

Maarit Virta

**KNOWLEDGE SHARING BETWEEN GENERATIONS IN AN
ORGANISATION
- RETENTION OF THE OLD OR BUILDING THE NEW?**

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ABSTRACT

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Knowledge Sharing between Generations in an Organisation
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The study explores knowledge transfer between retiring employees and their successors in expert work. My aim is to ascertain whether there is knowledge development or building new knowledge related to this organisational knowledge transfer between generations; in other words, is the transfer of knowledge from experienced, retiring employees to their successors merely retention of the existing organisational knowledge by distributing it from one individual to another or does this transfer lead to building new and meaningful organisational knowledge. I call knowledge transfer between generations and the possibly related knowledge building in this study knowledge sharing between generations.

The study examines the organisation and knowledge management from a knowledge-based and constructionist view. From this standpoint, I see knowledge transfer as an interactive process, and the exploration is based on how the people involved in this process understand and experience the phenomenon studied.

The research method is organisational ethnography. I conducted the analysis of data using thematic analysis and the articulation method, which has not been used before in organisational knowledge studies. The primary empirical data consists of theme interviews with twelve employees involved in knowledge transfer in the organisation being studied and five follow-up theme interviews. Six of the interviewees are expert duty employees due to retire shortly, and six are their successors. All those participating in the follow-up interviews are successors of those soon to retire from their expert responsibilities. The organisation in the study is a medium-sized Finnish firm, which designs and manufactures electrical equipment and systems for the global market.

The results of the study show that expert work-related knowledge transfer between generations can mean knowledge building which produces new, meaningful knowledge for the organisation. This knowledge is distributed in the organisation to all those that find it useful in increasing the efficiency and competitiveness of the whole organisation.

The transfer and building of knowledge together create an act of knowledge sharing between generations where the building of knowledge presupposes transfer. Knowledge sharing proceeds between the expert and the novice through eight phases. During the phases of knowledge transfer the expert guides the novice to absorb the knowledge to be transferred. With the expert's help the novice gradually comes to understand the knowledge and in the end he or she is capable of using it in his or her work. During the phases of knowledge building the expert helps the novice to further develop the knowledge being transferred so that it becomes new, useful knowledge for the organisation. After that the novice takes the built knowledge to use in his or her work. Based on the results of the study, knowledge

sharing between generations takes place in interaction and ends when knowledge is taken to use.

The results I obtained in the interviews by the articulation method show that knowledge sharing between generations is shaped by the novices' conceptions of their own work goals, knowledge needs and duties. These are not only based on the official definition of the work, but also how the novices find their work or how they prioritise the given objectives and responsibilities. The study shows that the novices see their work primarily as maintenance or development. Those primarily involved in maintenance duties do not necessarily need knowledge defined as transferred between generations. Therefore, they do not necessarily transfer knowledge with their assigned experts, even though this can happen in favourable circumstances. They do not build knowledge because their view of their work goals and duties does not require the building of new knowledge. Those primarily involved in development duties, however, do need knowledge available from their assigned experts. Therefore, regardless of circumstances they transfer knowledge with their assigned experts and also build knowledge because their work goals and duties create a basis for building new knowledge.

The literature on knowledge transfer between generations has focused on describing either the knowledge being transferred or the means by which it is transferred. Based on the results of this study, however, knowledge sharing between generations, that is, transfer and building is determined by how the novice considers his or her own knowledge needs and work practices. This is why studies on knowledge sharing between generations and its implementation should be based not only on the knowledge content and how it is shared, but also on the context of the work in which the novice interprets and shares knowledge.

The existing literature has not considered the possibility that knowledge transfer between generations may mean building knowledge. The results of this study, however, show that this is possible. In knowledge building, the expert's existing organisational knowledge is combined with the new knowledge that the novice brings to the organisation. In their interaction this combination of the expert's "old" and the novice's "new" knowledge becomes new, meaningful organisational knowledge.

Previous studies show that knowledge development between the members of an organisation is the prerequisite for organisational renewal which in turn is essential for improved competitiveness. Against this background, knowledge building enables organisational renewal and thus enhances competitiveness. Hence, when knowledge transfer between generations is followed by knowledge building, the organisation kills two birds with one stone. In knowledge transfer the organisation retains the existing knowledge and thus maintains its competitiveness. In knowledge building the organisation develops new knowledge and thus improves its competitiveness.

Keywords: knowledge sharing between generations, knowledge transfer between generations, knowledge building between generations, organisational renewal, expert work

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Helsinki, December 2010

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1. Introduction

1.1. Knowledge Transfer and Sharing in an Organisation

Finnish society is undergoing a unique change as the baby boomers are retiring. This retirement is faster in Finland than in other countries because Finland no longer witnessed baby booms in the 1960s as did many other countries. (Sihto 2005.) Therefore, the Finnish work age population will start to decrease after 2010 when those born in 1945–1950 reach the age of 65. In the next few decades very many experienced and skilled employees will retire, because it has been predicted that by 2025 the over 65-year olds will have increased to 25% of the population. (Sihto 2005, Ministry of Labour 2007.) This is why, for Finnish companies and the national economy to remain competitive, it is important that the knowledge and the skills of the retiring employees be transferred to the next generations (Tiainen 1999; 161-162).

Even though the rapid retirement of the baby boomers involves great societal changes, knowledge transfer between generations has not been investigated in scientific empirical studies either in Finland or elsewhere (DeLong 2004, Rothwell 2007). In addition to its effects on the economy and commerce, knowledge transfer between generations is related to individuals and their work: knowledge is primarily and concretely transferred from one individual to another, after which its influence spreads throughout companies and organisations and to society. In this study I aim to answer one basic question about knowledge transfer between generations, that is, how knowledge can be transferred from a retiring employee to the successor so that it helps the new employee in his or her work and at the same time maintains the competitiveness of the company.

The concept of knowledge transfer implicitly includes a notion that knowledge can be transferred or that it should be transferred as such from one person to another or from one situation to another. The objective is thus knowledge retention. In the literature on knowledge transfer between generations, the goal of knowledge transfer is first and foremost the retention of knowledge ignoring the possibility of knowledge development and creation (DeLong 2004, Rothwell & Poduch 2004). One basis of this study, however, is that knowledge transfer between generations may indeed lead to the development of new knowledge. This development I call here knowledge building. For the organisation,

knowledge building may provide an opportunity for renewal and improved competitiveness when the knowledge built by individuals is spread throughout the organisation to those who need it and when the recipients understand and employ the received knowledge (Tsoukas & Vladimirou 2001, Szulanski 2003). My purpose in this study is, thus, to determine whether knowledge transfer between generations is merely an opportunity for the organisation to retain its existing knowledge, when individuals transfer knowledge among themselves, or whether it involves new knowledge building which enables organisational renewal and improved competitiveness. I address knowledge transfer and the possible building of knowledge in this study as a process of knowledge sharing.

When the object of investigation is knowledge transfer and management in the organisation, the study can be based on two different research philosophical views and on their different understandings on the concept of knowledge. The first of these concepts of knowledge is realism (Guba & Lincoln 1994, Keso et al. 2006). It is the basis of the resource-based view of the organisation and knowledge management which considers organisational knowledge as an intangible and constant resource that can be transferred as such where needed (Rumelt 1984, Wernerfelt 1984). Knowledge transfer and management are understood as knowledge distribution to all the members of the organisation; this ensures the flow of knowledge (Spender 2006). The second concept of knowledge is based on constructionism (Keso et al. 2006, Alvesson & Sköldböck 2009). It is the basis of the knowledge-based view of the organisation and knowledge management which sees knowledge as activity among the members of the organisation, created and developed in their interaction (Spender 1996, Tsoukas & Mylonopoulos 2004, Pöyhönen 2004). Knowledge transfer is examined as a process of knowledge sharing, when the purpose of knowledge management is to enable and maintain the process (Tsoukas & Vladimirou 2001).

Of the two views mentioned above, the resource-based view sees that knowledge can be transferred immutable from one person or setting to another (Rumelt 1984, Wernerfelt 1984), whereas the knowledge-based view holds that it is impossible to transfer knowledge without it changing (Sveiby 1996, Tsoukas & Mylonopoulos 2004, Spender 2006). From the perspective of knowledge transfer, the resource-based and knowledge-based views include another substantial difference both in research and practice. That is, the notion of when the knowledge transfer has occurred or is "complete". The resource-based view considers knowledge transferred when it has been made available to the recipient (Spender 2006), whereas the knowledge-based view acknowledges the transfer only when the recipient has

received, understood and employed the knowledge. Thus, making the knowledge accessible to the recipient does not yet entail that it has been transferred. (Ibid., Davenport & Prusak 1998, Szulanski 2003.)

When examining the organisation from the knowledge-based view, knowledge in the organisation not only is social by nature, but also comprises individual characteristics, experiences and skills as well as is bound to the situation (Tsoukas 1996, Tsoukas & Vladimirou 2001, Spender 2006, Spender & Scherer 2007). These features of knowledge, that is, its individual and context specificity, mean that knowledge always changes somewhat when transferred from one person or setting to another (Carlile 2002, Szulanski 2003, Spender 2006). The possibility of building new knowledge underlies the various individual interpretations and perceptions of knowledge: when knowledge is seen as socially constructed and changing, individuals can through co-operation build new knowledge from their different knowledge and perceptions (Brown & Duguid 1991, Carlile & Reberntisch 2003, Carlile 2004).

Knowledge building enables and maintains organisational renewal because renewal entails continuous development of new knowledge in social interaction (Stähle et al. 2002, Pöyhönen 2004). Organisational renewal stems from balancing between the past and the future: it is the result of retaining previous knowledge, allowing the development of new knowledge and combining these two to create a meaningful future (Tsoukas 1996, Stähle et al. 2002). Renewal, thus, depends on how the organisation can create new meaningful knowledge by merging its existing knowledge with new knowledge from outside (Stähle et al. 2002).

The knowledge-based view on organisation and knowledge management brings forward the enabling and strengthening of social communication because new organisational knowledge is created only in interaction between individuals (Tsoukas 1996, Tsoukas & Vladimirou 2001), which is imperative for organisational renewal (Stähle et al. 2002, Pöyhönen 2004). The knowledge-based view on organisation and knowledge management, thus, makes individuals and their interaction the core of knowledge transfer and building.

1.2. Research Strategy and Research Questions

In this study I describe, elucidate and explain knowledge transfer between generations and the possible knowledge building from the conceptions and experiences of those participating in the study. Instead of organisational operations, my focus is on individuals, their work and their use of knowledge. In the study I explore knowledge transfer between generations and the possible building of knowledge in expert work.

In the study I address the organisation and knowledge management from a knowledge-based view according to which knowledge is continuously adapting to circumstances, and, thus, it cannot be transferred as such from one person and setting to another (Sveiby 1996, Tsoukas & Mylonopoulos 2004, Spender 2006). The mutability of knowledge is, therefore, inherent in the transfer of knowledge. Accordingly, the main research question looks to answer what happens in the knowledge transfer between generations and how knowledge is treated during this transfer.

Main Research Question:

How do shortly retiring employees and their successors transfer knowledge and possibly build knowledge between themselves in expert work?

According to the knowledge-based view, organisational knowledge is located in the members of the organisation and their interaction: knowledge is activity between the members, created and developed in interaction (Tsoukas & Mylonopoulos 2004, Spender 2006, Widén-Wulff 2007). Thus, the first sub-question looks to answer how interaction is related to knowledge transfer between generations and the possible building of knowledge.

Sub-question 1:

What is the role or task of social interaction in the transfer of expert work-related knowledge between generations and the possible building of knowledge?

When examining organisational knowledge from the knowledge-based view, knowledge is formed of individual characteristics, experiences and skills (Polanyi 1961, Tsoukas 1996; Tsoukas & Vladimirou 2001), as well as bound to the practice and the setting (ibid., Carlile 2002, 2004). The second sub-question, therefore, aims to answer how carrying out duties is related to knowledge transfer between generations and the possible building of knowledge.

Sub-question 2:

Why and how does carrying out duties direct or define expert work-related knowledge transfer between generations and the possible building of knowledge?

Expertise builds from knowledge and experience which are accumulated over time and intuitively combined depending on the changing circumstances (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Pyöriä et al. 2005). Hence, it cannot be acquired at once; it develops gradually guided by knowledge, experience and circumstances. So, the third sub-question proposes to answer how expertise-related knowledge transfer between generations takes shape over time.

Sub-question 3:

How does expert work-related knowledge transfer between generations and possible knowledge building between an experienced employee and a novice change over time and how long does it last?

The research philosophical basis of this study is constructionism (Alvesson & Sköldberg 2009). My research strategy and objective are aptly described by the view of Haridimos Tsoukas and Christian Knudsen (2003) which sees research on organisation theory as a practical social activity. According to them, developing and creating scientific knowledge is a practical activity in which the researcher proposes to understand what happens in the community or the object of the study. Therefore, Tsoukas and Knudsen maintain that the experiences and views of organisational members should be more strongly taken as part of the studies which should aim to produce a hermeneutical model of the organisation, building the depictions and clarifications of organisational phenomena on the meanings and conceptual schemes of those studied (ibid.).

Established in 1957 in Finland, the company involved in this study designs and manufactures electrical equipment and systems. It is the only business of its kind in the Finnish market, and 90% of its production is exported. Its global competitiveness and success are based on knowledge and know-how which has been built over decades by its experts and which was being transferred to the next generation at the time of the study. The turnover of this limited liability company was approximately €51 million in 2006 with 270 employees.

The primary empirical data consists of theme interviews with twelve employees involved in knowledge transfer in the company being studied and five follow-up theme interviews. Six of the interviewees are shortly retiring expert duty employees, and six are their successors. All those participating in the follow-up interviews are successors of those soon to retire. The research method is organisational ethnography (Rosen 1991, Schwartzman 1993), and the data analysis is conducted by using thematic analysis (Hirsjärvi & Hurme 2004) and the articulation method (Hall 1992, 1997, Grossberg 1995, Lehtonen 2004).

1.3. Key Concepts of the Study and Delineation of the Object

In this study I explore knowledge transfer between generations and the possible building of knowledge as a continuous, work-related process based on interaction which is in this sense called knowledge sharing. (Widén-Wulff 2007.) I apply the concept knowledge sharing between generations to describe such knowledge transfer between generations that involves interaction and that can entail knowledge building between generations. By this building of knowledge I refer to target-oriented action between individuals in which they develop new knowledge (Bereiter 2002, Carlile 2004). I use the concept of organisational renewal to denote activity in which the community uses its capabilities and develops its knowledge, supporting the long-term strategy of the organisation and in concordance with its environment (Stähle et al. 2002, Pöyhönen 2004).

I address knowledge sharing, or the transfer and possible building of knowledge, between expert employees, soon to retire from the company, and their successors. Therefore, the study does not concern managerial succession related to the ownership or the management of the company (e.g. Giambatista et al. 2005, Hautala 2006). In the literature, knowledge transfer between company employees is also called technical succession to distinguish it from owners' and managers' managerial succession (Rothwell & Poduch 2004). First mentioned in the 1950s, the study of managerial succession has mainly focused on business level phenomena (cf. Hautala 2006), such as what types of new managers the company needs, how the succession is timed in relation to the company's performance and how it affects the company strategy and financial result (Kesner & Sebora 1994, Giambatista et al. 2005). Technical succession, however, concerns knowledge transfer between generations from the same perspective as here: it aims to describe and comprehend the act of knowledge transfer between individuals, that is, how knowledge is transferred in practice (Rothwell &

Poduch 2004). To the best of my knowledge, technical succession has not been the object of scientific empirical research and therefore there is no previous scientific knowledge available on the subject of this study (DeLong 2004, Rothwell 2007).

By expert work I refer here to knowledge work which requires the ability to use knowledge creatively, learn rapidly and combine knowledge from different fields (Pyöriä 2006). Knowledge workers, as defined above by Pasi Pyöriä (ibid.), have become the largest and most important group of employees in Finland in the past 50 years, when knowledge became the new factor of production along with capital, raw material and workforce (Blom et al. 2001). The know-how of employees has become the most significant source of competitiveness for businesses, and in the future responsibilities that go beyond the grasp of machinery, such as co-operation, discussion and absorption and production of new information, become more important (Pyöriä 2006). These changes in work increase the need to understand the social nature of the work itself and organisations (ibid.), which is also one of the objectives of this study.

My study concentrates on describing and understanding the knowledge needs related to the work of individuals and the ways in which they use knowledge in their work. My aim is to find out how work-related knowledge needs and the use of knowledge affect knowledge sharing between generations. My purpose, however, is not to ascertain why and how the work-related knowledge needs and the ways in which knowledge is used are created and developed, and I do not consider work processes through individual work identity or the analysis of work motivation (cf. Argyle 1989). Moreover, I do not examine working and knowledge sharing from the perspective of individual on-the-job learning or organisational learning (cf. Argyris & Schön 1978, Argote 2002). Research in the field of information behaviour concerns individuals' information needs and the methods and mechanisms of seeking, using and transferring information (Wilson 1999) (e.g. Sonnenwald 2006, Rowlands et al. 2008). My study is related to these central elements of information behaviour and can, thus, provide new empirical knowledge on them even though my framework is not based on the theory of information behaviour.

The primary object of this research is the intertwining of work and knowledge as expressed in the interviews. In other words, I establish what the interviewees tell about their work and the knowledge they need and employ in their duties: how they describe their current work and the related knowledge and how they connect them. In this connecting of work and

knowledge, the interviewees give meaning to knowledge sharing between generations which guides and explains how they share knowledge or transfer and possibly build it in practice.

1.4. Outline of the Study

Chapter 1, Introduction, in this doctoral thesis includes a concise presentation of the study. In it I delineate the objectives and research questions, introducing the object phenomenon, the theoretical approach as well as the empirical method.

Chapter 2, Knowledge and Organisation, positions the study in the field of knowledge management and organisational studies. In it I present the most relevant theories and theoretical concepts, as well as previous research relating on the topic. I close the chapter with a summary describing the theoretical framework of the study.

Chapter 3, Empirical Research, explains the methodology and research methods of the study. I exhibit the empirical data and its collection as well as data analysis and its progression. I conclude the chapter with the assessment of the validity of the study and reflection on ethics.

Chapter 4, Knowledge Sharing between Generations in Expert Work, lays out the empirical findings. First, I report the results from the theme analysis by describing knowledge sharing, or knowledge transfer and building. Second, I present the contexts and themes I found in the interviewees' speech by interpreting the data with the articulation method. Finally, combining the results from these two analyses, I explain the forming of the phenomenon studied, that is, knowledge transfer and building between generations.

Chapter 5, Conclusions, comprises the central research results. I link them to knowledge management and organisational theories, as well as previous studies relating on the subject. In the chapter I also present possible managerial implications and give suggestions for future research.

2. Knowledge and Organisation

In the beginning of this chapter I examine the strategic views on organisation and knowledge management from two different understandings on the concept of knowledge. The first one of these understandings is realism (Guba & Lincoln 1994, Keso et al. 2006). Realism-based views include the competitive forces approach, resource-based view and evolutionary perspective on organisation and knowledge management. The other understanding of the concept of knowledge is based on constructionism (Keso & al. 2006, Alvesson & Sköldbberg 2009). It includes the knowledge-based view and the dynamic capability approach on organisation and knowledge management. (I elaborate on realism and constructionism in Sub-chapter 3.1.1.) Table 1 outlines the strategic views on organisation and knowledge management and their basic concepts.

The oldest among the above-mentioned strategic views on organisation and knowledge management, the competitive forces approach maintains that organisational competitiveness is based on monopolies which are striven for and sustained in a stable market situation (Porter 1980). Instead of developing internal operations, it emphasises concentration on external factors to build a monopoly. The market is considered unchanging, and, thus, the advantage achieved remains and there is no need to develop organisational knowledge. Knowledge is, therefore, seen as static and independent of time and place. Hence, the competitive forces approach is based on realism, which considers knowledge to be objective and independent of individual action and the situation (Guba & Lincoln 1994, Keso et al. 2006).

The resource-based view links organisational competitiveness to the acquiring of resources based on scarce knowledge necessary for one's business and ensuring that these resources are not made available to competitors (Rumelt 1984, Wernerfelt 1984). Knowledge is, thus, seen as an intangible, mobile resource. The basis of the resource-based view is realism because it considers knowledge objective: the "value" or meaning of knowledge is not situation-bound, and, therefore, it can be transferred from one organisation to another as such.

The evolutionary perspective on organisation and knowledge management considers organisational routines, and their development to respond to the needs of the environment, to be the building blocks of competitiveness (Nelson & Winter 1982). It relates the organisation

and its knowledge to biological evolution and its progression. Routines and related knowledge gradually become new knowledge without proactive attempts to change (von Krogh & Grand 2002). The basis of the evolution theory is also realism because the evolutionary perspective sees knowledge as evolving through the needs created by the environment independently of human action. The routines based on the knowledge of different organisations are seen as somewhat similar and transferrable between organisations. Knowledge is, thus, considered objective and independent of the situation.

The knowledge-based view of organisation and knowledge management sees the sustaining, creation and new combinations of knowledge and abilities, as well as activities and routines, as the basis of organisational competitiveness (Kogut & Zander 1992, Grant 1996, Spender 1996). Organisations function differently because they have different knowledge and different abilities to use and exploit the knowledge. Knowledge is, therefore, not considered one objective truth, which is the object of competition and the possession of which guarantees a competitive advantage, but as a changing resource, built in each organisation based on their own needs and from their own standpoint.

According to Haridimos Tsoukas and Nikolaos Mylonopoulos (2004), the knowledge-based view on organisation means that knowledge is understood as a social process being constructed from practical situations, and not as the theoretical handling of information. All organisational functions are based on knowledge, and all organisational work includes knowledge: the operation of the organisation is built on human communication, interpretations and skills that develop in social situations and work practices and routines. (Ibid.; 11-13.) Against this background, underlying the knowledge-based view of the organisation is the constructionistic knowledge concept which considers knowledge to be subjective and changing in social interaction (Keso et al. 2006, Alvesson & Sköldbberg 2009).

The most recently developed view on organisation and knowledge management is the dynamic capability approach. It sees the basis of competitive advantage in the inimitable organisational competences and their continuous renewal and creation (Teece et al. 1997, Eisenhardt & Martin 2000, Pöyhönen 2004). Dynamic capabilities are defined as specialised and recognisable organisational processes such as R&D, strategic decision-making and alliances (Eisenhardt & Martin 2000). These comprise the capability of the organisation to integrate, build and reconfigure their internal and external competences and, thus, to react quickly in their changing business environment (Teece et al. 1997). Dynamic capabilities are

based on knowledge, and they are accumulations or manifestations of organisational knowledge.

The dynamic capability of the organisation can be examined as constructed of the competences of its management, bringing the focus on strategic decision-making (Teece et al. 1997). Thus, the basis of organisational capability is seen in the competence of the management to allocate and coordinate existing resources so that they create added value and increase efficiency in the organisation. (Kianto 2007.) From this perspective, the dynamic capability approach is related to the resource-based view on organisation and knowledge management, with the principles of realism underlying its concept of knowledge (ibid.). However, in this study I see the capability of the organisation comprising the functions of all the members of the organisation. Interaction between the members of the organisation in which organisational knowledge constantly changes to respond to the situation is essential in creating and reconfiguring capabilities (Eisenhardt & Martin 2000, Pöyhönen 2004). This perspective of the dynamic capability approach considers organisational knowledge to be social; this is why its knowledge concept is based on constructionism.

The dynamic capability approach is also linked to the evolutionary perspective because it emphasises the continuity of organisational functions: a successful organisation needs functions that not only have built over time but are also new (Stähle et al. 2002). What is different from the evolutionary perspective, however, is that the dynamic capability approach posits that members themselves determine which existing functions are kept as such, developed or discarded. Not bound to evolution, the organisation and its operations are thus proactively shaped by its members. (Brown & Eisenhardt 1997.)

Table 1. Strategic approaches to organisation and knowledge management.

Based on Realism			Based on Constructionism	
Competitive Forces Approach	Resource-based View	Evolutionary Perspective	Knowledge-based View	Dynamic Capability Approach
Competitiveness is achieved by gaining and maintaining a monopoly in unchanging markets	Competitiveness is achieved by accumulating rare, immutable and transferable knowledge resources	Competitiveness is the result of the development of knowledge and operation based on the needs of the environment	Competitiveness is built on generating knowledge and operations and their new combinations	Competitiveness is achieved by maintaining and reconfiguring organisational capabilities in social settings
Porter 1980	Rumelt 1984, Wernerfelt 1984	Nelson & Winter 1982, von Krogh & Grand 2002	Kogut & Zander 1992, Grant 1996, Spender 1996, Tsoukas & Mylonopoulos 2004	Eisenhardt & Martin 2000, Stähle et al. 2002, Pöyhönen 2004

My underlying research philosophy in this study is constructionism (Alvesson & Sköldberg 2009). My approach applied to organisation and knowledge management is knowledge-based, relating also to the dynamic capability approach which sees knowledge in the organisation developing in the members' social interaction (Table 1). Thus, I examine knowledge in the organisation as social and bound to practice (Tsoukas & Mylonopoulos 2004).

2.1. Characteristics of Knowledge

Within organisation studies and knowledge management, knowledge has been examined and defined in different ways and from several standpoints. In this sub-chapter, I present

organisational knowledge from the constructionist perspective and with a knowledge-based view of the organisation.

2.1.1. Data, Information and Knowledge

Data, information and knowledge are usually defined as classes of knowledge and at the same time as a type of evolving system (e.g. Tsoukas & Vladimirou 2001). In this system, data is the lowest form of knowledge which develops under certain criteria and certain circumstances into information which again develops into the highest form in the system, that is, knowledge. In organisation studies, however, the concepts *information* and *knowledge* are also used synonymously without distinct definition (Widén-Wulff 2007, Mäki 2008; 12).

According to the general and established definition, data consists of separate facts that in themselves have no meaning or objectives (e.g. Davenport & Prusak 1998, Tsoukas & Vladimirou 2001, Spender 2006). Stored in electronic data storage and written documents in organisations, data becomes information when it is communicated between people through various media in social interaction. (Davenport & Prusak 1998.)

Knowledge is often described as “broader, deeper, and richer” than information (e.g. Davenport & Prusak 1998; 5). Besides facts, knowledge includes experiences, values and situation-specific factors that offer a framework to assess and adopt new information and experiences. Knowledge is created and applied by individuals, whereas organisational knowledge is embedded or hidden not only in electronic data reserves and documents, but also in work processes and practices. Unlike data or information, knowledge is engaged in action and deeds. (Ibid., Tsoukas & Mylonopoulos 2004.)

J.-C. Spender’s (2006, 2008) classification of knowledge differs from conventional wisdom because he categorises knowledge into data, information and, as a proxy for knowledge, skilled practice. Of these, “data is what seems to be objective, external to us” (Spender 2008; 8). When individuals connect their own understanding and needs to the data or give it meaning, it becomes information. The same data becomes different information for different people, because how the data is understood depends on each person’s individual needs: how individuals understand specific data in an organisation depends on the requirements of their work. By *skilled practice* Spender means effective action that can be either planned or

not. When it is not planned, it goes beyond our mental framing and has been enacted by using tacit knowledge (Sub-chapter 2.2.3.).

Data, information and skilled practice should be managed differently in the organisation (Spender 2006). Data management means designing and operating organisational databases and data-flows, whereas information management refers to planning and maintaining the vision and mission of the organisation so that each unit knows what the basis of its work and goal is in the organisation. Skilled practice management means that individuals are given opportunities and encouragement to develop their talent and skills at work. Working is related to work practices which individuals are unwilling to change (also Leonard-Barton 1995, Davenport & Prusak 1998, Carlile 2002) and which can be based on tacit knowledge. This is why the management has only limited control over work practices. If changes are introduced too quickly or if they are too radical, they create resistance because practices develop in context: they are specific to time, place and people. Therefore, they have to be re-created when transferred to a new context. (Spender 2006.)

Instead of defining the concept of data, Tsoukas and Mylonopoulos (2004) define information to be knowledge that has been extracted from social practices and contexts, reducing it to abstract representations that can answer *what* but not *how*. Practical *knowing how* refers to how something is done, and it is not as easily transferrable as knowing that, the adopting of which only requires processing abstract information. Not mere processors of information, individuals are, however, members of social practices which shape their knowledge. Besides practicality, information lacks three fundamental connotations of knowledge: it is social, personal and infused in values (ibid.; 5). Even though knowledge is adopted in social settings, it is always personal by nature because people have different resources and goals in understanding the knowledge (ibid., Eraut 2000). Infusion in values impacts on what knowledge is adopted in particular social settings and how (Davenport & Prusak 1998, Tsoukas & Mylonopoulos 2004).

Contrary to Davenport and Prusak (1998) and Spender (2006), Tsoukas and Mylonopoulos (2004) do not find information meaningful to the individual, but see meaning being created, and information turning into knowledge, in the social contexts where the knowledge is used. Conventional wisdom, however, is that data becomes information when the individual gives it meaning, which does not necessarily require its use or implementation, whereas information becomes knowledge when it is related to practice. I also adopt this generally accepted

definition here: when data is given meaning, it becomes information, and when information is used, it becomes knowledge.

2.1.2. Instrumentality and Practicality

The instrumentality and the related practicality of knowledge are features that distinguish it from data and information: knowledge realises and is created when it is being used as a medium.

According to Michael Polanyi (1961, 1975), knowledge is a tool used for a specific purpose. Gradually, individuals become so accustomed to using knowledge and applying it to practice that it becomes unreflected knowledge that they take for granted in situations. It is “dwelling in the tool”, and using the knowledge becomes tacit knowledge (ibid., Dreyfuss & Dreyfuss 1986, Tsoukas & Vladimirou 2001). The instrumentality of knowledge is, thus, related to its tacitness (Sub-chapter 2.2.3.): knowledge is learnt so well through practice and experience that mastering it is no longer thought of consciously and exhaustive verbal explanations become impossible. By “knowing”, Polanyi (1961; 59) refers not only to the actual mastering of knowledge or a skill but also to the mastering and applying of knowledge through thinking.

Paul R. Carlile (2002) calls his approach to organisational knowledge pragmatic. According to his view, individuals give different meanings to knowledge because of their distinct practical knowledge needs and ways of using knowledge. Knowledge and knowing are, thus, bound to practice and the situation where knowledge is needed and used. Knowledge that is specific to a certain practice or situation is also purposive because individuals develop and reconfigure knowledge to carry out a task or solve a problem. (Ibid.; 445.) This purposiveness of knowledge is related to Polanyi’s (1961, 1975) notion on the instrumentality of knowledge or using knowledge as a tool.

Carlile’s (2002; 445-446) ethnographic studies show that organisational knowledge is not only local and embedded, but also “invested in practice”. The locality of knowledge means that knowledge is always connected to problem-solving in the organisation. Since the problems of individuals and work teams vary, in various work practices, knowledge also varies. However, it can also be similar for different individuals and work teams, when they have similar problems to solve. Knowledge is embedded in practice, because it is invisible in the

work, in its methods, technologies used and rules-of-thumb, among others. Therefore, absorbing knowledge requires not only adopting the theory, but also gaining experience in practice. Carlile (ibid.) refers to Polanyi's (1966) definition of tacit knowledge: knowledge is inherent in action and cannot be verbally expressed or adopted without applying it to practice.

Carlile's (2002; 446) notion that knowledge is invested in practice means that knowledge is an acquired or adopted habit by which individuals can do their work successfully. They are not willing to reconfigure this knowledge because it is time-consuming and strenuous. Moreover, it is possible that when changing their practices, they lose their approved and successful work routine. (Ibid.) The necessary knowledge and functional, successful work methods and routines are, thus, absorbed when working. Once absorbed, they are not readily reconfigured, but the goal is to maintain the status quo. Carlile (ibid.) is not the only researcher to offer an explanation of this phenomenon: individuals tend to stick to their adopted knowledge and practices that are found to be useful, because possible problems are inherent in change (intentional rationality, Davenport & Prusak 1998; 104); they tend to hold on to their abilities and habits or signature skills because they define and validate their professional competence (Leonard-Barton 1995; 62); and they tend to maintain the state of affairs and find confirmation of their expectations to reduce insecurity (Weick & Sutcliffe 2001; 50).

Organisational knowledge is built in practice because work and the related duties and the ways of executing them are developed in practical social situations. For example, official, work-related instructions are given meaning and a practical method of implementation in the social setting of the work. (Brown & Duguid 1991, Tsoukas 1996, Wenger 1998). Gunilla Widén-Wulff (2007), who has studied information and knowledge sharing in organisations, maintains that the work task affects how knowledge is used in the organisation: work goals and functions explain how information is sought and used because information sharing must meet the work requirements of knowledge production. The work task is, thus, the context of knowledge sharing, and, therefore, the essential features of the work and the meaning of information to them have to be defined in research. (Ibid.; 171.)

2.1.3. Explicitness, Implicitness and Tacitness

Explicit and tacit knowledge can be presented as separate classes or types of knowledge as adapted from Ikujiro Nonaka and Hirotaka Takeuchi (1995). Some researchers (e.g. Polanyi 1966, Tsoukas 1996, Eraut 2004), however, see them as dimensions or characteristics of knowledge that are used simultaneously, and, therefore, it is not necessary to examine them separately

Explicit knowledge means knowledge understandably presented or expressed in words or other symbols, whereas tacit knowledge refers to knowledge linked to abilities, practices and action. It is know-how and knowing, what to do and how to accomplish tasks and things. A classic example of tacit knowledge is riding a bicycle (Polanyi 1966): it does not require understanding or managing explicit knowledge related to the action such as the laws of physics; it is enough to master the bicycle in practice, which is impossible to learn or teach in theory without practical exercise.

Researchers have differing views on whether tacit knowledge can be made explicit (Nonaka & Takeuchi 1995, Nonaka et al. 2001) or whether some of the knowledge always remains tacit (Polanyi 1966, Spender 1996, Tsoukas 2003, Wilson 2005). In addition to tacit and explicit knowledge, the supporters of the latter view include an intermediate form, that is, implicit knowledge which is not written down or articulated such as explicit knowledge, but when asked, it can be understandably explained or described, unlike tacit knowledge which is embedded in action. (Tsoukas 2003, Wilson 2005, Spender 2006.) Explicit, implicit and tacit knowledge have been further categorised into individual and organisational knowledge. Researchers, however, use different concepts of explicit, implicit and tacit knowledge (Figure 1).

The SECI model (for socialisation, externalisation, combination and internalisation of knowledge) by Nonaka and Takeuchi (1995) is partly based on Polanyi's (1966) notion on tacit knowledge. Unlike Polanyi (*ibid.*), Nonaka and Takeuchi (*ibid.*), however, maintain that tacit knowledge can be put into words: in their model organisational knowledge develops in a social process first from tacit into explicit knowledge, when it is reconfigured, after which it again becomes tacit knowledge used in work. The SECI model has been criticised, for example, by Tsoukas (2003), Wilson (2005), Spender (2006) and Spender & Scherer (2007). Wilson and Tsoukas state that Nonaka and Takeuchi (*ibid.*) confuse tacit and implicit

knowledge. Spender (ibid; 15) also speculates whether tacit knowledge can ever be made visible and ultimately to what use. Spender and Scherer (ibid.; 9) find the SECI model problematic because it rigidly and theoretically assumes that interaction and use of knowledge is automatic between individuals and that they automatically also distribute their knowledge in the organisation.

Michael Eraut (2000), who studies career-related learning from a constructivist view, maintains that many researchers use tacit knowledge as a comprehensive category the content of which, however, is left untouched. He continues reflecting upon the essence of tacit knowledge by asking whether it is knowledge that has not been communicated or that cannot be communicated: is the impossibility of communicating it a characteristic of knowledge or is it the characteristic or ability of the person, holding the knowledge—or partly both (ibid.; 118). Making knowledge explicit, thus, requires firstly awareness of the existence of the knowledge and secondly the ability to present it. Eraut (2000) comes to the conclusion that barriers to describing tacit knowledge explicitly are immense, but some degree of explicit description is possible (ibid.; 134). Furthermore, he finds it probable that “thick” tacit knowledge is the type of knowledge that is the basis of expert and professional work, whereas the “thin” explicit version is knowledge used in formal training, explaining knowledge transfer possibilities and evaluation of actions in research.

Later, Eraut (2004; 253) posits that tacit knowledge cannot be considered an independent type of knowledge. On the contrary, he sees the tacitness of knowledge as a feature related to different knowledge and its combinations. Tacit knowledge gradually builds from personal knowledge, experiences and situational needs, even though the person may not be completely aware of it (also Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995). As an example, Eraut (ibid.) mentions intuitive understanding: the intuitive understanding of an event through previous experiences and their combinations is not consciously observed if the event or reactions to it prompt discussion (when a “thin” explicit description can be given).

While Eraut (2004) finds tacitness a general feature of knowledge, Polanyi (1966) maintains that tacitness is a knowledge dimension. Another dimension of knowledge is focal knowledge which focuses on the matter or phenomenon that is the object of knowing, when tacit knowledge resides in the background. Tacit knowledge and focal knowledge are complementary and mutually exclusive. An example of their use is reading: focal knowledge is the ability to comprehend the content of the text, whereas tacit knowledge implies the ability to read the text. Tsoukas (1996), on the other hand, states that organisational

knowledge typologies and classifications aptly describe the complexity of organisational knowledge and its different sides and dimensions. However, he considers tacit knowledge to be an essential element or factor in all knowledge and knowing, and, thus, it cannot be separated as an independent type or specific class of knowledge. (Ibid.; 14.)

Based on theories, knowledge in the organisation divides into six classes (Figure 1):

Individual knowledge:

1. Tacit knowledge (Polanyi 1966, Nonaka & Takeuchi 1995, Tsoukas 2003, Wilson 2005, Choo 2006, Spender 2006)
2. Implicit knowledge (Tsoukas 2003, Wilson 2005, Spender 2006)
or automatic knowledge (Spender 1996)
3. Explicit knowledge (Nonaka & Takeuchi 1995, Tsoukas 2003, Wilson 2005, Choo 2006)
or conscious knowledge (Spender 1996)

Mutual organisational knowledge:

4. Mutual tacit knowledge (Nonaka et al. 2001)
or cultural knowledge (Choo 2006)
5. Mutual implicit knowledge
or collective knowledge (Spender 1996)
or conceptual knowledge (Nonaka et al. 2001)
6. Mutual explicit knowledge (Choo 2006)
or objectified knowledge (Spender 1996)
or systemic knowledge (Nonaka et al. 2001)

Following Polanyi (1966), Tsoukas (1996) and Eraut (2000), the theoretical classification of knowledge is problematic because the above-mentioned different types of knowledge (tacit, cultural, explicit etc.) are not distinguishable in practice or from the user's perspective because their use is overlapping and simultaneous. Working in an organisation requires at the same time explicit knowledge (e.g. facts about products), implicit knowledge (e.g. rules-of-thumb in work routines) and tacit knowledge (e.g. habits and practices guiding work). Therefore, understanding knowledge as dimensions, and not types, that are present in the knowledge and its use simultaneously (Polanyi 1966) or as features that relate to various knowledge combinations (Eraut 2004) can provide a more fruitful perspective than theoretical classifications when studying the use of knowledge. If the theoretically classified or split

organisational knowledge is described from the perspective of this study, the different types of knowledge merge in the social practices of work (Tsoukas 1996, Sub-chapter 2.2.2.) (Figure 1).

	Expression in symbols impossible	Expression in symbols possible	Expression always in symbols
Individual knowledge	1. Tacit (Polanyi, Tsoukas, Spender, Wilson, Choo)	2. Implicit (Tsoukas, Wilson); Automatic (Spender)	3. Explicit (Tsoukas, Wilson, Choo); Conscious (Spender)
↓ ↓ ↓ Social practices			
Mutual organisational knowledge	4. Cultural (Choo); Mutual tacit (Nonaka)	5. Collective (Spender); Conceptual (Nonaka)	6. Mutual explicit (Choo); Systemic (Nonaka & al.); Objectified (Spender)

Figure 1. Knowledge in the organisation.

2.1.4. Summary

In this study I address knowledge of the organisation from the constructionist and knowledge-based view which bring the social nature of knowledge to the centre of the examination: knowledge in the organisation develops and changes in members' interaction.

I see knowledge not only as social, but also as practical and instrumental: knowledge is created in practice and action, when it is used as a medium of work. Data becomes information when individuals give it meanings based on their own capacities and work-related

knowledge needs, and information becomes knowledge when it is employed in work. Therefore, individuals' knowledge can never be completely similar because individuals give data different meanings and use the knowledge differently for different purposes.

According to studies (Brown & Duguid 1991, Wenger 1998, Carlile 2002, Widén-Wulff 2007), work tasks affect how individuals use knowledge in the organisation, that is, the goals and functions of work explain the use of knowledge. The work task is, thus, the context of the use of knowledge; therefore, it is imperative that the specific features of the work and the significance of knowledge to them can be defined when examining organisational knowledge.

The theoretical classification into explicit, implicit and tacit knowledge is problematic from the perspective of this study because from the user's point of view different types of knowledge are indistinguishable. Therefore, I address the explicitness, implicitness and tacitness of knowledge here as dimensions that are simultaneously present in the knowledge and its use. In the organisation, the dimensions of knowledge come together in the social practices (Subchapter 2.2.2.) when knowledge is used in accomplishing the work (Figure 1).

2.2. Organisation and Distributed Knowledge

In many of his writings, Haridimos Tsoukas analyses the nature of organisational knowledge (e.g. Tsoukas 1996, Tsoukas & Vladimirou 2001, Tsoukas 2003, Tsoukas & Mylonopoulos 2004). Taking a constructionist approach to studying organisational knowledge (Tsoukas 1996), he sees the organisation as a distributed knowledge system where organisational knowledge cannot be examined and understood as one managed whole because it is inherently indeterminate: not a constant or immutable resource that can be shared, knowledge is constantly reconfiguring. The organisation is not self-contained in its knowledge, because it is dispersed among its units and some of its individual knowledge comes from outside. Moreover, no single mind can master all the organisational knowledge alone and foresee the organisation's future knowledge needs. To be able to operate, the organisation, thus, needs to use and benefit from knowledge that no one person possesses, understands or controls. To increase its efficiency, the organisation needs to exploit this distributed knowledge so that it extends the span of resource utilisation and at the same time exceeds the boundaries of control of any one mind. (Ibid.; 12-13.)

