimate its feasibility. In the situation under discussion, the corporation came to the conclusion that the prospective master data management projects needed more time in scale design and feasibility study than was initially indented.

5.3.4. Overlapping projects in the domain

This final sub-section examines the other projects executed in the domain simultaneously with the master data management project. Namely, with the vendor domain a yearly-implemented data cleaning initiative was planned to take place as a part of the master data project. Along with the other issues discussed, this initiative had a significant effect in the project not being on schedule. As a relatively lengthy process, the initiative formed a bottleneck to the project in terms of time and staff. This was unfortunate, since data cleaning could have been completed before the organization had even started with the vendor master data management project.

With the customer domain, the organization had engaged an intensive data cleaning initiative before starting with the master data management project. All the interviewees were in unison that a similar project would be committed before starting with master data management in all the remaining domains. It can be stated that the knowledge of not to have any other on-going data-related projects while engaging MDM in a domain had been institutionalized in the organization's guidelines.

6. DISCUSSION

As noted while discussing the chosen methodology in Section 4.1, it is characteristic of the case study approach that the theoretical framework of the studied phenomenon is formed simultaneously with the analysis. Hence, it should not be surprising that our framework worked reasonably well in studying the different methods of knowledge transfer. Knowledge transfer was observed with all but one of the identified methods: allocation of communities of practice between the projects' groups. Though not identified in practice, we see the theory to support this method. Here, we might again observe the problems associated with a single-case approach. We claim that with a larger amount of case organizations also this method of knowledge mediation might have occurred.

The first research question sought to answer the question: *with interrelated IS projects, how can the lessons learned in previous projects be transferred to subsequent ones?* Since a single-case study cannot comprehensively answer the question we do not claim that the study identified all the possible ways through which accumulated knowledge can be transferred from a project to another. We have, however, established a robust model through which one may observe knowledge interchange between related IS projects. It identifies tacit knowledge from explicit knowledge and classifies the knowledge transfer methods into three separate categories: allocation, reflection and codification. The framework also has a solid base on previous academic literature. We believe that this framework provides a valuable lens through which one can analyze organizational learning and knowledge interchange. It is also meant to be a starting point through which future research could build a more formalized theory of knowledge transfer in IS programs. To sum it up, we claim to have answered the first research question with a valid, general model of inter-project knowledge mediation in a program – though it may not identify all the possible methods of knowledge transfer.

The second research question '*How did the case company transfer the knowledge learnt from one project to another in its MDM program?*' was thoroughly answered in the previous chapter.

As stated above, we observed the case company utilizing indisputably all but one of the identified methods of knowledge transfer. The majority of the program's steering group's members being the same throughout the program could be argued to be a form of mediating communities of practice between the projects. We chose to omit this interpretation from this paper since the role of the steering group was limited to administration and deciding practices to be institutionalized. We assume these actions being of routine nature in the steering group's members' job description. Thereby, we presume that little new knowledge was created within the group during the course of the program.

Since tacit knowledge being, by definition, tacit and thereby harder to observe the section covering knowledge mediation on the individual level focused more on the initiatives the company took in order to enable the mediation of this knowledge. These initiatives proved to play their part in the knowledge accumulation on the organizational level. As we approached organizational learning with the assumption that learning is observable from action we cannot say we answered the third research question on the area of tacit knowledge mediation on individual level. To the question '*How can the knowledge accumulated in the previous MDM project be observed in the case company's current MDM project?'* on this level, the researcher should have been able to examine the employees' actions in the vendor domain project, before the knowledge accumulation, in order to deduce how it had changed during this project. We did, however, see how the individuals possessing this tacit knowledge were allocated to the next project – and that their presence altered the manner of approach of their colleagues. Hence, we may conclude that tacit knowledge was being transmitted. Also the customer domain's business stream's employees did continuously consult the vendor domain's members who were not transferred to the customer project – and utilized the knowledge gathered in these discussions in their decisions. We see that in these informal conversations both tacit and explicit knowledge was transmitted.

The third research question was answered on group and organizational level, as presented in Sections 5.2 and 5.3 respectively. The interchange of knowledge between groups resulted in e.g.

the customer domain project thoroughly defining their desired IT architecture and the functionalities of the intended software before engaging the project and assigning more time to co-ordinate the IT providers. Also the contents of the project post-mortem, discussing the previously mentioned matters and the knowledge institutionalized in the vendor project, was an important source of observing the knowledge accumulated in the previous project. When examining how the mediated knowledge may be observed on an organizational level, the reader only needs to read the headings of sections 5.3.1 – 5.3.4 for the major differences. As a result of institutionalization, the projects differed in terms of project methodology and scope, the project group's composition, the scale of feasibility study and the existence of overlapping domains in the domain.