2.2.1. Individual Knowledge and Organisational Knowledge

Knowledge in the organisation is dispersed because it is not controllably and comprehensively possessed by the organisation and not in the possession or control of any one individual (Tsoukas 1996). Organisational knowledge comprises formal operational rules set by the management, as well as the members' social practices and personal characteristics. Integrating these three aspects is governed by organisational history, the members' organisational understanding and social expectations, as well as changing interactive situations. Tsoukas (ibid.) connects this definition or description of knowledge to the entire organisation which reflects his constructionist thinking: he does not distinguish between knowledge built socially into the organisation and what the organisation is and how it functions. Similarly, individual knowledge in the organisation is not a property known and controlled by the individual but something that lies in the dispositions and experiences and takes its shape and meaning in practice to serve the situation.

Organisational members' activity is partly governed by organisational knowledge or rules that are formal, theoretical propositions or propositional statements. Tsoukas (1996) and Tsoukas and Vladimirou (2001) call organisational knowledge formal and propositional knowledge. Generally made by the organisational management based on their goal-setting, rules are abstract generalisations which aim at achieving certain organisational objectives. Therefore, they are at such a general, abstract level that they are not as such applicable to the social practices and work but have to be applied to practice conforming to the requirements of the job and its changing situations. (Also Brown & Duguid 1991, Orr 1996, Wenger 1998.)

Tsoukas and Vladimirou (2001) base their concept on individual knowledge on the notions of Polanyi (1961, 1975) about the personality of knowledge. Despite recognising the historically evolving collective background and understanding of knowledge, Polanyi (1961) acknowledges that all knowledge is personal. The three elements in the process of knowing are the subsidiary particulars or the initial pieces of knowledge, the purpose or objective of knowing and the individual who combines these two (Polanyi 1975; 36). Knowledge is built from these particulars based on collective knowledge and understanding learnt in socialisation. After building, generating the knowledge or knowing also requires the implementation of knowledge. Knowledge is used based on individual knowledge and understanding, which makes it essentially personal. (Polanyi 1961, 1975.) The instrumentality or practicality of knowledge is, thus, intertwined in the personal nature of knowledge: only

individuals can, alone or together, use knowledge; and, on the other hand, knowledge does not exist before it is used. Adapting Polanyi (ibid.), Tsoukas and Vladimirou (2001) see knowledge as not only personal but also instrumental.

Following Polanyi's (1961, 1975) knowledge concept, Tsoukas (1996), in his definition of organisational knowledge, brings knowledge close to the individual and practice: individuals realise knowledge when introducing it to practice and reconfigure it when necessary to help them manage the particular situation in the best possible way. In the organisation, individuals' stock of knowledge constitutes their (i) personal dispositions, (ii) external normative role-related expectations and (iii) local, context-specific knowledge and interaction. Individual knowledge is generated when individuals employ knowledge guided by their characteristics and external normative social expectations. This employment of knowledge takes place in changing, context-specific interactive situations. (Ibid., Mouzelis 1995; 104.) When employing organisational knowledge, individuals also have to manage the tensions building between these three factors (Tsoukas 1996; 11). New organisational knowledge only emerges in the action of individuals, and hence, Tsoukas and Vladimirou (2001) call individual knowledge heuristic knowledge.

Tsoukas (1996) connects Pierre Bourdieu's (1990) concept of "habitus" to the personal characteristics intertwined in individual knowledge: it is the way of thinking, acting and observing; it is based on individuals' past socialisations and, with it, how they rationalise the "correctness" of their behaviour and actions and their constancy over time. This learnt habit is a more reliable justification for individuals' actions than formal rules or explicit norms. Tsoukas (ibid.) furthermore adds individual knowledge, skills, experiences and dispositions to these characteristics which form the part of organisational knowledge that comes from outside and that the management cannot entirely know or control. Interactive situations are also beyond the control of the management because they vary according to the setting and the participants. The normative role-related expectations guiding individuals' work, however, is within the reach of the management, excluding how expectations are met in changing interactive situations. (Tsoukas 1996, Tsoukas & Vladimirou 2001.)

2.2.2. Social Practices

Organisational knowledge and individuals' knowledge meet in the social practices of work (Tsoukas 1996, Tsoukas & Vladimirou 2001) where individuals implement organisational rules by interpreting them and their meaning: individuals understand organisational rules or theoretical generalisations by relating them to a particular situation they are involved in. This understanding is simultaneous with applying rules; it does not happen beforehand through thinking. Comprehension is thus bound to practice. How individuals understand and follow the rules of the organisation is therefore manifest in their practices. (Taylor 1993, Tsoukas 1996.)

John Seely Brown and Paul Duguid (1991) as well as Etienne Wenger (1998) also emphasise social practices in organisational knowledge creation and find that work tasks and how they are carried out are configured in practical social situations. Official, work-related instructions are given meaning and practical implementation in the social setting or group where the work is being done. In these communities of practice, individuals continuously negotiate meanings because they do not exist as complete entities but are created in social situations: meanings reside in negotiation, not in individuals or the outside world. In the negotiation, meaning and practice are built in a historical and continually evolving situation thus constantly changing meanings and practices. (Wenger 1998; 54.)

Practical action cannot be solely based on explicit rules, because it is impossible to describe and explain them so that each individual would interpret and implement them in the same way. Therefore, interpreting and implementing explicit rules have to rely on the unarticulated background that guides social practices. (Tsoukas 1996; 16-17.) Tsoukas bases his definition of the unarticulated background on Charles Taylor's (1993) interpretation of Ludwig Wittgenstein's (1958) notion on following rules which is based on the collective understanding residing in the community and always takes place in practice (Wittgenstein 1999; 136, Taylor 1993; 47). Following this line of thought, Tsoukas (1996) maintains that individuals assimilate the unarticulated background when socialising in the community; this unarticulated background guides the community's social practices and is the basis of its articulated or explicit knowledge. The members take unarticulated knowledge as given or "complete" without questioning it and understand organisational rules partly from this background based on their observations, assessments and conclusions. Tsoukas (1996) maintains that individual knowledge and social knowledge learnt in socialisation are indistinguishable (cf.

Nonaka & Takeuchi 1995) because individual knowledge is always enabled through social practices. According to Tsoukas (ibid.), “social” is not a combination of individual experiences but a group of underlying understandings that guide individual action.

The unarticulated background or collective understanding (Tsoukas & Vladimirou 2001) forms a basis for the social practices in which working takes place in organisations. Social practices are based on discourse. To be able to act in a community, an individual needs to know the specific ways of discourse and using language in the community and the meanings behind expressions: where attention is paid overall and how things and phenomena are classified and sorted with language. In these discursive practices, practical phenomena, things and events are given meaning through language. (Harré & Gillett 1994, Tsoukas 1996, Tsoukas & Papoulias 1996.) Language also helps to build the reality as well as find new perspectives and meanings. (Taylor 1993, Tsoukas 1996, Wenger 1998.)

In spite of their collective unarticulated background, each member of the organisation has his or her individual interpretations of social practices (Tsoukas 1996, Orr 1996). When working, members integrate their own individual knowledge and organisational knowledge by which they configure the social practice of the job. How these two are integrated or how work is carried out and how individuals act is influenced not only by the collective unarticulated background, but also by the individual’s situational assessments based on their own dispositions and organisational rules (Tsoukas & Vladimirou 2001; 979).

Tsoukas (1996) highlights the significance of personal dispositions or Bourdieu’s (1990) “habitus” in the implementation of organisational rules. Citing Dierdre Boden (1994; 46), he states that individuals base their practical choices on two different grounds. On the one hand, individual choices are guided by personal characteristics and external normative role expectations. On the other, choices are based on local knowledge and the related interaction. Individuals need to reconcile these two possibly conflicting logics. (Tsoukas 1996; 19.) Some of the knowledge guiding individual action, that is, personal characteristics, originates partly from outside the organisation, being thus partly beyond the reach of management control. Interactive situations that guides action are also beyond management control. Tsoukas, thus, finds individual action in the organisation to be independent because the management cannot fully control and influence the work-related social practices (also Brown & Duguid 1991, Wenger 1998). (Tsoukas [ibid.] finds that the management can influence the normative social expectations about individuals that perhaps guide individual action, as well as

organisational rules that perhaps help individuals to evaluate the situation at hand and necessary action.)

Implementing organisational rules, thus, always involves individual, indeterminate and contingent assessment. These assessments and the related applications of organisational knowledge create new knowledge: when the formalism of organisational knowledge encounters practical situations and the experience related to individual knowledge, it necessitates human judgement which becomes practical action and a possible new experience and emergent knowledge (Tsoukas & Vladimirou 2001; 988). This knowledge can be transformed into formal or theoretical organisational knowledge, which cannot, however, completely describe knowledge related to action and, thus, "as far as organizational knowledge is concerned, there always is an improvisational element in putting knowledge into action" (ibid.). Individuals, therefore, develop and reconfigure organisational knowledge when employing it. When using knowledge, both organisational formal knowledge and individual heuristic knowledge are present, integrating rule-bound action and novelty, continuity and change, as well as regularity and creativity (Tsoukas 1996; 22). Heuristic knowledge cannot be governed or managed as formal knowledge because it pertains to employees' experiences, skills, motivation and social relationships, individuals' dispositions and their interaction. Managing heuristic knowledge is, therefore, maintaining and reinforcing the collective aspect and encouraging initiative and improvisation. (Ibid.; 991.) It also involves discursive practice, that is, observing and absorbing discourse that maintains and builds organisational social practices (Tsoukas 1996; 23).

When the organisation is seen as a distributed knowledge system the task of knowledge management is to coordinate purposeful individuals as they try to apply their unique interpretations to local circumstances, integrating their own knowledge and organisational knowledge, to create a satisfactory outcome (Tsoukas 1996; 22). Knowledge management, thus, requires that the relationship between the formal and theoretical organisational knowledge and individual heuristic knowledge based on experience is a two-way street: "While propositional knowledge is fed into organizational members and is instrumentalized through application (thus becoming tacit), heuristic knowledge needs to be formalized (to the extent this is possible) and made organizationally available." (Tsoukas & Vladimirou 2001; 991, brackets from the source.)

2.2.3. Summary

Tsoukas (1996) views the organisation as a constructionist knowledge system in which knowledge is not constant or immutable but something indeterminate and continually emerging. Not possessed or known by any single agent, organisational knowledge is dispersed among individuals (ibid., Tsoukas & Vladimirou 2001). Below I provide a brief presentation of the elements related to organisational knowledge and their relations according to Tsoukas and Vladimirou (ibid.).

Knowledge in the organisation is constructed of the following elements (Tsoukas 1996, Tsoukas & Vladimirou 2001):

Organisational knowledge elements:

- A setting in which action takes place (1)
- Rules or propositional statements (2)
- Historical collectiveness (3)

Collective knowledge elements:

- Unarticulated background or collective understanding (4)
- Discourse, language (5)
- Social practices (6)

Individual knowledge elements:

- Dispositions (7)
- Normative role-related expectations (8)
- Interactive situations (9)

The mutual interdependencies in the above-mentioned elements are summarised in the following:

The setting in which action takes place (1), the organisation is a distributed knowledge system because organisational knowledge is dispersed to individuals. Involving the use and application of knowledge through a shared language (5), collective social practices (6) are collections of individual knowledge. These social practices entail interactive situations (9) which conform to the context. Individuals' actions in them are guided by personal dispositions (7), partly coming from outside the organisation, and the normative role-related expectations from the organisation (8). The propositional statements in the organisation are implemented and realised in social practices (6) which are guided not only by individual dispositions and

social expectations, but also by the unarticulated background or collective understanding (4) which is based on the historically-evolved collectiveness of the organisation (3).

Knowledge is validated and utilised only in practice. The formal organisational knowledge or organisational rules become knowledge when individuals take them to use in their work. New knowledge can only emerge through using knowledge or in action when creating individual practice-related heuristic knowledge. Knowledge is, thus, instrumental or bound to practice and personal or bound to the individual. To benefit the entire organisation, new knowledge developed by individuals needs to be made formal organisational knowledge and available to all those that need it.

Individuals' heuristic knowledge cannot be controlled or managed in the same way as formal organisational knowledge because it pertains to personal dispositions and interaction. Therefore, managing heuristic knowledge is maintaining and reinforcing the collective aspect. (Tsoukas & Vladimirou 2001.) It also involves observing and understanding discourse maintaining and building organisational social practices because in this discourse members give meanings to knowledge, functions and events which guide carrying out work in the organisation alongside management-given rules, instructions and job descriptions (Tsoukas 1996, Spender 2006). The organisation is, hence, a social, human community where members do not just act according to their official roles (ibid., Brown & Duguid 1991, Wenger 1998).

2.3. Knowledge Sharing

When examining organisational knowledge from the resource-based view, organisational knowledge transfer can be addressed as mechanical activity the goal of which is to keep the existing knowledge immutable. When the adopted approach is the knowledge-based view, as in this study, knowledge transfer inevitably entails some transformation in the knowledge. Since knowledge is constantly subject to re-evaluation in interpersonal communication, the mutability of knowledge is built in in all uses of the knowledge (Tsoukas 1996, Szulanski 2003). This has also been aptly pointed out by Karl-Erik Sveiby (1996; 381, inverted commas and italics from the source): "Knowledge 'transfer' is therefore not quite appropriate [term], since knowledge is not moved as goods. Instead, the 'receiver' reconstructs his/her version of the 'supplier's' *process-of-knowing*."

Examining knowledge transfer also entails another essential difference when looked at from the resource-based and knowledge-based views: that is, when knowledge transfer has been considered occurred or “complete”. The resource-based view sees knowledge in the organisation transferred when the knowledge has been made available to the recipient (Spender 2006). Knowledge transfer is, thus, ensuring the flow or availability of knowledge. Conversely, the knowledge-based view considers knowledge transferred only when the recipient has received, understood and taken the knowledge to use. Thus, making the knowledge available to the recipient does not yet entail that it has been transferred. (Ibid., Davenport & Prusak 1998, Szulanski 2003.) When knowledge transfer is addressed from the knowledge-based view as an interactive process, it involves the sender ensuring that the knowledge reaches its destination and is understandable as well as usable. Correspondingly, the recipient has the opportunity to ensure that he or she has understood the knowledge in the sense meant by the sender or sufficiently close to the sense implied by the sender because individuals can never arrive at completely similar understandings (Tsoukas 1996, Szulanski 2003).

In this study I examine knowledge transfer between generations as a continuous, work-related process based on interaction which is in this sense called knowledge sharing (Widén-Wulff 2007). I apply the concept knowledge sharing between generations to describe such knowledge transfer between generations that involves interaction.

When studying knowledge transfer as an interactive process or knowledge sharing, the focus shifts away from organisational functions toward interpersonal action. Davenport and Prusak (ibid.; 106) translate this into shifting the focus in knowledge transfer “from access to attention, from velocity to viscosity, from documents to discussions”. Since individuals cannot put all the transferrable knowledge into words, the only means to increase knowledge transfer is to extend and intensify interaction or to sustain and improve the circumstances of knowledge transfer (ibid.). For her part, Widén-Wulff (2007; 178) points out that the emphasis in knowledge management is moving from managing information and knowledge resources toward people and action. Therefore, management requires understanding how information and knowledge is shared in the organisation and used in interaction between its members.

When viewing knowledge transfer as an interactive process, the significance of implicit and tacit knowledge becomes emphasised because they cannot be transferred without

interaction, unlike explicit knowledge (e.g. Polanyi 1966, Tsoukas 2003, Spender & Scherer 2007). This view, however, does not just consider the transfer of tacit and implicit knowledge, excluding the transfer of explicit knowledge, because the different types of knowledge are simultaneously needed and used in interaction and organisational operations (Polanyi 1966, Tsoukas 1996, Eraut 2004). The transfer of tacit knowledge always presupposes some sort of “transfer relationship” based on individuals’ joint work processes (Davenport & Prusak 1998, DeLong 2004). Interaction enables the transfer of much more detailed and complex knowledge that is difficult to define when compared to absorbing knowledge alone or independently. Even though interaction means lower velocity in the transfer of knowledge than independent studying, the viscosity of knowledge is much greater in interaction, the knowledge is more complex, practical and easily applicable than fast-learnt book knowledge (Davenport & Prusak 1998; 102).

In his studies on organisational knowledge, Gabriel Szulanski (2003) applies the concept “knowledge transfer” because he sees that it implies the notion of both the sender and the recipient and their influence on the transferred knowledge, unlike the concepts “knowledge dissemination” and “diffusion”. Addressing the transfer of practices and practical knowledge, he states that practice cannot be borrowed as such, but the recipients have to adapt it to suit themselves and their circumstances (ibid.; 15). The foundation of Szulanski’s (ibid.) studies is in the mathematical theory of communication by Claude E. Shannon and Warren Weaver (1969), even though he considers it sees knowledge transfer as being “almost instantaneous and costless” (ibid.; 25). According to Szulanski, the theory nevertheless clearly portrays the factors of knowledge transfer, that is, the source, the receiver, the channel and the message. Of these, Szulanski sees interaction between the sender and the receiver as the channel of knowledge transfer.

Based on his findings, Szulanski (ibid.; 75) identifies three most important barriers to knowledge transfer: (i) the arduousness of the relationship between the sender and the recipient, (ii) the recipient’s lack of absorptive capacity or the ability to adopt the knowledge and apply it, and (iii) causal ambiguity or the recipient’s lack of understanding the significance of the knowledge to the big picture or to carrying out his or her responsibilities. The recipient of the knowledge, thus, needs not only to receive the knowledge, but also to comprehend and employ it before knowledge can be considered transferred. According to Davenport and Prusak (1998), barriers to interactive knowledge transfer, in addition to those mentioned by

Szulanski (ibid.), can include external aspects related to the circumstances, such as the parties' lack of time and meeting places (Davenport & Prusak 1998; 101).

2.3.1. Knowledge Sharing between Generations

Knowledge transfer between generations refers to a process in which an experienced shortly retiring employee and a novice transfer work-related knowledge between themselves (DeLong 2004, Rothwell & Poduch 2004). In such knowledge transfer it is essential for the end result that the recipient or the novice employs the knowledge that has been transferred to them (DeLong 2004; 41); otherwise, the transfer is useless from the perspective of both the employee and the organisation. Since knowledge transfer between generations entails interaction and knowledge implementation is an essential part of it (ibid.), it can be considered knowledge sharing as defined in this study.

In this study I explore knowledge transfer or sharing between generations among the employees of an organisation, and not among the managers and owners which is called succession (Kesner & Sebora 1994, Giambatista et al. 2005). William J. Rothwell and Stan Poduch (2004) refer to the succession related to the owners and managers of an organisation as "managerial succession" and, thus, distinguish it from "technical succession" related to employees. Managerial succession concerns people or finding the right people at the right time to perform the right tasks from the perspective of the company's competitiveness. Initiated in the 1950s, the study on managerial succession examines, for example, what kind of new managers the company needs, how succession is timed in relation to the company's operations and how succession affects the company strategy and financial result. Studies are mainly based on quantitative comparisons, measuring the company's key figures before and after succession (cf. Hautala 2006). (Kesner & Sebora 1994, Giambatista et al. 2005).

Technical succession, however, concerns knowledge and its transfer: the content of the knowledge and how it is transferred (Rothwell & Poduch 2004). The object of this study, knowledge sharing between generations, can also be defined as technical succession according to Rothwell and Poduch (ibid.) because the purpose of this study is to find out what happens between the experienced employee and the novice in the succession or how knowledge is in practice transferred between generations. Such insights are necessary in

particular with succession concerning other organisational levels than the management and other than established corporations because succession in small and medium-sized companies is a far greater risk for their future than for large production plants, whether it concerns the management or the employees (Rothwell & Poduch 2004, Giambatista et al. 2005). To the best of my knowledge, technical succession has not been the object of scientific empirical studies (DeLong 2004, Rothwell 2007), so there is no previous scientific research directly related to the topic of this study.

DeLong (2004) finds technical succession, that is, knowledge transfer and retention between generations among employees, gaining increasing importance in companies. This is the result of not only the retirement of baby boomers, but also the rapid development of scientific, technical and professional knowledge, as well as the rapid increase of knowledge which make absorbing knowledge even more difficult. Furthermore, some of the knowledge developed in the 1950s and 1960s is nowadays considered inadequately documented because the degree of advances in technology and science, regardless of the discipline, determines boundaries to storing knowledge. (Ibid.; 3.) The retirement of experienced employees can weaken organisational efficiency, since they can carry out their tasks both rapidly and without errors. It also deteriorates the organisation's ability to develop and renew itself, if the experienced employees' knowledge is not transferred to their successors to an adequate extent and in time. (Ibid.; 31-32.)

Retiring employees normally have long careers behind them and have accumulated vast knowledge about their work and the organisation. Knowledge transfer between generations can, however, be hampered if experienced employees are unwilling to share their knowledge because they find it diminishes their role and power in the organisation (Leonard-Barton 1995, Carlile, 2002, DeLong 2004). Moreover, the significant age difference, which is normal between experienced employees and novices, can make interaction and mutual co-operation difficult because their knowledge, experiences and outlooks on things can be very different. The novices' lack of experience can also hamper their understanding and implementation of the knowledge. (DeLong 2004.)

Work-related knowledge transferred between generations entails not only explicit knowledge but also implicit and tacit or practical knowledge of how particular work has been traditionally carried out in the organisation (Wenger 1998, Tsoukas & Vladimirou 2001, DeLong 2004). The ethnographic studies of Brown and Duguid (1991) and Julian Orr (1996) show that the work practice and its theoretical or formal description only rarely coincide because the work

routines and the necessary knowledge are adopted in action and interaction with others. Therefore, formal instructions and rules are not enough to function in the organisation and master the work; informal interaction between the new and experienced employees is also needed. In this interaction new employees learn essential organisational knowledge that is not available in writing or from other individuals but resides only within the community (also Barley 1996, Wenger 1998). According to David W. DeLong (2004), knowledge related to work practices or how things are handled and done and who to ask for advice in particular instances, is generally poorly documented in organisations, and cannot even be exhaustively documented. For the continuity of organisational processes, the most essential part of knowledge transfer between generations is, therefore, the transfer of tacit knowledge (ibid.).

Whether the knowledge is explicit, implicit or tacit determines the methods and means of transfer between generations (DeLong 2004; 85). Explicit knowledge can be transferred in various documents, training sessions and interviews in which the experienced employee informs the successors about the work. Here, there is only one sender or giver of knowledge and recipients can be many. Implicit and tacit knowledge are best transferred in private conversations between two people and in practical situations, that is, when “mentoring and coaching” (DeLong 2004; 106).

Table 2 presents the different types of knowledge related to knowledge transfer between generations, which in this study I consider to be dimensions of knowledge, and the means of their transfer as seen by DeLong (ibid.). He categorises implicit knowledge into technical rules guiding the work, which can be easily written down or articulated when needed, and into situation bound knowledge which may come up in conversation when asking the right questions or in relevant context. Correspondingly, tacit knowledge is divided into work-related experiential knowledge and knowledge embedded in organisational practices and absorbed when socialising in the organisation. Both can only be transferred by observing and/or doing the work.

Table 2. Types of knowledge and means of transfer between generations.
(Adapted from DeLong 2004; 84.)

Type of knowledge	Explicit	Implicit rule-based	Implicit know-how	Tacit know-how	Deep tacit
Manifestation or content of knowledge	Written down, documented	Technical rules guiding the work	Related to the changing situations of work	Related to carrying out the job, learnt by doing	Related to organisational practices, learnt in socialisation
Means of transfer	Documents, interviews, training	Can be written down when needed, easily taken up in conversation	Taken up in conversation when the context is relevant or when asking the right questions	Observing and doing the work	Observing and doing the work

When transferring knowledge between generations, two-way interaction, that is, discussions and working together, is the most efficient means to transfer work-related skills and rules and practices related to acting in the organisation (DeLong 2004). It is also the best way to communicate who in the organisation knows and masters what and to introduce the novice to new people. In discussions the experienced employee finds out what knowledge the novice needs and how it should be presented so that it becomes best understood. Even though ready and willing to share knowledge with the novice, the experienced employee does not necessarily know how to communicate the knowledge comprehensibly. The experienced employee may not be aware of the novice's knowledge level, and even if he or she were, it may be hard to present things so that the uninitiated understands them correctly. (Ibid.; 106-107.) For the novice's part, working together, making observations and having practical experience help to adopt tacit knowledge (ibid.; 111).

When transferring and retaining explicit knowledge in the organisation, it is relatively easy for the management to focus on the content of knowledge and its storage or control of what knowledge has been successfully transferred and retained and what possibly not. When transferring implicit or tacit knowledge, however, the management can only create and maintain an auspicious setting for the transfer of knowledge or encourage interaction and working together. (Tsoukas & Vladimirou 2001, DeLong 2004, Spender 2006.) The management, thus, has no control over what knowledge is transferred or how and when this happens.

2.3.2. Knowledge Sharing in Expert Work

In this study I examine knowledge transfer or sharing between generations in the context of expert work. When referring to expert work I follow the definition of the sociologist Pasi Pyöriä (Pyöriä et al. 2005) and mean “self-controlled knowledge work” (ibid.; 55) and “modern craftsmanship” (ibid.; 114) which is based on formal education. The essence of such work is to use knowledge in new ways, to learn rapidly and to combine knowledge from different fields, benefiting the entire organisation (Pyöriä 2006). Experts also continuously develop their knowledge and skills; expert work is about generating ideas and planning. All this requires not only theoretical, formal education, but also co-operation and interaction or social skills and the ability to communicate. (Pyöriä et al. 2005.)

Hence, education is not the most important element in expert work but the ability to apply knowledge, for example, to problem-solving (ibid., Barley 1996). In other words, instead of knowledge and knowing, the abilities to utilise knowledge in various practical situations and develop knowledge with others become essential. Against this background, knowledge transfer in expert work can be considered knowledge sharing, as defined in this study, which takes place in interaction and in which knowledge is only transferred when the recipient has understood the knowledge given and is able to use it.

Developing expertise not only requires interaction, but also experience accumulating over time. Davenport and Prusak (1998; 7) state that experts “have been tested and trained by experience”. Experience brings an understanding of how knowledge is employed and exploited. This knowledge related to practical action or “ground truth” is more valuable in work than mere theoretical knowledge (ibid., Barley 1996). Accumulating knowledge creates rules-of-thumb and insights: if the new situation is sufficiently similar to corresponding previous situations reactions can be agile and correct from experience. Without experience, however, it can be very time-consuming to thoroughly analyse and understand the situation. Insight is based on intuition, which leads to a conclusion required by the situation without full awareness or knowing how, that is, intuitively, therefore also rapidly (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995). According to Dorothy Leonard-Barton (1995), expert intuition gradually builds into collected knowledge and experience, which enable the individual to recollect and notice connections between things and to combine them in different ways. Intuition builds upon deep, complex personal knowledge and experience about technologies, standards, customers and markets, among other things. Expert intuition is, thus, a

combination of versatile knowledge and experiences which comprises both factual explicit knowledge and experiential tacit knowledge.

Stephen R. Barley (1996), who has conducted ethnographic studies on technical occupations and technicians' work, categorises work-related knowledge into formal and contextual knowledge. Professional education is formal knowledge which is not much use in day-to-day work, even though it is found helpful in understanding the theoretical problems of the job (ibid.; 424). The knowledge that has the most significance to the job is gained by working or through experience, and the most valuable experience is of different settings and circumstances or contextual knowledge which helps to tackle the practical challenges of work.

Eraut (2000) points out that when a novice becomes an expert, instinctive action gradually replaces explicit rules and instructions. A novice tries to improve his or her recognition and understanding of changing situations, as well as to create routines to cope with different situations, whereas for an expert, intuitive observation and insight of situations often replace purposeful action. Hubert L. Dreyfuss and Stuart E. Dreyfuss (1986) name five steps of a novice becoming an expert. As the role of factual explicit knowledge and conscious analytical thinking guiding action diminishes and intuition and experiential deep understanding of different situations increases, the novice gradually matures to become an expert.

Table 3 presents the gradual development of expertise as defined by Dreyfuss and Dreyfuss (1986; 50) which particularly concerns the conscious efforts to master or acquire a skill, and not, for example, coincidental learning through trial and error. The five developmental stages in Table 3 are based on studies conducted by Dreyfuss and Dreyfuss (ibid.) with pilots, chess players, automobile drivers and adult learners of a foreign language. The premise of the five stages of skill acquisition is that at the beginning individuals cannot relate their skill to any situation. They act analytically by consciously organising recognisable, skill related elements and by following abstract rules. Gradually they become involved in the skill which builds through accumulating concrete experiences and increasingly identifying similarities between new and past situations with intuition. Over time experience connects the skill and its use to situations and at the same time makes following rules unnecessary. (Ibid.; 35.)

Even though Dreyfuss & Dreyfuss do not refer to Polanyi's (1961, 1975) notion on the instrumentality of knowledge, their empirical studies on skill progression find support in

Polanyi's thinking. They posit that when adopting a skill, practical experiences gradually replace conscious, deliberate action and rules guiding it which over time become so internalised that individuals are no longer aware of the guiding experiences and knowledge based on them when applying the skill (Dreyfuss & Dreyfuss 1986; 30). This description coincides with Polanyi's (ibid.) definition of the perfect absorption of knowledge by which the use of knowledge becomes tacit knowledge when individuals no longer are aware of it (also Eraut 2000).

Novices process information: they look for rules that define the skill to be acquired and based on such rules they identify facts and elements related to the skill. Seeing these elements without reference to the overall situation, they apply existing rules to them regardless of the situation or circumstances (e.g. shift gears always and only when the car reaches a certain speed) (Table 3). Gradually, acting by rules accumulates experience and decreases the need to follow them.

Novices become advanced beginners when they have enough experience to cope with real life situations. Thus, experience becomes more important in understanding than any form of verbal description. Advanced beginners make observations of elements that are not only context-specific but also context-free (e.g. shifts gears not only based on the speed but also on the sound of the engine) (Table 3). They apply subtler rules than novices, thus, increasing their understanding of the skill. The novice and the advanced beginner do not feel greatly responsible for the outcome of their action, because it is based on following the given elements and rules, the inadequate or ambiguous definition of which is seen as the result, if the outcome is unsatisfactory.

Advanced beginners become competent when they can independently organise and plan their action related to the skill. When accumulating experience, the number of both context-specific and context-free elements gradually becomes impossible to control, and, therefore, it is no longer evident what is important and what is not. Here, hierarchical decision-making becomes necessary: competent performers are capable of choosing the model or method by which to organise their action in the particular context to meet goals. Then they can analyse the context-specific elements in an organised manner in the order that the method necessitates. Having learnt how the different elements of skill are interconnected and interdependent, competent performers can independently devise a plan to guide their action. Independence brings with it the feeling of responsibility and involvement in the outcome:

competent performers are committed to what follows of their choices, plans and actions (Table 3). Their assessment and understanding of the situation and the related decision-making, however, are based on conscious analysis and are thus detached of the action.

Competent skill performers become proficient when they intuitively understand the requirements of the situation and their organising without detached choices or deliberation of the situation. Proficient performers, however, think analytically how to act in the situation (Table 3). Their decision-making is, thus, detached even though their assessment of the situation is intuitive: "The spell of involvement in the world of the skill will thus be temporarily broken." (Dreyfuss & Dreyfuss 1986; 29.) Intuition is, according to Dreyfuss and Dreyfuss (ibid.; 28-29), "holistic similarity recognition" or understanding that is intuitive and effortless and occurs when identifying similarities between the present and previous experiences.

Proficient skill performers become experts when they intuitively link previous decisions with resulted action which they are able to use as a basis of their current intuitive efforts (Table 3). Experts do not see problems, their solutions and the necessary procedures detached from their own action and do not think of them deliberately. When things proceed normally, they do not see themselves as solving problems or making decisions but doing merely what generally works: the skill has become intrinsic and they need be no more aware of it than of their own body. Experts' activities are based on mature and practiced understanding. In a critical situation they deliberate about their choices but this is not calculated decision-making but critical inspection of their own intuition. (Ibid.; 30-31.)

Table 3. Five stages of skill acquisition.
(Dreyfuss & Dreyfuss 1986; 50)

Skill level	Components	Perspective	Decision	Commitment
1. Novice	Context-free	None	Analytical	Detached
2. Advanced beginner	Context-free and situational	None	Analytical	Detached
3. Competent	Context-free and situational	Chosen	Analytical	Detached understanding and deciding; involved in outcome
4. Proficient	Context-free and situational	Experienced	Analytical	Involved understanding; detached deciding
5. Expert	Context-free and situational	Experienced	Intuitive	Involved

Expertise, thus, builds over time from combining formal education or explicit knowledge and experience or tacit knowledge to respond to changing situations (Leonard-Barton 1995, Dreyfuss & Dreyfuss 1986, Pyöriä et al. 2001). Developing expertise also presupposes social interaction (Pyöriä et al. 2005, Parviainen 2006). Expertise gradually becomes a personal disposition when individuals can no longer analyse their knowledge or knowing but act intuitively (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Eraut 2000).

Expert work not so much stresses formal education as the ability to learn and use knowledge according to the situation (Barley 1996, Pyöriä 2006). Against this background, for expert work-related knowledge transfer between generations it is more important to transfer practical, situation bound implicit knowledge and experiential tacit knowledge than explicit knowledge which can be acquired by education. Since practical and experiential knowledge cannot be transferred without interaction (Davenport & Prusak 1998, De Long 2004), the role of interaction becomes significant in the transfer.

Expertise can be distinguished from professionalism which is based on professional education and experience. Pyöriä (Blom et al. 2001) points out that a professional knows his or her own field thoroughly and possesses centred or deep knowledge, whereas expertise involves the ability to learn rapidly and integrate creatively knowledge from different disciplines to benefit the entire organisation. Pyöriä does not consider expertise and professionalism as mutually exclusive, but that an individual can be both an expert and a professional. In similar vein as Pyöriä (Pyöriä et al. 2005), Jaana Parviainen (2006; 68, 163-164), who studies expertise, also sees not only mastering one's own field but also interactive skills and the ability to generate knowledge collectively being highlighted when considering expertise. Professionalism, thus, can be roughly characterised as the complete and constant mastering of one discipline, whereas expertise is integrating multidisciplinary knowledge. This integration of knowledge requires interaction in which knowledge transforms to correspond to individual and collective needs. In this study the experienced employees are both professionals and experts: they possess expert skills in their own field and integrate knowledge acquired from various sources by their decades-long work experience making quick decisions and solving problems.

2.3.3. Summary

In this study I address knowledge transfer between generations as interactive knowledge sharing in which knowledge is only transferred when the recipient has received, understood and employed the knowledge given to his or her. Merely making the knowledge available to the recipient is, therefore, not considered knowledge transfer.

In interactive knowledge transfer, or knowledge sharing, the transferable knowledge may entail explicit, implicit or tacit knowledge, or most probably all of these because the different types of knowledge are not distinguishable when utilised. The transfer of explicit knowledge, however, is not as essential in interaction as that of implicit and tacit knowledge because it is difficult or even impossible to transfer them without interaction. Social situations enable the transfer of multiple, detailed and complex knowledge which is difficult to define compared to absorbing knowledge alone or independently. Even though interaction is a slower means of transferring knowledge than independent studying, knowledge adopted in interaction is stickier and better sustained or more complex, practical and easily applicable than faster acquired book knowledge.

In knowledge transfer between generations, or between an experienced shortly retiring employee and a novice, it is essential that the novice employs the transferred knowledge; otherwise the transfer is to no avail from the perspective of both the individual's work and organisational operations. The most efficient ways to transfer knowledge from one generation to another is to have discussions and work side by side. In discussions the experienced employee finds out what knowledge the novice needs and how it should be presented so that it becomes best understood. Working together, making observations at the same time and practical experience help the novice to adopt tacit knowledge. Tacit knowledge or work-related skills and organisational rules and practices are best transferred in social settings. Since knowledge transfer between generations presupposes interaction and ends when the novice is able to employ the knowledge, the transfer can be considered knowledge sharing as defined in this study.

In this study I examine knowledge transfer between generations in the context of expert work. Expert work is here considered to be mastering knowledge: the essence of work is the ability to apply knowledge in new ways, to learn rapidly and to combine knowledge from different domains. Expertise builds over time when integrating formal or explicit knowledge and

experiential or tacit knowledge to respond to changing situations. Furthermore, expertise cannot be developed without interaction. Expert work stresses not so much formal education as the ability to learn and to use knowledge according to the situation. Therefore, in expert work-related knowledge transfer between generations it is more important to transfer practical, situational implicit knowledge and experiential tacit knowledge than explicit knowledge which can be acquired by education. Since the development of expertise requires interaction and since expert work necessitates the ability to use knowledge in different settings, transferring knowledge related to expert work can be considered knowledge sharing as defined in this study.

In this study I see professionalism and expertise as complementary concepts, because the retiring employees of this study are both professionals and experts: they possess expert skills in their own field and integrate knowledge acquired from various sources by their decades-long work experience making quick decisions and solving problems. With the exception of one, all the novices that took part in the study have university degrees. Their theoretical education is the formal foundation, on which carrying out the job and the required expertise are gradually built.

2.4. Knowledge Sharing between Generations and Organisational Knowledge

When examining the organisation from the knowledge-based view, knowledge in the organisation not only is social by nature, but also comprises individual characteristics, experiences and skills as well as is bound to the situation (Tsoukas 1996, Tsoukas & Vladimirou 2001, Spender 2006, Spender & Scherer 2007). The possibility of developing new knowledge underlies the various individual interpretations and perceptions of knowledge: when knowledge is seen as socially constructed and changing, individuals can through co-operation develop new knowledge from their different knowledge and perceptions (Brown & Duguid 1991, Carlile & Reberich 2003, Carlile 2004). In this study I apply the concept knowledge building to describe this knowledge development between individuals. If knowledge building is related to knowledge sharing between generations it is, thus, knowledge building between generations.

2.4.1. Interpersonal Knowledge Building

Carl Bereiter (2002) gives a distinct definition of the concept knowledge building. A psychologist specialising in the study of education, he takes learning as the point of comparison or counterbalance to knowledge building. Bereiter started his research career with cognitive psychology but has later turned toward constructive research because "the alternative to the folk conception of mind as a container of beliefs and other mental objects is the connectionist view of mind as a self-organizing system...that produces knowledgeable behavior as an emergent". (ibid.; 209). In constructivism he finds it to be essential that "theories and the like are human constructions much like material artifacts. The other and much more controversial part is that the *truth* of propositions is a social construction." (ibid.; 208, italics from the source.) Bereiter bases his thinking on Karl R. Popper's (1979) notion that the world is divided into three complementary sub-worlds: World 1 describes the physical and material reality; World 3 is about conceptual entities such as theories and ideas; and World 2 denotes subjective experiences or the mental state which interacts with Worlds 1 and 3 (ibid.; 154-155). Knowledge building is developing and creating conceptual artifacts in World 3, whereas learning is absorbing concepts and phenomena, which takes place in World 2, or accomplishing tasks as the feature of World 1 (Bereiter 2002; 255-257).

Bereiter, thus, makes a distinction between learning and knowledge building. Contrary to learning, knowledge building is always collective. Moreover, the aim of knowledge building is to produce a conceptual artefact, such as an idea, design or explanation. This "product" needs to be useful or serve some purpose. Knowledge building can, however, also involve learning, which Bereiter calls indirect learning because it occurs as a by-product of some other action (ibid.; 296).

Analysing Bereiter's idea of knowledge building, Sami Paavola, Lasse Lipponen and Kai Hakkarainen (2004) apply it to organisations and posit that learning, as defined by Bereiter, inevitably occurs in companies even though learning is not the core function or goal of these organisations: their members solve problems, generate new ideas and promote collective knowledge or increase the value of conceptual artifacts. (ibid.; 561-562.) In other words, the members' primary task in the organisation is not to learn or improve their personal understanding but to build knowledge: to work toward generating new knowledge that can be accessed throughout their community. This perspective of knowledge building touches the

notions of Pyöriä (2006) and Parviainen (2006) on emerging expertise and its collective development (Sub-chapter 2.3.2.).

Paavola et al. (ibid.; 566) argue that the goal of knowledge building, as defined by Bereiter (2002), in the organisation is to develop, assess and reconfigure conceptual artifacts in co-operation so that it supports the community in the long term. Knowledge building is, thus, target-oriented, collective action which develops knowledge necessary to the organisation. However, Bereiter (ibid.) does not relate knowledge and knowledge building explicitly to practice or doing. Even though he maintains that built knowledge should be useful, it does not necessarily entail usefulness related to practical work. World 3, as defined by Bereiter, is based on history and cultural practices (Bereiter 2002; 58-61), which leads Paavola et al. (ibid.) to argue that Bereiter's knowledge building does not take place in a detached conceptual world but is connected to the results and consequences of human action, even though not directly to concrete action.

Carlile (2002, 2004) and Carlile & Rebutisch (2003) also examine transforming and developing knowledge in the organisation even though they do not refer to it as knowledge building. Unlike Bereiter (2002), Carlile (ibid.) sees knowledge connected to practice and calls his knowledge concept pragmatic: knowledge is local, situation-bound and absorbed and embedded in practice (Carlile 2002). In his ethnographic studies, Carlile (2004) has examined i) knowledge transfer, ii) knowledge translating and iii) knowledge transformation occurring in the interfaces of different organisational functions. Carlile (ibid.; 558-559) describes these functions and their differences as follows:

i) Transferring knowledge is processing existing information without transforming or developing it. It is functional and productive as long as circumstances remain the same and do not generate the need for new knowledge or action.

ii) Translating knowledge is interpreting it when new circumstances and emerging issues make the distinctions and dependencies between existing phenomena and events unambiguous which blurs their meaning. Therefore, when acting together, individuals constantly develop shared meanings or translate knowledge (also Lave & Wenger 1991, Brown & Duguid 1991). In the interfaces of various organisational functions, individuals can, however, have different views of the meanings of phenomena and events: knowledge is bound to practice and doing the work, which entails that when moving from one function to

another the different goals and practices of work can transform the meaning of the knowledge. Therefore, functional interfaces require not only domain-specific knowledge but also common knowledge among the members of the organisation which helps to translate knowledge by steering discussion and defining common interests to guide action.

iii) Transforming knowledge in the interfaces of organisational functions begins when new circumstances or phenomena generate the need for new knowledge. The different goals and practices of work in the different functions can, however, give rise to discrepancy among individuals in what existing knowledge is considered meaningful and necessary. The prerequisite for the continuity of collective action is that individuals can transform not only their own expert knowledge but also knowledge common to all so that everyone accepts both the new expert knowledge and new common knowledge. Transforming knowledge is based on existing knowledge and new knowledge chosen together by individuals. This combination of knowledge is new organisational knowledge.

Paul R. Carlile and Eric S. Rebentisch (2003; 1187) present the above-mentioned knowledge transformation as a cycle which entails knowledge storage and retrieval (Figure 2). The starting point for knowledge transformation is knowledge stored in the organisation or its existing knowledge. Retrieving and implementing this knowledge depends on its usefulness in the current situation. The members of the organisation collectively define the usefulness and meaning of knowledge by deciding what the goal of the situation is and how it can be achieved with the knowledge. Transforming the stored knowledge to correspond to the current situations presupposes, thus, a mutual agreement between the individuals of how and into what the knowledge should be transformed.

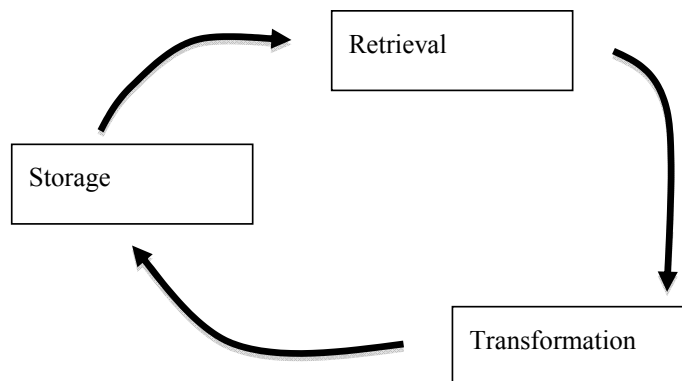


Figure 2. Knowledge transformation cycle.

(Carlile & Reberntisch 2003; 1187)

Carlile and Reberntisch (*ibid.*; 1191) emphasise transforming knowledge because the mere acquisition of knowledge existing or stored in the organisation without changing it can mean that the knowledge proves useless in the current situation and is thus left unused. They see organisational knowledge transformation as a continuous, active process in which knowledge storage, retrieval and transformation interact. All previous history, what knowledge has been stored and how, what knowledge has been employed after retrieval and what knowledge has been transformed and how, affects what knowledge is stored, retrieved, employed and transformed in the next cycle. The same thought of continuity, that is, building new knowledge on old and combining them to satisfy situational and circumstantial needs, in the development of organisational knowledge is also emphasised by Brown & Duguid (1991), Tsoukas (1996) and Stähle et al. (2002), among others.

Carlile (2002, 2004) and Carlile and Reberntisch (2003), thus, use the term knowledge transformation when referring to knowledge development. Likewise this study, Carlile and Reberntisch (*ibid.*) connect the knowledge to its use: the meaning and value of knowledge derive from its employment. Utilising knowledge is related to the target-orientedness of knowledge transformation—or building: the goal is to develop knowledge that facilitates successful working, as deemed by individuals, in the prevailing circumstances.

Knowledge transformation is always connected to a new situation or new circumstances (Carlile 2002, 2004, Carlile & Reberntisch 2003) and its initiation necessitates an external demand or pressure because people are intrinsically unwilling to change their practices and

ways of working (Carlile 2004; 557, 565). In this study, novelty or a new situation accompanies new employees and their knowledge, experiences and dispositions to the organisation (Brown & Duguid 1991, Tsoukas 1996).

In this study I mean by knowledge building target-oriented action between individuals in which they develop new knowledge. Knowledge building is based on organisational knowledge, individual knowledge and individuals' work-related knowledge needs. (Bereiter 2002, Carlile 2002, 2004, Carlile & Rebentisch 2003.)

Not only "knowledge transformation" but also "knowledge creation" could be considered synonymous to "knowledge building". Creating knowledge, however, is something that does not consciously rely on existing knowledge, practices and rules. Moreover, it does not necessitate social activity. (Dreyfuss & Dreyfuss 1986; 40-41.) Dreyfuss & Dreyfuss (*ibid.*) argue that creativity is based on imagination and its induced action which has no historical predecessor but comprises the broadminded, unconventional and unexpected interpretation of previous events based on intuition. Based on this definition, creativity can be a sort of impetus for knowledge building; it can be, for example, an idea that gives rise to conscious and target-oriented knowledge building.

2.4.2. Organisational Renewal

In her doctoral thesis on organisational dynamic capabilities and renewal from the knowledge-based view, Aino Pöyhönen (2004) defines organisational renewal capability as the community's ability to control, repeat, develop and transform its intangible assets or knowledge and strategies in a way that supports the long-term strategy of the organisation and is in concordance with the environment. Renewal is a collective capability related to action and social activity. Pöyhönen (*ibid.*) stresses that organisational knowledge is interpersonal or intersubjective: it changes constantly in social interaction, and, therefore, it is more important to describe organisational social relationships than the knowledge of the entire organisation or its members as such. Social relationships and interaction sustain and transform organisational knowledge, which is necessary for organisational renewal. Renewal capability is, thus, an organisational characteristic which builds and constantly changes in interpersonal activities. Therefore, knowledge building between individuals can be considered the prerequisite, facilitator and sustainer of organisational renewal.

Organisational renewal capability is influenced by how the organisation manages to generate new, meaningful knowledge by integrating existing knowledge and internal knowledge development into new external knowledge (Stähle et al. 2002). Competitive organisations renew themselves by balancing between the past and the future: they are able to combine their previous experiences and knowledge with their current functions to benefit their future. Allowing the development of new practices, these organisations base their operations on continuity. (Ibid., Tsoukas 1996.)

Organisational renewal, thus, requires new knowledge from outside the organisation. Wesley M. Cohen and Daniel A. Levinthal (1990) call the organisational ability to utilise new knowledge as the absorptive capacity which is built upon noticing new knowledge, understanding its value or use, adopting it and applying it to processes. The organisational capacity to absorb external knowledge is enhanced by internal diversity or the different knowledgeable and experiential backgrounds of employees. Different individuals understand things differently and examine them from different perspectives which increases the organisation's opportunities to absorb new knowledge (ibid.). Moreover, the absorptive capacity can be improved by transferring new knowledge within the organisation or making it available to as many as possible. However, Cohen and Levinthal (ibid.) point out that experts in the organisation should be similar to the extent that they are able to communicate or share knowledge with each other: diversity can thus also be excessive (also Carlile 2002, Parviainen 2006).

One way to increase organisational absorptive capacity or acquire new knowledge and perspectives is to hire new employees (Cohen & Levinthal 1990, Brown & Duguid 1991), even though their orientation takes time and only after they have familiarised themselves with the setting are they able to understand which new knowledge is meaningful to the organisation. The more strongly the new knowledge is related to existing organisational knowledge, the more easily it can be applied; the less connected the new knowledge is to existing organisational knowledge, the more effortlessly it can be employed innovatively (Cohen & Levinthal 1990). In other words, the newer the employee is to the organisation, the more easily he or she uses knowledge differently than before because of not yet mastering all the existing organisational knowledge. On the other hand, it is more difficult to employ knowledge to benefit the organisation for the new employee than for the experienced one. He or she can unwittingly even utilise it harmfully.

Further defining Cohen and Levinthal's (1990) concept of organisational absorptive capacity, Shaker A. Zahra and Gerard George (2002) examine it from the perspective of dynamic capabilities, when Cohen and Levinthal (ibid.) base their notion on cognitive psychology. Zahra and George (ibid.) make a distinction between potential and realised capacity within the organisational absorptive capacity. Potential capacity is created when acquiring knowledge and merging it into the organisation, whereas realised capacity also entails transforming and utilising the knowledge in the organisation. Only reconfiguring and exploiting knowledge or realised absorptive capacity means that the organisation develops new knowledge based on absorbed knowledge. Organisations that are proficient in their potential capacity most likely sustain their competitiveness, whereas organisations that also master their realised capacity most likely create new competitive advantages for themselves. According to Zahra and George (ibid.), enhancing the organisation's transfer from potential to realised absorptive capacity, internal social interaction increases opportunities to share and transform knowledge.

One inherent feature in knowledge sharing between generations is that the organisation and its practices are generally new to the recipient of the knowledge, whereas the senders or transmitters usually have long careers behind them in the organisation. Knowledge recipients or new employees can, thus, promote new knowledge development because they see the organisation and its practices from a new angle, through outside eyes, and moreover bring new individual knowledge to the organisation which can be used in building new organisational knowledge. (Cohen & Levinthal 1990, Brown & Duguid 1991, Zahra & George 2002.) In knowledge sharing between generations, the age difference between the experienced employee and the novice is often rather notable which leads to an assumption that their knowledge, experiences and perspectives may vary quite a lot (DeLong 2004). This increases organisational diversity or improves opportunities for new knowledge development.

From the organisational perspective, new employees can, therefore, be seen as an opportunity to generate new, meaningful knowledge. Based on this, it is fair to assume that knowledge sharing between generations involves new knowledge building provided that employees consider knowledge building as necessary for their work (Carlile 2002, 2004). For the organisation, knowledge building may provide an opportunity for renewal or improved competitiveness when the knowledge built by individuals is spread throughout the organisation to those who need it (Tsoukas & Vladimirov 2001), the recipients understand the received knowledge and employ it in practice (Szulanski 2003).

As defined by Zahra and George (2002), knowledge transfer between generations is connected to potential absorptive capacity in which new knowledge is acquired and merged into the organisation without generating new knowledge. Hence, organisational competitiveness is sustained. Knowledge building, however, according to Zahra and George (*ibid.*) is the realised absorptive capacity in which new knowledge is employed or transformed and exploited in the organisation. Employing this new knowledge strengthens organisational competitiveness.

The literature on knowledge transfer between generations does not propose that knowledge transfer might involve knowledge building or organisational renewal but that its purpose is to retain knowledge in the organisation (DeLong 2004, Rothwell & Poduch 2004). Even though DeLong (2004) emphasises the importance of interaction in transferring knowledge, he does not mention knowledge development or building in connection with knowledge transfer. DeLong (*ibid.*; 86, 225) merely states that knowledge transfer and retention between generations should strategically focus on such knowledge that is important for future operations and competitiveness and leaves out the possibility that knowledge transfer between generations might generate new knowledge, considering knowledge retention as the particular goal in transfer efforts.

Knowledge sharing in expert work can be assumed to involve some degree of changing in knowledge because expertise builds by combining over time acquired formal knowledge and experiences (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Pyöriä et al. 2001). Expertise is, therefore, a gradually developing personal skill or understanding which is impossible to transfer from one person to another without changing it. As Widén-Wulff (2007; 171) posits, knowledge in expert work is a personal, not collective, resource. How, then, does this personal and individual expertise become common or collective organisational knowledge? According to Parviainen (2006), organisational knowledge generation models have not sufficiently analysed the individual perspective, that is, that of the expert or employee, and more specifically their interest in collective knowledge generation benefiting the entire organisation (*ibid.*; 164). For collective knowledge production to succeed, agents need to have a mutual problem and will to solve it, as well as a common background which is conducive to dialogue (also Cohen & Levinthal 1990, Carlile 2002). Currently, however, there is no full understanding of how collective knowledge generation works, how it can be improved and what kind of knowledge it may produce (Parviainen, 2006; 164). Marja Eriksson (2006), who studies the management of expert work, sees a scientific challenge in

analysing the mechanisms through which individual knowledge and expertise become organisational knowledge. As the most remarkable barriers to knowledge sharing, she considers shortcomings in the management, interaction and making people committed (ibid.; 124).

2.4.3. Summary

In this study I use the concept knowledge sharing between generations to describe such knowledge transfer between generations that involves interaction and that can entail knowledge building between generations. By knowledge building I mean target-oriented action between individuals in which they develop new knowledge. Knowledge building is based on organisational knowledge, individual knowledge and individuals' work-related knowledge needs.

Organisational renewal means here activity by which the community sustains and develops its capabilities and knowledge in a way that supports the organisation's long-term strategy and is in concordance with the environment. Organisational renewal is connected to knowledge, action and interaction; thus it builds and changes in social action. Interpersonal knowledge building is the prerequisite, enabler and sustainer of organisational renewal.

New organisational knowledge is generated in individuals' activities when they are using knowledge. This new knowledge is constructed upon integrating existing organisational knowledge and new knowledge corresponding to the situations and circumstances. Knowledge new to the organisation or the "building blocks of organisational knowledge" come to the organisation, for example, with the introduction of new members. The opportunities to benefit from this introduced knowledge are improved by the members' diversity and interaction.

New employees participating in the knowledge transfer between generations are, thus, bearers of new organisational knowledge which enables not only the transfer of knowledge but also its building. Transferring existing knowledge means retaining organisational knowledge as such and sustaining competitiveness, whereas new knowledge building can denote renewal and strengthened competitiveness to the organisation. Knowledge sharing between generations can involve knowledge building provided that employees consider it

necessary for their work. For the organisation, this knowledge building provides an opportunity for renewal if the knowledge built by individuals is spread throughout the organisation so that the members understand the received knowledge and apply it to practice.

2.5. Summary: Theoretical Framework

In this study I apply the knowledge-based research approach to organisation and knowledge management. (Figure 3 illustrates the theoretical framework of the study.) According to this view, organisational competitiveness is built upon sustaining, generating and innovative combining of not only knowledge but also functions and routines (Kogut & Zander 1992, Grant 1996). Organisational knowledge is constructed in practical situations and interaction (Tsoukas & Mylonopoulos 2004).

Knowledge in the organisation is divided into mutual organisational knowledge and individual knowledge (Tsoukas & Vladimirou 2001) of which organisational knowledge is made up of theoretical and explicit rules and instructions which are generally prepared by the management based on their goals. Individual knowledge in the organisation, on the other hand, is made up of individuals' dispositions, external social expectations and the changing interactive situations in which they use knowledge in the organisation. Organisational knowledge is theoretical and formal, whereas individual knowledge is practical and heuristic and generating new knowledge. (Ibid.)

General and abstract by nature and not as such applicable to organisational members' concrete work practices, the rules and instructions related to organisational knowledge have to be adapted to suit the individual practices of work and its changing situations. Thus, organisational knowledge realises in social practices when individuals use knowledge in their work (Figure 3) (Brown & Duguid 1991, Wenger 1998, Tsoukas & Vladimirou 2001, Spender 2006). Organisational rules are, therefore, interpreted and implemented in social practices in which members give them shared meanings and apply them in practice (ibid., Carlile 2002, 2004).

In this study I examine knowledge transfer as a continuous, work-related process based on interaction. This using or handling of knowledge is called knowledge sharing (Widén-Wulff

2007) (Figure 3). I consider knowledge transferred only when the recipient has received, understood and employed it in practice. Hence, making the knowledge accessible to the recipient is not yet knowledge transfer. (Davenport & Prusak 1998, Szulanski 2003.)

In this study I use the concept knowledge sharing between generations to describe such knowledge transfer between generations that involves interaction and that can entail knowledge building between generations. By knowledge building (Figure 3) I refer to interpersonal activity the goal of which is to produce new knowledge (Bereiter 2002, Carlile 2002, 2004). Existing organisational knowledge and individual knowledge new to the organisation are the building blocks of knowledge. Knowledge building is essential in using and sharing knowledge because the mere acquisition of existing or retained organisational knowledge without further developing or building it can lead to the knowledge proving futile in a specific situation and remaining unused (Carlile & Rebentisch 2003). The possibility of building knowledge underlies the different individual interpretations and understandings related to using and sharing knowledge: when knowledge is seen as socially constructed and transforming, individuals in co-operation can build knowledge new to the organisation from their varied understandings and knowledge bases (Brown & Duguid 1991, Carlile 2002, 2004).

By organisational renewal (Figure 3) I refer here to activity by which the community sustains and develops its capabilities and knowledge in a way that supports the organisation's long-term strategy and is in concordance with the environment. Competitive organisations renew themselves by balancing between the past and the future: they are able to combine their previous experiences and knowledge with their current functions to benefit their future. Allowing the development of new practices, these organisations base their operations on continuity. (Tsoukas 1996, Stähle et al. 2002.) Organisational renewal is linked to practice and interaction: it is an organisational characteristic which builds upon and constantly changes in interpersonal activity (Pöyhönen 2004). Therefore, interpersonal knowledge building is the prerequisite, enabler and sustainer of organisational renewal.

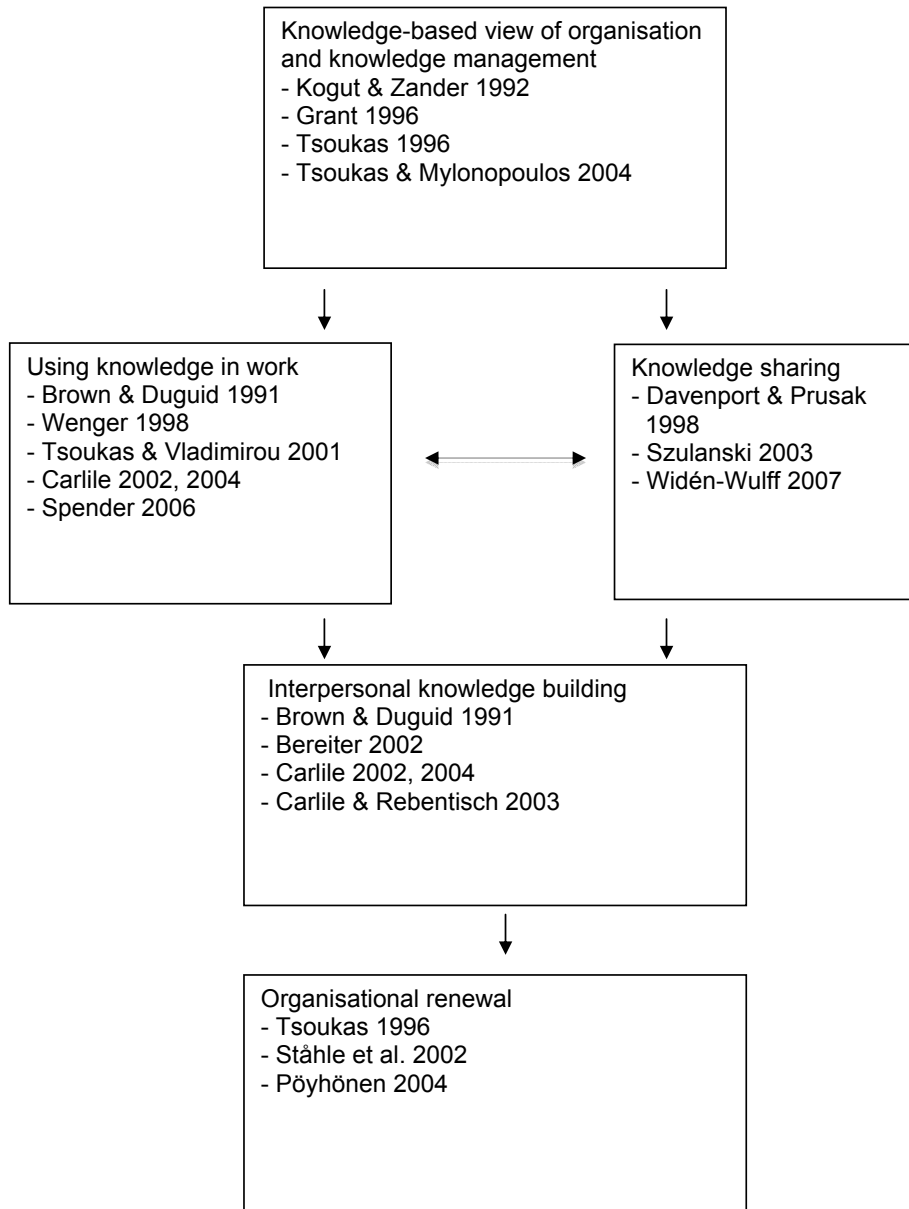


Figure 3. Theoretical framework of the study.

3. Empirical Research

3.1. Methodology

In scientific research, methodology is constructed on the researcher's philosophical knowledge concepts. In other words, methodology uses the researcher's ontological and epistemological concepts to outline the research strategy and choose the research methods. (Guba & Lincoln 1994, Keso et al. 2006, Eriksson & Kovalainen 2008.) Ontology is understanding what (knowledge) exists in the world: what the interpersonal social relations and the existence of societies are based on, and how they are formed and transformed (Eriksson & Kovalainen 2008). In scientific study, epistemology defines the criteria for research knowledge by describing what relevant knowledge is available, what arguments can be put forward about it and how more possible knowledge can be generated (ibid., Guba & Lincoln 1994, Keso et al. 2006).

3.1.1. Constructionism

In this study I base the research philosophy on constructionism. Underlying it is social constructionism, a sociological theory of knowledge, according to which social reality is constructed and constantly changing in interaction among people (Berger & Luckmann 1994). Social reality refers here, for example, to social institutions and the related roles, as well as traditions, rituals and habits transferred from one generation to the next. The immaterial phenomena being constructed socially among individuals are, thus, the object of constructionist scientific research. The phenomenon being studied is socially formed and, therefore, socially defined realities are central in the study. (Alvesson & Sköldberg 2009.)

The knowledge concept in the constructionist view is fundamentally subjectivistic and ontologically relativist (ibid.). Relativism means that knowledge is always intertwined in individuals, as well as their interpretations responding to time and place, and that no knowledge is independent of interpretation (Gergen 1998, 2009). From the epistemological perspective this implies that the researcher's task is to interpret the meanings that study subjects assign to the phenomenon being studied and, thus, to aim to understand the

phenomenon. Since the researcher unavoidably also makes his or her own interpretation of the phenomenon, the result of the study is created in combining these interpretations. (Ibid.)

Even though regarding knowledge as subjectivistic, constructionism sees social reality being constructed as the result of interpersonal or social interaction. For this reason, language is in an important role in constructionist studies: it enables interpersonal communication, transfers meanings and, further, creates and sustains social reality. (Alvesson & Sköldbberg 2009.) Scientific research based on constructionism aims to ascertain meanings that the individuals being studied together attribute to the phenomenon by using language and by interpreting these free of assumptions of what is “correct” or generally accepted (Burr 1998, Gergen 2009). According to constructionists, relativism as the basis of scientific research means that the researcher questions the existing truths or knowledge structures found to be objective. The aim of research is, therefore, the freshness of interpretation and argumentation. (Ibid.)

Constructivism is a research philosophical view, close to constructionism by its ontological and epistemological premises (Keso et al. 2006). However, what distinguishes constructivism from constructionism is that it does not focus on the socially constructed meanings and the social reality they form, but on the attributions of meaning and interpretations related to the reality of the subjects or individuals. In constructivist research, the researcher tries to gain as clear an understanding as possible of the reality of the particular individual or the study subject as he or she finds and experiences it. The researcher ascertains the study subjects’ own understanding and conception of the phenomenon being studied, as well as describes it in detail. (Guba & Lincoln 1994, Keso et al. 2006.)

“Opposite” the science philosophical view adopted in this study, constructionism, lies positivism (e.g. Eriksson & Kovalainen 2008, Alvesson & Sköldbberg 2009). Its knowledge concept is fundamentally objectivistic, and its ontology is based on realism or naïve realism. Positivism argues that there is one objective truth independent of time and place which conforms to the law of causality. From the epistemological point of view this means that the researcher collects and organises existing data by subjecting it to objective observation and measurement. (Guba & Lincoln 1994, Alvesson & Sköldbberg 2009.)

Critical realism is a research philosophical view, the ideas of which are located “between” positivism and constructionism (Bhaskar 1998, Alvesson & Sköldbberg 2009). The knowledge concept of critical realism is fundamentally objectivistic, as in positivism, but it questions how

perfectly individuals can understand or explain their surrounding reality. From the epistemological point of view this implies that the researcher's personal conceptions and views hamper his or her opportunities to completely objectively describe and present the phenomenon being studied. (Guba & Lincoln 1994, Alvesson & Sköldberg 2009.) Like constructionism, critical realism considers the social constructions created by individuals as real and, therefore, as possible research objects. Contrary to constructionism, however, critical realism argues that these constructions are objective phenomena, the deep structures of which, as well as the mechanisms affecting their emergence and continuation, that is, social phenomena, can be studied objectively. Positivism and critical realism, therefore, maintain that the philosophical foundation in both the natural and social sciences can be identical. (Alvesson & Sköldberg 2009.) Constructionist scientific research, such as this study, however, examines phenomena being socially constructed between subjects or individuals that are not material or objectively measurable. The phenomenon being studied is socially formed and, therefore, socially defined realities are central in the study. (Ibid.)

Underlying constructionism, social constructionism is a comprehensive theory on the sociology of knowledge which, according to Mats Alvesson and Kaj Sköldberg (2009), can be applied to scientific research from four perspectives: the critical, social, epistemological and ontological. Of these perspectives, the first one, the critical variant, is the "mildest" and the fourth one, the ontological variant, the "strongest" conception of social constructionism. The first or the critical perspective considers reality to be partly socially constructed through the attribution of meanings, the second or the social theory sees that society is partly produced by shared assigning of meanings, the third or the epistemological theory argues that knowledge is socially constructed, and the fourth or the ontological theory regards reality to be constructed socially. (Ibid., 35.)

Social constructionism has been criticised, for example, for regarding it to be self-evident that individuals and their subjective meanings to phenomena create and sustain a collective reality that has been held objective (Alvesson & Sköldberg 2009). However, social constructionism does not explain how individuals' subjective meanings create the collective reality. In scientific research this may lead to the researcher focusing only on the individuals being studied and investigating how they construct their social reality. Thus, the researcher may forget theory not only as the starting point of the study, but also as its goal, acting against the fundamental aim of scientific research. (Ibid.)

In this study, my object is the phenomenon being socially formed between the study subjects, that is, knowledge sharing between generations. My objective is to ascertain what meanings the individuals participating in the study attach to the phenomenon and, further, how they perceive and implement it. Adopting the classification of social constructionism I described above, I apply its “mildest” perspective: I consider the reality to be partly socially constructed through the meanings people endow it with (Alvesson & Sköldbberg 2009). From this perspective, therefore, the individuals studied and the researcher also have the kind of (shared) knowledge and reality not dependent upon individuals’ social attribution of meanings. Applying the critical perspective, I aim to take into account the criticism Alvesson and Sköldbberg (2009) levelled at social constructionism I described above. The critical perspective helps to utilise and develop theory as part of the study because the perspective outlines that all the relevant knowledge is not created in the study subjects’ attribution of meanings but part of this knowledge exists regardless. Hence, for example, scientific theories comprise part of the knowledge by which the researcher can describe, understand and explain the phenomenon being studied.

There was no previous scientific research directly related to the topic of this study, knowledge transfer and possible knowledge building between generations. Therefore, I decided to approach the subject from the perspective of those participating in the study and adopt their views as the starting point to initiate myself into the phenomenon studied. This, of course, required analysing and understanding the participants’ conceptions and experiences. At the onset of the study, I could not have presented myself to the participants as an expert on the research topic concerning them and, for example, asked relevant interview questions on the topic. At first, my idea of the topic was mainly based on a lay understanding, and the study subjects possessed more knowledge and experience on the topic—after all they were applying knowledge transfer between generations in their work.

The research philosophical approach of this study and its related aims are aptly described by the view of Haridimos Tsoukas and Christian Knudsen (2003) referring to organisation theory research as practical social activity: because the object of organisation theory, the organisation, is a social community, also the relation between the researcher and the object of the study needs to be a social one (*ibid.*; 8). Developing and generating scientific knowledge is practical activity through which the researcher tries to understand what goes on in the subject community. Therefore, Tsoukas and Knudsen acknowledge the growing significance of organisational agents’ experiences and conceptions in the field of organisation

studies and maintain that they should not be discarded as unscientific. "Such questions purport to explain organizations in a substantive way by embracing the complexity of the issues involved, rather than abstracting them away for the sake of analytical rigor" (ibid.; 11). According to Tsoukas and Knudsen (ibid.), instead of describing organisational operations and defining their laws, organisation studies should aim to generate a hermeneutical model of the organisation. That is, research should produce descriptions and explanations of organisational phenomena, which build upon the meanings and conceptual schemes of those studied, that is, the organisational agents.

3.1.2. Organisational Ethnography

The scientific research strategy adopted here is ethnography, the roots of which are in anthropology. Its aim is to understand foreign cultures, their operation and practices from the perspectives and experiences of their members (e.g. Malinowski 1999, van Maanen 1995, Hammersley & Atkinson 2004). The commercial application of ethnography is called organisational ethnography which focuses on examining how people understand and experience their daily activities and the related situations in the work environment and studies the behaviour, functions and associated meanings of the members of organisations. (van Maanen 1979; 540, Rosen 1991; 12, Schwartzman 1993).

Launched in the 1930s in the United States, the ethnographic research strategy applied to organisations at the time introduced the existence of informal work organisations in companies and their effects on business (Schwartzman 1993; 26-27). Gaining more popularity as a research method in organisation theory in the 1980s and the 1990s, ethnography has been applied when studying, for example, work and its methods in information technology (ibid.) (e.g. Gregory 1983, Kunda 1992, Barley 1996, Orr 1996, Vehviläinen 1997) and the relationship between knowledge and work (e.g. Carlile 2002, 2004, Carlile & Reberntisch 2003).

An ethnographer and organisation studies expert, Helen B. Schwartzman (1993) draws an analogy between society and organisational ethnography by stating that ethnography is a research strategy that aims to understand and explain how individuals and groups build societies or organisations in their everyday interaction. Ethnography can link individual interaction or micro-level activities with macro-level structures both in society and the

organisation, because its goal is to comprehend how practices create and reconfigure institutional structures. (Ibid.; 4.)

Organisational ethnography, thus, focuses on studying organisational members' interaction and practices, that is, work which is seen to influence the formation and function of the entire organisation—when organisational features and activity concurrently influence individual activities. In the current study I address knowledge transfer between generations and the possible building of knowledge between individuals in the context of work. This research strategy predominantly focusing on individuals took shape when I decided to take the views and practical activities of the study subjects as the starting point, instead of organisational processes and the goals and functions of the management. This was because the subject company had no plans or terms of reference concerning the phenomenon being studied, that is, knowledge transfer between generations. Some individuals were merely given a task to transfer knowledge between themselves. Thus, it was only those assigned to the task who knew what takes place when transferring knowledge and what knowledge was transferred. When there was also a lack of previous scientific evidence on the topic, a natural starting point was to elucidate the participants' conceptions. The particular research strategy was chosen because my background is in sociology and social psychology and so I find human activities to be both an interesting strategic perspective and a fitting research approach.

Organisations and their operation differ from society and its activities, which brings certain specific features to organisational ethnography (Rosen 1991). Organisations are part of society, so their culture is not entirely their "own" or independent but partly the same as that of the societies in which they operate. It follows that ethnographers studying organisations generally do not come from a completely different culture than their study subject—as in anthropological ethnography. Therefore, theory plays a central role in organisational ethnography: it is a tool "used to strip down the cultural blinkers" to rid oneself of cultural conceptions or prejudices and to "see" the object being studied, becoming conscious of the culture (ibid.; 13).

When conducting the study, throughout the first data analysis I understood that the phenomenon I was examining was succession in the company. This was because the company uses this term when referring to knowledge transfer between generations and I had to adopt it if I wanted to ascertain and understand what the term meant and also what was its purpose and meaning in the company. Based on my lay understanding, I also assumed that

the term is scientifically valid in describing the phenomenon being studied. Having familiarised myself with the theoretical literature after the first data analysis, I realised that the company was “transferring knowledge between generations” which in scientific terminology is not the same as “succession” which refers to transferring ownership or entrepreneurship from one generation to another (Rothwell & Poduch 2004, Giambatista & Rowe 2005, Hautala 2006). Adopting Rosen’s (1991; 13) idiom, studying the theory made me “see” by giving me a new perspective to replace the one I had unquestionably assumed from my study subjects: “succession” in the mutual culture shared by me and the study subjects and by my lay understanding was not considered succession in the scientific literature, but something else.

Not only the similar cultural background of the subject organisation and the researcher, but also data collection distinguishes organisational ethnography from anthropological ethnography in which data is collected in the field when the researcher acquires a pool of data as vast and versatile as possible by spending long periods in the target culture observing, interviewing and working with it. The aim is to create an intimate and personal relationship with the members of the culture and thus “enter” their culture. (Malinowski 1999; 1-25, van Maanen 1995; 6.) In organisational ethnography, however, data collection is normally relatively brief. In practice “fieldwork” in organisational ethnography means that the researcher works in the subject company or is in some other way intensely involved in it to get as comprehensive a picture of its operation as possible, to understand it and to easily discuss with its members “in their language”. (Rosen 1991; 15, Eriksson & Kovalainen 2008; 141). Many ethnographers believe, however, that the researcher should not try to become a full member of the subject group (Eriksson & Kovalainen 2008; 146). Martyn Hammersley and Paul Atkinson (2003; 115), among others, point out that the researcher should not be at home in the group he or she is studying but retain a social and intellectual distance without which the critical and analytical perspective is lost and analysing group dynamics is no longer possible.

I acquainted myself with the subject company in 2000, and our co-operation started when I began editing the company’s public relations and communications material and continued, with the exception of a few short breaks, until 2006 when I started collecting the study data and my role in the company changed from a collaboration partner to a researcher. Before collecting data, I, therefore, had had a client relationship with the subject company for approximately five years. The period that can be considered fieldwork was relatively long, during which I had developed a relaxed relationship with the company management. My work

in the company, however, cannot be considered to be actual data collection because I did not know at the time that the company would be the subject of my later studies.

According to the ethnographer and organisation researcher Michael Rosen (1991), organisational ethnography, based on social constructionism (Berger & Luckmann 1994), studies how people adapt and guide their concrete actions by endowing things and phenomena with meanings. Practical actions and the world of meanings, thus, have to be integrated, and, therefore, organisational ethnography explores how meanings are created and reconfigured in the collective action and social interaction of organisational members. (Rosen 1991; 6.) The focus of organisational ethnography is in the meaning, and the researcher's task is to describe and analyse the action of those being studied through the meaning they assign to it. To identify the subjects' perspective requires an active or thick description of the phenomenon which refers to integrating activity and the related meaning instead of merely presenting or describing it. (Ibid.; 7.) Therefore, besides presenting and describing activity, a thick description also involves understanding it from the subjects' perspective. A thick description is not enough, however, but a diagnosis is needed stating the researcher's observations, conception and explanation of the phenomenon studied. To understand social action, the researcher, therefore, needs to first realise the interpretations of those participating in the action, that is, the study subjects, and then, based on these, to construct his or her own interpretation. (Ibid.; 8.)

In this study I have two aims, following Rosen (1991): firstly, to identify and understand the conceptions and meanings of those participating in the study related to the phenomenon being investigated and, secondly, to explain the phenomenon through these persons' interpretations and meanings. In this study, both of these aims were met: on the one hand, the findings of the first analysis, that is, the thematic analysis is the researcher's description of what the interviewees tell about the phenomenon being studied; on the other, the interpretation from the second analysis, created by the articulation method, integrates the meanings interviewees assigned to the phenomenon (Rosen's first aim), and finally, in the third analysis the phenomenon is endowed with the researcher's own explanation (Rosen's second aim) (Figures 4 and 5).

This study represents the inductive dimension of ethnography based on social constructionism. Inductive research begins because of mere interest in the phenomenon, and the proper research problem is only formulated in the course of the study. (Eriksson ja

Kovalainen 2008; 142). I began researching out of a general interest in the company known to me and its ongoing transfer of knowledge between generations. So I had no structured theoretical hypotheses about the subject phenomenon nor a detailed research question. Based on my theoretical pre-understanding and the background interview with the company's managing director (May 17, 2006), I nevertheless thought that knowledge transfer between generations could involve building new knowledge. This helped in formulating the interview themes (Appendix 3) and the first issue questions (Figure 4).

During the research, my knowledge and understanding of the phenomenon increased, at first, with the participant interviews and their analyses and, later, through exploring theory. With gradually constructing and clarifying the theoretical framework, the research questions also evolved. Pertti Alasuutari (2007; 216) purports that qualitative research cannot be merely making observations and findings but it must answer at least one why question. The progress of this study (Figure 4) can be aptly illustrated by Alasuutari's elaboration on the question why: "Individual questions why are formulated only when describing the data... The data spawns new learning and ascertaining previously unknown knowledge about the subject, ...which leads to such why questions which would have been unimaginable to the researcher prior to examining the data and the phenomenon studied." (ibid.; 217, the quote translated from a Finnish source) In this study I was able to ask why only at the beginning of the third phase of analysis, having completed the thematic analysis and arrived at an interpretation by the articulation method (Figure 4). During these first two analyses, my knowledge and understanding of the subject phenomenon increased and deepened which led to not only identifying the question why but also answering it.

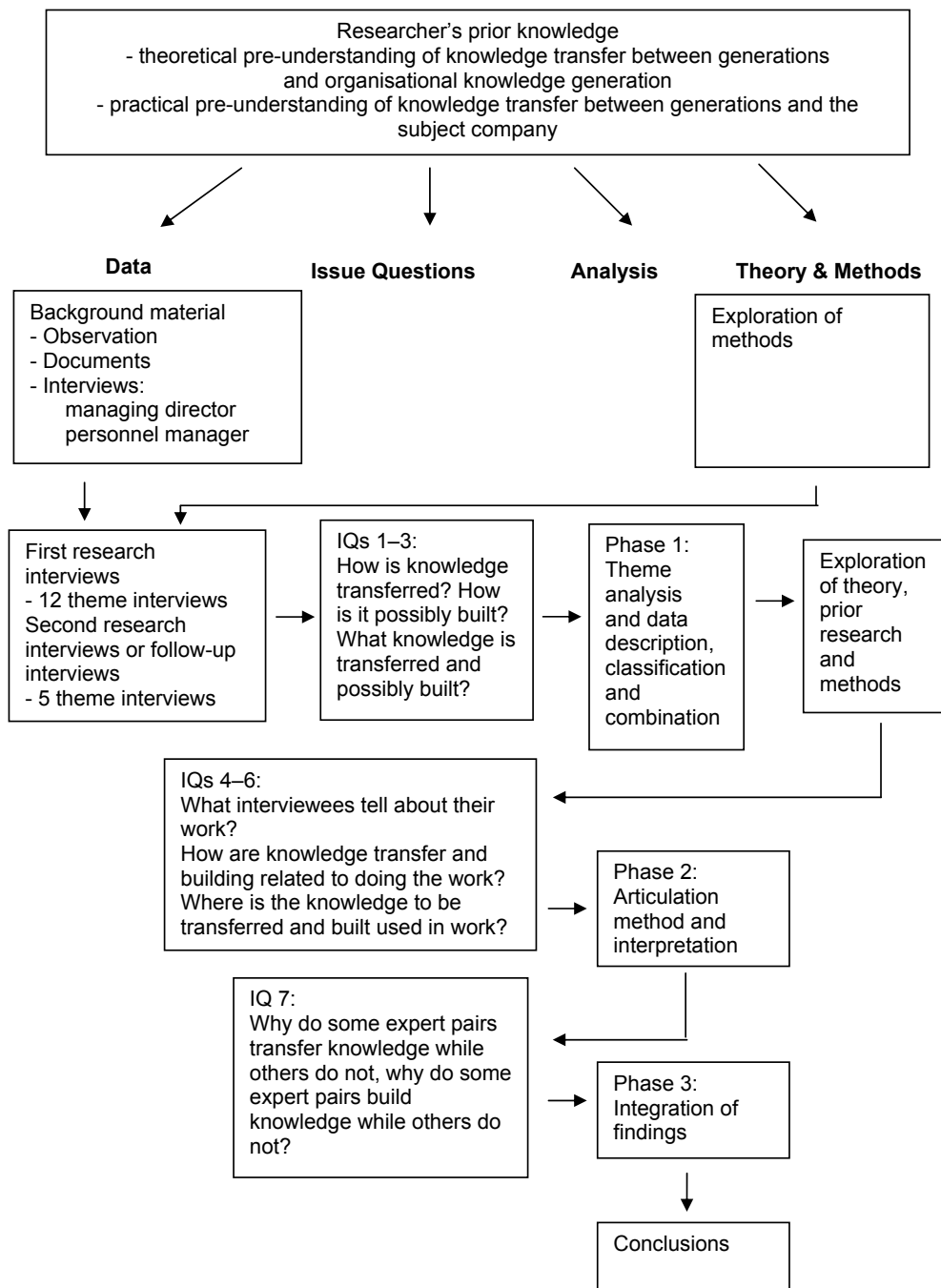


Figure 4. Research process.

3.1.3. Thematic Analysis and Articulation Method

Thematic Analysis

The first phase of data analysis in this study comprised a thematic analysis, following the suggestions of Sirkka Hirsjärvi and Helena Hurme (2004). I collected the primary data in theme interviews, because as a semi-structured collection method it suits studies in which there is only little prior scientific knowledge on the phenomenon being investigated and when the researcher wishes to avoid leading the interviewees with too formulated questions and, instead, to reveal the interviewees' perception of the phenomenon. It was important for me, however, that the themes I considered relevant for this study would come up in each interview which would, thus, create a comprehensive whole that namely relates to the phenomenon being studied. Consequently, I did not perform completely open interviews. (Ibid.; 48.)