From the previous chapter, the reader may notice the section regarding knowledge transfer on a group level being relatively short in comparison with the sections regarding knowledge transfer through individual and organizational levels. This is, however, not a result of the small size of the group level learning stock in the customer domain project – in fact quite the opposite. The underlying reason for the scarcity of text is that a great deal of the knowledge accumulated at the group level in the vendor domain project was institutionalized. Therefore, it was discussed in the section regarding knowledge mediation through the organizational learning stock. As mentioned in Section 5.3, the vendor master data domain project was widely considered as a pilot and a learning opportunity, which would help establishing a more robust framework to build on with the latter master data management projects.

The observed case supports the notion discussed at the beginning of Section 5.3 and hypothesized in Section 3.2.3; i.e. the claim that IT programs aiming to the implementation of novel concepts tend to be explorative by nature at the beginning and turn more exploitative as the program matures. As a master data management program was a novel IT initiative to the organization, the institutionalization of the accumulated knowledge seemed to be wide in scale at the beginning of the program; i.e. the approach to the project was explorative in nature. When writing this Master's Thesis, the case organization was only starting with the second project of

the program. Therefore, nothing certain can be said about how the rest of the program will fall into the presumption. Even if the following projects would become more exploitative, a single-case study would not provide a credible basis for the assumption.

When analyzing the obstacles the case company faced in the implementation of its vendor master data management solution one cannot help to find similarities to the writings of Sammon et al. (2010). In their article, the authors expressed their concern that software vendors would approach the concept primarily as an IT project and therefore fail to provide the promised business benefits – as has happened to many other concepts in the field of information systems. Though the case company did achieve the desired business benefits, the lack of organizational know-how on the supplier's side pushed the project's completion further. With no previous experience on the execution of such a project, the customer is usually unable to challenge the vendor on what is needed in order to run the project smoothly. Hence, organizational learning plays a major role in such initiatives. When engaging the customer domain, the case company had a lot more expertise under its belt and had a lot more to say in what they actually wanted to be provided for them.

This supports the notion that master data management is best completed in small steps – preferably one domain at the time with agile methods. This way the procuring organization has the maximal ability to learn from the concept and their own needs and with this knowledge influence the implemented solution.

6.1. Managerial implications

Especially during the interviews, it became clear that tacit knowledge plays a crucial role in the success of nearly any organizational action – IS projects being no exception. Therefore, if an organization wants to transfer acquired knowledge from a project to another it should keep in mind that all knowledge cannot be codified or communicated. As mentioned often in the text, we do not intend to downplay the importance of explicit knowledge but seek to emphasize that both

pieces are required in the efficient mediation of knowledge. Though often downplayed, taking notice on the transfer of tacit knowledge has potential to positively affect the outcomes of upcoming projects.

During the study, we have identified several efficient ways of transferring knowledge between the projects in the case company's MDM program. Perhaps the simplest and most certain way is to transfer workforce from a project to another. If the projects are lined one after another, an organization should strive for keeping the same employees working on all projects. If keeping the workforce static is not possible (or feasible), another way of mediating tacit knowledge is to assign employees from the previous projects to mentor the upcoming initiatives.

In order to enhance the transfer of both tacit and explicit knowledge, one should encourage the employees from the past and future projects' groups to engage in formal and informal meetings. The latter may require substantial devotion to change the organizational culture in a direction where the employees have the time and willingness to consult each other when difficulties occur. It is also crucial that the organizational culture does not sanction the employees from constructively bringing forth the failures in the projects. Without identifying their defects, organizations may have a hard time when trying learn from the previous initiatives.

While generating codified knowledge aiming for knowledge mediation – such as project post-mortems – one should focus on documenting the processes that led to the learning outcome instead of the outcome itself. With the case company, we found that the actors indented to utilize the codified knowledge providing feedback was an efficient way of ensuring the quality of these documents. This also helped the project group, which was meant to utilize the documents, to vividly live through the instances that led to the original knowledge accumulation. It is obvious that it is not always possible for the actors meant to utilize the codified knowledge to provide feedback – one of the key aspects of codified knowledge is that it is usable without any further contributions from its makers. In this situation it might provide useful that the writers of such a document would reflect their work with someone who has not been a part of the project and possesses similar capabilities as the intended end-user.