The data analysis based on thematic analysis here comprises describing, classifying and combining the data (Hirsjärvi & Hurme 2004; 145-150). Data analysis proceeds through its three phases as elucidated below:

1. Familiarising oneself with the material and organising it based on the outline of the interview is a logical way to start the thematic analysis. This produces a description of data which maps the interviewees' perceptions of the phenomenon being studied and the related issues and events. (Ibid.; 145.)

2. When classifying data, interviewees' perceptions and issues and events related to the phenomenon, revealed during data description, are compared. There is no straight answer or strict rules about formulating the criteria for classification; instead, classes can be based on, for example, the data, research problem, theoretical models or the researcher's intuition. (Ibid.; 148.)

3. The resulting classes are linked when combining data. Its goal is to identify regularities or similarities between the occurrences of classes based on which they can be either combined or separated. The researcher's "own understanding" or "reasoning" is the starting point for this combining process, and the aim is to develop a theoretical perspective or model that can accommodate the classified data. (Ibid.; 149-150.)

Articulation Method

The second phase of data analysis in this study is the interpretation of data which is searching for meanings, bringing out the social meanings of the subject phenomenon from the researcher's interpretive explanations and thus guiding to see things and events comprehensively. The aim of interpretation is to gain a deeper and more theoretical understanding of the phenomenon studied than during data description and classification. (Hirsjärvi & Hurme 2004; 151-152.) In qualitative research, however, interpretation is conducted throughout the study (ibid., Alasuutari 2007; 24, Alvesson & Sköldböck 2009) when, related to the analysis, it can be considered the researcher's holistic, interpretive explanation of the subject phenomenon (Hirsjärvi & Hurme 2004; 152).

In the interpretation of data I apply in this study the concept of articulation and the theory and method based on it. Based on social constructionism, articulation is an ethnographic research method applied in social cultural studies (Hall 1997, Uotinen 2005) which provides a framework for understanding culture and a strategy for conducting cultural research. Articulation offers a theory to understand how social phenomena are formed. (Slack 1996; 112.)

In cultural studies, articulation means interconnecting or linking detached concepts and phenomena. The emergence and utilisation of the concept has been strongly influenced by the cultural researcher Stuart Hall (1992, 1997) who bases his definition on the ideas of Ernesto Laclau (1977). Hall defines articulation as "linking together particular ideas, discourses and practices which under certain terms can make two elements a unified whole. This link, however, is not constantly indispensable, unconditional and essential." (Hall 1992; 368.) Adapting this definition, articulation is also seen as "a practice in which elements that do not necessarily have a previous relationship are connected" (Grossberg 1995; 269). Here, I describe how the articulation or interconnecting of work and the knowledge being transferred defines knowledge transfer between generations.

Ernesto Laclau (1997) was a pioneer in his efforts to formulate an explicit articulation theory by theorising articulation in relation to political practices. His premise was that there are no indispensable links or connections between the concepts of language. Scientifically this means that the analysis of a concrete situation or phenomenon comprises investigating or exploring complex and multifaceted links that are not mutually indispensable. Focusing scientific research on cultural contexts and understanding their meanings, articulation theory

makes it possible to examine how texts produced in a culture and their meanings are connected to contexts and how they both are articulated to cultural practices (Lehtonen 2004). In this study, the transcribed interviews are considered to be texts produced in a culture, and work is the context in which I explore knowledge transfer between generations. The cultural practice here is knowledge transfer between generations occurring in the subject company.

The articulation method or articulation as a research method means constructing, dismantling and reconfiguring signifying practices through articulations. "The researcher aims to track how meanings emerge by exploring how cultural texts are connected or articulated to contexts and further to cultural practices" (Lehtonen 2004; 216, the quote translated from a Finnish source). Not merely a connection, articulation is also a process of dismantling and creating links which provides tools to describe and understand practices and the relations between their impacts, as well as their practical implications (ibid., Uotinen 2005; 47). In this study, the interviewees connect their knowledge transfer to the context of work or work practices; this connection or articulation influences how knowledge transfer is perceived and effected. In other words, knowledge transfer is given meaning or signified in connection with work, and this signifying determines the practice of knowledge transfer.

Exploring connections or articulations between phenomena, the articulation method examines not only their construction and transformation in discourse, but also their practical implications (Grossberg 1995, Hall 1997, Lehtonen 2004). Articulations are always formed in a situation, and using the method does not determine their "content". Therefore, the articulation method is a suitable foundation for multidisciplinary research (Slack 1996; 112-114, Grossberg 2000; 43-44). I chose articulation theory for my method of analysis because I wanted to understand how a person's work and how it is done are related to knowledge transfer: how they are interconnected, how this connection gives meaning to the transfer and, further, how this meaning steers the concrete transfer process.

In cultural studies the articulation method has been used, for example, in exploring racial questions (e.g. Hall 1992). Besides traditional cultural research, in Finland it has been adopted in studies on the introduction and use of information technologies (e.g. Uotinen 2005). The field of business economics, to the best of my knowledge, hosts one study conducted based on articulations in which Mary Anne Moffitt (1994) examines the business image of a company called State Farm Insurance and how it was created. The empirical data

of the study is based on 13 in-depth interviews. The findings show that the messages created or directly controlled by the company are not the primary factors in creating the image because people form their conceptions based not only on the company's target-oriented communications but also on their personal experiences and the social and historical events in their environment. (Ibid.) In her study, Moffitt draws an analogy between the concepts of corporate image and meaning. Subsequently, Karvonen (1997; 252) points out that Moffitt's results can be explained by the practice of signifying: people have individual realities, and, therefore, they endow things with different meanings in different contexts and under different practices. Hence, they all form a different image of the company.

The articulation method tries to understand and explore how things and phenomena are attached with meanings, that is, their articulative signifying practices. Johanna Uotinen (2005; 50, the quotes translated from a Finnish source) identifies three features of the signifying process:

1. Constructiveness

"All signifying is active (inter)personal activity in the framework of cultural and social processes."

2. Contextuality

"The given meanings are not definite or permanent, rather they are reconfigured and adapted in changing situations."

3. Articulatedness

"New meanings are produced by connecting previously separate things, meanings and phenomena in a way that is relevant in the particular situation."

The instruments of articulative signification, representation and discourse concern narrative which is the central means to produce meanings: things and phenomena are attached with meaning when narrated to others. (Lehtonen 2004, Uotinen 2005.) In representation, the members of the culture produce and exchange meanings through language. Meanings are, therefore, not complete and permanent elements of phenomena, rather they are created by representing and presenting them in the signifying processes. (Hall 1997.) Producing meanings involves interpretation because people interpret the same phenomenon differently or endow it with slightly different meanings. As a result, the meaning is in constant transition or it "slides". (Ibid.; 32-33.)

Articulations are always bound to contexts: meanings assigned through articulation cannot be detached from their social and cultural reality even in research (Grossberg 1995). When

using the articulation method, it is imperative to identify the contexts because the researcher can only understand the meaning of things and events in relation to the context: without the context and interpretation within it, meanings are reduced to mere descriptions of the content (Uotinen 2005). Contexts are not permanent and immutable which makes them difficult to access from the research point of view. They are created, at least partly, in the signifying processes not only of those being studied, but also of the researcher. The processes find support in the context but also transform and produce them (Lehtonen 2004). Hence, the researcher cannot determine or choose the context at the beginning of the study, rather it evolves and manifests itself only in the course of research (Grossberg 1995).

Meanings are, therefore, always produced in a context which are again constructed in different discourses generated in a particular situation, location and history. In connection with representations, discourses are defined as contexts of interpretation in which things are articulated into or connected in certain ways to certain systems. Therefore, they steer signification: meanings and signifying practices are created and realised in discourse. In other words, meanings and the available ways of expression are dependent upon the particular discourse in use which defines who can say what and how in a certain situation, as well as what cannot be said. (Grossberg 1995, Uotinen 2005.)

In articulation theory the concept of discourse is the object of research—it is not a methodical tool as, for example, in discourse analysis—and its definition suggests that signifying is inherent in language. However, contrary to “language” which seems to connote to a static entity or state of affairs, “discourse” entails a notion of action. (Lehtonen 2004; 69.) Meanings are never abstract because they are generated in discourse which is social, historical and institutional. The concept of discourse refers not only to the processes of interaction in which meanings are produced, but also to their outcome. (Ibid.) Discourse, like context, is not available as something “complete” in the data set; rather researchers have to formulate their data into discourse. In other words, “people do not consciously apply discourse, rather it has to be actively identified from the data. Discourse is thus linguistic systems located outside individuals” (Uotinen 2005; 52, the quote translated from a Finnish source).

In this study the application of the articulation method is based on close reading which Uotinen (2005) defines as the way of analysing data by reading it through repeatedly which meets the above-mentioned requirements about the constructive, context-bound and articulative nature of the signifying of data (ibid.; 97). In practice, close reading requires that

"the data is read through so many times that it is possible to construct justified classification and understandings as well as explanatory and insightful interpretations about the subject's social and cultural contexts" (ibid.; 98, the quote translated from a Finnish source). There is, thus, no precise definition as to how many times or how the data should be subjected to close reading. Here the process of close reading was completed when I had found a factor in the classified data that explains the phenomenon studied, that is, knowledge transfer and possible building between generations.

3.2. Data and Its Collection

3.2.1. Subject Company

The company of this study designs and manufactures electrical equipment and systems. Established in 1957, it is the sole operator in Finland in its field and 90% of its production is exported. In the global market it has three major competitors. Its global competitiveness and success are based on knowledge and know-how which has been built over decades by its experts and which should now be transferred to the next generation. The turnover of this limited liability company was approximately €51 million in 2006 with 270 employees.

The company is undergoing a "succession" as they call the subject phenomenon of this study, that is, knowledge sharing between generations. It refers to *"transferring the tacit knowledge of experts soon to retire to their successors, because the company won't succeed in the future without the knowledge"* (managing director's interview May 17, 2006). The management has chosen six key experts or "seniors" among those retiring and assigned each a successor or a "junior" to whom the senior is to transfer knowledge necessary for the work. (Inverted commas denote concepts used in the company; in the following I shall refer to experienced key experts as seniors and their successors as juniors.) None of those taking part in the "succession" are part of the management group, and so the "succession" does not involve company management but rather employees who have expert duties in R&D and production planning, as well as management duties in sales and manufacture.

Seniors and juniors have received haphazard guidance about how to carry out the "succession" and no common terms of reference exist—neither is there a schedule or formal follow-up. The managing director stated that *"this is typical of us: when we are in a hurry and notice a need, we do something about it straight away"* (May 17, 2006). Each senior–junior

pair, therefore, can freely effect the "succession" and define what knowledge is transferred and how. Notwithstanding the lack of systematic follow-up procedures, the managing director has, through his personal contacts and discussions, his own view of how the "succession" is proceeding, just as the pairs also have their own view of how each other is advancing. The situation is most likely influenced by the non-hierarchical form of organisation which entails "*a lot of informal conversation and too little systematic documentation*" (managing director May 17, 2006).

3.2.2. Research Data

The primary research data comprises interviews with 12 expert-duty employees involved in knowledge transfer between generations. The follow-up interviews consist of interviews with five "beginner experts" conducting knowledge transfer. The background data includes interviews with the managing director and the personnel manager, as well as written documents and observation. In the course of the study I presented its primary results to the managing director to get comments from the practical perspective. I shall refer to these two interviews as comment interviews. Furthermore, I kept a research journal for approximately two years. Appendix 1 shows the entire set of data, which is presented below in its order of collection.

Observation

In the spring 2006, before starting the research, I had had a five-year client relationship with the subject company. As an editor, I had prepared the company's PR material. My knowledge and pre-understanding of the study subject had, therefore, accrued over a relatively long time (Rosen 1991; 15, Eriksson & Kovalainen 2008; 141). The company seemed progressive: the management was trying to change the company's slow, rigid methods to make the organisation run more smoothly and efficiently. This could be partly explained by their business goals, that is, expanding the international market and achieving economic growth.

Of the personnel, I was best acquainted with the managing director, sales director and executive secretary with whom I planned the projects I had been commissioned to do and

handled practical matters. When editing the PR material, I also met many other staff in connection with conducting interviews and gathering background information. I learnt about company operation on a tour of the plant and informally during occasional lunches at the cafeteria. Given free access, I became familiar with the premises; for example, when coming to a meeting, I did not have to wait at the reception but was allowed to go to the person by myself. Our co-operation became smooth and open, and I believe I gained the management's trust. Due to our successful relationship, I was later easily accepted into the company as a researcher (Silverman 2005; 255, Eriksson & Kovalainen 2008; 141).

My work with the company before launching the study can be considered ethnographic fieldwork or observation (Rosen 1991; 15, Eriksson & Kovalainen 2008; 140-141), even though I did not know at the time that I would be applying my experiences to research. If that had been the case, I would have paid attention to different things and undoubtedly have kept a field journal which would have made my observations more acute and comprehensive than is possible after the fact. On the other hand, as a "mere" researcher, without a natural practical connection to the company's operation, I might have not been accepted as easily as in the capacity of an editor and told things that I learnt as an editor (*ibid.*). For practical reasons my research observation period could not have lasted as long as it had when working with the company.

Documents

I began collating written material on the subject company in April 2006, "re-acquainting" myself with the company, because I had previously read company archival documents five years ago at the onset of our collaboration. Now I explored the documents as a researcher, which made them site documents in ethnographic research (Eriksson & Kovalainen 2008; 147). I could access the material easily and swiftly, thanks to the executive secretary. We spent many moments in the dusty archive in the company's basement. I collated the following documents: company archives since 1977 which mainly include the minutes from the meetings of the Board of Directors and the Management Group and media texts; the annual results from work ability assessments conducted with personnel since 1994; Annual Reports (published since 2000); product brochures; the most recent issues of customer magazines (the texts of which were partly written by me) and personnel bulletins (from 2005–2006); Human Resources Strategy for 2006 and Terms of Reference. I also studied the

company's web site and the intranet even though the executive secretary told that information is mainly disseminated to personnel on the bulletin boards and not through the intranet. In 2007 the company celebrated its golden jubilee and published a book which I included in my background documents.

I examined the collected documents in April–May 2006 before conducting any research interviews. The documents gave me general company-specific information about its history and management changes, its economic development, its foundation and goals, the organisational structure, personnel (demography, turnover), workplace atmosphere and employees' opinions about the management. Moreover, a half-day tour of the plant with the personnel manager introduced me to their products and the different phases of their manufacture. A remarkable addition to the tour of the facilities conducted five years earlier was the new plant, which had been built next to the old plant as a response to the need for more capacity, inaugurated in December 2005. The products and production methods of the new plant are based on the expertise that was at the time being transferred from the generation about to retire to the next one.

Background Interviews

I started gathering background data on the subject of my research, which was referred to as "succession", at the company by interviewing both the managing director and the sales director since there was no written material available about the process. I considered this initial orientation to the subject matter necessary (Rosen 1991; 15, Eriksson & Kovalainen 2008; 141) because I wanted to begin the study with an understanding of what "succession" refers to and means in this particular company and not, for example, as a theoretical concept.

I conducted one interview with the personnel manager, in May 2006, and two with the managing director, in May and June of 2006. The personnel manager shared general matters on human resources management, such as the strategic goals and principles of personnel policy, orientation of new recruits, personnel development and internal communications. Closely connected to my topic was that the company saw the skills of their employees as their critical resource, which is not surprising since the company is the sole operator in the Finnish market with only three major competitors worldwide. The interviews with the managing director concentrated on the company's general situation and operation as well as the "succession" itself. I recorded all three interviews so that I could go back to them in the course of the study.

Theme Interviews: Research and Follow-up Interviews

I collected the primary research data in semi-structured interviews or theme interviews which do not pose direct questions to the interviewees, but rather encourage conversation in which they can tell about the subject phenomenon in their own words (Hirsjärvi & Hurme 2004; 48). This, however, does not mean that the researcher has no influence on the course of the interview and its results. Ethnographic studies are always conducted in interaction, in which the researcher influences the study subjects and subsequently also the formulation of data. The researcher is, therefore, not collecting “complete data” but participates in generating or creating material for the study (Hammersley & Atkinson 2003, Coffey & Atkinson 1996), since his or her interpretations influence the data: the researcher, for example, steers the interview as to what the subjects talk about and how (ibid.).

The outlines of the theme interviews (Appendix 3) were quite detailed in their content and included a relatively wide subject area for two reasons. Firstly, my theoretical knowledge of the phenomenon being studied was limited. Secondly, I wanted to pursue what the interviewees themselves mean by “succession” and how they carry it out, and I could not know what things they would relate to it. My aim was to draft the interview outlines into as comprehensive “check lists” as possible so that not a single point would be missed. On the other hand, their content was based on my own conceptions about the company and its “succession”, so it would be quite possible that the interviewees would also talk about issues other than those expected based on my themed outlines.

There were 12 interviewees in the study since there were six senior–junior pairs participating in the knowledge transfer in the company. Five of the juniors have Master’s degrees in technical sciences and one is a graduate from a vocational institute. Three of the juniors have been employed with the company for a relatively long time, 4–18 years, whereas the other three have been with the company for approximately 1.5 years. Employed by the company for 31–44 years, the seniors have varying educational backgrounds. At the time of the research interviews in summer 2006, the pairs had been transferring knowledge for about a year. All those involved in the succession were men: they were employed in expert duties in R&D and production planning, as well as in management duties in sales and manufacture. At the time of the research interviews in 2006, two of the seniors were in part-time retirement, and during the follow-up interviews in 2007, one of the seniors had retired.

I collected the primary research data in theme interviews with 12 individuals involved in succession in June–August 2006 by interviewing first the senior and then the junior of each pair. This way I could remember the seniors' and juniors' accounts "as pairs". I decided to interview the senior first, because it was likely that the seniors could tell more about the knowledge to be transferred: what the knowledge is, how it has evolved and what its significance is in work and the entire company.

I arranged the interview date with each interviewee beforehand by phone. I had already sent them an e-mail informing them of the study (Appendix 2), since the ethic code in ethnography requires openness toward the study subjects, entitling them to know in what kind of research they are participating and why (Hammersley & Atkinson 2003; 264). The managing director also undersigned the e-mail with his encouragement to participate. The purpose of this signature from the company's gatekeeper (*ibid.*; 135) was to ensure that all those involved in the knowledge transfer take part in the study. None of them declined, but it is impossible to say how much influence the managing director's advice to participate had.

I normally performed one interview per day; only once did I interview two persons. The pace was hence not too rapid, which gave me the opportunity to return to each interview fresh from the session going over my notes, as well as complementing and specifying them by checking points I considered relevant or interesting from the recording. The interviews were conducted in a leisurely fashion which was most likely due to it being summer and the relaxed work pace. Some interviewees indicated that this was why the time was particularly suitable for them.

The follow-up interviews I performed in June–August 2007 when I interviewed again five of the six juniors participating in the study to explore how the "succession" had proceeded in a year. This time I contacted the interviewees personally by phone and set the date for the interview. Based on the first round of interviews and their analysis it had become evident that the juniors' role in knowledge transfer and, in particular, the further employment of the transferred knowledge is undoubtedly more important than that of the seniors which is why I did not include the seniors in the second round. Based on the first round of interviews, one of the juniors had not attempted to transfer knowledge with his senior, and, therefore, no knowledge had been transferred. As I approached this junior after a year, he stated that there was nothing new to tell about the situation, and since the managing director and personnel manager agreed, I excluded him from the interviews.

There were altogether 17 interviews: in summer 2006 I conducted 12 interviews and in summer 2007 5 interviews. All were performed during work hours on the company's premises, and varied from one to one and a half hours. I recorded them and made notes during the sessions. All the interviews were transcribed by a professional.

Comment Interviews

Having completed the analyses of both the first and second phase, I presented their findings to the company's managing director to elicit comments and insights about their practical veracity and credibility. The managing director, furthermore, commented on the findings of the third analysis and the entire research by e-mail. At that time (in May 2010) he no longer worked with the company.

The purpose of the comment interviews was to confirm the plausibility and viability of the findings from the practical perspective. Therefore, I did not discuss with the managing director about his expectations concerning the study or his satisfaction with the findings because the study subjects cannot participate in the data analysis or influence the research results (Hammersley & Atkinson 2003; 231). Qualitative research can, however, use the subjects' views to verify the credibility of the study (Miles & Huberman 1994; 279, Eriksson & Kovalainen 2008; 293).

During the comment interviews with the managing director, my role in the company had changed from what it was at the beginning of the research process. When I started collating data in summer 2006 in the company, I was there in the capacity of a learner or a "collector and recipient of information" trying to investigate and comprehend what was taking place in the company's "succession" process. When I shared the first findings with the managing director in spring 2007, I was a researcher reporting the results of her study and giving him scientific knowledge he found interesting. In both roles, however, I was the initiator of interaction: in the former I gravitated toward the sources of information actively seeking and probing for knowledge, whereas in the latter I arranged a meeting with the managing director because I wanted to inform him about my findings and hear his opinion. My second role was more equal to the head of the company than the first one, balancing my first unequal role even though with a gap of one year. When collecting data, I only accepted and received knowledge without giving anything in return, whereas when commenting on the results or in

the role of the researcher, I “returned” the knowledge analysed and thus gave the managing director information he wanted.

Research Journal

I kept a research journal from August 2006 until May 2008, that is, throughout the collection of data and the first and second phases of analysis. Not a field journal, it does not describe or analyse what I have learnt and experienced in the interviews and generally in the subject company (Eriksson & Kovalainen 2008; 148). These types of accounts I have included in my interview notes. The journal entails contemplation on why I have paid attention to certain things and then ended up describing and examining them or how I have reached certain conclusions in analyses. It, thus, includes reflection in order to clarify the course of the study and the influencing factors. In ethnography, as in qualitative research in general, reflection plays an important role in interpreting and verifying the study subjects’ meanings (Hammersley & Atkinson 2003; 21, Eskola & Suoranta 2008; 148, Alvesson & Sköldbberg 2009). Nevertheless, it has to be excluded from describing and analysing data (Eriksson & Kovalainen 2008; 148), which is why keeping a log to track one’s own interpretations and their motives made my research easier. At best, my reflection in the journal led me to look at the data in new ways in the course of the study, finding new perspectives and methods of analysis; at worst, however, they showed that I had erred in applying “wrong” methods or following my own assumptions.

3.3. Analysis Process

Before the data analysis I listened to all the 12 recorded interviews from the first round conducted in summer 2006 twice, making notes not only about the content of the speech, but also about the stresses, breaks, clearing one’s throat and other elements of expression that seemed to have meaning in the speech. I went over the recordings, because I wanted to recall what the first interviews were about; conducting the interviews took about three months, and when I got to the end of the last session, I had already forgotten some details about the first one. I listened to the recordings twice because I wanted to paint a picture of each interviewee and roughly remember what each of them talked about. When analysing the transcribed material, my goal was not to get lost in the abundance of text but to keep the data concrete or bound to practical situations and specific to persons.

With the five follow-up interviews conducted in summer 2007 I proceeded in the same way as the research interviews.

3.3.1. Phase 1: Thematic Analysis

I began data analysis with the thematic analysis (Figures 4 and 5) which sought to answer the main research question and issue questions concerning sub-question 1:

IQ 1. How do a retiring expert employee and the successor transfer knowledge between themselves?

IQ 2. Does the knowledge transfer lead to building new knowledge and how?

IQ 3. What kind of knowledge is transferred and possibly built?

Describing Data

Before conducting the actual analysis, I studied the transcribed material by reading all 12 interviews in the primary data set and making spontaneous notes on them. The proper analysis began by organising the data into themes in which I used the Atlas.ti software to locate all the remarks and descriptions about the phenomenon studied. These sections, thus, pertained either to the knowledge, its content and shape or to the knowledge transfer or building between the senior and the junior. I further organised these discoveries in a notebook. The result was a description of data which maps the interviewees' perceptions of the phenomenon studied and the related issues and events. (Hirsjärvi & Hurme 2004; 145.) This analysis gave me insight into what the interviewees mean or understand by "succession" and what issues they bring forward in connection with it, revealing the factors related to knowledge transfer.

Classifying Data

Having prepared descriptions of the data, I started classifying the material by comparing and then grouping the things and events brought forward in the description phase. The starting point of classification was, thus, the interviewees' perceptions of knowledge transfer and the things and events connected to it identified during the description. The criteria for classes

were built partly based on the data and partly on the three first issue questions mentioned above. Only the classification of knowledge dimensions is based on theory. (Hirsjärvi & Hurme 2004; 148.) At this point I no longer used the Atlas.ti program. I found it increased the work load because it required removing the items, culled from the data, from their original context. Using a notebook I could group material more rapidly without losing these connections, that is, the interviews and their sections, from which the text items located into different groups had been originally extracted. Maintaining the connections throughout the analysis was imperative, firstly, because I explored knowledge transfer in pairs and had to keep the juniors and seniors “together” in the analysis. Secondly, knowing the connections facilitated defining the classes and the classification itself: it was easier to distinguish between concepts, issues and events when the situation described in a particular interview or its section was clear. The classification of data produced a structured view of the transferred knowledge, its intertwining into work tasks and its dimensions, as well as the means of the transfer.

Combining Data

Having classified the data, I began combining it. I applied typification which links cases based on their mutual characteristics (Hirsjärvi & Hurme 2004; 174). It involved comparing the interviewees' descriptions about knowledge transfer and building and identified the methods of transfer, as well as the double dichotomy describing them. The descriptions about the contents of these methods have been culled from the interviews. Therefore, I did not apply a theoretical model or framework when building the double dichotomy.

At the end of combining the data, the phases of knowledge transfer and building took shape when I integrated the interviewees' accounts. They represent a simplified combination of events connected to the transfer and building of knowledge in the interviewees' speech. The phases were, thus, formed based on the interviewees' descriptions and linking them. Moreover, how the phases are presented and the related concepts are based on the data.

Combining the data in this way produced the methods of knowledge transfer and building, as well as the phases illustrating them. I did this without technical aids, using pen and paper, based on the notes from data classification and the original transcribed interviews. I began combining by studying the notes taken while classifying the data. When I found descriptions

related to knowledge transfer or building, I returned to the original material to ascertain what kind of events they specifically concerned. Then I identified the type of method and how it can be connected to explain the phases of knowledge transfer and building. When formulating the descriptions of the phases of knowledge transfer and building, it was imperative to ascertain the chronology of events from the original data because it is, of course, impossible to present the sequence of phases without knowing the original timeline.

Thematic analysis began in October 2006 and ended in April 2007. In autumn 2007, I also analysed the data from the follow-up interviews, conducted in summer 2007, in the manner described above. By describing, classifying and combining the data from the follow-up interviews I sought answers to follow-up interview issue questions (FIQ) pertaining to the third research sub-question:

FIQ 1. How have knowledge transfer and possible building between the senior and the junior changed since the previous interview?

FIQ 2. How have the knowledge transfer and possible building progressed; has the junior perhaps become an expert?

Comparing the findings from the thematic analysis was the basis for the first analysis of the follow-up interviews: I compared how each interviewee described and perceived knowledge transfer and building both in the first interview in summer 2006 and the second one in summer 2007. Using transcriptions from the original interviews in the comparisons, I produced notes on how the knowledge transfer and/or building had progressed and changed for each junior. The notes, thus, comprised five descriptions or accounts of how knowledge transfer and building transform over time and how the novice gradually becomes an expert. Since there were only five interviewees and they all had become familiar to me in the first round of interviews and their analysis, it was easy to keep each interviewee's background (e.g. circumstances related to knowledge transfer and job content) in mind during the analysis of the follow-up interviews. However, it is possible that the impression I had formed of the interviewees during the analysis of the first interviews affected not only the follow-up interviews, but also their analysis. This possibility, nevertheless, cannot be excluded or its effects eliminated because in qualitative research the researcher does not collect complete data but rather influences the generation of data (Coffey & Atkinson 1996, Hammersley & Atkinson 2003).

3.3.2. Phase 2: Articulation Method

After the first phase of analysis, that is, the thematic analysis I was not completely satisfied with the findings because they remained at the level of content analysis: I described, classified and combined data without accomplishing interpretation. In constructionist research, however, the researcher must be able to create a personal interpretation of the phenomenon being studied, that is, to reach “beyond” the narrative, apparent meaning and explanation of those participating in the study (e.g. Rosen 1991; 8, Alasuutari 2007; 25). For this reason the findings from the thematic analysis took me to theoretical and methodological literature (Figure 4) for new perspectives and methods to get me “deeper” into the data. The doctoral thesis of Johanna Uotinen (2005) gave me methodological support to examine the interviews from the perspective of articulation.

The analysis based on the articulation method can be characterised as re-arranging the interview data. During the analysis I no longer analysed the interviewees' accounts that were explicitly or literally related to the phenomenon studied. Instead, I began categorising them based on their content not knowing how the categories pertained to the phenomenon. Thus, I “re-arranged” the data, that is, the interviewees' speech. The premise for my articulative interpretation was the spoken narrative produced by the interviewees or the research interview data, of which I constructed my own interpretation steered by my goals and needs to understand the phenomenon.

The second phase of analysis, thus, took me beyond the apparent “succession” talk and deeper into the data to interpret the speech and at the same time to understand it from a new perspective. In the first phase of analysis I took to the accounts in which the interviewees shared explicitly and literally things related to the topic of the study, resulting in much knowledge, valuable and meaningful to the study, going unnoticed. When in the second phase of analysis I started analysing the interviewees' accounts “blindly” or as categories based on their content which had no clear or explicit links to the topic, I found talk in which the phenomenon is related to the context of work. In this talk, the interviewees give meanings to the phenomenon being studied which did not surface in the first analysis.

The analysis of the second phase is, thus, based on the articulation method, seeking to answer issue questions related to sub-question 2:

IQ 4. What do the interviewees tell about their work and working?

IQ 5. How are knowledge transfer and building related to the work?

IQ 6. Where is the knowledge being transferred and built needed and used in work?

Contexts in the Interviewees' Speech

I conducted the second analysis by close reading. I began by reading through all the texts from the 17 interviews, at the same time "culling" the points which mentioned either work or knowledge transfer, that is, the subject phenomenon of this study. As I was reading, I noticed that the interviewees divided into two groups based on how they talked about their work, and I separated these different types of "work narrative". I also noticed that there was relatively little talk about knowledge transfer outside the "work narrative". This talk of knowledge transfer was related to the entire company and its operation and, therefore, I concluded it to be "company narrative" in which knowledge transfer was articulated or connected to the company. Close reading, thus, gradually produced a "gamut" of three contexts, that is, the context of the company and two different work-related contexts, quite concretely because I marked the contexts using different coloured markers in the interview texts. Not all the interviewees' speech is included in these three contexts but some is left out.

During close reading I went over the interviews numerous times. I read through not only one interview at a time but also in tandem to ensure that the contexts culled from different interviews "corresponded" to each other. In other words, I wanted to make sure that the interviewees really talk in three "mutual" contexts.

Themes in the Interviewees' Speech

Uotinen (2005) adopts the concept of theme when referring to subjective narrative sections in the text. A study subject's text or speech comprises many interlocking themes that are, therefore, not chronological or logical sets but they have to be "read out" from the texts. Themes are not necessarily context-bound. Having identified three contexts in the data, that is, the context of the company and two contexts of work, I began searching for themes, as described by Uotinen (*ibid.*), through close reading. At first I looked for remarks or descriptions referring to "knowledge" and themes being constructed on them for two reasons.

The first reason was that just browsing through the interview material made it clear that it included much discourse on “knowledge” even though it was referred to in many different ways. The second reason is also an explanation for the proliferation of “knowledge” in the data: “knowledge” is related to the topic of the study, that is, knowledge transfer.

When looking for knowledge themes, I made notes of all the points referring to knowledge in the interview texts even if they did not explicitly include the word “knowledge” (e.g. “...there are these laws of physics that there’s some viscosity and then the temperature... it’s more like combining many different things and gaining insights...”). Then, I categorised all the references to knowledge according to the context based on whether knowledge occurs as an explicit fact, implicit and work task-related or tacit or as a general company-related description, or whether it is a question of retaining or acquiring knowledge. By further combining these categories, I formed altogether six knowledge-related themes which I named based on their contents. The context of company came to include two knowledge themes (Table 10, Themes 1 and 2) and the contexts of work three themes (Table 11, Theme Group 2) the contents of which vary depending on which context of work is referred to.

The sixth knowledge theme identified in the data was partly related to each of the three contexts. I called this theme the availability of knowledge based on its content. I combined its references to the retention or acquisition of knowledge into three groups or topics which I later named based on their contents (Table 14).

Having formulated the themes related to knowledge, I began studying more closely what and how each interviewee speaks about their work, looking for themes connected to work in the data. Now I made notes on all the points related to work in the interview texts. I categorised these references to work according to the context, first, as to whether they were about the content of the work and work tasks, methods or working, the targets of work or the meaning of work both to the interviewee and the company. By further integrating these categories, I formulated two themes describing the character of the work (Table 11, Theme Group 1) the contents of which vary based on which context of work is referred to.

When looking for references to knowledge in the contexts of work, I noticed that the beginner experts also talk about knowledge transfer in the contexts of work; this, of course, became apparent in the references to knowledge that talked about knowledge transfer. I extracted these references from other references to knowledge related to the contexts of work and

categorised them into independent themes. First, I grouped them context-specifically based on whether they referred to knowledge being transferred and its employment or the event of knowledge transfer. By further combining these groups, I formulated four themes describing knowledge transfer in the contexts of work (Table 13) the contents of which vary based on which context of work is referred to.

The context of company, thus, came to include two knowledge themes. In addition, the context includes narrative which describes the significance of knowledge transfer for the company. I culled these references from the data and they formed directly, with no combining of references, the third theme in the context of company (Table 10).

At the onset of my study I had chosen a company employing expert workers as its context simply because my intention was to explore the phenomenon of the study in an expert organisation. During the analysis based on the articulation method, however, this context selected beforehand proved to be too abstract or "distant" for the interviewees when considering knowledge transfer and what it signified, whereas work and working seemed to be closely connected to the reality in which knowledge is being transferred. Therefore, in the course of the study its context became work besides the company, that is, the interviewees signified knowledge transfer by articulating it to their own work. Having decided the context at the beginning of my study, in the course of the analysis I nevertheless had to admit that it was "inadequate" when the data "revealed" a context in which I could interpret the interviewees' accounts related to the phenomenon being studied. As Grossberg (1995) states, a researcher applying the articulation method cannot decide beforehand on the context of the study, rather it evolves or reveals itself in the process.

The interpretation of data generated altogether 13 themes, of which 6 relate to knowledge, 4 to knowledge transfer, 2 to work and 1 to significance of knowledge transfer. During the analysis it became evident that the contents of these themes are partly interconnected. They are, thus, partly "overlapping" or referring to the same things in the interviewees' accounts. However, the perspective on the content of the theme or its interpretation is different based on the context. For example, knowledge being transferred is described differently whether in the context of company or work (Figure 10).

The analysis based on the articulation method produced themes without presuppositions as "discoveries from the data". Thus, they were not constructed on the interview themes as in

the thematic analysis (Hirsjärvi & Hurme 2004) but on what the interviewees tell about the knowledge being transferred, the transfer of knowledge and their work, as well as on how they articulate or connect these (Uotinen 2005). The concept of theme, therefore, refers to different things in the thematic analysis and the interpretation based on the articulation method.

Discourses in the Interviewees' Speech

When building the themes and making comparisons between the thematic contents of the three contexts, I identified the different discourses in the interviewees' speech. The thematic contents of the context of the company is very "thin" or declaratory, emphasising the overall significance of knowledge transfer in the company. In this context the interviewees present knowledge transfer in a positive light. The contexts of work, however, also include negative matters related to knowledge transfer, and in these contexts the interviewees also admit its failure. I, therefore, deduced that the contexts of the company and work are part of different discourse, because if all three contexts were part of the same discourse, telling about knowledge transfer within them would be guided by the same rules, for example, as to what things are talked about and what not or in what light things are presented (Grossberg 1995, Uotinen 2005).

I started the second phase of analysis in January 2008 and concluded it in May 2008. It also includes a comparison of interpretations made of the juniors or the beginner experts' first interviews (2006) and follow-up interviews (2007) based on the articulation method. With it I sought to answer the follow-up interview issue question related to sub-questions 2 and 3:

FIQ 3. How has each interviewees' speech on work and the related knowledge transfer and building changed in a year?

In this second comparison of the juniors' interviews I compared the findings from the articulation method, that is, the interpretation of each interviewee's first and second interview, to ascertain whether the interviewees spoke in the same contexts of work and of the same themes in both interviews; in other words, whether their accounts of work and the related knowledge transfer and/or building has remained similar or not.

3.3.3. Phase 3: Linking the Findings

As a result from the first phase of analysis, the thematic analysis, data was described, categorised and combined. I ascertained what factors are related to knowledge transfer, what the knowledge being transferred is, how knowledge is transferred, by what methods it is transferred and built, as well as what phases the transfer and building include. The second phase of analysis based on the articulation method yielded interpretation of the data. It revealed the contexts and themes of the interviewees' accounts which led to insights into how beginner experts signify and implement knowledge transfer and building as part of their work, that is, in the context of their work. In the third phase of analysis I created linkages between the findings from the first two phases. (Figures 4 and 5.)

By connecting the findings from the first two phases of analysis I sought to answer the main research question, as well as an issue question related to research sub-question 2:

IQ 7. Why do some experienced–beginner expert pairs transfer knowledge while others do not; why do some experienced–beginner expert pairs build knowledge while others do not?

The third phase of analysis seeks to explain the findings from the thematic analysis with those achieved by the articulation method by creating a connection between the methods and phases of knowledge transfer and building, and in which context of work and how each beginner expert talks about knowledge transfer and building. This connection was also made with follow-up interviews. The contexts of work and interpretation of the beginner experts' knowledge transfer in these contexts, formulated in the second phase of analysis, thus, make it possible to explain how knowledge transfer and building is realised between the experienced expert and the beginner.

In the third analysis I returned to the original data to check what each beginner expert had shared in the first analysis about the methods and phases of knowledge transfer and building. I then linked these accounts and statements from each beginner to the context of work in which he talks about his work in the second analysis and the related knowledge transfer and/or building.

I began the third phase of analysis in August 2008 and completed it in November the same year. With the three phases, the complete analysis took altogether about two years, that is,

from October 2006 until November 2008. Figure 5 illustrates the analysis process with the timeline.

Phase 1 (October 2006 – April 2007)

Thematic analysis:
describing, classifying and combining data.

Issue question:

IQ 1. How do a retiring expert employee and the successor transfer knowledge between themselves?

IQ 2. Does the knowledge transfer lead to building new knowledge and how?

IQ 3. What kind of knowledge is transferred and possibly built?

Findings: factors of transfer, knowledge being transferred, means of transfer and methods and phases of transfer and building.

Other: comparing findings from research and follow-up interviews, in autumn 2007 (FIQs 1 and 2).



Phase 2 (January 2008 – May 2008)

Articulation method:
interpreting data.

Issue questions:

IQ 4. What do the interviewees tell about their work and working?

IQ 5. How are knowledge transfer and building related to the work?

IQ 6. Where is the knowledge being transferred and built needed and used in work?

Findings: contexts and themes in the interviewees' speech, signifying knowledge transfer and building in the context of work.

Other: comparing findings from research and follow-up interviews, in autumn 2008 (FIQ 3).



Phase 3 (August 2008 – November 2008)

Linking findings:
examining the findings from the first-phase thematic analysis in the light of those made through the second-phase articulation method.

Issue question:

IQ 7. Why do some experienced–beginner expert pairs transfer knowledge while others do not; why do some experienced–beginner expert pairs build knowledge while others do not?

Findings: explaining how knowledge transfer and building or knowledge sharing is realised in the context of work.

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3.4. Research Evaluation

Assessing the validity of qualitative research can be based on four criteria which are (i) credibility, (ii) transferability, (iii) dependability and (iv) confirmability (Miles & Huberman 1994; 278-279, Eriksson & Kovalainen 2008; 294). These criteria are applied here because they are well suited to evaluating an ethnographic study based on constructionism (Eriksson & Kovalainen 2008; 296). Ethnographers interpret their data in the light of their current perception and understanding, and, therefore, these interpretations and the research results they yield cannot be stated to be finally or absolutely correct. Connecting to the data, explaining the phenomenon being studied credibly and enabling readers to draw their own inferences of the phenomenon create the value of the results in this type of research. (Rosen 2004; 281.)

(i) The credibility of the study concerns the believability and truthfulness of findings when assessed based on data; in other words, how believable it is to infer the results and conclusions presented in the study based on particular data. The criteria for evaluating credibility are, for example, whether the data is sufficient to make inferences, whether the linkages between observations and classifications are logically compelling and whether the participants in the study consider the inferences truthful. (Miles & Huberman 1994; 278, Eriksson & Kovalainen 2008; 294.)

The quantitative sufficiency of data is not crucial in the credibility of ethnographic research which considers details and uniqueness to be important as "normal" or frequent behaviour (Rosen 2004; 280). In this study, the number of interviewees was determined by a practical aspect: in the subject company 12 persons participated in knowledge transfer between generations. I could have enhanced the qualitative sufficiency of the study data by gathering a more detailed or "deeper" data set than here, for example, by participant observation. However, collecting and analysing a wider data set was impossible within the resources of this study.

In this study I try to make the linkages between the data and the related classifications transparent through examples from the interviewees' speech or direct quotations. Furthermore, in the table listing the dimensions of knowledge (Table 6), as well as those showing the findings from the articulation method (Tables 10, 11, 13 and 14) I present excerpts from the interviewees' speech to illustrate to the reader what kind of observations

the presented findings are based on. I shared all the results from the study with the company managing director to elicit his view of their validity and functionality. In his comments, the managing director acknowledged that the findings give a comprehensible and functional picture and explanation of the knowledge sharing between generations taking place in the company. I did not elicit the interviewees' comments on the findings, because I suspected that their perspective on the topic was too personal, that it would override their opportunity to examine the research results holistically or from the company's point of view. The truthfulness and believability of the findings should, however, be assessed based on the whole research and its goals and not from the personal views of the individuals taking part in the study (Hammersley & Atkinson 2003; 261, Eskola & Suoranta 2008; 211).