As stated earlier, master data management is a vast initiative and usually best implemented in small steps. It is also a commonly accepted fact that MDM is primarily an administrative – as opposed to a technical – concept and should therefore be approached accordingly. The vendor domain project in the case study showed us how important it is to get the business domain involved with the project – as the scarcity of business process experts turned out to form a bottleneck to the progress. Though this message is widely broadcasted in the field, many companies tend to engage master data management initiatives from an IT point-of-view and downplay the central role the operative business should take in the process. At worst, master data management software can be implemented purely as a Band-Aid to cover previously occurred symptoms without altering the main cause – the underlying processes and incoherence in data ownership. An organization thinking to engage master data management should put emphasis on all the elements introduced in Figure 5-1, not just two purely technical ones.

Another important lesson to be learned from the case company's program is the long-term commitment to the initiative. As stated e.g. in the author's Bachelor's Thesis (Aaltonen, 2013), master data management is more a journey than an initiative. With iterative development – be it within a project or between projects – the organization has a possibility to continuously learn more about master data management and enhance its corresponding processes. Of course, in order to get a company buy-in one needs to provide short-term benefits even to a long-term initiative. The iterative approach is feasible also from this perspective, e.g. with separate business domain's being convertible to short term MDM benefits at a relatively fast phase. To sum it up, in order to harness the full potential of master data management an organization should plan big but deploy small.

6.2. Conclusions

This paper sought to identify a model for knowledge transfer between projects in a IS program through a single-case study. In order to maintain simplicity and to suit the needs of the analysis of the case company's master data management program, it resulted in a framework explaining unidirectional knowledge transfer between an IS program's two projects. Because of the chosen single-case approach we do not claim to have identified all of the possible streams of knowledge mediation. However, we claim to have established a valid general model of inter-project knowledge transfer.

The framework consists of two projects' individual and group level learning stocks, and a shared organizational level learning stock. In addition to the knowledge transfer methods identified in the 4Is framework by Crossan et al. (1999) – that was used as a basis for the framework – the model identifies three additional paths for knowledge transfer: between the projects' individual level learning stocks, between the source project's individual level and the receiving project's group level learning stock and between the two project's group level learning stocks.

The framework identifies two types of knowledge – tacit and explicit – that can be transmitted between the projects. In addition, the framework includes three methods that are all capable of transferring different kind of knowledge through different paths between the two projects: allocation, reflection and codification. Allocation of individuals and groups between the projects is focused on transferring the tacit knowledge possessed by the individuals or the groups' social fabric. Reflection is suitable for mediating both explicit and tacit knowledge between an individual and a group inside or between the projects – or between the projects' groups. With codification, the organization may seek to freeze and transmit a group's preferred actions; it is also suitable for knowledge transfer between the projects' groups e.g. in form of project post-mortem documents. In both situations, codification is a purely explicit method of knowledge transfer. The formed framework was presented in Figure 3-6 and, for clarity, is shown again in Figure 6-1.

The framework sought primarily to answer the research question '*with interrelated IS projects, how can the lessons learned in previous projects be transferred to subsequent ones*'. With the model, we identified all the described methods of knowledge transfer from the case company's MDM program, except the mediation of tacit knowledge between groups via allocation. This, in turn, answers the second research question: '*How did the case company transfer the knowledge learnt from one project to another in its MDM program?*'.

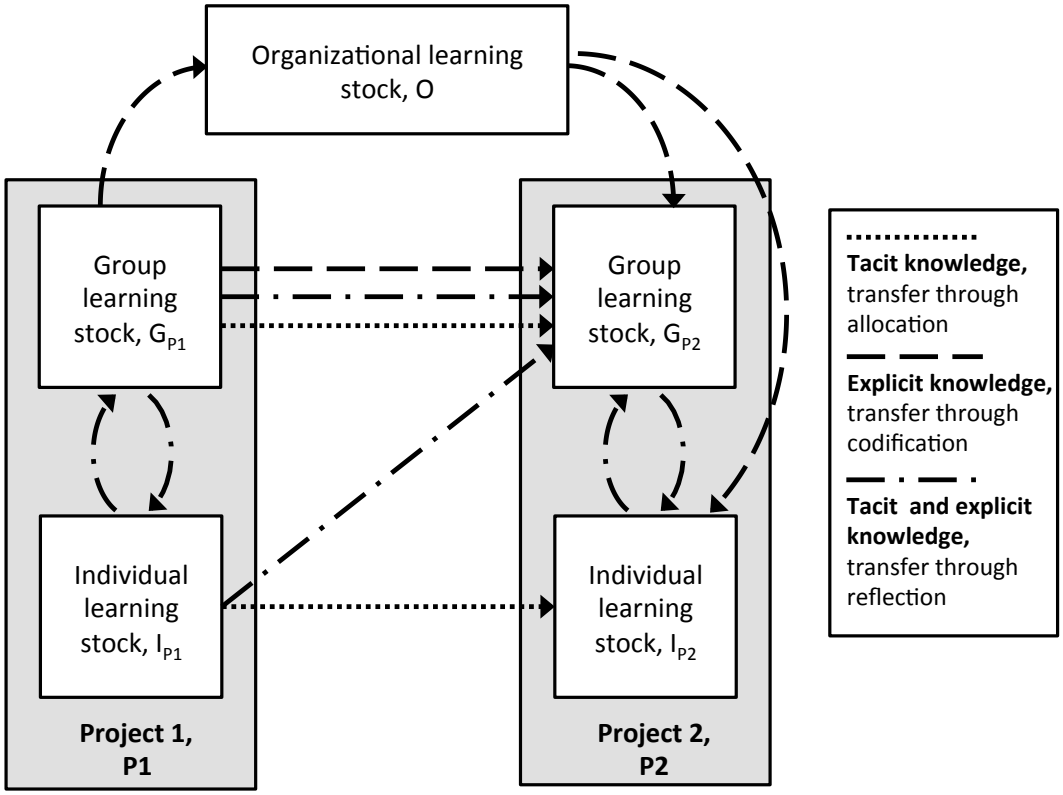


Figure 6-1 Knowledge transfer between projects

The central statement of the framework and this Master's Thesis is that tacit knowledge plays an important role in knowledge mediation and is too often dismissed in favor of its explicit counterpart. It also seeks to point out that when studying knowledge mediation between projects the current literature is often too focused on studying solely knowledge transfer through

codification. Allocation and reflection are both viable and efficient methods of knowledge transfer and should be treated as such. By studying all of the three knowledge mediation methods simultaneously the observer is able to get a more comprehensive picture of the knowledge transfer process in general. The framework also emphasizes the significance the group level learning stocks play in knowledge transfer, since they are the central interpreters of both tacit and explicit knowledge and the only entities capable of mediating knowledge on all the identified methods. We argue that without the formal an informal group level knowledge transfer initiatives an organization cannot efficiently allocate the accumulated knowledge from a project to another.

The third research question sought to identify the knowledge accumulated in the case company's first MDM project (vendor master data management) in the consecutive project (customer master data management). The accumulated knowledge could be observed on multiple levels. Since the tacit nature of the knowledge on the individual level, the verification of the existence of the knowledge was limited in secondary observations – such as the members of the second project's members actively consulting the prior project's staff.

On the group level, the knowledge accumulated in the vendor domain project could be observed in the consecutive project's project group engaging activities that would – in the eyes of the vendor domain's project group – preempt the major problems that occurred in the first project. The knowledge mediation could be observed on the organizational level with the corporation stating that the future projects would differ from the vendor domain project in terms of project methodology and scope, project group's composition, the scale of feasibility study and the inexistence of overlapping domains in the domain.

6.3. Limitations and recommendations

It has been brought forth several times in this paper that the presented single-case study is not sufficient to provide evidence for a formalized framework. This Thesis sought to identify a

model of how the knowledge accumulated in an IS program's project can be further transferred to the program's other projects with the help of a case study. It analyzed in depth how the lessons learned in the case company's first MDM project were transferred to the subsequent one. The study was limited in studying the knowledge mediation between the case company's two first projects since at the moment the remaining initiatives are nothing more than future prospects. Though we see the knowledge mediation methods identified by the framework generally applying, there might be other methods suitable for inter-project knowledge transfer that were not identified in it.

Nonetheless, the Thesis has shed light to a previously unstudied phenomenon: organizational learning and knowledge transfer between IS programs. We suggest that the framework should be used as a stepping-stone in further analysis of organizational knowledge transfer in programs. With its robust base on academic literature, the model could have potential to become a formalized theory – or serve as a theory against which scholars could reflect their alternative models.

As the framework is focused on discussing intra-organizational knowledge transfer inside a program, it suffers from a problem of perspective. In the 4Is model the organizational learning stock was considered as a set of organization-wide best practices (Crossan et al., 1999). In the formed framework, the organizational learning stock refers to the program's institutionalized knowledge. Outside the program – e.g. on higher organizational levels – no institutionalization has necessary happened. In principle, one could try to downplay this by stating that the institutionalized knowledge is about the organization's approach to all of its projects in a certain field – usually including a maximum of one program. However, we think it is important to emphasize that the viewpoint of the framework is within a program as it results in it seeing the institutionalization of knowledge differently than the model it was originated from. Widening the point-of-view outside a single program is left for further studies.