The credibility of the findings in this study can be considered enhanced because the data analysis was conducted with two different methods which yielded parallel results (Denzin 1989; 241, Flick 2005; 226). This two method application in getting confirmation for the results is called method triangulation (ibid.). However, the use of triangulation was not purposeful in this study, but rather an "accident" brought about by the two methods of analysis. As in qualitative research in general, the purpose of the second method of analysis was to complement the findings made with the first one, and not to increase the credibility of the study (Flick 2005; 227).

(ii) The transferability of the study assesses the significance of findings. The criteria of transferability include the similarity of findings with previous research results and their transferability to other research contexts. The prerequisite of transferability is that the study results and conclusions are sufficiently general to be applied to other contexts. (Miles & Huberman 1994; 279, Eriksson & Kovalainen 2008; 294.)

The topic of this study, that is, knowledge transfer and building between generations of organisational employees, to the best of my knowledge, has not been the subject of previous, directly related scientific studies (DeLong 2004, Rothwell 2007). However, it has been the focus of non-scientific studies, the results and insights of which I shall apply as source material in this study (DeLong 2004, Rothwell & Poduch 2004). DeLong (2004; 7) describes his own work as follows: "It is based on more than 200 original interviews in dozens of organizations around the world. The exploratory research reported here is broad-based and thoughtful, but it is not scientific."

Since no scientific literature directly related to this topic was available, I shall apply scientific theories and studies touching on the topic, in addition to the above-mentioned non-scientific references, as source material in this study. The results are congruent with these studies and theories touching on the topic and partly congruent with the non-scientific research results. Considering the methods and phases of knowledge sharing between generations and the factors and means of knowledge transfer, the results of this study are generalisations which are applicable to different types of work tasks and organisations. Moreover, the effects of interviewees' work-related knowledge needs and conducting the work on knowledge sharing between generations are most likely applicable to different work tasks. Considering the content of the knowledge being transferred, the results, nevertheless, clearly pertain to the company of this study and its expert work and are not transferable as such to other research contexts.

The criterion for evaluating (iii) the dependability of the study is that the study process be presented completely and comprehensibly (Miles & Huberman 1994; 278, Eriksson & Kovalainen 2008; 294). In this report I have striven for as detailed an account of the data and its collection as possible. When presenting the methods of analysis and their application, I have focused on the articulation method, because it is rarely used in business economics and organisation studies and, thus, less known than the other method, that is, thematic analysis. I have tried to describe the analysis process and its three phases as specifically as possible and by explaining my choices of methods. The study report summarises not only the entire study but also its analysis (Figures 4 and 5) so that readers would get a holistic idea of the multi-level study and its phasal development.

(iv) The confirmability of the study concerns its understandability and consistency. The criteria for evaluating confirmability presuppose, for example, that the observations and interpretations made from the data are linked to the data comprehensibly, the results are clearly connected to the theoretical study premises and research questions and inferences are logical based on the data. As I already stated about assessing credibility, this study aims to present as clearly as possible how the observations and interpretations are linked to the data by including direct quotations from the data, that is, the interviewees' speech in reporting the findings. Quotations are included not only as relatively extensive "stories" but also as short excerpts presented in tables. I have concluded the chapters presenting different fields of theory and result categories with summaries to give a concise account of the theoretical views and concepts relevant to this study, as well as the central findings so that readers find

it as effortless as possible to follow and understand the theoretical premises of this study, the results gained as well as their interconnections and drawing of conclusions.

Ethnographic research essentially involves ethical conduct toward the study participants and informants. International research organisations have moral codes, which also include guidelines about informants (ASA Code of Ethics, ISA Code of Ethics). In Finland the National Advisory Board on Research Ethics has issued guidelines for good scientific practice (1998). With informants, the main contribution of these codes and guidelines is that informants must be treated as independent, competent individuals and not as involuntary objects or means of research to help researchers to achieve their goals. Following and implementing ethical codes become manifest in researchers' attitudes toward their informants and how they treat them in practice. The moral treatment of informants can be divided into four segments which are the participants' (i) conscious consent to the study, (ii) confidentiality, (iii) anonymity and (iv) the consequences of the study (Suojanen 1996; 42-43, Hirsjärvi & Hurme 2004; 20, Uotinen 2005; 72).

Conscious consent (i) means that before launching the study the informants must decide whether to participate in the study, and this decision must be based on the information they have received about the objectives of the study and to what purpose the findings are meant to be used. Before beginning this study, I sent all the interviewees an e-mail (Appendix 2) in which I explained, for example, the purpose of the study, the role of the company in the study and who I intended to interview in the company. Then, I contacted all the interviewees by phone to arrange the date for the interviews. At this point I did not take their participation for granted, but asked each individual whether they wanted to take part in the study. No one declined.

Confidentiality (ii) includes conducting interviews in a "good atmosphere" by respecting the participants and the things and perceptions they share. In the study report, the direct quotations must not lead to unfavourable representations of the participants, and, therefore, unnecessary colloquialisms have been "cut". Spoken language may seem awkward or repetitive when written down, and thus redundancies and unnecessary connectives can be removed. (Suojanen 1996, Uotinen 2005; 73-74.) Confidentiality also requires that the study data be stored so as to be unavailable to outsiders and the possible transcriptions are made carefully—preferably word for word—so that the content of the interviews is not skewed during transcription.

In this study, I tried to be an equal and open conversation partner in the interviews instead of presenting myself as a researcher who controls the situation (Pekkala 2003; 95, Eriksson & Kovalainen 2008; 293). My aim was to get as much information on the phenomenon being studied as possible and from the interviewees' perspective. Against this background, it is understandable that I let them speak a lot and did not limit the topics—at least not before it became clear that the interviewee was about to deviate completely from the subject matter. In these situations I assumed the role of researcher or “director” to steer the conversation back on track. Some interviewees talked about this and that which makes the requirement of confidentiality even more understandable.

The data of this study has only been explored by the researcher and the transcriber, who took up the issue of data confidentiality even before I had the opportunity. The transcriber took confidentiality for granted and had been accustomed to assuming secrecy and diligence in storing the data which was also my advice concerning this study. The interviews were transcribed literally, and the original recordings were also stored carefully in the event that some parts would require checking, which was indeed the case during the analysis. In the study report, that is, this publication I have eliminated repetition and unnecessary connectives (like, you know) which, even though normal in speech, are awkward when reading from the direct quotations.

Anonymity (iii) means that the informants' names are not mentioned in the study. In spite of this, those acquainted with the informants may recognise their quotations from the report. The informants themselves naturally recognise their own words when reading them. In this study I do not cite the interviewees' or the subject company's names which makes it less likely that those outside the scope of this study recognise the sources of direct quotations. This would, however, be at least theoretically possible because those involved in knowledge transfer between generations in the subject company, that is, the interviewees of the study, are also known outside the company.

In this study I could not avoid the interviewees possibly recognising not only their own quotations, but also those of others from the report because all the interviewees know each other. It was also unavoidable that the company's other personnel recognise at least some of those cited. This can be seen from the comment interview with the managing director in which he states that *“it was not at all difficult to recognise who said what”* (May 17, 2010). Due to the participants' recognisability within the company, I do not state which senior–junior

pairs are the source of quotations presented in the report. I find it more essential, with regard to the findings, to mention whether the quotations were presented either by seniors or juniors because it sheds light on their knowledge sharing. If I identified both the pair and the source senior or junior, the reader could follow each interviewee's accounts throughout the report. This would remarkably increase the risk of revealing the participant's identity. Since my research goal was not to analyse and understand the interviewees as individuals but to paint a comprehensive picture of the phenomenon being studied, it was not imperative to individualise the interviewees' verbal accounts and, moreover, it would not have essentially enhanced the reader's chances of understanding my findings.

Researchers, of course, cannot foresee the consequences of their studies (iv) and their opportunities to influence them is limited. Therefore, it is in the best interest of the informants that their anonymity is protected and their representation in the study is not unfavourable or offensive (Suojanen 1996, Uotinen 2005; 76). In this study my aim has been to protect the interviewees' anonymity as well as possible. To my mind the study does not give an unfavourable or offensive representation of the interviewees, even though it is difficult to know or estimate what may offend people. This is why each interviewee has read his quotations included in this study report and given his permission for their anonymous publication. Based on this, it is a fair assumption that the quotations do not portray the interviewees unfavourably.

4. Knowledge Sharing between Generations in Expert Work

4.1. Knowledge Sharing: Transfer and Building

Reporting the research results from the thematic analysis, this chapter first describes knowledge transfer between generations and the related factors and then presents the knowledge being transferred and its dimensions. Next, I show the means of knowledge transfer as well as the methods of knowledge sharing, that is, knowledge transfer and building, and finally I describe the phases of knowledge sharing. This chapter also reports the results from the thematic analysis based on the follow-up interviews, in the light of which I describe how knowledge transfer and building, as well as the juniors' expertise, develops in 2006–2007.

4.1.1. Factors of Knowledge Transfer

This chapter illustrates what the interviewees understand by “succession” and what it means to them in practice. Moreover, I present four factors that are related to knowledge transfer between generations and in the light of these factors I report the results from the senior–junior pairs' knowledge transfer, that is, whether they transfer knowledge or not.

When the interviewees talk about *succession* (in reporting the results, all the direct quotations from the interviewees' speech appearing in the text are in italics), they mean knowledge transfer from experts, soon to retire, to other employees, who over time will continue the work of the retirees. In the subject company this knowledge transfer takes place in assigned senior–junior pairs.

For the seniors, knowledge transfer is important for the continuation of their life's work and to secure the success of the company relying on that work:

“It's quite natural to be transferring this knowledge. And honestly I wish that this thing would go on at full speed without any hiccups when I leave. After all this has been my life's work.”

The seniors also want to help and support the juniors. They have had to learn their jobs *the hard way*, and that is why they are willing to facilitate their successors' access to knowledge:

"It's an opportunity for the successor to receive ... that I know and can give, or the other individual can absorb and ask. In that sense this is a much better situation than the one I got into when I accepted the job. I spent two weeks with the previous employee, so that felt quite short. It was hard because there was no one to ask."

The seniors consider the young to be the future asset because they bring new, modern skills to the company. Managing information technology, in particular, has included deficiencies which the new employees are able to remedy. The seniors are also relieved that the young accept new tasks and assume the related responsibility:

"That too [the new simulation system] is so impressive that I've stayed away on purpose. Not that I wouldn't be interested but there's no denying that retirement hits me before I learn it, so I have to limit these new subject areas they're trying to jam in."

Even though the seniors are willing to pass on their tasks to their successors, they are nonetheless worried whether their skills are needed and respected when compared to those of the young. They are concerned about their own input's necessity having transferred the knowledge:

"If we think that this knowledge is left to some young guy, the older guy is sort of left out or can think that he's left high and dry. Is he really any use. The young always have better education and better capacity to take in knowledge. Development is forward and ultimately the young know more."

For the juniors, knowledge transfer is important because over time it makes independent and full employment in the company possible. The juniors want to follow in the footsteps of the experts they regard so highly, and to become as skilful at their work:

"In practice I know that X [a senior's name] has the kind of expertise I don't have but which I want...The goal is to kind of accelerate my development. Kind of absorbing things all the time so that I can stand more on my own two feet. So right now it's still adapting, because it's such a difficult field."

The interviewees identify four factors that influence their knowledge transfer in each pair. These factors are the senior and junior's mutual (i) interaction, (ii) external expectations of them, (iii) their personal dispositions and (iv) the circumstances of knowledge transfer (Figure

6). These factors partly explain, regardless of the positive attitude described above, why knowledge is not always transferred from the senior to the junior.

1. Interaction

The interviewees also call knowledge transfer between the senior and junior *mentoring*. Knowledge transfer is considered to be a task or activity between two individuals, the senior and the junior, in which the senior's role is to *teach, train* and *orient*, whereas the junior's role is to *learn, absorb, assimilate* and *understand*. Even though situations involving knowledge transfer do not always occur between the two individuals and even though the junior also receives work-related knowledge from other individuals, the seniors and juniors are particularly assigned pairs with a mutual task:

"X [a senior's name] is still the individual in whose footsteps I must follow."

"X [a senior's name] has a lot of knowledge and experience in particular, so it's of course a big loss to us that he's leaving. So we should get to transfer X's experience my way."

In the knowledge transfer within the senior–junior pairs, interaction is essential because written knowledge or *documented knowledge* is not enough to absorb conducting the work, but rather the transfer requires dialogue. One senior sums this up succinctly:

"There's no knowledge transfer without conversation. It's really quite difficult to get it all on paper."

One junior's perception of knowledge transfer also includes the demand for interaction:

"The problem is not if this is the right formula or it should be calculated like this. It's more like is this the right practice and so on. So it's more a question of help from experience. It's good to have someone that can explain the issue more closely. With formulas it's easy to look them up in some standards archives."

Because of their Master's degrees in technical sciences, the juniors have the necessary educational background in their future work. However, they do not have knowledge or experience of the products, production or clients, that is, how the academic theories are applied in practice in the company. The seniors know that the knowledge cannot be fully mastered without practical experience:

“You can always read a bit of theory if you like, but it’s only in practice and work when you learn and understand.”

“Everyone thinks things differently and combines them when they see something concrete. Actually the knowledge doesn’t exist before it’s created when you see something.”

The seniors have two conceptions of the reciprocity of knowledge transfer. Some consider the knowledge transfer to be their own unilateral task. They see that they need not or they cannot get any knowledge from the junior. Some, however, see the knowledge transfer with the junior to be a two-way relationship in which they also receive new knowledge. These seniors state that they have learnt *to use the computer, technical details and new perspectives and attitude* from the juniors. They furthermore state that *interaction with the junior is also beneficial to them:*

“Each time we have a discussion [with the junior], it feels like I always learn something... when I explain something to someone or discuss with someone how this thing is handled, it also becomes clear to me.”

Knowledge transfer between the senior and the junior, thus, presupposes a practice in which things and phenomena are observed and therefore understood. Intertwined in their mutual work, dialogue is maintained and fuelled by the junior’s questions which lead the senior to communicate things necessary to the junior. The interaction between the senior and the junior, that is, dialogue and working together, is thus an essential element in knowledge transfer.

2. Expectations

The company management has given the seniors and juniors haphazard or “loose” guidance about the knowledge transfer: there are no common or pair-specific plans, schedules or follow-up procedures. In unofficial conversations, the seniors’ task has been defined as transferring knowledge, considered important for the work, to their assigned juniors, whereas the juniors’ task is to receive this knowledge so that they are able to do the seniors’ work after the seniors retire. Therefore, management has not defined the knowledge to be transferred (Sub-chapter 4.1.1.).

It has been stressed to the juniors that not all the seniors' knowledge is necessarily currently relevant. Therefore, the juniors should not take what the seniors say as the "only truth", but they can try to develop the knowledge received:

"The management says and claims that it's not really necessary to learn all the old stuff, that we have to know what to pick, that this may be a bit out-dated. Or of course we can learn it but then try to develop it and apply something new."

"The supervisor especially has stressed that we must try to find our own angles and solutions to things."

Based on the guidance given to the juniors, the company management, thus, knows or at least assumes that part of the seniors' knowledge may be unnecessary or outdated and that the juniors may be able to build new knowledge while they are absorbing existing knowledge in the company (Sub-chapter 4.1.4.).

The juniors are concerned whether they can meet the company's expectations. They want to absorb knowledge from the seniors, but *other stuff* takes time from the knowledge transfer:

"We haven't had time to really get to it [the knowledge transfer]. I've had so much other stuff going on that my training is in quite a bad way. If we put more effort into it, it would be possible to transfer enough knowledge so that I'd manage and get started until my own experience will carry. But in practice this pace is not enough, there's too little time to learn this stuff."

"It's [the knowledge transfer] interesting and really nice but when I should all at once know a hundred things, it's kind of frustrating, it's impossible, there's no way I can learn and absorb everything on time."

The company's expectations regarding the juniors are, thus, not met due to the hectic pace of the work—at least not sufficiently or easily. This is why the juniors are afraid that they cannot absorb enough knowledge before the seniors' retirement, whereas the seniors are concerned with the juniors' increasing work load as they absorb new knowledge which continuously eats into the time for the knowledge transfer:

"The new guy, he has to absorb a lot, so that the time you'd like to dedicate to the knowledge transfer, it's less and less, because there's always new tasks when he's learnt something new."

"The problem seems to be that X [a junior's name] is too busy, that he's being pulled in too many directions. Perhaps there should really be more time designated to this knowledge transfer."

3. Dispositions

The interviewees endow the knowledge transfer with the seniors and juniors' personal dispositions and qualities which facilitate or, on the other hand, hamper interaction and also the knowledge transfer within it. The seniors consider the juniors' university-level technical education to be their "common good quality" because it is the best possible foundation for learning the seniors' work. The juniors, on the other hand, consider the seniors' expertise and the underlying experience to be their best quality, that is, what they themselves wish to achieve.

In addition to education, the seniors consider the following to be the juniors' "positive" qualities:

- Initiative*
- Ability to absorb new things*
- Will to learn something new*
- Being active*
- Diligence*
- Courage*
- Logical thinking*
- Being analytical*
- Computer skills*

The seniors reflect the said qualities either on the shortcomings in their own skills, such as their ability to use computers, or on how they have learnt the job, that is, by working hard and boldly taking up new projects:

"You learn by doing, young people have the wrong attitude 'I can't', 'I don't know'. I stop there because I don't want to listen. At this age I can't be bothered about everything. In our day me and X [a senior's name] did many projects of which others said they didn't know how. Neither did we. We just did it and learnt."

The seniors mention two "negative" qualities about the juniors: *quietness* and *operating alone*. One junior states about the senior and himself: *"used to operating alone... not too eager to make suggestions, and I'm quite similar"*. However, some juniors are frank about their efforts to obtain the senior's knowledge and expertise: *"I know that he's [the senior] got*

the expertise that I don't and that I want". These efforts lead to a capacity to actively seek knowledge and ask questions which the seniors consider necessary in the knowledge transfer (Sub-chapter 4.1.3.). If the junior does not ask, it is impossible for the senior to know what knowledge the junior needs. In such a case, the senior can share things on a general level or provide the junior with material that can be useful:

"I made a habit of visiting X [a junior's name]. He's a bit of a quiet fellow and sometimes you get a quiet guy to whom you're supposed to give background information, so I just start talking about this and that about the matter and hope that he catches the interesting points and gets the hang of it. I gave X a pile of my own memos and papers...And he got results and it really showed that he had spent time studying and thinking about them."

If the junior does not ask questions, the senior's other alternative is not to communicate anything to the junior—in which case no knowledge is transferred. This has been the case here:

"There's not been too many questions... There's surprisingly few of them. Either he, you know, he [the junior] can solve and process things himself so that there are no questions or then he's received so thorough an orientation that everything's crystal clear."

In the case above, the junior acquires knowledge from other individuals; he, therefore, does ask questions and receives knowledge but not from his assigned senior. He does not go to his senior, because he says that he *withholds knowledge* or keeps it only to himself on purpose. The juniors consider this *withholding knowledge* as the seniors' "negative" quality and suspect that it is the result of the seniors' fear of becoming unnecessary. *Withholding knowledge*, however, does not necessarily mean that the junior does not receive knowledge from the senior. The junior can be willing to "take pains" to acquire knowledge, if he, in particular, has no other sources of knowledge and, thus, manages to receive knowledge from the senior despite problems:

"Probably all those moving over still want to have the last knowledge. That you have to a) search, b) ask for it a bit...And I start with thinking how the heck I can get it, I flatter a bit and say since you've done an amazing job for many decades you must have it there right and everything. And then I get it... I go through all this because I need the knowledge and want to get it. I'm willing to make the effort."

4. Circumstances

Knowledge transfer occurs between the senior and the junior in their interaction which is influenced not only by their personal qualities but also by their possible busy work schedules and their physical distance from each other at the workplace. I refer to these factors affecting knowledge transfer as external circumstances.

Both the seniors and the juniors are willing to transfer knowledge, but for the juniors in particular their busy schedules hamper the transfer:

“A lack of time is a problem caused by pressures related to making a profit, among other things. First and foremost euros and time limit knowledge transfer.”

“We should be discussing more with X [a senior’s name] about these things but there’s no time.”

If the senior and junior’s offices or work stations are located far away from each other, it understandably hampers knowledge transfer which necessitates interaction:

“But in practice the communication between me and X [a senior’s name], we’ve got a bit of a geographical problem, as X is in Vantaa and I’m here [in a different town].”

“It just so happens that our offices are at the opposite ends of the building... he [the junior] is in another section and there’s really no one that he could go to with these problems.”

The physical distance between the senior and the junior can mean that the junior receives knowledge from individuals other than his assigned senior. Even though helpful for the junior’s work, this knowledge is not the kind that the senior has defined as knowledge to be transferred to the junior, and, therefore, the senior’s knowledge is not being transferred to the junior.

Table 4 presents the above-mentioned four factors related to knowledge between generations examining each senior–junior pair (Pairs 1–6). In it I link interaction, the senior and junior’s dispositions, as well as external circumstances to how they possibly hamper each pair’s knowledge transfer. Expectations I link to the realisation of the knowledge transfer in Table 4: if the pair transfers knowledge, it meets the expectations of the company, and if

there is no transfer, expectations are not met. The realisation of the transfer of knowledge within the pairs is based on the juniors and seniors' accounts: if the senior says that he has given knowledge involving his work to the junior and the junior says he has received knowledge from the senior that he has employed in his work, knowledge transfer has taken place. In all the pairs the senior and junior are unanimous about whether they have transferred knowledge or not.

The seniors and juniors are aware of the expectations the company has set on them concerning their knowledge transfer, and they also want to meet those expectations. External expectations, thus, have a positive effect on knowledge transfer, which is why I do not examine them in Table 4 as a factor hampering the transfer. If anything, external expectations represent for some pairs (in particular Pairs 2 and 3) the need to get knowledge transferred even if interaction, personal dispositions and circumstances were not favourable.

Table 4 shows that Pair 1 does not transfer knowledge, because the senior and junior's interaction is not successful and their personal qualities create problems. This is at least partly due to their not understanding what knowledge they should transfer. Based on the interviews it appears that the senior wants to transfer not only knowledge, but also the kind of attitude related to the work that is contradictory to the junior's conceptions. Both the senior and the junior do not consider circumstances to be hampering knowledge transfer which can be regarded as a sign of honesty: neither one of them "blames" external circumstances for their failed knowledge transfer.

Table 4 indicates that in Pair 2 the junior's quietness hampers interaction according to the senior but does not prevent knowledge transfer which is also the case with physical distance. In Pair 3 the senior's withholding of knowledge hampers interaction according to the junior but does not prevent knowledge transfer, neither does the junior's busy work schedule. In this pair the junior is active and "thirsting for knowledge" which may explain why the knowledge transfer has succeeded despite difficult circumstances. In Pairs 4 and 5 interaction is successful according to both the senior and the junior; they have no problems pertaining to the senior or the junior's personal qualities and they transfer knowledge. In both pairs, however, the junior's busy schedule hampers the transfer.

Table 4 reveals that Pair 6 does not transfer knowledge. I assume that this is due to the circumstances, that is, the physical distance and both the senior and the junior's busy

schedules. Not only these hampering circumstances, but also the personal quality attached to both the senior and the junior, *accustomed to operating alone*, make interaction and the subsequent knowledge transfer difficult. However, they interact and, furthermore, they have a shared view of what knowledge they should be transferring—contrary to Pair 1 which is also not transferring knowledge.

Table 4. Factors related to knowledge transfer between generations in expert work in senior–junior pairs.

Factors of knowledge transfer	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5	Pair 6
<u>Interaction in knowledge transfer</u>	Senior and junior: unsuccessful	Senior: unsuccessful Junior: successful	Senior: successful Junior: unsuccessful	Senior and junior: successful	Senior and junior: successful	Senior and junior: successful
<u>The senior and junior’s dispositions hampering knowledge transfer</u>	Senior: the junior does not ask questions. Junior: the senior withholds knowledge.	Senior: the junior does not ask questions, a “quiet fellow”.	Junior: the senior withholds knowledge.	No problems.	No problems.	Both the senior and the junior are “accustomed to operating alone”.
<u>Circumstances hampering knowledge transfer, i.e. physical distance and busy schedules</u>	Senior and junior: no negative effect.	Senior and junior: distance has a negative effect.	Senior and junior: the junior’s busy schedule has a negative effect.	Senior: no negative effect. Junior: own busy schedule has a negative effect.	Senior: no negative effect. Junior: own busy schedule has a negative effect.	Senior and junior: distance and both of their busy schedules have a negative effect.
<u>Are expectations met; does the pair transfer knowledge?</u>	No: does not transfer.	Yes: transfers.	Yes: transfers.	Yes: transfers.	Yes: transfers.	No: does not transfer.

The factors related to knowledge transfer between generations for their part explain what the transfer is like in each senior–junior pair. These factors—interaction, external expectations, personal dispositions and circumstances—become intertwined in the process of knowledge transfer, and, therefore, it is impossible to assess each factor’s individual value or significance in the transfer (Figure 6). Interaction is, nevertheless, an essential part of

knowledge transfer because it is not possible to teach or absorb the knowledge needed in the work without dialogue and the senior and junior's working together. (Tsoukas 1996, Szulanski 2003.)

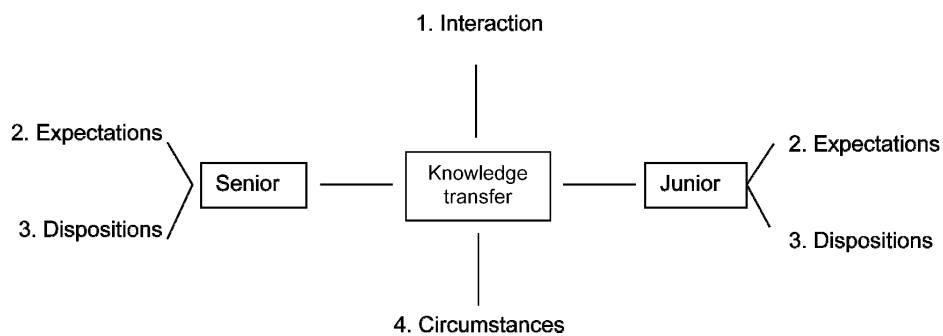


Figure 6. Factors related to knowledge transfer between generations in expert work (1–4).

4.1.2. Knowledge to Be Transferred

This sub-chapter examines the knowledge to be transferred in expert work between generations. As the result of the classification from the thematic analysis, I present the knowledge elements and the related work tasks, as well as the dimensions of knowledge. Moreover, I describe how the knowledge to be transferred has been recorded in the subject company.

In each senior–junior pair of this study, the senior primarily has defined the knowledge to be transferred. In the course of the knowledge transfer, the junior also builds an understanding of what knowledge he needs from the senior. How the senior defines or “chooses” the knowledge to be transferred is based on what knowledge the junior must master and possess to carry out the senior’s duties. The knowledge to be transferred is divided into four elements and their related work tasks (Table 5), that is, the senior–junior pairs partly transfer the same knowledge, since there are altogether six pairs. The elements in the knowledge to be transferred consist of products, production, sales and computer simulation. These elements include essential basic knowledge which underlies carrying out work tasks. This basic

knowledge, however, is not enough to manage the tasks, and, thus, the tasks also require that knowledge be transferred from the senior to the junior.

In the company of this study, the first element of knowledge to be transferred between the seniors and the juniors is products (Table 5, elements presented in a random order). The work tasks, requiring a holistic understanding of the company's products or equipment and systems, include tender design which means calculative planning about the products and systems needed by the client, as well as client application designs, which means engineering equipment and systems according to the client's order. Client application design is conducted based on a previous tender design for a particular client. Naturally, a comprehensive understanding of the products also underlies product development.

The second element of knowledge to be transferred is production and the related product know-how and quality enhancement. The work tasks that have their foundation on these are the maintenance and development of production as well as supervision. The third element in the knowledge to be transferred focuses on the sales and client-specific product knowledge. These are the foundation for managing client contacts, pricing and preparing tenders. The fourth element in the knowledge to be transferred is computer simulation and technical product knowledge. These are the basis for measuring the products which is related to product design in the first knowledge element. In simulation or technical computing, software is used to create a model of the system the client needs after which the program makes the different components compatible.

Table 5. Elements of knowledge to be transferred between generations in expert work and the work tasks connected to them.

Elements of knowledge transferred	Products i.e. equipment and systems	Production i.e. machinery and methods	Sales	Computer simulation
Product knowledge	Holistic product knowledge in different technical environments	Product knowledge related to production, quality	Product knowledge related to clients' needs	Technical product knowledge
Work tasks connected to the knowledge to be transferred	Product design in tender preparation i.e. computational product design	Maintenance of production	Managing client contacts: client relationships, client meetings	Measuring products in tender preparation i.e. by technical computing
	Client application design i.e. practical product design	Production-related R&D	Pricing	Measuring products in client applications i.e. in practical design
	Product development	Supervision	Writing tenders	

The company's products and knowledge related to them is connected to all the elements of knowledge to be transferred (Table 5). The "perspective" on products, however, changes based on the work tasks they are related to, that is, which element of knowledge is being examined. Developing and designing products for clients requires a holistic understanding of products and their operation in different technical environments. In production, on the other hand, the focus is on product knowledge in connection with manufacture and quality enhancement. In sales, the knowledge of the clients' "product history" is emphasised: what kind of products the client has been previously supplied with, when and how they have been manufactured or who has been involved in the project. Computer simulation requires, first and foremost, technical knowledge about the products.

The juniors refer to the comprehensive understanding about the products in various technical environments as the *soul of the machines*:

"In principle what I've learnt when I came to this firm was the soul of these machines, what they are, why and what's their purpose. And through that I've learnt what they should be like and how they should be designed. So in practice the machine's internal life and the outside network in which it's connected has to be taken into consideration."

The soul of the machines is an example of the *basic knowledge* or theoretical knowledge related to the work, the understanding of which is, nevertheless, enough that the juniors get their work done or master and manage their duties:

“Of course you have to understand the soul of the machines, but if you don’t know how to do technical computing, you can’t make the tender.”

The product knowledge to be transferred from the senior to the junior is, thus, basic or theoretical knowledge, the “focus” or “perspective” of which varies according to the tasks in which this knowledge is needed or connected to in the tasks (Table 5). In other words, absorbing the elements of the knowledge to be transferred requires their interconnection to practices and tasks: only when employing the knowledge, does it become clear from what “perspective” the theoretical knowledge should be approached in work and how it can best facilitate work.

Surpassing the lines between the elements of knowledge and the related work tasks I describe in Table 5, the seniors’ knowledge is extensive. With versatile knowledge about the products accumulated over decades, the seniors know the products and their operation thoroughly in their own responsibility areas. For example, the seniors involved in product design in the tender preparation phase have full technical knowledge of the equipment and systems; moreover, they know the clients and their “product history” and also master pricing. This is aptly described by one junior’s statement of the seniors as *walking mines of information*. The seniors’ knowledge can also be found elsewhere in the company but acquiring this knowledge is difficult because it is “spread” among individuals and various locations:

“We do have knowledge but it’s much more in bits and pieces. So getting the knowledge involves putting these pieces together. X [a senior’s name] has them more or less in the same place.”

The seniors were traditionally responsible for both the sales and the entire product design, that is, from the design during tender preparation until the supply and installation of products. Now these tasks are being divided among individuals, as the seniors recount:

“Before, you had to go abroad alone and communications were poor and there were many technical problems. Now that you have mobiles and usually two or three people travel, it’s essentially easier. Once I had to count was there really 36 countries where I’d been to launch systems.”

“They're starting to specialise tasks. In the old days it was just that one guy travelled and did everything. Today it's maybe five.”

The specialisation of tasks is partly due to the increase in the personnel. Tasks also become specialised because the seniors cannot fully exploit current information technology and all its possibilities. Tasks related to information technology are conducted by employees (not necessarily the juniors) that are younger than the seniors but who do not know the products and the related electrotechnical features thoroughly as do the seniors. Therefore, sales nowadays involves coordinating tenders: the individual responsible for the tender gathers all the necessary technical information and documents from the experts who are specialised in designing various products and conducting computer simulation. One junior describes the gap between the seniors and juniors in their IT utilisation:

“When I showed my computing program, X [a senior's name] was all amazed how handy these computers are nowadays. That they get instant results. Maybe it's a bit too big a gap, as they even have trouble using e-mail.”

In Table 6 I show the dimensions of knowledge to be transferred between generations in the subject company. The explicit dimension of knowledge includes knowledge that can be expressed in words or symbols, the implicit dimension knowledge that can be expressed in words or symbols when needed and the tacit dimension knowledge that cannot be expressed in words or symbols. (Polanyi 1966, Tsoukas 2003, Eraut 2004.) In Table 6 I have gathered all the words and expressions that the interviewees use as synonyms of “knowledge” when referring to knowledge transfer or that they use to describe the knowledge being transferred, excluding the phrases already presented in Table 5. The explicit knowledge column includes such references that not only indicate how the knowledge is expressed (in words or symbols) but also its content (formal, exact). The implicit knowledge column refers to expressions with a conception or assumption of the content of the knowledge (meaning that knowledge can be somehow “dealt with”: it can be discussed or asked about) but not of how the knowledge is expressed. The references in the tacit knowledge column are not related to a conception or assumption of how the knowledge is expressed or its content (e.g. a “skill” can be expressed in different ways and it can connote to anything).

The elements of the knowledge to be transferred and their related work tasks I mentioned above (Table 5) are not included in the dimensions of knowledge because, based on this data, I could not divide the knowledge elements and the contents of the tasks into

components which I could have further categorised into the dimensions of knowledge. For this, the data should be more accurate or “deeper”, for example, collected using different methods (Sub-chapters 3.4. and 5.5.). However, based on the data I can say that the elements of the knowledge and the tasks to be transferred are not just based on the explicit dimension, because the knowledge related to these is created from knowledge collected from various sources and combined by experience. The juniors, for example, recount how understanding and designing products (which is related to the *soul of the machines*) or understanding and maintaining the various functions of production require combining knowledge based on experience:

“When you’re talking about high-powered equipment, whether some conductor is an underground or overhead cable can have an effect. It affects measuring and systems, so it really requires the kind of wisdom and experience so that you see how it should be done.”

“There [in the production phase] are these laws of physics that there’s some viscosity and then the temperature at which it somehow absorbs or doesn’t absorb. It’s more like combining many different things and gaining insights.”

Of the knowledge dimensions I have listed in Table 6, explicit knowledge is formal knowledge acquired through education (Barley 1996) which is thus not only mastered by the seniors. The juniors have already acquired this knowledge in their education, and, therefore, it is not effectively transferred but rather applied to the products, production and working in the company. As one senior says *“the Master’s degree in technical sciences is the foundation on which the knowledge necessary in this work is built here”*, and one junior states *“at TUT I was laying the foundation for this, and this job is now applying it to practice on top of all the theory”*.

Implicit knowledge (Table 6), that is, knowledge that has not been written down or is *undocumented* is transferred on top of or based on the explicit knowledge acquired in education. It includes, for example, knowledge the seniors have acquired in various technical tests about what methods can improve production and how the products function in different technical environments (i.e. the *soul of the machines*). Through these practical activities the seniors have accumulated situation-specific knowledge related to product design and development, as well as to maintaining production and making it more efficient (Barley 1996) which has been applied to working in the company:

“If you had to get it [the knowledge] from somewhere else, it would be this physics formula. And now when you get it from X [a senior’s name] in practice, it’s not just a physics formula, but it’s fitted to function in this factory.”

The knowledge related to work and gathered in practice, however, has not been written down, at least not systematically or available to all those that need it (implicit knowledge related to situations of work, DeLong 2004; 84). This is why transferring this knowledge is important not only for the seniors but also for the juniors:

“If you make changes to the process, all the tests and testing take a long time to see the effects. So that the new guy wouldn’t have to start from scratch, that there would be some sort of foundation to continue on.”

“I’m interested in what’s already been tried, what’s tested and seen, so that in a way you don’t have to make the same mistakes.”

Implicit knowledge involves a notion that the knowledge to be transferred and the related duties can only be learnt by working in the company:

“It’s basic electrical engineering in the background, but then there’s the real job, it really has to be learnt here. By doing this.”

“Sadly this is just the type of field where there’s no teaching anywhere about how to do this work.”

However, a lack of written work and design instructions makes it more difficult for the juniors to adopt the duties (implicit knowledge related to technical rules guiding the work, DeLong 2004; 84):

“We’ve very few such documents, so that perhaps we have unnecessarily too much information only in people’s heads. I guess people aren’t in the habit of writing down things, rather you’d make some design instructions or something...It would be a big help for all those that come later, if we had, for example, just basic design instructions for measuring some equipment. Another way is just to always ask someone.”

Integrating experience and knowledge from different sources, tacit knowledge (Table 6) is knowledge the seniors have accumulated over decades: it connects explicit and implicit knowledge to personal experiences and views (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995). The seniors’ knowledge is extensive expertise about electrical engineering, products and clients which they employ, for example, when preparing tenders:

"X [a senior's name] always stresses that he knows the laws of physics, that in principle he goes by electrical formulas...X is like a top expert in power engineering technology... he masters everything about Y [the name of the company's product], what's been sold the most throughout the history, so he knows it like the back of his hand. But preparing a tender about the Y, in principle it's a complete black hole to me. So in practice this X's know-how, it's so far out that it can't all be transferred... that when you can make a tender by yourself so fast, learning that would take at least four years."

The seniors work intuitively: they act rapidly and interconnect knowledge accumulated from different sources instinctively (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Eraut 2000). One junior's account provides an apt description of this:

"So just as we were in India and they wanted to talk, the clients, the big bosses, just in general about this equipment and the history and what not, so I couldn't but admire when X [a senior's name] just kept pouring out example cases from 20 years ago. And they asked about something, when they knew about some instances around the world. X knew the case and explained all the details what it was about and why these things have happened. And I had no clue that those things had even happened. That's when I thought wait a minute, X will retire in a year, so what are we gonna do."

The juniors want to absorb tacit knowledge from the seniors which they refer to as expertise, experience and know-how, among others, and describe its content *undocumented*. This is how juniors recount their knowledge needs related to tacit knowledge:

"There's a lot of the knowledge that you kind of need that someone tells you. And based on experience, it can't be proven or shown from the books or by computing, that there's a lot of stuff that you just know that this is the way it's supposed to be."

"...help from experience. It's good to have someone that can explain the issue more closely. That it's easy to look up formulas in some standards archives."

One of the seniors cannot define what knowledge he should transfer to the junior. This senior has perhaps over time assimilated his knowledge so fully that he is no longer aware of using it and thus cannot analyse it (Dreyfuss & Dreyfuss 1986; 30). When asked about the content of the knowledge being transferred, the senior answered:

“It’s a bit difficult to specify anything. It’s the way they come, and X [a junior’s name] probably collects some of them himself. It’s just difficult to be pushing something, that this is the thing. It can be a completely silly issue for someone else. The other individual thinks about it along similar lines, but still differently.”

However, the particular senior’s assigned junior receives knowledge from him; thus, the senior is correct in assuming that the junior can gather the knowledge he finds necessary. It, therefore, appears that knowledge transfer does not essentially require conscious or target-oriented transfer from the senior.

Table 6. Dimensions of knowledge to be transferred between generations in expert work.

Explicit knowledge	Implicit knowledge	Tacit knowledge
a fact	technical tests	a skill
theory/theoretical knowledge	the soul of machines: equipment operation in technical environments	know-how
technology/technical knowledge	theoretical knowledge applied to this company/work	expertise, proficiency
electrical engineering	work done in this company	special competence
laws of physics		core competence
physical formulas		extensive competence
		the result from integration
		wisdom
		understanding
		vision
		opinion
		experience
		feeling
		intellectual capital
		senior’s heritage
		inside the senior’s head
		senior’s brains

The items in the table are quotes from the interviewees’ speech.

Surprisingly, all the references to explicit knowledge in Table 6 consider general knowledge external to the company which the juniors already possess when introduced to the company and which, therefore, needs not be transferred; nevertheless, this knowledge needs to be applied to the company and working there. Hence, the interviewees do not mention the

explicit or documented knowledge internal to the company (e.g. product design instructions or production reports) as knowledge to be transferred. This may be because they find the knowledge documented in this company inadequate to be transferred. In other words, the company-specific explicit knowledge is to be transferred, but it is as such inadequate to meet the juniors' knowledge needs. This can be partly explained by a lack of documentation in the company regarding the knowledge to be transferred. Explicit knowledge is, however, essential in knowledge transfer, because the explicit knowledge the juniors have acquired through education is adapted in the transfer so it is usable in the company. This adapting or applying explicit knowledge to the company and working there requires that the seniors' implicit and tacit knowledge be combined with the juniors' knowledge: both the seniors and the juniors want to transfer *undocumented knowledge* and *experience* of what the seniors have learnt throughout their careers.

The knowledge transferred between generations has not been systematically recorded in the company over the years. The company has not issued official rules or guidelines about documenting knowledge; therefore, each employee has, alongside carrying out his duties, recorded related knowledge as he deems appropriate:

"It's been a lot like some basement firm or shop, that everyone here knows what they do, but this should be a business with certain guidelines and how to do things."

"At the moment it's all in people's heads in a way how they do things, and different people have different ways of doing things. It's quite essential things really that we haven't defined. Everyone just wings it. It's a little bit based on history and partly on feeling and how it's been done in other countries. It's never been thought out and documented how you do or determine certain things."

The seniors write down knowledge varyingly concerning both knowledge produced in work and work instructions. Some seniors have written and are actively writing documents related to their work which they post on the company's *web available for everyone*. However, this documentation has not been instructed by the company, and the seniors have no idea whether anyone will ever read the documents:

"And I like to write all kinds of memos and reports, I've actually written hundreds of them and I've posted them on the factory's web, organised them in different directories. Then again I don't know how widely it's known that there's a lot of them."