The framework has also focused solely on knowledge mediation between the organization's own entities and intentionally left e.g. the intermediating effect of the software vendors and other

external parties out of the scope of the research. As stated when forming the framework, we also choose to model only unidirectional (i.e. one-way) knowledge mediation between projects. We saw this decision suiting our needs with the studied phenomenon and simultaneously keeping the framework simple enough for observation. While the theoretical basis for generalizing the framework to a bidirectional case might be trivial, the empirical observations with such a model could lead to interesting results.

It was emphasized throughout the paper that the study regarded all knowledge having equal value. While the phrase mainly wanted to emphasize the equal importance of explicit knowledge and, the often neglected, tacit knowledge equality was assumed also from another point-of-view. The formed framework namely does not differentiate knowledge based on its usefulness or the potential value it could have to its possessor on individual, group or organizational level. Some knowledge mediated from a project to another might even be counter-productive to the receiving project's performance. An interesting goal for further research would be exploring whether the usefulness of a piece of knowledge affects the method through which it is transferred from a project to another. Of course, with tacit knowledge, this would require identifying and classifying knowledge into measurable units and smaller sub-concepts, which could prove to be quite challenging because of its unspoken nature. However, this kind of research would provide invaluable information to the field of knowledge management.

On the master data management's side we see another set of recommendations that the literature should be focused on. With the case company's first MDM project, we witnessed a majority of the problems the literature discussing MDM implementation is worried about. The concept was approached from a too information technology oriented perspective, the software provider was unable to provide the needed consultation about the organizational side of the implementation and since the lack of better knowledge the project group had unrealistically high expectations about the potential benefits of the master data management initiative. Interestingly, all these problems were tackled when starting with the second master data domain. Not only does this highlight the crucial importance of organizational learning and intra-organizational knowledge

transfer – it serves as an indicator that the concept of MDM is not yet fully understood by the majority of players in the field. As suggested by multiple scholars (e.g. Loshin, 2009; Sammon et al., 2010; Smith and McKeen, 2008), further research should be done on the subject of how an organization should approach master data management implementation.

The core elements of master data management presented in Figure 5-1 and the scope matrix in Table 5-2 could be used as a basis e.g. for an action research that would identify best practices when engaging master data management. As organizations take the shift from function-based to process-based structure, the need for consistent high quality data is destined to rise. Therefore, it is inevitable that the same organizations will engage initiatives, such as master data management, that promise to bring consistency to the heterogeneous organizational data. As the hindrance typically lies within the organizational processes and administration instead of the qualities of the acquired IS solutions, the occurred problems are likely to remain unchanged unless the organization has the know-how to engage a more structured way of data management.

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APPENDICES

Appendix 1 Questionnaire for semi-structured interviews

Research questions	Theory questions	Initial interview questions
How can the knowledge accumulated in the previous MDM project be observed in the case company's current MDM project?	What did the organization learn in vendor master data management initiative	Describe the challenges your company met at the vendor MDM initiative and the way you overcame these challenges?
		How could these challenges be avoided in the consecutive projects?
		In your own words how would you describe the forming of vendor and customer domain projects' scopes?
	How has the case company's approach changed towards master data management in the organization (e.g. Explorative / Exploitative)	Please, describe the program in your own words
		Could you sum up with a couple of sentences the main difference between VMDM and CMDM projects?
		Do you consider the MDM projects primarily as separate entities?
		How did the operative business contribute to the scope and content of the projects?
		Was the decision for a 'time-out' between VMDM and CMDM projects done in unison?
How did the case company transfer the knowledge learnt from one project to another in its MDM program?	Individual level	Could you describe the composition of the customer/vendor domain project team
		How many similar job titles are there in vendor and customer domain projects?
		How many members have remained the same throughout the two projects?
		Do you consider the number of the same members high enough?, why?
		How many of the projects' employees were full-time / part-time attendants ?
	Group level	Are the two projects' teams situated in the same location?
		What kind of communication have the two project's members had with each other?
		How would you describe the role of the official and unofficial meetings in knowledge transfer?
		How do you think the lessons learned in the vendor domain project apply to the customer domain project?
	Organizational level	What kind of initiatives have you taken in order to transfer knowledge from the vendor domain project to the customer domain project?
		How have you planned to handle the knowledge mediation in the future?
		How do you think the domain projects initiated after the CMDM project will differ from the VMDM project?
		Tell me about the process of making and editing the VMDM post-mortem documents