Some seniors, on the other hand, do not produce documents at all, as one junior puts it:

"It's just the way X [a senior's name] works. He doesn't produce documents, and in particular not so that he'd distribute them anywhere."

The haphazard custom of documenting knowledge in the company is the company's tacit knowledge related to practice (DeLong 2004; 84). It affects the individuals' activity on the one hand by hampering work, on the other by "freeing" from the obligation of preparing documents. Nor do the juniors document the knowledge being transferred to them (Subchapter 4.1.4.) in every situation which may be because they have adopted the custom related to documentation in the company.

A lack of systematically documented knowledge hampers the juniors' knowledge acquisition in particular after the seniors' retirement—now they can still clarify things with the seniors when necessary:

"They [the projects] have not been documented because it's not been necessary to prepare elaborate documents for the clients like we do nowadays... The most essential knowledge which is lost is what has been supplied [to the client] and who else has been involved and what the whole set-up has been. We young guys have no knowledge of how it goes, but these [the seniors] can say it, name the people who's been involved and what's been done and all, so that in principle it could be documented somehow... How can we then respond, when our older guys are no longer here to tell what's been done with a particular client."

The juniors not only complain about the lack of documents, but also express doubt about the comprehensiveness of their content. They assume that busy schedules have also limited how detailed reports have been prepared. The seniors' reports can also be inadequate because they have been meant for a wider audience:

"Even though he's [the senior] really good at putting things on paper... like when you do a test, it only says that yeah we tested this and this was the result. But there's no mention of what the temperatures were or some things that anyway have an effect... So they would be easy to read and absorb... But first and foremost that's okay, you have written this but what's your own opinion. Because we might be doing it for like a) the management, b) the material supplier or somewhere, where you don't write down everything."

The deficient documentation of knowledge in the company partly explains why the knowledge transfer between generations has become so important. It is now too late to write down all the knowledge and skills accumulated by the seniors for over forty years, and the only way to transfer the knowledge paramount to the company's future—or at least part of it—for the new employees is interpersonal interaction in which the seniors communicate their knowledge to the successors.

4.1.3. Means of Knowledge Transfer

In this sub-chapter I present the means of knowledge transfer between the seniors and the juniors formed in the classification conducted in the thematic analysis. Moreover, I link these means to the dimensions of knowledge being transferred which were introduced in the previous sub-chapter.

The means of knowledge transfer between generations are activities or processes with the help of which or during which the senior and the junior transfer expert work-related knowledge between themselves. These means are three: orientation with documents, dialogue and work situations.

Orientation with Documents

As I stated in the previous sub-chapter, there are no formal guidelines about documenting in the company studied, rather it is haphazard. This concerns not only knowledge generated when working, but also knowledge needed to perform one's duties. For example, product design instructions, reports about production development or client project follow-up in writing in sales have been conducted to a varying extent, that is, responding to the demands of a particular situation and the opportunities it provides. This is why there is a limited amount of documented knowledge available of the elements of the knowledge being transferred and the connected work tasks (Table 5, Sub-chapter 4.1.2.), and furthermore the contents of the existing documents are insufficient.

Even though deficient, documents are important sources of knowledge for the juniors in the early phases of the transfer. The seniors pick the documents essential for knowledge transfer among all the existing ones and give them to the juniors to be examined. The documents

provide the juniors with *background information* on the basis of which the necessary knowledge is built:

“I provide X [a junior’s name] with material, I’ve given him quite a lot of my memos and articles. X has got background information from them and seen these models.”

“The folder becomes the background information by combining which you have to see that if the voltage is this, it pops. So it’s putting together the pieces of a puzzle and the more time goes by, the less you have to look things up in the folder, when it’s all in the head.”

As the knowledge transfer progresses, the juniors start independently looking for the necessary knowledge both from the company and from external sources if the knowledge cannot be found within the company. These written sources include the company archives, international standards, as well as the literature on electrical engineering and the clients’ industry.

Dialogue

When orienting oneself with the knowledge being transferred through documents, the knowledge is primarily chosen by the senior. In dialogue, however, the senior and junior together define the knowledge to be transferred and how the junior orients to it. The juniors’ questions are important in initiating dialogue and steering the knowledge transfer, because otherwise the senior does not know what knowledge the junior needs and what he may already know about the knowledge being transferred. Correspondingly, it is important for the juniors to ask questions to stimulate fruitful discussion in which the juniors receive the knowledge they consider necessary:

“The two of us, we just talk and then I go and ask X [a senior’s name] a lot of questions. In practice it’s [the knowledge transfer] completely between X and me.”

“I have to say what’s not clear to me, after which X [a senior’s name] starts telling his own facts. So if I only mention a topic and say that I can’t do it, I get a week’s lecture. So it’s important to describe the situation properly.”

Work Situations

When confronted with work situations in practice, the juniors come to realise the gaps in their knowledge, and, therefore, work situations spawn new questions and further discussion. This is why discussions in knowledge transfer between generations are not “occurrences of giving and receiving knowledge” detached from work, but rather they are conducted on the job:

“It’s truly so that when there’s a situation there [in production] it’s easier to deal with the matter when you see the surrounding situation. The case, so to speak.”
“Then there are these situations in practice. Then it’s, hey, I’ve got this gadget here all up in pieces, do you [the senior] have any tips, and then we look for a solution.”

The significance of work situations for knowledge transfer is, however, much greater than the mere prompting of questions: understanding the knowledge read from documents and arisen in discussions becomes easier through making concrete observations. In particular, work situations facilitate knowledge transfer when the situation involves several factors all the combined effects of which are impossible to take into account based on mere theory, without making observations. Such situations pertain to how the products function in different technical environments as well as the production methods:

“If you read the formulas and the theory, you can always find the reason there why some piece of equipment doesn’t function, but it’s impossible, because there’s always a billion things affecting one another and you can’t consider them all... So the reasons can always be found in some formulas, but you can’t pinpoint them directly.”
“There [in the production phase] are these laws of physics that there’s some viscosity and then the temperature at which it somehow absorbs or doesn’t absorb. It’s more like combining many different things and gaining insights.”

In the juniors’ words, knowledge is transferred *in bulk* or *rapidly* particularly in problem situations which pertain to interruptions in production, product flaws or complaints. These situations mean stretching beyond the familiar and the safe to investigate the unfamiliar. No single individual knows the solution, and to find it requires *brainstorming*, that is, all the possible knowledge and opinions. These situations involve external pressures brought about by the economics as well as the clients’ deadlines and reactions which necessitate not only a rapid response but also finding the correct solution. One junior recounts one such event:

“With one problematic project I was faced with the types of problems that made me truly study the subject thoroughly. The piece of equipment was out there on the prairie and it could not be started because it didn’t function and no one knew why...It just stood there and we got no money and the client was angry, so you got to do something. It became a kind of brainstorming in which everyone offered their ideas as to what’s right... It required really long deliberation and learning the hard way. But now I know what kind of filter doesn’t suit a tower structure and so on.”

The juniors speak enthusiastically about problem situations and their solutions, about how they perceive things happening in practice, how rewarding it is to see the effects and causal relationships and thus gain insights:

“Now there’s a problem because the machine is not functioning as it should. Then we start solving the problem and examining whether the machine runs as we think, whatever voltages and tensions or something there, and we find that, okay, this belt slides, so here’s the problem and this needs to be changed. I really like to be there where problems are being solved because there when you try something, you instantly see the result.”

The seniors also regard problem situations as the most fruitful ones for knowledge transfer, because in them they can be certain that the juniors absorb the knowledge needed in work: *the only way to learn this stuff is to do it*. The seniors themselves have also learnt their work *the hard way or through trial and error*.

On the basis of this study it appears that the junior must be better aware of his own knowledge than the senior of his when transferring knowledge between generations: if the junior knows his own knowledge needs, the senior may give him knowledge without recognising it. Even if the senior is not able to define the knowledge to be transferred, the junior may receive it given that he knows what knowledge he needs from the senior. One junior tells how he has acquired knowledge in such situations not only from documents, but also by discussing with the senior in work situations:

“About the materials or measurements and other things related to those, they can be studied from documents... Then there have been solutions to these more difficult deviations in production and complaints and they’ve been done together [with the senior]. In those situations you always go deeper than the normal daily level and they always reveal something new.”

In Table 7, I examine the means of knowledge transfer between generations by following the categorisation by DeLong (2004) through dimensions of knowledge. In it I have included examples of the knowledge in each knowledge dimension used in the company as well as the means, by which the knowledge is transferred from the senior to the junior.

The explicit dimension of knowledge, background knowledge based on physics and electrical engineering in this case, can be transferred in documents (Table 7). This knowledge is also transferred, or at least handled, in dialogue and work situations because it is based on the juniors' knowledge acquired in education, which is, through dialogue and work situations, applied to the company and work there.

The implicit dimension of knowledge, that is, the knowledge related to technical rules and guiding the work means in the company of this study product design guidelines and the measuring of products in computer simulation (Table 7). This knowledge can be transferred in documents and it can also be presented in dialogue without the junior having to steer the senior to tell the "right" or necessary things by asking pertinent questions. This rule-related knowledge is, moreover, transferred or at least handled in work situations in which the rules are put into practice. Implicit knowledge pertaining to the changing work situations in the company refers to tests involved in production and the functioning of products in technical environments (i.e. the *soul of the machines*). This knowledge can be transferred in dialogue if the junior "knows the right questions". If the conditions are favourable for the knowledge being transferred, this asking is facilitated when prompting the junior to ask just these "right" questions. Thus, the work situations in which the knowledge is needed are fruitful for transferring situation-bound knowledge.

Knowledge related to the tacit dimension or work in the company of this study is the seniors' extensive and thorough knowledge and experience of the products and clients, as well as the production methods and systems (Table 7). This tacit knowledge is transferred gradually in practical work situations when the juniors are able to understand more, by accumulating knowledge and experience, the knowledge the seniors use in their work, to apply their own knowledge to the seniors' work and to work based on this knowledge they have combined. Tacit knowledge pertaining to organisational practices here comprises the non-directed, haphazard documentation. How the seniors write down knowledge varies because the company has not issued official guidelines or rules about documenting knowledge. It is fair to

assume that this habit of haphazard documentation is transferred to the juniors in work situations because documentation is varied also among the juniors (Sub-chapters 4.1.4. and 4.1.6.).

Table 7. Dimensions of knowledge and means of transfer between generations in expert work. (Adapted from DeLong [2004; 85].)

Dimension of knowledge	Explicit	Implicit rule-based	Implicit know-how	Tacit know-how	Deep tacit
Examples of the content of the knowledge	Background information: physics, electrical engineering	Product design guidelines, measuring products in computer simulation	Production methods and tests, product operation in various environments	Interlinked knowledge and experience: product and client knowledge, knowledge of production equipment and methods	Non-directed, haphazard knowledge documentation
Means of transfer	Documents (dialogue) (work situations)	Documents, dialogue (work situations)	Dialogue, work situations	Work situations	Work situations

When examined through the dimensions of knowledge (Table 7), the means of knowledge transfer are not mutually exclusive because it is not possible to distinguish between the dimensions when using the knowledge (Polanyi 1966, Tsoukas 1996, Spender 2006). In other words, the explicit dimension of knowledge is transferred not only in documents but also in dialogue and work situations, and the implicit dimension or rule-related knowledge is transferred not only in documents and dialogue but also in work situations. In Table 7 in the means of knowledge transfer row, the means I mention first are the minimum requirement for transfer but the ones I show in brackets are hence also possible. The implicit, situation-specific dimension of knowledge cannot, however, be transferred in documents because all the factors related to the situations and their combined effects are impossible to take into account or describe in theory. Not expressed in words or symbols, the tacit dimension of knowledge cannot be transferred in documents or dialogue (ibid.).

Therefore, the explicit dimension of knowledge can be transferred in documents, but the transfer of both the implicit and the tacit dimension requires dialogue between the senior and the junior and their joint action in work situations, that is, interaction (Table 7). The explicit

dimension of knowledge transferred in documents is produced by the seniors or other organisational members, formally expressed knowledge. In dialogue the juniors can acquire knowledge related to the implicit dimension based on their own needs, that is, instead of formal knowledge, aim to receive knowledge applied to the company and their own needs which helps them to perform the seniors' work. The transfer of tacit knowledge in work situations or seeing the issue enveloped in a situation helps the juniors to understand several factors related to the knowledge being transferred and simultaneously influencing it, as well as to create links between them.

4.1.4. Methods of Knowledge Sharing: Transfer and Building

In this sub-chapter I present the methods of knowledge sharing between generations, outlined based on combining data in the thematic analysis. To present the findings, I need a concept to describe the difference or relationship between the knowledge transfer and building. Therefore, I use the term knowledge sharing (Sub-chapter 2.3.) which can include only knowledge transfer or both knowledge transfer and knowledge building. By knowledge transfer (Sub-chapter 2.3.1.) I mean the transfer of knowledge between generations without the knowledge being purposefully transformed, whereas by knowledge building (Sub-chapter 2.4.1.) I refer to the intentional reconfiguring of knowledge between generations.

The data analysis revealed six methods of knowledge sharing related to expert work between the seniors and juniors. Of these, two do not involve knowledge transfer or building between the senior and the junior, and, therefore, they are exceptions when looked at from the phenomenon being studied (Hirsjärvi & Hurme 2004; 176). Hirsjärvi and Hurme (*ibid.*) note that irregularities and their analysis contribute to the study as much as the regularities of the data. I have included the exceptions in the analysis because they provide unexpected and, thus, remarkable knowledge of the phenomenon studied. They can also be considered extreme cases (*ibid.*) because they delineate the phenomenon by being located "barely" outside its boundaries.

There are, thus, four actual methods of knowledge sharing between the seniors and juniors. These include either only knowledge transfer or both knowledge transfer and knowledge building. Moreover, not only knowledge transfer, but also knowledge building can involve passing the knowledge along in the company. The methods of knowledge sharing between generations related to expert work and the exceptions to the sharing are presented below.

Method 1.

Knowledge transfer from the senior to the junior. The junior uses the knowledge being transferred as such, for example, the existing models for tender preparation, and does not communicate the knowledge being transferred to others:

“But it’s just for saving time, that you take the finished model that’s been used in previous tenders. It’s quite often that you just repeat the old one. At the beginning you maybe realise that this is not the most sensible way to do it but when you’ve done it five times, you’re used to it and changing it doesn’t feel as important anymore... I haven’t passed the knowledge on, at least not significantly. So that there’s a need even within our own department, because we have one individual in our sales team who doesn’t use these tools.”

Method 2.

Knowledge transfer from the senior to the junior. The junior uses the knowledge being transferred as such, for example, in client-specific product design, and communicates the knowledge to others:

“I’ve learnt how to do client-specific product design from the entire team. I’m currently making their [the product’s name] design guidelines for the team, there were none before. The aim is that in the future we could do at least 95% of our products based on these documented guidelines.”

Method 3.

Knowledge transfer from the senior to the junior and knowledge building: the junior builds new knowledge by himself based on the knowledge transferred. The junior does not communicate the knowledge transferred or built to others. For example, the junior enhances the simulation software employed in product design for his own use:

“Measuring overvoltage protectors and the related modelling and simulation of systems, I’ve learnt and assimilated them directly from X [a senior’s name]... I’ve later had to change them, compared them case by case to fit the particular need. I’ve actually changed them quite a lot, you could say they have my print on them... It could be documented, but I haven’t done it. It’s come up that this measuring should be documented so that someone else could also do it or at least try to learn from the guidelines if necessary.”

Method 4.

Knowledge transfer from the senior to the junior and knowledge building: the junior and the senior together build new knowledge based on the knowledge transferred. The junior communicates the built knowledge to others. For example, the junior makes a computer program to facilitate product design in tender preparation and disseminates it to all those that may benefit from it:

“It was my idea to enter the necessary values on the computer after which you can just print the documents. X [a senior’s name] had previously done the calculation almost entirely by hand which took a really long time... so I made this system, the program calculates the needed output in less than a second. But the best thing was when we examined the finished results through X’s expertise. There was nothing more to it, that it’s been working just fine... I’ve posted the program on the web and encouraged people over and over again to go check it.”

Exception 1.

No knowledge transfer or building between the senior and junior because the junior receives the necessary knowledge from another individual or individuals other than his assigned senior:

“If I truly need or want some information about it [the production line], it’s really not X [a senior’s name] but someone else that I get it from...but it hasn’t felt much of a burden as long as I get it somewhere.”

This exception revealed that the juniors can have knowledge sources in the company that replace their assigned seniors. In these cases the knowledge transferred to the juniors is not necessarily that of the senior’s but, nevertheless, knowledge that enables the juniors to perform their duties.

Exception 2.

No knowledge transfer or building between the senior and junior because the junior does not need the senior’s knowledge. When the junior starts working in the company, he brings with himself “ready” knowledge, for example, about production methods:

“What I learned in my previous job is my knowledge and when it comes to production I might have ideas how to do this better... When developing

methods, this contracting is starting to be a bit outdated and I try to suggest that we forget these punching-ins and stuff. It has partly happened but not as quickly as many would hope, of course.”

The exception revealed that the junior can bring “new knowledge ready built” to the company. This knowledge, thus, is applicable as such to the company and does not require building in co-operation between the senior and junior. It is, nevertheless, knowledge that has been introduced to the company in connection with knowledge transfer between generations because the junior has been hired to the company as the senior’s successor.

The methods of knowledge sharing are not specific to certain senior–junior pairs, that is, the pairs employ more than one method of knowledge sharing. Moreover, the second exception does not exclude the methods of knowledge transfer and building because the senior and junior transfer and build other knowledge than the kind the junior already had when coming to the company. However, the first exception excludes all the four methods of knowledge sharing because the senior and the junior do not transfer or build knowledge between them.

Building new and meaningful knowledge for the company requires interaction between the senior and the junior. As Method 4, which I presented above, describes, both the experienced expert and the novice combine knowledge that the novice brings and that is new to the organisation with the experienced expert’s knowledge of the organisation, its functions and working there when building knowledge. The new knowledge introduced by the novice to the company relates to information technology, such as computing software and its utilisation. When this knowledge is linked with the experienced expert’s knowledge of the company’s products, client needs and preparing tenders, the result is a new computing program tailored specifically to the company. The junior then makes this program available to all those that need it in the company. Not only the senior but also the junior, thus, give his own knowledge or “material” to build new knowledge, and this co-operation produces such knowledge that neither one of them could generate alone.

Illustrating the above-mentioned methods of knowledge sharing between generations in the form of a double dichotomy, Figure 7 does not include Exceptions 1 and 2 because they do not involve the phenomenon presented in the figure, that is, knowledge sharing. The extreme case, Exception 1 would be located outside the double dichotomy in the bottom left corner: it does not involve knowledge transfer so the company loses the senior’s knowledge when he retires. The other extreme case, Exception 2 would be situated in the top right corner outside

the double dichotomy: it does not entail building knowledge but the company, nevertheless, receives new knowledge “directly” from the junior without the senior’s knowledge or assistance.

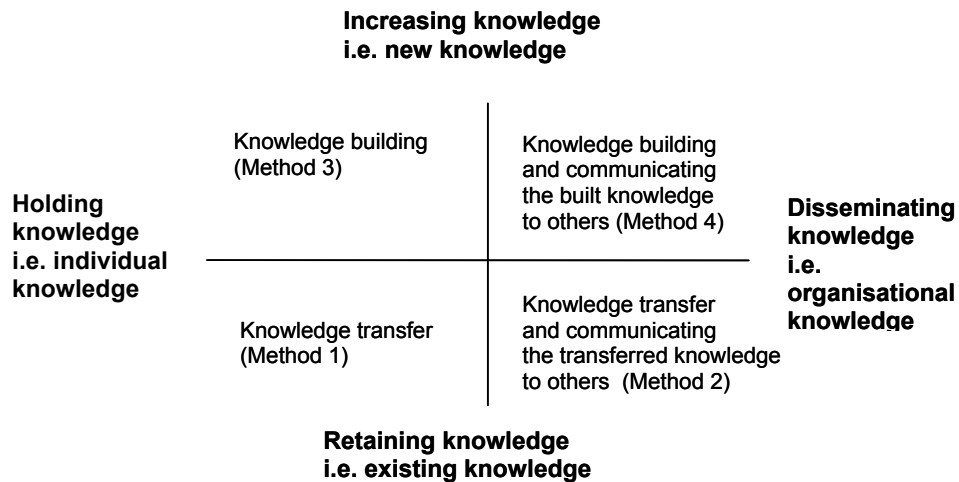


Figure 7. Methods of knowledge sharing (1–4) between generations and their effects on knowledge in the organisation.

The methods of knowledge sharing between generations are, thus, formed of knowledge transfer or knowledge building and whether the junior communicates the knowledge transferred or built to others in the company or not. Linking these methods creates the effects of knowledge sharing on the knowledge in the organisation as presented in the double dichotomy (Figure 7): retaining and holding knowledge follows from knowledge transfer and storage as individual knowledge (Method 1); retaining and disseminating knowledge follows from knowledge transfer and communicating it to others in the organisation (Method 2); increasing and holding knowledge follows from building and storing knowledge as individual knowledge (Method 3); and increasing and disseminating knowledge follows from building and communicating the knowledge to others in the organisation (Method 4).

In the double dichotomy (Figure 7) knowledge is transferred between the senior and the junior in all the segments; however, new knowledge is created only in the top segments (Methods 3 and 4) which involve knowledge building. In the top left segment (Method 3), the built knowledge remains in the junior’s use, because he does not pass it along to others. In the top right segment (Method 4) the built knowledge is communicated to others or

disseminated to become organisational knowledge. In the double dichotomy (Figure 7) the individual receives new knowledge in all the segments but new organisational knowledge only emerges in the right hand segments (Methods 2 and 4). In these, individuals do not keep the knowledge to themselves but communicate it to others. In the bottom right segment (Method 2), the knowledge being passed along is transferred or existing knowledge which is already known to some of the members of the organisation. In the top right segment (Method 4), the knowledge being communicated is built or new knowledge which is not yet known to the members of the organisation.

When comparing the concepts of holding knowledge to oneself and disseminating it to the organisation (Figure 7), it is rather a question of different degrees than “fully” holding or disseminating knowledge. Holding knowledge means that the junior only documents knowledge to his own use, but when asked, he gives the knowledge, for example, verbally:

It's come up that this measuring should be documented so that someone else could also do it or at least try to learn it from the guidelines if necessary. Some know that I mastered it and they come and ask, but there are not that many that need the stuff.”

Disseminating knowledge means that the junior documents the knowledge or writes it down and disseminates it to all those that need it in the company:

“I'm currently making their [the product's name] design guidelines for the team, there were none before.”

When disseminating knowledge, in addition to mere documenting, the parties can adapt knowledge so that it can be used by all those that need it, as well as orient them in using the knowledge:

“I've posted the program on the web and encouraged people to go check it. I made the user interface really easy and all these technical measurements are nowadays conducted on it. And the old and more laborious methods are no longer in use.”

“When I got people to trust that, hey, this thing calculates these right and fast and everything, so people started using it one by one. At first I was running back and forth over there to explain what was happening where and what this is and what this means and so on. Now I don't have to do that as much.”

Documenting knowledge for one's own use and giving knowledge only when asked are, thus, holding knowledge to oneself, whereas documenting knowledge so that others can also use it

is disseminating knowledge to the organisation. The distinguishing feature between keeping knowledge and disseminating it is therefore initiative: when disseminating knowledge, the aim is to make it available to all those that need it either through documents or face-to-face, with those that need the knowledge not having to ask or look for it. The variation in the methods of knowledge dissemination among the juniors may at least be partly explained by the haphazard nature of documenting knowledge in the company, as no official terms of reference exist (Sub-chapter 4.1.2.).

The commonly accepted goal of knowledge transfer between generations, retention of knowledge in the organisation (DeLong, 2004; Rothwell & Poduch, 2004) is achieved in the bottom left segment (Method 1) in the double dichotomy (Figure 7) in which knowledge is transferred from one individual to another; in other words, the senior's knowledge has been transferred to the junior as the senior retires. The possible goal, in accordance with the perspective of this study, of knowledge transfer between generations or knowledge sharing is building new knowledge for the organisation. It is achieved in the top right segment (Method 4) of the double dichotomy in which new knowledge is built or existing organisational knowledge is increased and passed along to others so that the knowledge built is spread to all those that need it. The company's managing director commented on the top right segment of the double dichotomy in the interview (April 18, 2007) by referring to it as the "*ideal result of succession*". He was aware that this result had been achieved in the company. He was also aware that the "*basic requirement*" of knowledge transfer, represented in the bottom left segment of the double dichotomy had not been achieved with all the pairs.

Based on the findings of this study, knowledge sharing between generations related to expert work involves not only the transfer of knowledge existing in the company, but also building new and meaningful knowledge for the company. The knowledge built is then passed on in the company to be employed by others, that is, it is disseminated to become organisational knowledge. In the company of this study the knowledge built and disseminated in knowledge sharing between generations proved to be the computing programs in product design. The findings show that the company's personnel have used this built knowledge, it has made the company's operations more efficient and improved its competitiveness.

4.1.5. Phases of Knowledge Sharing

This sub-chapter presents the phases of knowledge sharing between generations between the senior and the junior which I formed when combining the data in the thematic analysis. These phases describe the “body” or basic framework of knowledge transfer and building. Outlining them attempts to illustrate how knowledge sharing proceeds and how the knowledge being shared develops. The phases, thus, present a simplified framework of the process of knowledge sharing; in practice, they cannot be as easily distinguished from each other as I describe below. In practice, some phases may receive more significance or weight in knowledge sharing than others, whereas the role of some other phases may be minor than presented.

The phases of knowledge transfer related to expert work between the senior and junior are the following (Figure 8):

1. Familiarisation

Familiarisation occurs through the means of knowledge transfer, that is, through documents, dialogue and work situations (Sub-chapter 4.1.3). It, therefore, starts with the junior examining documents which are chosen by the senior based on the knowledge to be transferred:

“X [(a senior’s name)] goes through the basic stuff as he has done it and shows that this is what we’ve thought of before and that we have these guidelines and instructions for the production staff. That’s what we go through first.”

“I’ve got loads of ready texts and background information... I gave X [a junior’s name] some of my own memos and papers, so he gets off to a good start. Otherwise you only waste time and make wrong calls.”

Having gone through the documents, the junior discusses with the senior (i) based on the documents, (ii) in relation to work situations and/or (iii) steered by the junior’s questions:

(i) “He [the junior] showed me some of his documents and I could see he had studied them thoroughly and achieved results.”

(ii) *Our [with the junior] rooms are adjacent so we talk about different things daily. It's good when you're working and you see something and you can say that this has an effect on what you know about this. These different processes.*

(iii) *"I go to X [a senior's name] quite often with my questions. Always when I do something that X has done before I do it so long that I get a few good questions and then I go again to see X and we go through them and he explains the theory and why it's been done this way and so forth."*

With familiarisation it is possible that a sudden work-related problem situation prompts the familiarisation and further the transfer of knowledge. For example, problems with production and flaws in products require a rapid solution and, thus, break the normal work flow or routines. Such a situation offers a good opportunity to transfer knowledge or is a *fruitful learning situation* in which the junior can easily make observations and absorb knowledge:

"A problem situation, like a customer complaint, is one natural and fruitful learning situation...In those situations you always go deeper than the normal daily level and they always reveal something new."

"In problem cases you always learn a lot in one quick instant, it's partly because you have to examine quite deeply what's happened. It always leads to quite quickly identifying causal relationships which is not necessarily the case otherwise."

In familiarisation the senior is the initiator and the "controller" of the activity because he chooses the knowledge which is the object of familiarisation, as well as the documents and work situations applied. As a result the junior receives knowledge that the senior has chosen and defined to be transferred, that is, the senior's knowledge being transferred (Figure 8).

2. Deliberation

Having received knowledge being transferred from the senior, the junior examines it and deliberates over it. He aims to "make the knowledge being transferred clear to himself" by

understanding it in the light of his own knowledge and experience. Juniors describe deliberation:

“He [the senior] mostly showed me the ropes and then I chewed on it by myself and then went again to ask and that’s how we went on.”

“At least I require an uninterrupted period to absorb a bit bigger things when I go through them from the beginning to the end and vice versa a few times. If I take only a bit from there and another from there, the big picture tends to remain unclear.”

In deliberation the junior can look for work situations related to the knowledge being transferred and facilitating understanding in which he can make observations:

“Even if it’s not a problem case, I may come up with a question that why do they [production staff] do something like that. And then I go see and they show me right there on the spot.”

“It [the realisation] requires that you play with it for half an hour and maybe calculate the formulas, so that this is how it goes and then you go over it again and then you go and see in practice that, right, this is where it happens.”

When deliberating, the junior creates his own understanding or conception of the knowledge being transferred, as the result of which the senior’s transferred knowledge from the familiarisation phase becomes the junior’s understanding of the knowledge being transferred in the deliberation phase (Figure 8).

3. Corroboration

Having formed his own conception of the knowledge being transferred, the junior goes to the senior to seek corroboration of his knowledge conception or “check the validity of the knowledge” from the senior. In the corroboration phase the junior shows his documents to the senior, which the senior corrects or comments on. In dialogue the junior asks questions to clarify his knowledge conception, and when opportunity arises the junior and senior examine the knowledge to be corroborated in work situations. In corroboration, thus, all the three means of knowledge transfer are employed, that is, (i) documents (ii) dialogue and (iii) work situations:

(i) *"Some of these sub studies have gone so that I've read X's [a senior's name] old document and then seen how it can be used on the current project, made project-specific changes and finally written it out after which X has read it and said that check this and this once more."*

(ii) *"... it [the knowledge being transferred] includes stuff that I'm clear about and then there are things that have remained a gray area for me. They are the ones I go tackle and ask X [a senior's name]."*

(iii) *"When you read these test results, you get the basic information...It's only out there in practice when you realise that, hey, this is it: if the static electricity remover doesn't function in the roving frame, and you put your hand in there, the plastic sticks to your hand because it's too static."*

In corroboration the junior is the initiator and sustainer of interaction: he starts looking for confirmation from the senior on his conception of the knowledge being transferred and his questions steer the dialogue. In corroboration the senior corrects and "accepts" the junior's conception of the knowledge which does not mean that the junior's knowledge being transferred would be entirely the same as that of the senior (Eraut 2000, Szulanski 2003, Spender 2006). Rather, the junior's knowledge is "close enough" to the senior's knowledge which means that the junior can operate and work based on this knowledge. The juniors do not expect to receive the seniors' knowledge as such, but regard it as the foundation or starting point for their own knowledge:

"In practice this X's [a senior's name] know-how, it's so advanced that it's impossible to transfer completely... I believe that it's possible to transfer it to the extent that I'd manage and get started until my own experience starts carrying me."

The junior's knowledge being transferred formed in the deliberation phase becomes the senior and junior's unanimously accepted knowledge being transferred assessed by the senior's knowledge and experience in the corroboration phase. In other words, corroboration leads to the senior and junior's mutual understanding of the knowledge being transferred (Figure 8).

4. Use

Having received corroboration from the senior for the validity of the knowledge being transferred, the junior starts using it in his work. By using the knowledge being transferred, it becomes the junior's *own skill* when he is able to act independently based on it:

"In practice X's [a senior's name] core competence...It has transferred and it's become my own skill, I no longer have to go to X for advice in these matters."

During the knowledge transfer the junior, thus, gradually proceeds from "equations to experience" or from theory to practice when the physics formula evolves into practical knowledge to help work. One junior captures knowledge transfer and the related work as follows:

"It's just what this thing [work] is in a nutshell, like if you only have some theory or just a practice, you're not going to solve any problems. It requires both."

When the junior works independently based on the knowledge being transferred, the knowledge becomes transferred knowledge and the particular knowledge transfer ends between the senior and the junior (Figure 8).

Work situations as a means of knowledge transfer (Sub-chapter 4.1.3.), thus, differ from using knowledge because in work situations the junior familiarises himself with the knowledge being transferred rather than employs it independently:

"They [the work situations] have now been more or less learning situations for me, so that's why I've wanted to be more involved in them... When I've got more understanding, I can say right away that I don't have to go and orient myself, familiarise with it."

If the junior uses the knowledge in a work situation, he does it with assistance or support from the senior:

"Then there are these situations in practice. Then it's, hey, I've got this gadget here all up in pieces, do you [the senior] have any tips, and then we look for the solution."

Figure 8 illustrates the phases of knowledge transfer. The transfer proceeds in cycles so that the knowledge being transferred is divided into elements and work tasks (Sub-chapter 4.1.2.) which can be transferred both simultaneously and consecutively. In other words, having transferred a piece of knowledge, the senior-junior pair moves on to transfer some other knowledge and, thus, begins the cycle anew. Gradually the cycles become "fewer and farther

between” as the junior’s knowledge increases so that he is finally able to work independently without the senior’s assistance (Sub-chapter 4.1.6.).

The phases of knowledge building related to expert work between the senior and the junior are the following (Figure 9):

5. Assessing

When using knowledge transferred, the junior may identify shortcomings in the knowledge or the activity based on it when reflecting upon his own previous knowledge and experience. This is why he starts assessing the knowledge. This assessment may lead to an *idea* based on which the junior begins developing the knowledge. The idea is based on knowledge that the junior already possessed when coming to the company, that is, he integrates the knowledge previously absorbed into that assimilated in the company. The junior, for example, masters spreadsheets which spawns an idea of enhancing calculation processes related to product design:

“At first I learned how to do the sub studies and these technical documents [product design in tender preparation], after which I realised that they kind of follow the same pattern, that the process can be made a lot faster... X [a senior’s name] had calculated them in his own way, mostly by hand, which is why it was so time-consuming... It was my idea to do the calculations in a new way.”

Assessing the transferred knowledge, thus, leads to the junior’s idea (Figure 9) of how the knowledge can be transformed or developed.

6. Modifying

Based on his idea, the junior starts modifying the knowledge transferred to him. He acts alone, that is, he gets no help from the senior or anyone else in the company, because they do not possess such knowledge or competence that would help in the modification. Instead, the junior searches for knowledge from sources outside the company, such as the literature, standards in the field, universities of technology or the sub-contractors:

“The knowledge can quite rarely be found in-house, so that quite often you have to research the issue. You learn to look for knowledge in international standards and elsewhere.”

The junior begins modifying the knowledge independently and of his own free will, and so it is not officially included in his duties. As the modification proceeds, it becomes known in the company but still remains the junior’s task along with his other duties even though it demands a lot of effort as one junior recounts:

“Its [the computing software] development started when I wanted to know how the calculations really go and I learned all the theories and formulas and other stuff like how you calculate the resonances and what’s due to what. And when I had learnt the entire theory I noticed that, hey, this can be created in a spreadsheet. And I just started working on it... And it was no picnic... I thought that it was going to be like a straight road and then I hit a dead end, so I had to go back a bit. I just had to reflect on it and ask around if someone would have a clue and if not, I just had to examine the literature and find the solution that way.”

Modifying the knowledge is, thus, a challenging task for the junior in which he gets help from the senior or other people in the company. Acting alone and assuming sole responsibility create pressure on the junior about the success of the modification:

“The stress is greater when you haven’t built your own wisdom on someone else’s foundation. When you’ve basically started from scratch. You always wonder if you’ve taken everything into consideration. After all it’s a question of big money and so on.”

As a result of modifying the knowledge, the junior’s idea becomes knowledge built by the junior (Figure 9).

7. Honing

When the junior is finished with modifying or building the knowledge, he checks with the senior whether the knowledge is applicable in the company and whether it fulfills the company’s needs. The junior himself does not have adequate knowledge of the company’s

products, production, clients and procedures, and therefore the knowledge being built needs honing in co-operation between the junior and the senior.

When honing, the new knowledge built by the junior *is reflected on* the senior's knowledge and experience about the company's needs and operations. The junior presents the knowledge he has built to the senior who comments on it and proposes revisions. In the honing process, the junior and the senior employ documents and dialogue as means of knowledge transfer. Work situations, however, are not applicable because the knowledge built by the junior is not in use in the company and there are no "genuine" work situations, only *example cases*:

"The best thing was that when it [computing software] was finished, we went through many example cases with X [a senior's name] and put our brains to it that can it be like this and then we went to check and make sure of certain things in the program. It was really reflecting my results on X's expertise and getting approval."

According to the juniors, the new knowledge they have built may create resistance in the seniors or other staff. They may consider the knowledge unnecessary or too risky for the company, and they may not be ready to give up procedures found successful. In such a situation the juniors have to defend their own view about the appropriateness of the new knowledge in the company. Another alternative is to abandon the use of the new knowledge which the juniors are, nevertheless, not willing to do as illustrated by the example below:

"There are a couple of people who've been here for 40 and some years... they [the renewal proposals] are not going through and you kind of get frustrated that you have to struggle with tremendous extra work. I could have ideas about the production how it could be done better, so that we could make little adjustments, but no. I just said I'm going to try it anyway."

The modifying phase gives rise to the knowledge built by the junior which becomes knowledge built by the junior and applied to the company in the honing phase (Figure 9). This knowledge has been assessed based on the senior's knowledge and experience.

8. Use

When the junior and the senior have honed the new knowledge to be applicable to the company, the junior starts using it in his work. In knowledge building, the phases of assessing, modifying and honing are planning the knowledge or examining it through theory, during which the junior and senior are not certain how the knowledge in practice facilitates or enhances work or how it is applicable to the company. The relevance of the new knowledge both to the individual and to the company is only proven in use:

“Last autumn there were many sleepless nights when I was nervous about how my systems work until practice showed that my calculations were right on the money.”

“It’s been acknowledged in this firm that my program is useful and I received a bonus for it. It’s really been acknowledged that it saves time and avoids big mistakes and everything. So that I’m developing it further, always when I come up with something new about it, I start working on it right away.”

When the junior starts independently using the knowledge he has built, applied to the company, it becomes knowledge built (Figure 9) and the knowledge building ends. The seniors are not interested in employing the knowledge built because they do not consider, for example, the new computing methods useful for them: *“after all I don’t have much use for it”*. Their interest in the new knowledge, however, comes from making the knowledge accessible to others:

“It [the new simulation system], too, is useful and top of the line...I’ve stayed away on purpose...I bet that the retirement will hit me before I’ll learn it.”

The cycle of knowledge building progression (Figure 9) illustrates how the junior may assess the transferred knowledge over and over again when using it and start modifying it having had an idea. The junior each time receives new tools and perspectives from the senior along with the transferred knowledge to assess and further modify the knowledge. Thus, accumulating more and more transferred knowledge over time, the junior increases his own knowledge and skills and always needs less and less assistance from the senior in honing the knowledge he has built until he is finally able to build knowledge independently (Subchapter 4.1.6.). New knowledge is, therefore, built on knowledge acquired previously, that is, existing knowledge (Carlile & Rebentisch 2003).

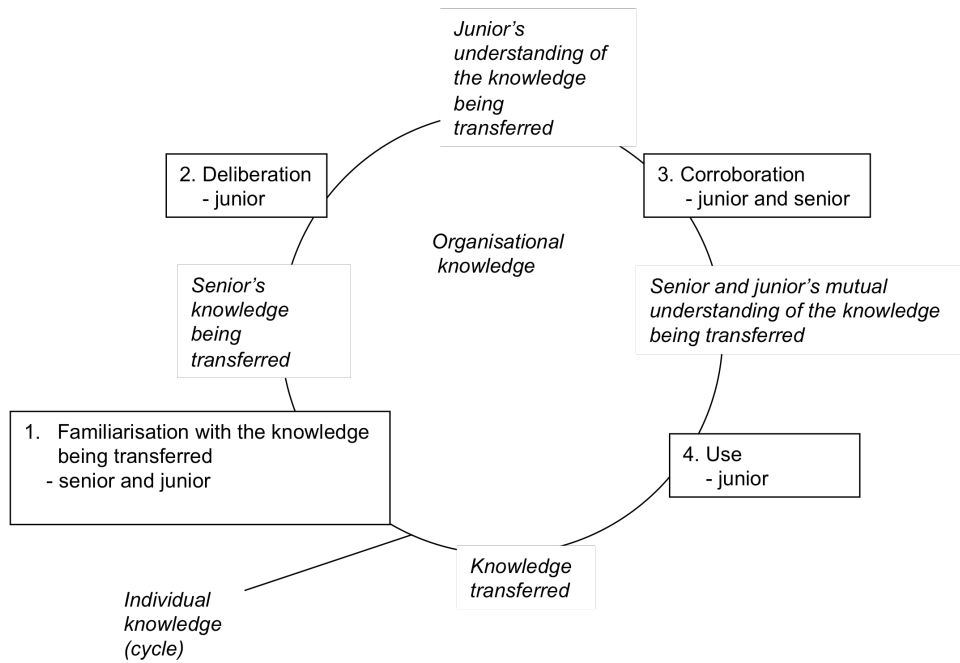


Figure 8. Phases of knowledge transfer between generations in expert work (i.e. Phase 1 of knowledge sharing).

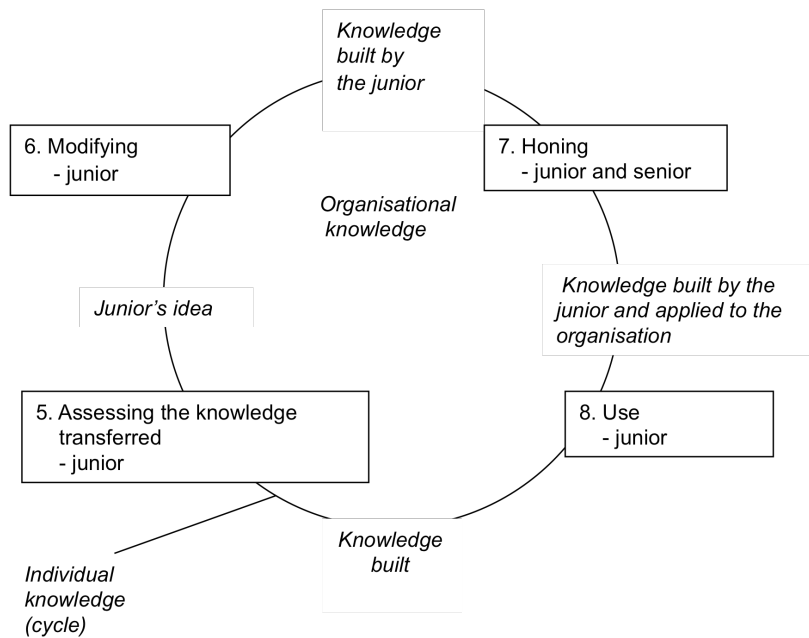


Figure 9. Phases of knowledge building between generations in expert work (i.e. Phase 2 of knowledge sharing).

In knowledge sharing between generations the transfer of existing knowledge is the prerequisite for building new knowledge because knowledge is built on the knowledge transferred. This means that only after the phases of transfer (Phases 1–4 in Figure 8) can one proceed to the phases of knowledge building (Phases 5–8 in Figure 9). The senior and junior may also continue knowledge transfer without ever building knowledge. In knowledge transfer, the phase of knowledge use (Phase 4 in Figure 8) leads to assessing knowledge building (Phase 5 in Figure 9) when the junior notices shortcomings in the transferred knowledge when using it. Knowledge building begins if the junior starts modifying the knowledge transferred.

In the phases of knowledge sharing the knowledge is categorised into individual knowledge (cycle lines in Figures 8 and 9) and organisational knowledge (cycle centres in Figures 8 and 9). Individual knowledge includes not only knowledge and experience, but also personal dispositions, such as personal characteristics and individual perceptions about things and processes that could have been absorbed before joining the organisation. Individual knowledge has not been disseminated in the organisation accessible to everyone, whereas organisational knowledge involves both formal rules guiding individual's activity and collective understanding which steers knowledge use in the organisation along with personal dispositions. Organisational knowledge is collective knowledge among all the members, created partly as a result of their action and interaction. (Tsoukas 1996, Tsoukas & Vladimirova 2001.)

Based on the results of this study, the seniors' knowledge being transferred between generations in expert work is built of formal explicit knowledge acquired in education which is applied to work situations and practices or implicit knowledge based on tacit knowledge acquired through experience (Sub-chapter 4.1.2.). The seniors' knowledge, thus, includes individual knowledge and experience which is applied to organisational knowledge or the rules, customs and practices that underlie organisational operation. Therefore, the seniors' knowledge or the knowledge being transferred between generations is the combination of individual and organisational knowledge.

The juniors' knowledge is built of explicit knowledge acquired in formal education and personal dispositions, experiences and conceptions. This juniors' knowledge, however, is not applied to organisational knowledge at the onset of knowledge transfer, that is, it does not include organisational knowledge. Based on the findings, the knowledge the junior brings

from outside the organisation is an essential element in knowledge building because based on it or guided by it the juniors assess the knowledge transferred and further adapt it to generate new knowledge. For example, making a computing program that enhances product design in tender preparation requires such information technological vision and competence from the junior that the company did not possess previously. Applying this program to the company's needs, however, requires honing the new knowledge based on the senior's knowledge, that is, individual experience and organisational knowledge.

The knowledge being transferred and built in Figures 8 and 9 can be categorised not only into individual and organisational knowledge, but also into data, information and knowledge (Spender 2006, 2008). Following Spender's (ibid.) definition, data comprises facts related to knowledge sharing. They have no significance as such until they are applied to working in the company. In all the phases of sharing, information concerns such data that has been given meaning based on work needs. Knowledge is then such information that has been connected with practice or work.

In Figure 8, the senior's knowledge being transferred is knowledge because it is based on the senior's practical experiences. The junior's understanding of the knowledge being transferred is information because when in the deliberation phase the junior has understood the knowledge in the light of his own knowledge and experience, as well as given it his own meaning based on what knowledge he deems necessary in his work. The senior and junior's mutual understanding of the knowledge being transferred is also information for the junior because in the corroboration phase the junior has received confirmation from the senior that he has understood the knowledge "correctly" from the perspective of his work, which is also the senior's work. For the senior, the mutual understanding of the knowledge being transferred denotes knowledge because it is based on practical experiences of the knowledge necessary in work. The transferred knowledge means knowledge for the junior because in the phase of using the knowledge he has connected the information to practice, that is, work.

In Figure 9, the junior's idea is considered knowledge because it is based on practical experiences which combine the transferred knowledge and previous knowledge. The knowledge built by the junior is information because in the modifying phase the junior has understood the knowledge he has modified and endowed it with meanings based on what knowledge he needs in his work. The knowledge built by the junior and applied to the

organisation denotes information for both the junior and the senior because in the honing phase they have understood the knowledge built by the junior and given it meanings based on what knowledge can be used and exploited in the company. The knowledge built is junior's knowledge because in the phase of using knowledge he has connected the information to practice, that is, work.

Not only knowledge transfer but also knowledge building may lead to disseminating the transferred or built knowledge to other members of the organisation. After the phase of using knowledge, that is, having accumulated practical experience of the knowledge, the junior starts disseminating it. By "dissemination" I refer here to making the knowledge available to all those that need it by the junior's initiative (Sub-chapter 4.1.4.). When disseminating the knowledge, the junior makes the transferred and built individual knowledge into organisational knowledge by presenting it formally and making it accessible to everyone (Tsoukas 1996, Tsoukas & Vladimirou 2001).

The double dichotomy in Figure 7 (Sub-chapter 4.1.4.) illustrates how the means of knowledge sharing are connected to knowledge dissemination in the organisation. Of the phases of knowledge sharing, the phases of knowledge transfer (1–4) take place in the bottom segments of the double dichotomy. After the transfer, the transferred knowledge is either not communicated to others (bottom left) when it remains individual knowledge or it is communicated to others (bottom right) when it is distributed to become organisational knowledge. All the phases of knowledge transfer (1–4) as well as assessment and modification of the phases of knowledge building (Phases 5 and 6) take place in the upper left hand segment of the double dichotomy. In it the knowledge built by the junior remains his own knowledge in his own use because there is no honing with the senior to create knowledge applicable to the organisation or the knowledge is not communicated to others. In spite of increasing individual knowledge, there is no increase in organisational knowledge in this case. All the phases of knowledge transfer and building, that is, knowledge sharing (1–8) take place in the top right segment of the double dichotomy. In it the knowledge built is also communicated to others, thus, increasing knowledge in the organisation.

According to the findings of this study, knowledge sharing between generations, that is, knowledge transfer and building take place in interaction between the senior and the junior in eight phases. The cycle of knowledge transfer comprises the phases of familiarisation, deliberation, corroboration and use. Knowledge transferring, thus, ends when the junior has

received the knowledge, understood it and used it. The cycle of knowledge building between the senior and the junior consists of the phases of assessing, modifying, honing and use. Based on the findings, knowledge transfer and building between generations, therefore, occur in interaction and end in using the knowledge.

Knowledge transfer is the prerequisite for knowledge building, that is, the senior and the junior can only go through the cycle of knowledge building having completed the cycle of transfer with the knowledge. In the first cycle, the cycle of knowledge transfer, knowledge existing in the organisation is retained, whereas in the second cycle, the cycle of knowledge building, knowledge in the organisation is increased by building new knowledge based on the knowledge transferred. This built knowledge makes organisational operations more efficient.

4.1.6. Development of Knowledge Sharing and Expertise

In this sub-chapter I report the findings from the juniors' follow-up interviews and the comparison conducted between the research and follow-up interviews. As findings from the thematic analysis, I show how knowledge sharing has proceeded with the senior–junior pairs over one year. I also describe the progression of knowledge transfer and building from the perspective of knowledge being transferred and built. Finally, I examine how the juniors' expertise evolves.

During the follow-up interviews in the summer 2007, one year after the actual research interviews, knowledge transfer had ended with one senior–junior pair and continued with three pairs. Two pairs had not engaged in knowledge transfer either in 2006 or in 2007. The status of knowledge transfer both in 2006 and 2007 has been included in Table 8 in which I show a summary of the methods of knowledge sharing by each senior–junior pair. (I have previously outlined the pairs' knowledge transfer in Table 4 in Sub-chapter 4.1.1. In Table 8 I have kept the numbering of the pairs unchanged.) Of the senior–junior pairs in Table 8, Pair 1 has not transferred any knowledge in 2006 or a year later. Pair 2 transferred knowledge in 2006, but a year later transferring has ended. The reason is a change in the junior's duties, because the senior does not possess such knowledge that the junior needs in his new line of work:

“X [a senior’s name] has quite a lot of knowledge of the traditional SVC project, but about this new product X probably doesn’t know much. So I don’t think there’ll be much knowledge transfer ahead.”

Pair 3 transferred knowledge in 2006 and continues to do so in 2007. Pair 4 also transferred knowledge in 2006, but a year later the transfer is in effect only with one task. The junior describes the status of knowledge transfer:

“In practice X’s [a senior’s name] core competence, if you leave out this series capacitor tender stuff, it’s transferred and it’s become my own skill, I no longer have to go to X for advice.”

Pair 5 transferred knowledge in 2006 and continues to do so in 2007. Pair 6, however, did not transfer knowledge in 2006 or one year later. The senior in the pair retired in the summer 2007, and before this the junior had already received knowledge related to his work from other individuals. The knowledge defined to be transferred with his assigned senior was available to the junior to some extent from the other seniors in the company:

“In our work me and X [a senior’s name] haven’t done much co-operation in learning ...I know these component designers so well that I have no problem going there to ask stuff and I know who knows what... In practice I go ask Y [a senior, not specifically assigned] or Z [a colleague, not a senior]. I’ve completely learnt this system calculation, which is an essential part of the tender, from him.”

Table 8. Methods of knowledge sharing by senior–junior pairs in 2006 and 2007.

Methods of knowledge sharing	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5	Pair 6
Transferring knowledge in 2006	No	Yes	Yes	Yes	Yes	No
Disseminating knowledge transferred in 2006	-	No	No	Yes	No	-
Building knowledge in 2006	-	Yes	(Yes)*	No	Yes	-
Disseminating knowledge built in 2006	-	No	(Yes)*	-	Yes	-
Transferring knowledge in 2007	No	No	Yes	Yes	Yes	No
Disseminating knowledge transferred in 2007	-	-	Yes	Yes	No	-
Building knowledge in 2007	-	-	Yes	No	Yes	-
Disseminating knowledge built in 2007	-	-	Yes	-	Yes	-

* Knowledge building is not based on knowledge that is transferred but that the junior already possessed when joining the company.

In the interview in 2006 the juniors were concerned about whether they would adopt the seniors' knowledge sufficiently and rapidly enough (Sub-chapter 4.1.1.). A year later the juniors are confident that they can handle the seniors' work tasks; however, they cannot help but wonder whether they are as efficient in their work as the experienced seniors:

"It [knowledge transfer] did make me quite nervous six months or year ago...Perhaps the biggest concern is that X [a senior's name] has such long experience and he does these tasks so efficiently...I don't think that it's the end of the world even though X steps aside."

"I can say that I cope with these people and first and foremost with all that equipment and systems. Some things may take a little more time but it'll come around."

Table 9 summarises the elements of knowledge being transferred and the connected work tasks, as well as knowledge transfer and building in 2006 and 2007. (I have previously presented the elements of knowledge to be transferred and the connected work tasks in Table 5 in Sub-chapter 4.1.2.) In 2006, knowledge being transferred naturally included all the knowledge elements and work tasks listed in Table 9. New knowledge was built in 2006

based on transferred knowledge in tender preparation product design by developing a new computing program, as well as in computer simulation conducted in designing the client applications of products by enhancing the simulation software. Work methods were also made more efficient but this was done based on knowledge that the junior already possessed when joining the company, and, thus, it is not built on transferred knowledge. Nevertheless, it is new knowledge to the company, introduced in knowledge transfer between generations, and, therefore, I mention it in this connection.

Of the knowledge built, in 2006 the juniors disseminated the new computing program, as well as the knowledge about improving work methods within the company. The simulation software developed was, therefore, not disseminated and made available to others. Of the knowledge transferred, the juniors disseminated design guidelines utilised in designing the client applications of products.

By the follow-up interviews in 2007, knowledge transfer had ended concerning computer simulation and the related work tasks (Table 9). However, the transfer is still on-going with knowledge pertaining to product development and product design in tender preparation. In all the work tasks related to production—excluding supervision which has never been initiated—knowledge transfer is going on. In sales, knowledge transfer has never been initiated with regard to client-related product knowledge and customer relationship management, whereas the transfer has been completed with regard to pricing and tender preparation.

With knowledge transfer I refer to in this study to the process taking place, in particular, between the senior and the junior. When Table 9 refers to the status of knowledge transfer as “never initiated”, it means that the knowledge has never been transferred between the senior and the junior. The junior, nevertheless, has received and still receives knowledge from other individuals in the company:

“But then this knowledge transfer, the greatest lessons I’ve learnt about sales have surprisingly come from the younger fellow. That X [the ‘fellow’s’ name] has taught me this rough tender writing routine and calculation methods...In practice I learn things by asking Y [a senior, not assigned to the interviewee] and X. Y knows all about history and X all the essentials of preparing a tender.”

In the follow-up interviews, the seniors and juniors’ mutual knowledge building has transformed into the juniors’ independent knowledge building and part of work: the juniors

themselves now have enough company-related knowledge needed to build knowledge, and, therefore, they no longer need the seniors' assistance in their knowledge building. This juniors' independent knowledge building is located in the last column of Table 9. In all the cases mentioned, the juniors communicate that they disseminate their built knowledge available to others by documenting it. However, documenting practices are not instructed or established—as is the case with the seniors (Sub-chapter 4.1.2.):

“I don't get to do enough documents. It's a clear shortcoming on my part that I do it 'eventually' when it should be done right away.”

“I do document the created knowledge somehow. And for the part that concerns the entire team I try to distribute it either verbally or by e-mail.”

The junior's independent knowledge building involves social interaction but it's not merely, or perhaps not at all, between the senior and the junior. Developing a finished product in the operating environment is one example of a problem situation which the junior solved independently without the senior's help:

“There was a situation when the component designers said that their components can't produce such values...I said that they must because otherwise the results are not right. Then we built a model in the lab and fetched equipment from the university to measure them and saw that my hunch was right. I started to think about it, made all kinds of measurements and complex analysis... It was left to me because others didn't have enough interest or time to solve it...And now we can prevent all these situations beforehand.”

The juniors also conduct research and testing related to maintaining and developing production methods without the seniors' assistance:

“We washed that high voltage container out there in the production and I placed an order for a new 'dishwasher', like we say. With the order came a new detergent, so I had to go through it that we'd get the same or at least a sufficient result compared to the old one. X [the senior's name] didn't have the kind of knowledge or experience because they've always used the same detergent.”

“It [a certain production process] is being investigated all the time, even at the moment there are test units...even though it has been studied here for a long time there's not enough experience and validated knowledge that if this particular oil, the Chinese plastic and Korean aluminium foil, even if they all have been examined separately, they still need to be examined together.”

Table 9. Knowledge being transferred between generations in expert work and the connected work tasks, as well as knowledge transfer and building in 2006 and 2007.

Elements of knowledge being transferred and the connected work tasks in 2006	Knowledge building based on knowledge transferred in 2006	Status of knowledge transfer in 2007	Independent knowledge building in 2007
Products i.e. equipment and systems			
Products: holistic product knowledge in different technical environments		Complete	Developing a complete product in its operating environment
Product design in tender preparation i.e. computational product design	Making a new computing program	On-going	Developing the computing program made in 2006
Client application design i.e. practical product design		Complete	
Product development		On-going	Developing a new product
Production i.e. machinery and methods			
Products: Product knowledge related to production, quality and its improvement		On-going	
Maintenance of production		On-going	
Production-related R&D	(Enhancing work methods)*	On-going	Enhancing production methods
Supervision		Never initiated	
Sales			
Products: Client-related product knowledge		Never initiated	
Managing client contacts: client relationships, client meetings		Never initiated	
Pricing		Complete	
Writing tenders		Complete	
Computer simulation			
Products: technical product knowledge		Complete	
Measuring products in tender preparation i.e. by technical computing		Complete	
Measuring products in client applications i.e. in practical design	Developing simulation software	Complete	

*Knowledge building is not based on knowledge transferred but knowledge that the junior possessed already when joining the company.

It is difficult to define unequivocally when the knowledge transfer between generations related to expert work is concluded or “complete” as I state in Table 9. Expertise builds over time from combining formal education and experience to responding to changing situations (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Pyöriä et al. 2005). In the subject company, the seniors’ knowledge being transferred consists of extensive and thorough knowledge and experience about electrical engineering, the company’s production and products as well as about clients. This expertise acquired over decades cannot be “transferred at once” but it also builds with the juniors gradually as experiences accumulate in different situations and circumstances. The end of the knowledge transfer related to expert work cannot, therefore, be determined based on when the junior has received “all” the senior’s knowledge. The findings of this study show that knowledge transfer is concluded or “complete” when the junior possesses enough knowledge to work independently and at the same time to absorb new knowledge. The juniors acknowledge that everything cannot be mastered and acquiring knowledge takes time:

“It’s completely impossible that one individual would know it [the production] entirely which means that it’s enough to know how to conduct the first analysis, to identify where the problem is and to know where you can get help.”

“Learning and gathering new stuff is an endless journey. The knowledge increases every day in practical situations.”

The juniors’ expertise, thus, increases and strengthens continuously when working and accumulating experiences, that is, expertise is not “complete” when the knowledge transfer ends.

The juniors’ independent work involves taking responsibility of one’s own action and its outcome, rather than “blindly” relying on the knowledge received from the seniors. The juniors connect assuming responsibility with comprehensive understanding of things and phenomena:

“When you’re working with electricity, in principle you should know everything right from the basics that you can in a tight spot justify how things have been done and so on. When the client asks a question, you can’t say that we did it this way before and the equipment didn’t catch fire. It’s not a justification. That’s why I started learning all this stuff.”

“I need a justification for why something is the way it is. It’s a question of whether I truly understand and absorb it or am I just repeating what I’ve read or heard.”

Even if the junior is able to work independently, it does not necessarily mean that the knowledge transfer between the senior and the junior ends completely. All the senior's knowledge is not transferred to the junior at once and not all the knowledge is absorbed simultaneously (Sub-chapter 4.1.5.) which means that the junior manages some elements of the knowledge and the connected work tasks earlier than others and can therefore work with them more independently. One junior recounts:

"I've come to consider myself quite the expert at this point but preparing tenders for series capacitors is still a bit vague area."

The end of knowledge transfer between the senior and the junior does not mean that their interaction also comes to an end. It merely decreases and reconfigures. The senior becomes one source of knowledge among others: the junior turns to the senior when knowing that he, in particular, possesses knowledge about the issue at hand:

"But of course nowadays if I come up with things that X [a senior's name] knows, I'll ask him...we talk in meetings with different projects."

At the same time, the interaction between the senior and the junior evolves from giving and receiving knowledge to a more equal exchange of knowledge:

"Knowledge transfer no longer fully describes my and X's [a senior's name] interaction, I mean in principle there's no asking and explaining. Because both of us manage the basic theory that my questions were about before."

"If one of us prepares a document, the other one reads through it from another angle and makes notes of the things that sound a bit fishy."

4.1.7. Summary: Knowledge Sharing

Based on the findings of this study, expert work-related knowledge transfer between generations involves four factors. These are (i) interaction, (ii) expectations imposed on the senior and the junior, (iii) their personal dispositions and (iv) external circumstances, that is, a lack of time and the physical distance between the parties (Figure 6, Sub-chapter 4.1.1.). Shaping the knowledge transfer between the senior and the junior, these factors become intertwined in knowledge transfer, and, therefore, it is impossible to assess each factor's individual value or significance in the transfer. Interaction is, nevertheless, an essential part of knowledge transfer because it is not possible to teach or absorb the knowledge needed in

the work without dialogue and the senior and junior's working together. (Tsoukas 1996, Szulanski 2003.)

In the subject company the knowledge being transferred between generations in expert work divides into four elements: product, production, sales and computer simulations. These elements of knowledge include basic or theoretical knowledge which alone is not sufficient to perform the work. This is why the elements have to be connected to work tasks and the knowledge needed in them when transferring knowledge. In other words, only when employing the theoretical knowledge, does it become clear from what "perspective" this knowledge should be approached in work and how it can be best used to facilitate work.

In the company of this study, the knowledge being transferred between generations involves the explicit, implicit and tacit dimensions (Polanyi 1966, Tsoukas 2003, Eraut 2004). The explicit dimension of knowledge, however, is not as such or in effect transferred for two reasons. Firstly, the juniors have acquired this theoretical knowledge in their education before coming to the company. This knowledge acquired in education is, nevertheless, needed and used in the knowledge transfer because it has to be applied to the company and working there. Secondly, the explicit dimension of knowledge did not prove to be knowledge to be transferred in this study possibly because the knowledge documented in the company, or explicit knowledge, is considered inadequate for the juniors' knowledge needs. This can be partly explained by a lack of documentation in the company regarding the knowledge to be transferred.

The implicit dimension of the knowledge to be transferred includes theoretical or explicit knowledge applied to the subject company and working there. This situation-bound knowledge comprises, for example, product design guidelines and knowledge pertaining to testing conducted in production development and the operation of products in different environments.

The tacit dimension of the knowledge to be transferred consists of knowledge acquired by the seniors over decades which integrates explicit and implicit knowledge with personal views and experiences. The seniors' knowledge being transferred consists of extensive and thorough knowledge and experience about electrical engineering, the company's production and products as well as about clients. This seniors' tacit knowledge is the expertise that the juniors want to receive and absorb.

The means of knowledge transfer between generations are activities or processes with the help of which or during which the senior and the junior transfer knowledge between themselves. These means are three: orientation with documents, dialogue and work situations. When orienting oneself with the knowledge being transferred through documents, the knowledge is primarily chosen by the senior. In dialogue, however, the senior and junior together define the knowledge to be transferred and how the junior familiarises with it. The junior's questions are important in initiating dialogue and steering the knowledge transfer, because otherwise the senior does not know what knowledge the junior needs. It is important for the juniors to ask questions because otherwise they would not receive the knowledge they consider necessary from the seniors. When confronted with work situations in practice, the juniors come to realise the gaps in their knowledge, and, therefore, work situations generate new questions and further discussion. The significance of work situations for knowledge transfer is, however, much greater than the mere prompting of questions: understanding the knowledge read from documents and that has arisen in discussions becomes easier through making concrete observations. In particular, work situations facilitate knowledge transfer when the situation involves several factors all the combined effects of which are impossible to take into account based on mere theory, without making observations.

The means of knowledge transfer between generations are related to the dimensions of knowledge (Table 7, Sub-chapter 4.1.3.) by following the categorisation by DeLong (2004). The explicit dimension on knowledge transferred in documents is formally presented knowledge produced by the seniors or other members of the organisation. In dialogue the juniors can acquire knowledge related to the implicit dimension guided by their own needs, that is, instead of formal knowledge, they can aim to receive knowledge applied to the company and their own needs which helps them to perform the seniors' work. The transfer of tacit knowledge in work situations or *seeing the issue enveloped in a situation* helps the juniors to understand several factors and circumstances related to the knowledge being transferred and simultaneously influencing it, as well as to create links between them.

When examined through the dimensions of knowledge, the means of knowledge transfer are not mutually exclusive because it is not possible to distinguish between the dimensions when using knowledge (Polanyi 1966, Tsoukas 1996, Spender 2006). In other words, for example, the transfer of explicit knowledge in documents is the "minimum requirement" as a means, which does not imply that the explicit knowledge could not be transferred by other means as well. The findings show that explicit knowledge is treated and used not only in documents but

also in dialogue and work situations, and correspondingly implicit knowledge is “present” not only in dialogue but also in work situations.

By the concept knowledge sharing between generations I refer here to the interactive process which can involve only knowledge transfer or both knowledge transfer and knowledge building. Knowledge transfer and building are methods of knowledge sharing which can lead to communicating the transferred or built knowledge along in the company. Interlinking these methods produces the organisational effects of knowledge sharing (Figure 7, Sub-chapter 4.1.4.): (i) retaining and holding knowledge follows from knowledge transfer and storage as individual knowledge; (ii) retaining and disseminating knowledge follows from knowledge transfer and passing it on to others in the organisation; (iii) increasing and holding knowledge follows from building and storing knowledge as individual knowledge; and (iv) increasing and disseminating knowledge follows from building and communicating the knowledge to others in the organisation.

The commonly accepted goal of knowledge transfer between generations, retention of existing knowledge in the organisation (DeLong, 2004; Rothwell & Poduch, 2004) is achieved in retaining and holding knowledge. In it knowledge is transferred from one individual to another; in other words, the senior's knowledge has been transferred to the junior as the senior retires. In accordance with the perspective of this study, the possible goal of knowledge transfer between generations or knowledge sharing is building new knowledge to the organisation. It is achieved when increasing and disseminating knowledge: new knowledge is built or existing organisational knowledge is increased and communicated to others so that the knowledge built is spread to all those that need it and it becomes organisational knowledge.

Based on the findings of this study, knowledge sharing between generations related to expert work involves not only the transfer of knowledge existing in the organisation but also building of new and meaningful knowledge to the organisation. Knowledge building takes place in co-operation or interaction between the senior and the junior, in which the new knowledge brought to the organisation by the junior is integrated into the senior's knowledge of the organisation and working there. In the company of this study the knowledge built and disseminated in knowledge sharing between generations proved to be the computing programs in product design. This built knowledge has been disseminated in the company

available to everyone, it has made the company's operations more efficient and improved its competitiveness.

Knowledge sharing between generations occurs in phases between the senior and the junior. Outlining them I illustrate how knowledge sharing proceeds and how the knowledge being shared develops. The process of knowledge sharing proceeds through eight phases in two cycles: the cycle of knowledge transfer comprises the phases of familiarisation, deliberation, corroboration and use, whereas the cycle of knowledge building consists of the phases of assessing, modifying, honing and use (Figures 8 and 9, Sub-chapter 4.1.5.). Knowledge sharing between the senior and the junior, thus, occurs in interaction and ends in using the knowledge. Knowledge transfer ends when the junior has received the knowledge, understood it and taken it to use (Szulanski 2003).

Knowledge is transferred in cycles because the knowledge being transferred divides into elements and work tasks which are not transferred "at once", rather the transfer proceeds following work tasks and practices. In other words, having transferred a piece of knowledge, the senior-junior pair moves on to transfer some other knowledge and, thus, begins the cycle anew. Gradually the cycles become "fewer and farther between" as the junior's knowledge increases so that he is able to work independently without the senior's assistance.

The progression of knowledge building in cycles illustrates how the junior may assess the transferred knowledge over and over again when using it and start adapting it having had an idea. The junior each time receives new tools and perspectives from the senior along with the transferred knowledge to assess and further modify it. Thus, accumulating more and more transferred knowledge over time, the junior increases his own knowledge and skills and always needs less and less assistance from the senior in honing the knowledge. New knowledge is therefore built on knowledge acquired previously, that is, existing knowledge (Carlile & Rebentisch 2003).

In knowledge sharing between generations, knowledge transfer is the prerequisite for knowledge building. This means that knowledge building is always the second cycle of knowledge sharing between generations which possibly takes place after the first cycle, that is, knowledge transfer. This first cycle concerns retaining existing organisational knowledge, whereas the second cycle entails building new knowledge based on the transferred knowledge.

In the phases of knowledge sharing, knowledge is distinguished between individual and organisational knowledge. Individual knowledge includes not only knowledge and experience, but also personal dispositions, such as personal characteristics and individual's perceptions about things and processes that could have been absorbed before joining the organisation. Individual knowledge has not been disseminated in the organisation accessible to everyone. (Tsoukas 1996, Tsoukas & Vladimirou 2001.) Organisational knowledge involves both formal rules guiding individual's activity and collective understanding which steers knowledge use in the organisation along with personal dispositions (Tsoukas & Vladimirou 2001). Based on the results, the seniors' knowledge being transferred between generations in expert work is built of formal explicit knowledge acquired in education which is applied to work situations and practices or implicit knowledge based on tacit knowledge acquired through experience. The seniors' knowledge or knowledge being transferred is, thus, the combination of individual and organisational knowledge.

The juniors' knowledge is built of explicit knowledge acquired in formal education and personal dispositions, experiences and conceptions. This juniors' knowledge is not applied to the organisation at the onset of knowledge transfer, that is, it does not include organisational knowledge. However, the knowledge the junior brings from outside the organisation is an essential element in knowledge building because based on it or guided by it the juniors assess the transferred knowledge and further adapt it to generate new knowledge. Applying this adapted knowledge to the company's needs, however, requires honing the new knowledge based on the senior's knowledge, that is, individual experience and organisational knowledge.

Comparing the findings from the research interviews (2006) and follow-up interviews (2007) conducted with the juniors revealed that the knowledge transfer between the seniors and the juniors has partly ended in one year. Mutual knowledge building has also transformed as part of the juniors' independent work: the juniors themselves now have enough company-related knowledge needed to build knowledge, and, therefore, they no longer need the seniors' assistance in their knowledge building. Even if the junior is able to work independently, it does not necessarily mean that the knowledge transfer between the senior and the junior ends completely. It merely decreases and reconfigures. The senior becomes one source of knowledge among others, and their interaction evolves from giving and receiving knowledge to a more equal exchange of knowledge.

Based on this study, I cannot unambiguously define the end or “completion” of the expert work-related knowledge transfer between the senior and the junior. Knowledge transfer decreases or ends gradually when the junior possesses enough knowledge to work independently and at the same time to absorb new knowledge. However, the juniors’ expertise is not “complete” when the knowledge transfer between the two parties ends, but it increases and strengthens continuously when working and accumulating experience. (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Pyöriä & al. 2005.)

4.2. Contexts and Themes in the Interviewees’ Speech

In this sub-chapter I report the findings from the analysis I conducted by the articulation method. The goal of interpreting the interviewees’ verbal accounts is to understand knowledge sharing between the seniors and juniors by examining it in the context of work. Next, I outline the three contexts that emerged in the interviews as well as the thirteen themes and two discourses entailed in them.

4.2.1. Themes of Knowledge Transfer in the Context of the Company

In the context of the company the interviewees connect knowledge transfer to the company of this study. Two of the three themes in this context describe the knowledge being transferred, in the first one on a general level or from the perspective of the company and in the second one more specifically or from the individual’s perspective. The third theme considers the significance of knowledge transfer to the company (Table 10).

In Theme 1 in the context of the company, that is, knowledge being transferred generally (Table 10), knowledge is described from the perspective of the company. Elaborating on the nature and type of the knowledge, the theme emphasises the lack of knowledge: in Finland it can only be learned in the company of this study. At the same time, it acknowledges that technology trends and knowledge are constantly evolving, which is why the company needs not only *expertise brought about by experience* and *continuity in the life’s work*, but also *new blood*. The knowledge being transferred involves the explicit, tacit and implicit dimensions of knowledge (Polanyi 1966, Eraut 2004, DeLong 2004): it entails linking the explicit laws of physics with implicit company-specific knowledge through tacit expertise. In the company, the

knowledge to be transferred is, thus, presented as based on theory and connected to practice.

In the context of the company, the knowledge being transferred specifically or Theme 2 (Table 10) distinguishes the content of the knowledge and what the knowledge being transferred is. In this second theme the knowledge being transferred is presented more concretely than in the first one, when the knowledge is connected to the company's operations and individuals' work tasks. The knowledge, however, is not linked to the practices and situations in which it is employed or transferred, but the interviewees just list or mention the content of the knowledge that applies to them and their work:

"The specific things that we've listed and that we should be going through with X [a senior's name] include getting to know X's contact network, client histories, pricing and the series capacitors from the product side."

In the context of the company, the significance of knowledge transfer or Theme 3 (Table 10) shows the effects of the transfer on the company's future to be beneficial and important. The significance of the knowledge transfer or *succession* for the company is illustrated in the theme as follows:

"It's really important for the company's continuity that this knowledge will be transferred. Otherwise, the future will be bleak not in the short term but rather in the long run."

The juniors have been instructed to transfer knowledge, and they understand its importance for the company. One junior recounts:

"Ever since I came to this firm, I've been reminded that you have to learn these old masters' jobs. The boss has come up almost daily and said 'now remember to learn'."

Table 10. Themes of knowledge transfer in the context of the company.

Theme 1: Knowledge being transferred generally, throughout the company: the essence and nature of knowledge				
Fact or explicit knowledge - theory - physical formulas and laws of physics - power engineering	Holistic or tacit knowledge - through long experience - expertise - combined - understanding	Company-specific or implicit knowledge - applied to this company - only to be learned in this company - scarce	Combination of theory and practice - theory-based - to be absorbed in practice - to be transferred between the senior and the junior - to be developed - to be applied	Evolving or constantly changing - partly outdated - life's work will continue - the young will inevitably know more - the company needs new blood
Theme 2: Knowledge being transferred specifically, individually: the content of knowledge				
Products or equipment and systems - products in technical environments - product design - R&D	Production or machinery and methods - manufacture and quality of products - maintenance of production - development of production - supervision	Sales - product knowledge - client knowledge - pricing	Computer simulation - measuring products	
Theme 3: Significance of knowledge transfer				
Effects of knowledge transfer on the company - important for the future - important for continued success				

The items marked with dashes are quotes from the interviews. The headings are statements summarised by the researcher about the contents of the themes.

In the context of the company, knowledge is examined as being kind of abstract and detached from its use and work: it is looked at as being beyond the daily work. Knowledge receives its meaning when it is intertwined in the company's business and success in the past, present and future: knowledge is described as brought about by long experience,

constantly changing and important in the years to come. The existence of the knowledge being transferred related to the individual is noted in the context of the company or only briefly described when compared to how knowledge is depicted in the contexts of work. The interviewees “present” the knowledge related to the knowledge transfer to the interviewer, but they do not elaborate on the transfer or employment of this knowledge, and therefore the knowledge remains “detached”: not connected to practical needs, situations or work, it is only related to the company.

In the themes in Table 10, knowledge being transferred appears partially similar to that in Tables 5 and 6 (Sub-chapter 4.1.2.). In the context of the company, the individual's knowledge theme (Table 10) is included in the elements and work tasks of knowledge to be transferred (Table 5). The company's knowledge theme in the context of the company (Table 10), however, is included in the dimensions of knowledge to be transferred (Table 6). Moreover, in this theme knowledge being transferred is described as a combination of theory and practice as well as constantly evolving. Both of these features also emerge in the thematic analysis (Sub-chapters 4.1.2. and 4.1.5.). In the previously presented Tables 5 and 6, reporting the findings from the thematic analysis, the description and classification of knowledge are not bound to the contexts found in the interviewees' accounts which is why the knowledge is presented more widely and thoroughly than in Table 10 which includes only part of the data in depicting the knowledge, that is, references to knowledge that only relate to knowledge transfer and not, for example, to work. This being bound to the context in the analysis explains why Table 10 “lacks” part of the knowledge related to work tasks as shown in Table 5.

4.2.2. Contexts and Themes in Maintenance and Development Work

In the subject company both the seniors and the juniors are employed in expert duties as defined officially. All the interviewees, furthermore, communicate that their work entails carrying out both current procedures, that is, *maintenance* work, and their *development*. However, the interviewees have two separate views of their own work and performing it, and these differ with regard to what the role or significance of “development” is in work. I shall refer to these two conceptions of one's own work as maintenance work and development work.

In the subject company, the central tasks in development work, depending on the job description, consist of product design in tender preparation, product development, production development as well as enhancing sales and marketing. The interviewees talk about these tasks as *development work*. The primary duties in maintenance work, however, involve practical client-specific product design, maintenance of production and supervision, as well as coordinating sales and preparing tenders. These tasks the interviewees describe as *maintenance work* in which they also include *project work*. It means carrying out a project created through/by the client's order and involves practical product design or project-specific design with the necessary measuring, as well as testing and launching equipment and systems. Maintenance work is also referred to as *routine work*.

All the seniors and juniors' work, therefore, involves duties both in maintenance and development according to the official definition. In practice the interviewees can to some extent adapt the content of their work by "choosing" between maintenance and development which means that the tasks in the particular type of work become emphasised while the other type receives less attention. It is, therefore, not a question of total or clear division but rather of determining priorities in one's own work. When analysing the data, I categorised the interviewees into either maintenance or development work based on which type of duties they say they are doing and to which type they say their work belongs. Thus these two criteria support each other. Whether the work is part of maintenance or development is expressed not only by stating the type, but also by distinguishing it from the other. Thus, the interviewees come to tell which of the two types of work is primary to them or which "takes all the time so that there's none left for the other":

"Development work involves more freedom even though client-specific product design projects are defined by clients' schedules and not the company management... Product development has to be done on top of one's own duties because operative routine procedures take all the time."

"My job is of course also product development in sales, but it's taken a back seat...Development work has been minimal and it's because there's a big demand in the global market and our resources are limited...In that sense this is routine work. You could say there's no development in any activity."

The interviewees talking about their work in the context of maintenance work describe development work as a *procedure outside their normal work*:

"What counts is the budget first of all and secondly the business plan. The daily routines are about achieving the budget or sales, so that if we just develop

something new, there's no bread on the table. The business plan then defines these development and other procedures as being performed outside normal work."

Those talking in the context of development work, however, see it *vice versa*, that is, daily routines and maintenance work are considered to hamper or slow down development efforts:

"At least I wish that I had more time for thinking about the future and development work and not doing these daily routines and solving problems."

When describing maintenance and development work, my purpose is not to prioritise between the types of duties in maintenance and development work or the conceptions and interpretations connected to them by the employees, but rather to investigate these conceptions and their differences to understand the effects of work on knowledge transfer and building. I, therefore, consider both types of work and conceptions of work and working equally "correct" and acceptable, and they are both equally important and beneficial to the company's operations.

Of the seniors interviewed, one talks in the context of maintenance work and five in that of development work, whereas with the juniors, three talk in the context of maintenance work and three in that of development work. None of the interviewees talks in both contexts during one interview. Moreover, all the five juniors interviewed twice talk about their work in the same context both in the research interview (in 2006) and the follow-up interview (in 2007). The juniors that talk in the context of maintenance work had been employed with the company for 4–18 years at the time of the interviews, and those that talk in the context of development work for approximately 1.5 years.

Table 11 presents a comparison of the themes and their contents in the contexts of maintenance and development work. The contextual themes form two groups of which the first one, the nature of work, depicts the work and its functions. The second theme group, work and knowledge, defines what knowledge is needed in one's work and how the knowledge is used in work. The contexts of work, thus, include two mutual theme groups which comprise altogether five themes. The content of the themes depends on whether the interviewee speaks in the context of maintenance or development work.

Included in Theme group 1, nature of work, Theme 1.1. or the basic function of work (Table 11) involves the effort to understand things comprehensively in the context of development

work, which makes it possible to develop products and operations, as well as to prepare for the future. One junior illustrates this in his account of preparing the computing program:

"I wanted to know exactly that I can show the client anytime even by writing it down on a piece of paper how these resonances are computed and what is due to what and how things can be avoided. And when I had learnt the entire theory I noticed that, hey, this can be created in this spreadsheet. And then I just started doing it...I was kind of over-enthusiastic about it and did it on my own time... One by one people started taking it [the computing program] to use."

In the context of maintenance work, the basic function of work is acting based on plans given so that short-term goals can be achieved:

"My most important task in this firm is to make sales and preferably at a price that achieves our profit goals...One year is the timeline which makes everything clear... Daily routines are about achieving the budget or getting the sales."

The interaction related to work are created differently in the contexts of development and maintenance work. In the context of development work, work is said to be performed alone and interaction emerges unofficially responding to situations:

"I've been doing this development work by myself for quite some time...You always gather up people as needed or discuss with some people individually. As needed. It's actually done daily."

In the context of maintenance work, interaction in work is based on the official organisational structure, management and coordination:

"I work under the managing director and these individuals in our sales department report to me...This operation and coordination of project sales is my responsibility."

The different conceptions of those talking in the contexts of either development or maintenance work are succinctly illustrated by their attitudes to independence or freedom. Those talking in the context of development work value freedom in their work:

"They give total freedom here. No one has ever asked me or come to say that I should be pushing a bit harder. The boss trusts us."

In the context of maintenance work, leadership is part of interaction in the work, whereas the seniors talking in the context of development work endow the freedom of work with a notion of "freedom from assuming supervisory duties":

"I have no subordinates, I'm that way lucky."

“They’ve tried to sell me a supervisory status and subordinates but I’ve made it clear that I’d like to stay here in the technical sector...That kind of career advancement has not been my goal, quite the opposite.”

In the context of development work, therefore, freedom in work is considered positive. In the context of maintenance work, however, the interviewees express doubt about the company giving *too much freedom* which slows down work and decreases efficiency:

“This company is rather relaxed as a business environment, sometimes maybe a bit too relaxed. People have too much freedom, which means that things aren’t evolving as fast as they could. I see that as a clear minus.”

Theme 1.2. purpose and goal of work (Table 11) includes, in the context of development work, developing the company’s know-how and one’s own skills, which means not only better business opportunities for the company, but also self-satisfaction:

“Realising and absorbing something new is meaningful and satisfying, of course. But when you think about this task, the most important thing here is that you’ve made improvements in some sectors in the firm.”

In the context of maintenance work, the goal of work is to achieve the economic targets set by the company, as well as to answer for work efficiency:

“I evaluate our success based on orders received and the profit margin. These are the most important indicators for me and that’s what my daily work is, I can’t do my job just based on a strategy.”

“I’m a bit worried about the efficiency of our production. I’ve always been interested in the firm’s success, so that it would thrive and it would be led in the best possible way.”

In Theme group 2, work and knowledge, Themes 2.1. the essence of knowledge and 2.2. the content of knowledge (Table 11) hardly differ from each other in the contexts of development and maintenance work. Maintenance work involves a bit more practical knowledge than development work, which shows in the ready applications of knowledge and work instructions. The knowledge related to development work, however, is somewhat more theoretical or “general” by nature than in maintenance work, which manifests itself in its applicability to different situations, connecting the products’ functions to environments (i.e. the *soul of the machines* adopting the juniors’ idiom), as well as the requirement of managing the theory of physics. The difference, in how theoretical or applicable the knowledge is, is illustrated in the different attitudes to product design guidelines and their necessity between

the contexts of maintenance and development work. A junior talking in the context of maintenance work would like to have written terms of reference to facilitate product planning:

“Of course you have to understand the soul of the machines, but if you can’t do the calculations, it’s impossible to prepare a tender... It would be a big help if we had basic design guidelines, for example, to measure some equipment...I would have been really happy, if they had given me design instructions for the series capacitor bank. They are those things that you anyway have to dig up from somewhere.”

A junior talking in the context of development work states, however, that it is not sensible to prepare design guidelines, because flawless equipment cannot be engineered without knowledge of the underlying theory, that is, the *soul of the machines*:

“It’s impossible to write comprehensive design guidelines so that anyone could design this equipment completely. And if we did the guidelines so that anyone could do this equipment by merely pressing a button, in reality he wouldn’t know anything about the theory. In essence, someone who knows the stuff would anyway have to check everything.”

The above quotes reveal how practical implementation and ready applications of theory are prioritised in the context of maintenance work and how the efficiency of working is valued. In the context of development work, however, a deep understanding and theoretical knowledge underlying the work come to the forefront.

The differences between the contexts of development and maintenance work related to knowledge are most clearly seen in Theme 2.3. (Table 11) which refers to where the knowledge is used in work: in development work it is used in testing as well as R&D; whereas in maintenance work it is employed in supervisory duties and coordinating and project planning. The differences in knowledge use between the contexts of development and maintenance work become evident in problem-solving. In the context of development work the goal of problem-solving is to improve the initial situation, and the goal can thus be unknown beforehand, whereas in the context of maintenance work the goal is to reset the initial or *normal situation*. Interruptions in production need, of course, to be solved immediately as communicated by one interviewee in the context of maintenance work:

“We need to have the resources to do the work according to schedule...If there’s a deviation or interruption in the production, it needs to be solved quite quickly and get the system running normally.”

In the context of maintenance work, a problem situation is, thus, referred to as a deviation or interruption which is avoided and remedied as rapidly as possible. In addition to solving these inevitable problems, in the context of development work problem situations are sought or "created" by evaluating and *questioning* the current practices and functions by looking for new and unforeseen solutions. For example, enhancing production may involve questioning product design:

"Even from the perspective of production it's really important to know the product, so that you can analyse whether it could be done differently to make the manufacture much more efficient. It's kind of questioning our product design. And offering them a new idea for planning which would increase efficiency."

Table 11. Themes in the contexts of maintenance and development work.

Development work context	Maintenance work context
Theme group 1: Nature of work	
Theme 1.1. Basic function of work	
<ul style="list-style-type: none"> - comprehensive understanding, developing - orienting to the future - interaction: unofficial discussions 	<ul style="list-style-type: none"> - routines, maintenance - acting in the present - interaction: management, coordination
Theme 1.2. Purpose and goal of work	
<ul style="list-style-type: none"> - developing the company's know-how - self-satisfaction from learning and solving problems 	<ul style="list-style-type: none"> - achieving the company's economic goals, profitability - increasing work efficiency
Theme group 2: Work and knowledge	
Theme 2.1. Essence of knowledge: what kind of knowledge is needed in working	
<ul style="list-style-type: none"> - expertise - to be applied, to be tested 	<ul style="list-style-type: none"> - professionalism and expertise - ready applications, instructions
Theme 2.2. Content of knowledge: what knowledge is needed in working	
<ul style="list-style-type: none"> - products in different operating environments - production knowledge - product quality demands - knowledge about client needs - the budget - schedules - international standards in the field - the theory of physics - electrical engineering 	<ul style="list-style-type: none"> - product design guidelines - production knowledge - product quality demands - knowledge about client needs - the budget - schedules - business plan - computer simulation - electrical engineering
Theme 2.3. Work tasks: where knowledge is used in work	
<ul style="list-style-type: none"> - product design and measuring in tender preparation - product development - production development, testing equipment and methods - managing client relationships - the goal of problem-solving unknown beforehand, improving the initial situation 	<ul style="list-style-type: none"> - client-specific product design and measuring i.e. project planning - production maintenance, supervision - managing client relationships - coordinating tenders and pricing i.e. routines of tender writing - the goal of problem-solving to reset the normal situation

The items marked with dashes are quotes from the interviewees. The headings are statements summarised by the researcher about the contents of the themes.

Even though the context of development work emphasises the applicability of the knowledge and the context of maintenance work the ready applications of the knowledge, it does not mean that the knowledge applied would not be mentioned in the context of development work and, correspondingly, applying the knowledge would not be mentioned in the context of maintenance work. Development work is not merely planning novelties but rather, as with maintenance work, it uses the existing knowledge as a tool to carry out tasks, for example,

the computing program in product design during tender preparation. Similarly, in maintenance work the knowledge is refined or applied while it is being used, for example, when applying the simulation software to correspond to the situation being modelled. Even though the interviewees talk more about applying the knowledge in the context of development work and about utilising the applications of the knowledge in the context of maintenance work, it does not mean that development work would employ more tacit dimension of knowledge and maintenance work more explicit dimension of knowledge (Polanyi 1966, Eraut 2004). In the context of development work, the knowledge being applied can be specific and explicit, such as electrical engineering, which is applied to the company's needs and functions:

“For example, the first project we [the company] had to manage ourselves was specifying a transformer. I knew a lady from the university who had taught a course about it. So I contacted her a couple of times when I had no one else to turn to. I also read a lot of literature and so on. I always knew where I could find information about electrical engineering when it wasn't available in-house.”

Correspondingly, in the context of maintenance work a practical application can be absorbed not just as explicit knowledge or “by reading ready instructions”. For example, an application making project planning more efficient can be absorbed in a practical situation when responding to a product complaint as described in the following:

“The complaint from a client at the turn of the year was an incredibly serious problem. We had experts coming from outside, so the solution was a result of team work. It was a valuable lesson for future product design projects and I attached its solution to the design guidelines so that similar situations can be avoided in future.”

The differences in content between the contexts of maintenance and development work in Theme group 2, work and knowledge, are related to the contextual differences in Theme group 1, the nature of work (Table 11). This theme group brings up the basic functions and goals of work which define why and where the knowledge is used in work, that is, what one wants to achieve with the knowledge, and how the knowledge is used in work. Knowledge is bound to the context of work, in which the employee or the user of the knowledge gives it meaning by interpreting and understanding it from his or her own resources, as well as from his work goals and needs (Tsoukas 1996, Wenger 1998, Carlile 2002).

The differences in the functions and goals of work between the contexts of maintenance and development work reflect how the knowledge is used in work and furthermore what knowledge is needed to conduct the work (Table 11). The difference in knowledge use between the contexts of maintenance and development work depends on whether the work concerns primarily using knowledge or applying and adapting it. In the context of maintenance work, knowledge is a fully applied tool which is used as such. The aim is to complete the work according to the goals set, for example, in the company's budget or business plan and the prevailing circumstances which are defined by the clients' and production schedules, among other things. In the context of maintenance work, work is therefore reactive: adapting to the company's operations and acting in the present. (Table 12.)

In the context of development work, knowledge is seen as material to be refined and adapted to one's own use or that of the company's. The goal is to improve the prevailing circumstances, for example, by making production more efficient or increasing computer-aided design so that in future the employee, the company or both have a better chance to operate and succeed. In the context of development work, work is thus proactive: spontaneous assessing and reconfiguring the company's operations, as well as orienting to the future. (Table 12.)

Table 12. Differences in maintenance and development work.

	Maintenance work	Development work
Basic function of work	Adapting	Reconfiguring
Using knowledge in work	As a tool as such	As material to be refined
Starting point of work	Goals given	Own perceptions
Goal of work	Efficiency	Improving functions
Time frame of work	The present	The future

4.2.3. Themes of Knowledge Transfer in the Contexts of Work

In addition to themes describing work, the contexts of maintenance and development work also include themes that are related to knowledge transfer. Contrary to the context of the company in which knowledge being transferred and the transfer situation are communicated from the perspective of the company, in the contexts of work the interviewees give accounts

of the knowledge transfer from their own standpoint and based on their work practices. The individual's activity related to the knowledge transfer comes, thus, forward in accounts which refer to the transfer as part of their own work, that is, which connect knowledge transfer themes to the contexts of work.

In the interviews, both the seniors and the juniors talk in the context of the company and in two different contexts of work. In these contexts they also talk about the same themes the contents of which, thus, vary according to the context. Unlike the juniors, however, the seniors do not relate knowledge transfer themes to the contexts of work. In the interviews, the seniors therefore do not interpret or signify knowledge transfer or the knowledge to be transferred as part of their work. One explanation may be that they have already mastered the knowledge to be transferred. They also have a "ready" reason or justification for knowledge transfer in securing the company's future and the continuity of one's work which they speak about in the context of the company (Sub-chapter 4.2.1.). Based on this it seems that the seniors see the knowledge transfer as a clearer or "simpler" issue or process than the juniors, and this is why the seniors need not interpret or explain the transfer as part of their work, either to themselves or to the interviewer. However, the juniors must absorb the knowledge being transferred and connect it and the knowledge transfer to their work. Furthermore, they are perhaps still learning to operate in an unfamiliar environment, embarking on a new career in a new company.

In the juniors' accounts, the contexts of work entail four themes, which concern knowledge transfer: the relationship of knowledge transfer to work, the need for knowledge transfer in work, carrying out knowledge transfer in work and using the knowledge transferred in work (Table 13). The contents of these themes depend on whether the junior speaks in the context of maintenance or development work.

Theme 1 of knowledge transfer connected to the contexts of work is the relationship of knowledge transfer to work (Table 13). In the context of development work it involves no problems, because the juniors express that they need the knowledge available from the seniors in their work and they also want to achieve the seniors' expertise:

"In practice I know that X [a senior's name] has the kind of expertise I don't have but I want...The goal is to kind of accelerate my development. Kind of absorbing things all the time so that I can stand more on my own two feet."

In the context of maintenance work, however, the relationship between work and knowledge transfer is problematic because the work does not require much of the senior's knowledge to be transferred. It is quite understandable that there is no knowledge transfer if the junior does not consider the knowledge to be transferred necessary in his work even though the company management sees that his work tasks should require the knowledge. One junior sums up the reason for the infrequency of knowledge transfer from his experience:

"A couple of guys left the firm and I assumed some of the project engineer duties and stepped aside from R&D...It's really a question of is there still need for the [senior's] knowledge in my work and it has led to the point in which the need for the transfer has diminished."

In the context of maintenance work, knowledge transfer is considered taking place *beyond the daily work routines* and the problem situations in the transfer are depicted as going *deeper than the normal daily level*. Such activity does not proceed systematically and, therefore, it is not a desirable method to transfer knowledge:

"In those situations [problems related to knowledge transfer] you always go deeper than the normal daily level and they always reveal something new. But they are dictated by the situation and schedule defined outside. They are not systematic, so that some matter is taken under examination, but rather the situation has come up and required solving. There's been no time for systematic knowledge transfer even though it would be of course desirable for my own and internal knowledge transfer to perform the transfer systematically."

Theme 2 of knowledge transfer connected to the contexts of work is the knowledge to be transferred in work (Table 13). In the context of development work, the knowledge to be transferred is imperative for performing the work because the junior receives knowledge from the senior to conduct all his work tasks. Even though the senior is not the junior's only knowledge source, he is still the most important because the senior's knowledge is already applied to the needs of both the work and the company:

"If you had to get it [the knowledge] from somewhere else, it would be this physics formula. And now when you get it from X [a senior's name] in practice, it's not just a physics formula, but it's fitted to function in this factory...There is knowledge but it's much more in bits and pieces. So getting the knowledge is putting these pieces together. X [a senior's name] has them more or less in the same place."

“In practice it’s [knowledge transfer] completely between me and X...It’s good to have someone that can explain things more thoroughly. That it’s easy to look up formulas in some standards archives.”

In the context of maintenance work, the only knowledge related to work tasks in Table 13 that is available only from the seniors is client knowledge required in preparing tenders, that is, knowledge of client-specific projects: for example, what products they have included, who has been involved in them and how they have been implemented. In the context of maintenance work, the senior is indeed just one knowledge source among others and the knowledge necessary in work is acquired from different individuals according to needs that arise in practical situations:

“It [the knowledge] comes bit by bit, so that you go and ask if you need information on something. It would be good to always have someone to go to, when some issue arises.”

“In project product design, measuring overvoltage protectors and the related modelling and simulation of systems, I’ve learnt and assimilated them directly from X [a senior’s name]...Initialisation simulation I’ve learnt from Y [a colleague’s name] since he’s right there next to me and X has really not been involved in it... Then I’ve discussed with Z [a product manager] that he sees that my work seems to be right.”

In the context of development work, the interviewees mention *maintaining production* involved in maintenance work (Table 13) because the junior requires the knowledge available from the senior to conduct this task. However, *maintaining production* is only part of the work the junior wants to be performing in production in the context of development work:

“I’m in development duties in production but whenever production faces problems I also have to go solve them. The long-term goal is that I would have more time to just concentrate on this planning for the future and developing methods and profitability.”

In the context of development work, the knowledge being transferred from the senior and knowledge transfer are thus prerequisites for the junior’s work, and the junior’s primary source of knowledge in the company is his assigned senior. In the context of maintenance work, however, there is little or no need for the knowledge to be transferred from the senior

and knowledge transfer, and the junior has several sources of knowledge in the company which he uses according to the situation.

Theme 3 of knowledge transfer connected to the contexts of work is the knowledge transfer situations in work (Table 13). This theme brings forward the means of knowledge transfer, that is, documents, dialogue and work situations (Sub-chapter 4.1.3) which are the same regardless of the context being either that of maintenance or development work. These two contexts, however, differ in how actively these means are used. In the context of development work, interaction or discussions and mutual work situations are important in knowledge transfer:

“The two of us, we just talk and then I go and ask X [a senior’s name] a lot of questions. Always when I do something that X has done before I do it until I come up with a few good questions and then I go again to see X and we go through them and he explains the theory and why it’s been done this way and so forth.”

“Then we start examining [with a senior] whether the machine runs as we think it does...I really like to be there on the spot where we do quite a lot of problem-solving. Because there when you try something, you instantly see the result.”

In the context of maintenance work, knowledge is primarily sought independently and by reading documents. It can also be elicited from different individuals when necessary. Hence, knowledge is received from one’s “own” senior occasionally which is why the implementation of knowledge transfer between the senior and the junior is uncertain and random. This is how the means of knowledge acquisition are described in the context of maintenance work:

“It [the knowledge] can be pulled out from some old papers and stuff but it’s better to ask where to find these things and then study them yourself.”

“I’ve learnt quite a lot by myself, I read all kinds of material if the knowledge can be found in the literature. Or then you can find the answer just by opening a few doors...Out there in the equipment sector I know these component designers so well that I have no problem in going there to ask. And I know who knows what.”

In the context of development work, busy schedules hamper but do not prevent knowledge transfer. *Other stuff* slowing down the transfer consist in this case of development work, that is, developing computing programs or solving product problems:

“I have so much other stuff that I haven’t had time to study things with X [a senior’s name] in a long time. This other stuff is more urgent and X is busy, too. We can’t find the time for it [the knowledge transfer] so that we could both really concentrate on it.”

Despite his busy schedule, the above junior has transferred and still transfers knowledge with his senior. Contrary to the context of development work, in the context of maintenance work, busy schedules can be a barrier to knowledge transfer:

“We set a goal [with a senior] that certain things should be handled together or transfer the knowledge but we haven’t done that. You can always blame our busy schedules which is indeed perhaps the reason.”

In the context of maintenance work, busy schedules and the physical distance between the senior and the junior may thus prevent the transfer. In the context of development work, they hamper the transfer but do not prevent it (Table 13). The same applies to the senior’s withholding knowledge which, in the context of maintenance work, makes the junior look for other knowledge sources:

“Sometimes I really think that they want to keep the knowledge to themselves, that it’s somehow painful to give up the knowledge that has not been documented. I know that X [a senior’s name] has long experience and I appreciate it, but if I truly need and want some information about it [a production line], it’s really someone other than X that I get the knowledge from.”

In the context of development work, the senior’s withholding knowledge does not prevent knowledge transfer. The juniors find the seniors’ knowledge essential for their work, which makes them acquire it even though it may be difficult:

“All those moving over still want to have the last knowledge. That you have to a) search, b) ask for it a bit...and I start with how the heck I can get it...And then I get it. I go through all this because I need the knowledge and want to get it. I’m willing to make the effort.”

Theme 4 of knowledge transfer connected to the contexts of work is using the knowledge transferred in work (Table 13). In either context of work, the “knowledge transferred” does not just originate from the senior, because the junior receives knowledge from many different sources in the changing situations of his work. In the context of development, however, the senior is the junior’s primary source of knowledge transferred. In the context of maintenance

work, the “knowledge transferred” does not necessarily include knowledge from the senior because the junior acquires the knowledge necessary in his work from several people.

In the context of development work, the knowledge transferred is employed in more ways than in the context of maintenance work. In the context of development work, the knowledge transferred is used as such, applied and exploited as a foundation to build new knowledge, whereas in the context of maintenance work the knowledge transferred is either utilised as such or applied as *standard practice*.

In the context of development work, the juniors want to understand and absorb the knowledge transferred thoroughly, rather than “take it as the truth” as told by the senior:

“When I question things, it means that I want the explanation behind it. When X’s [a senior’s name] papers say something and I absorb it, I need to know how to explain the thing...It’s a question of do I really know it and understand and absorb it or am I just repeating it.”

In this context, the knowledge transferred is applied, for example, to a new product which is unfamiliar to the senior:

“X [a senior’s name] doesn’t probably know much about this new product...I still receive the type of knowledge from X, even though not directly related to this new thing, that I can then apply there. X still has experience and capacity to study the issue if I go ask even on quite short notice, I’ll always get an answer quite quickly.”

The knowledge transferred is also utilised as the foundation for building new knowledge, for example, when creating the computing program:

“At first I learnt how to do the sub studies and these technical documents [product design in tender preparation], after which I realised that they kind of follow the same pattern, that the process can be made a lot faster...I did a system [computing program] that computes the needed output in less than a second.”

In the context of development work the juniors aim to completely understand the knowledge transferred, whereas in the context of maintenance work the focus is on using the knowledge. The knowledge transferred is used as such in work, even though employees may notice insufficiencies in it:

“But it’s just for saving time, that you take the finished model that’s been used in previous tenders and just work with it... You just repeat the old. At the beginning you maybe realise that this is not the most sensible way to do it but when you’ve done it five times, you’re used to it.”

In the context of maintenance work the knowledge transferred is applied as *standard practice*, for example, when employing simulation software:

“The simulation software is ready. You create a model of the system under simulation and with it you can measure the protectors or the whole equipment. It’s applied case by case to meet the particular need.”

Storing the knowledge transferred does not involve work context-specific differences, that is, all the juniors retain knowledge in writing and also disseminate it available to others (Table 13). The methods of producing written knowledge or documentation differ between the juniors (Sub-chapter 4.1.4.) but these methods are not bound to the contexts of work.

Table 13. Themes of knowledge transfer in the contexts of maintenance and development work.

Context of development work	Context of maintenance work
Theme 1: Relationship of knowledge transfer to work	
Balanced - provides knowledge to perform and develop work - secures own expertise in the future	Problematic - the knowledge to be transferred is not much needed in work - knowledge transfer is beyond the operative functions of work
Theme 2: Knowledge to be transferred in work	
Knowledge to be transferred needed essentially - in tender preparation product design (knowledge needed about products and clients) - in developing products (knowledge needed about products) - in maintaining and developing production (knowledge needed about production and products)	Knowledge to be transferred is needed to some extent - in client-specific product design (knowledge needed about products and clients) - in writing tenders (knowledge needed about clients and pricing) - in measuring products (knowledge needed about computer simulation)
Theme 3: Knowledge transfer situations in work	
Knowledge acquired from one's "own" senior - in documents - in discussions - in work situations and problems related to them - busy schedules, physical distance and the senior withholding knowledge hamper knowledge transfer	Knowledge received occasionally from one's "own" senior - in documents - in discussions - in work situations and problems related to them - busy schedules, physical distance and the senior withholding knowledge hamper or prevent knowledge transfer
Theme 4: Using the knowledge transferred in work	
Knowledge received from the senior - employed as such (in tender preparation product design and maintaining production) - applied (in product and production R&D) - employed as the basis for new knowledge (devising spreadsheets) - stored, available in writing and verbally	Knowledge received from the senior - employed as such (in writing tenders and maintaining production) - applied as a standard practice (in computer simulation) - stored, available in writing and verbally

The items marked with dashes are quotes from the interviews. The headings are statements summarised by the researcher about the contents of the themes.

Examining knowledge transfer in the contexts of work clarifies the previous findings of this study not only from the thematic analysis, but also from the articulation method. Theme 2 of knowledge transfer connected to the contexts of work, the knowledge to be transferred in

work (Table 13), supplements the theme of knowledge to be transferred in the context of the company (Table 10, Sub-Chapter 4.2.1.): in the context of the company, the knowledge to be transferred is presented without linking it to practice or work, and in the contexts of work, the knowledge is looked at through the work tasks. This is how the “knowledge list” in the context of the company builds knowledge needed and used in the tasks in the contexts of work. The knowledge connected to work tasks is also presented in the findings of the thematic analysis (Table 5, Sub-chapter 4.1.2.). When studied in the contexts of work, the need for knowledge transfer is greater in the work tasks related to products and production in the context of development work (product design in tender preparation, product development, production maintenance and development) than in the tasks connected to sales and computer simulation in the context of maintenance work (writing tenders, client-specific product design and product measurement) (Table 13).

Theme 3 of knowledge transfer related to the contexts of work, the knowledge transfer situations in work (Table 13) connect busy schedules, the physical distance between the senior and the junior and the senior’s withholding of knowledge to knowledge transfer. These factors do not appear in the context of the company—apparently because in this context knowledge transfer is presented detached from work practices. In the thematic analysis, the above-mentioned three factors proved to hamper knowledge transfer (Sub-chapter 4.1.1.). When connected to the contexts of work, they hamper knowledge transfer in both development and maintenance work but prevent it only in the context of maintenance work.

Theme 3, knowledge transfer situations in work (Table 13), is also shown in the findings from the thematic analysis as the means of knowledge transfer (Sub-chapter 4.1.3.). However, when investigated in the contexts of work, the findings from the thematic analysis are more clearly defined so that the most important means of knowledge transfer in the context of development work prove to be dialogue and work situations, and work documents in the context of maintenance work.

I have previously outlined knowledge transfer by senior–junior pairs, numbered 1–6, in Tables 4 (Sub-chapter 4.1.1.) and 8 (Sub-chapter 4.1.6.). In Pairs 1, 4 and 6, the junior communicates in the context of maintenance work. Of these, Pair 4 transfers knowledge both in 2006 and 2007, and Pairs 1 and 6 transfer no knowledge. In Pairs 2, 3 and 5, the junior talks in the context of development work. Of these, all pairs transfer knowledge in 2006, but the following year the knowledge transfer ended for one pair because of a change in the

junior's duties. Of the three juniors speaking in the context of maintenance work, therefore, one transfers knowledge with his senior, whereas of the three juniors talking in the context of development work, all transfer knowledge with their seniors.

The three juniors communicating in the context of maintenance work have been working with the company longer (4–18 years) than the three juniors in the context of development work (each approximately 18 months). Those talking in the context of maintenance work, therefore, know the company personnel and operations better than those talking in the context of development work, which may partly explain their use of knowledge sources other than their assigned seniors in their knowledge transfer (Table 13, Theme 3). It is also possible that communicating in the context of maintenance work would be generally explained by the individual's long experience with the same job which has become a routine. This assumption, however, does not find support in the contexts of work in the seniors' accounts. The seniors have been employed in the company and the same duties for 31–44 years. Yet, five out of six seniors talk in the context of development work and only one in that of maintenance. Based on the findings of this study I, therefore, cannot offer any explanation as to why all the juniors with the longest careers in the company talk in the context of maintenance work. It can just be a coincidence.

The findings of this study show that the knowledge the junior needs in his work, to which the knowledge being transferred between the senior and junior also relates, receives its meaning in the goals of the work and performing the work. These are not only guided by the company's official job descriptions or terms of reference, but also by the employees' personal conceptions about their own work. This means that the expert work-related knowledge, defined to be transferred in the knowledge transfer between generations, is not necessarily or "automatically" transferred. If the junior sees that the knowledge to be transferred is not necessary for his work, even though the company management thinks differently, the knowledge is only transferred from the senior to the junior coincidentally or not at all.

4.2.4. Interconnections between the Contexts and Themes

The contexts and themes appearing in the interviewees' accounts are not completely detached from each other, because they partly involve the same topics and issues, even though from different perspectives. Next, I outline this interlinking and, moreover, present the interviewees' discourses.

Availability of Knowledge Theme

In the interviewees' talk, not only transfer and work, but also accounts about storing and acquiring knowledge are connected to knowledge. These accounts create a theme, which I call the availability of knowledge. Contrary to the other themes in this study, it appears in all the three contexts, that is, in the contexts of the company, maintenance work and development work.

The availability of knowledge theme consists of three topics which are retention of knowledge, difficult to acquire knowledge and easy to acquire knowledge (Table 14). The first of these considers where the knowledge to be transferred between the seniors and juniors has been stored in writing in the subject company. Part of this stored knowledge is in personal use and part employed by everyone that needs it. Moreover, this topic describes the content of the stored knowledge and mentions individuals that have wisdom or verbal knowledge related to the knowledge being transferred.

The availability of knowledge theme is only connected to the context of the company for the part of wisdom in the topic of retention of knowledge (Table 14). Wisdom then refers to the knowledge that is in the company only with the seniors and that should be transferred to others in *succession*. Why the availability of knowledge is for other parts not connected to the context of the company is explained by the content of the context which is general and introductory by nature and does not include description of action. The theme of availability of knowledge primarily illustrates how the availability of knowledge hampers or facilitates work. The topic of retention of knowledge is present in the interviewees' accounts in both contexts of work, for knowledge transfer as well. In these accounts the interviewees communicate their knowledge needs in their work and in the related knowledge transfer, as well as the sources of knowledge that fulfil those needs.

The second topic in the availability of knowledge theme outlines the difficulties in acquiring knowledge in the contexts of both maintenance and development work (Table 14). In both contexts acquiring knowledge is hampered by *withholding knowledge*, that is, written or verbal knowledge in personal use is not willingly made available to others. As I reported in the previous sub-chapter, the senior's withholding knowledge hampers knowledge transfer in the context of knowledge work and prevents it in the context of maintenance work (Tables 13 and 14).

The juniors, thus, speak about withholding knowledge in both contexts of work as part of knowledge transfer. However, the seniors communicate in the context of development work that knowledge is being withheld in the company but it does not hamper their work. They, nevertheless, see it hampering other individuals' knowledge acquisition.

Not only withholding knowledge, but also insufficient documentation makes acquiring knowledge difficult (Table 14, also Sub-chapter 4.1.2.). It is mentioned in both contexts of work as a factor hampering both work and knowledge transfer. The insufficiency or haphazardness of documentation is mentioned as a common custom in the company:

"We've very few such documents. So that perhaps we have unnecessarily too much information only in people's heads. I guess people aren't in the habit of writing down things, rather you'd make some design instructions or something."

Outlining what knowledge is easily acquired, the third topic in the availability of knowledge theme (Table 14) shows that knowledge is most readily acquired in discussion and when asking questions. Eliciting verbal knowledge in the topic describing easy to acquire knowledge is mentioned as a factor facilitating not only work, but also knowledge transfer in both contexts of work. Knowledge already applied to the company and related to the problem at hand is most readily acquired by eliciting it face-to-face from a skilled individual:

"Or then it's [the knowledge] so difficult to find in any document. Or the document is hard to find, it's faster to just go and ask."

Table 14. Topics in the availability of knowledge theme.

Topic 1: Retention of knowledge		
Location of written knowledge - documents - archives - contracts - brochures - literature - folders - the Net, in electronic form - in personal use - used by everyone	Content of written knowledge - work instructions - product design guidelines - general product information - computer programs - production tests - client project reports - international standards	Wisdom i.e. verbal knowledge - with the seniors - with others in the company - sub-contractors - outside experts
Topic 2: Difficult to acquire knowledge		
Withholding written knowledge - the seniors' not giving their knowledge prevents knowledge transfer - not everyone is giving his knowledge, which overall hampers knowledge acquisition	Withholding wisdom - the seniors' not giving their knowledge prevents knowledge transfer - not everyone is giving his knowledge, which overall hampers knowledge acquisition	Deficient documentation of knowledge - ambiguous documents - poor sources of information - too much knowledge just in people's heads - the company practice
Topic 3: Easy to acquire knowledge		
Asking for knowledge is common in discussions - knowledge is readily available - response/knowledge already applied to the company - knowledge is best transferred in discussions - asking others for advice is no problem		

The items marked with dashes are quotes from the interviews. The headings are statements summarised by the researcher about the contents of the themes.

Figure 10 illustrates the interconnection of contexts and themes in the interviewees' speech. It, therefore, does not present the relative extent or significance of the themes and contextual contents. It merely describes how the contexts and themes are not completely distinguishable in the interviewees' verbal accounts, but their contents are partly connected to each other. All the interpreting and attributing of meaning involved in the interviewees' knowledge transfer, illustrated in the figure, occur in the collective of the organisation, that is, within the collective understanding, mutual language and shared social practices. These guide knowledge use in the organisation. (Tsoukas 1996, Tsoukas & Vladimirou 2001.) (Figure 10.)

In the interviewees' accounts, the contexts of maintenance and development work are interlinked in Theme group 2 describing work and knowledge. In it the contexts meet in *maintenance and development of production, product development and client-specific design*, as well as *coordinating tenders and product design in tender preparation* (Figure 10, Theme 2.3. in Table 11). These six tasks are linked by pairs so that making distinctions between them is not always possible in practical situations. For example, when developing a new product, client-specific design or project design and product development go hand in hand:

"I'm quite closely involved in product R&D because developing the adjustments for this [the product's name] in the early stages of the product is mostly product R&D even though it's been done for some client project...At some point I shall like to get more development duties. In a way it's maybe better that you first assimilate the products through projects and then concentrate on the R&D."

Even though the tasks mentioned above cannot always be unambiguously divided into maintenance and development work, the interviewees, nevertheless, tell that they concentrate on either one in their work and pay less attention to the other. They, thus, "choose" one context in their interview, as illustrated by the choice of development work in the above quote. *Managing client relationships* is also a common work task in the contexts of work, and moreover work requires *expertise* in both contexts (Figure 10, Themes 2.3 and 2.1 in Table 11).

The context of the company is connected to the contexts of maintenance and development work in Theme 2, individual's knowledge being transferred (Figure 10, Theme 2 in Table 10). The content of this theme is the same as in Theme 2, knowledge to be transferred in knowledge transfer, related to the contexts of work (Figure 10, Theme 2 in Table 13). The perspective on the content or the meaning given to the knowledge being transferred however is different: in the context of the company, the knowledge being transferred is examined generally or from the company's viewpoint, and in the contexts of work the knowledge being transferred is looked at from one's own work. In the contexts of work, the knowledge being transferred is examined in closer proximity or more concretely than in the context of the company, and, therefore, it is endowed with a more practical and detailed description.

All the three contexts, that of the company and those of maintenance and development work, are interconnected in the availability of knowledge theme which is, thus, included in all the contexts (Figure 10). The content of this theme comprises descriptions of retention of

knowledge, as well as situations related to knowledge acquisition which either hamper or facilitate it (Table 14).

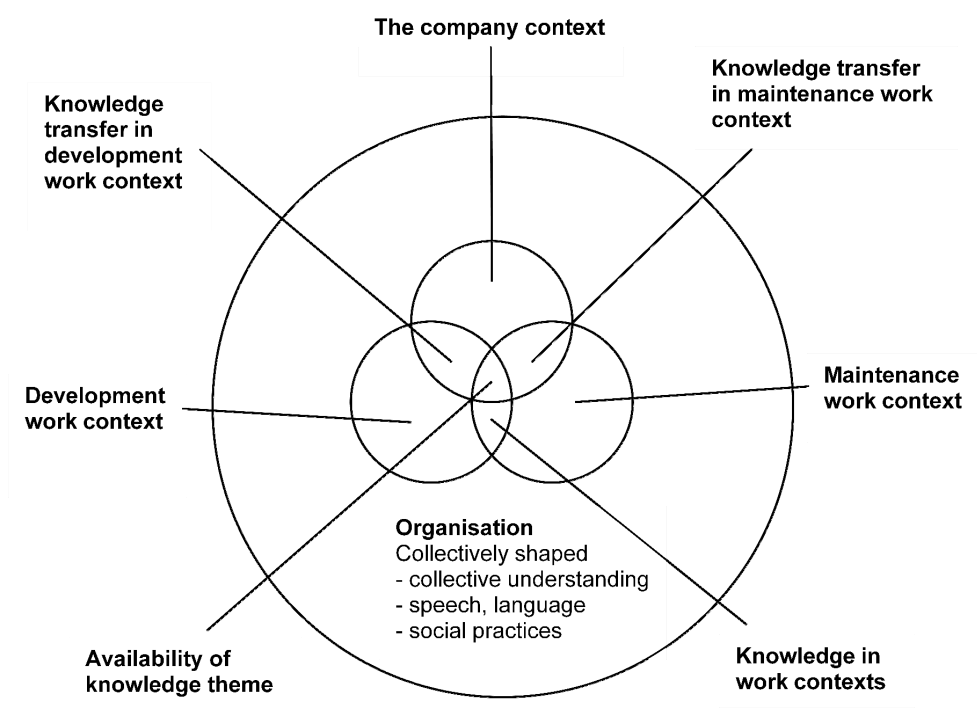


Figure 10. Interconnections between the contexts and themes in the interviewees' speech. (According to Uotinen [2005; VI, 138].)

Discourses in the Interviewees' Speech

In the interviewees' speech the context of the company and those of work are part of different discourses (Grossberg 1995, Uotinen 2005) because in them the interviewees speak about knowledge transfer differently or in a different light. In the context of the company, the interviewees sort of present the company's *succession* or knowledge transfer to an outsider, the interviewer, and describe the company's knowledge transfer very positively. In the accounts, knowledge transfer is considered an essential process connected to scarce knowledge and expertise and securing the company's future (Table 10). I interpret the accounts in the context of the company as part of a discourse in the subject company related to the entire company and its success. Within this discourse the knowledge transfer, its

necessity and implementation is not doubted or questioned. I refer to this discourse as the discourse of the company's success.

In the contexts of work, the possible difficulties and problems in knowledge transfer become noticed, when the interviewees communicate about their daily functions and the related work tasks and knowledge needs (Table 13). Contrary to discussion in the company context, these accounts show "permission" to speak about failure, difficulties and problems. I refer to this discourse as the discourse of practice.

The seniors talk about knowledge transfer only in the discourse of the company's success because in their speech the themes of knowledge transfer are not related to the contexts of work. The juniors, by contrast, speak about knowledge transfer in two discourses, both of which give rise to their own signifying practices (Uotinen 2005; 52): in the company's success discourse, the juniors present knowledge transfer as necessary, unproblematic and positive; in the discourse of practice they also tell about negative matters related to knowledge transfer and admit its failure.

Having completed the second analysis of the study, I presented the findings to the company's managing director as I had done with the first analysis. He found examining the knowledge transfer in the contexts of work, that is, "*attitudes to work*", a successful approach to the implementation and understanding of the transfer from the practical perspective (May 22, 2008). He said he could understand based on the findings why knowledge transfer is not progressing with certain juniors even though they otherwise are doing their work well and they do not seem to have any problems related to the knowledge transfer. The managing director inferred that these juniors prioritise maintenance duties in their work, and, therefore, they only have a little time for development work and the knowledge transfer it requires. By stating "*luckily we have both kinds*" he brought up that the company needs experts that prioritise both maintenance and development work.

4.2.5. Summary: Contexts and Themes

The interpretation of the data I conducted by the articulation method revealed altogether three contexts in the interviewees' accounts: the context of the company, as well as those of maintenance work and development work (Grossberg 1995, Uotinen 2005). These contexts

include altogether thirteen themes (Uotinen 2005). In the contexts of maintenance and development work, the contents of the themes vary according to the context of the interviewee's account.

In the themes in the context of the company, the interviewees speak about the knowledge being transferred and knowledge transfer from the perspective of the company, without describing practical activity. In the themes in the contexts of work the interviewees talk about their work in the context of either development or maintenance work. In the themes of knowledge transfer involved in the contexts of work, the juniors tell about the knowledge transfer as part of their work, and, hence, the knowledge being transferred generally described in the context of the company is now integrated into one's own work and performing it. The availability of knowledge theme deviates from the other themes because it is communicated in all three contexts. This theme comprises three topics which are retention of knowledge, difficult to acquire knowledge and easy to acquire knowledge.

Both the seniors and the juniors in the subject company are employed in expert duties according to the official definition. Furthermore, all the interviewees tell that their work involves not only carrying out current functions or *maintenance work*, but also developing them or *development work*. Interpreting the data revealed, however, that there are two distinct views of one's work and performing it among the interviewees, based on what the role or meaning of "development" is in work. I call these two different views of one's work maintenance work and development work. However, this distinction is not absolute; rather it is a question of prioritising between maintenance and development duties in one's own work.

The differences between maintenance and development work become manifest in their basic functions and goals. Those talking in the context of maintenance work build the basic functions of their work on routines and concentrate on acting in the present. The purpose of work is to achieve the set goals by maintaining efficiency. However, those talking in the context of development work build their work's basic functions on a deep understanding and orient towards the future. The purpose of work is to develop the company's know-how and one's own skills.

Interpreting the data uncovered that the differences in the knowledge and its use between the contexts of maintenance and development work depend on whether the work primarily concerns using the knowledge or applying and adapting it. In the context of maintenance

work, the knowledge is a tool already applied and employed as such. The goal is to complete the job according to the objectives set in the company's budget or the business plan and in the prevailing circumstances which are defined, for example, by the clients' and production schedules. In the context of maintenance work, work is therefore reactive: adapting to the company's operation and acting in the present.

In the context of development work, the knowledge is material to be refined and accommodated to one's own and the company's use. The goal is to improve the prevailing circumstances, for example, by enhancing production or increasing computer-aided design so that in the future the employee, the company or both have better opportunities to operate and succeed. In the context of development work, work is thus proactive: spontaneous assessing and reconfiguring the company's operations, as well as orienting to the future.

According to the interpretation of the data based on the articulation method, work goals are determined based not only on the tasks given by the organisation and the goals inherent in them, but also on how the employee understands his or her own work and its goals in different situations (Tsoukas 1996, Tsoukas & Vladimirou 2001, Carlile 2002, 2004). In the light of the findings, the employee builds his or her own conception of the work based not only on the organisation's official and unofficial expectations, but also on personal dispositions and previous experiences (Tsoukas 1996, Tsoukas & Vladimirou 2001). This conception of work partly guides the work-related knowledge needs and using the knowledge in work. This is why people, working in the same organisation and similar duties according to official definitions, may concentrate on achieving different goals and performing different tasks, which leads to different practices and results in practice even though in principle the work is the same.

In this study, the juniors articulate or connect knowledge transfer and the knowledge being transferred to their own work, either development or maintenance work. Hence, they endow the knowledge being transferred with a meaning in the context of their work based on what needs they have about the knowledge in their work. Furthermore, they define where and how they use the knowledge transferred in the context of their work, for example, whether they build new knowledge based on the knowledge transferred or not. In other words, when the juniors articulate the knowledge transfer and building to their work, they receive meaning in practice: they become something that is either worthwhile implementing or unnecessary.

Thus, the juniors' conception of their own work and how they perform it defines and guides how they implement knowledge transfer and building.

The juniors speaking in the context of maintenance work have only a little need for knowledge to be transferred between generations. Recounting that knowledge transfer is located *beyond the operative functions of the work*, they receive knowledge from their assigned seniors only randomly. This knowledge they then use as such or apply it as a *standard practice*, for example, when employing computer software in preparing a tender.

For the juniors talking in the context of development work, however, the knowledge being transferred between generations is essential in their work. They actively acquire knowledge from their seniors which they use as such, apply it, for example, to developing production and use it as the foundation for new knowledge, for example, when devising a computing program.

4.3. Knowledge Sharing and the Contexts of Work

In this sub-chapter I present the interlinking between the findings made in the thematic analysis and the interpretation of the data by the articulation method. In the light of the results from this process, I explain how knowledge sharing takes shape between the seniors and juniors.

4.3.1. Methods of Knowledge Sharing in the Contexts of Work

In connection with the findings of the thematic analysis, I have presented the methods of expert work-related knowledge sharing between the senior and the junior (Sub-chapter 4.1.4., Figure 7). In this sub-chapter I supplement these findings by adding the context, maintenance or development work, in which the juniors, using the different methods of knowledge sharing, communicate.

The findings made with the articulation method show that the juniors transferring knowledge speak about their work in the context of maintenance or development work, whereas the juniors building knowledge talk about their work in the context of development work. The

effects of these knowledge sharing methods on knowledge in the organisation are illustrated in Figure 11. In the double dichotomy (Figure 11), the juniors, performing maintenance work or development work and transferring knowledge, retain knowledge and are situated in the bottom segments, whereas the juniors, performing development work and building knowledge, increase knowledge and are located in the top segments. Speaking both in the context of maintenance work and in the context of development work some juniors communicate the knowledge transferred or built to others, that is, they disseminate the knowledge to the organisation, and others keep the knowledge to themselves as individual knowledge. In the double dichotomy (Figure 11), those keeping the knowledge to themselves are located in the left-hand segments, whereas those disseminating the knowledge are situated on the right.

The commonly accepted goal of knowledge transfer between generations, the retention of existing knowledge in the organisation (DeLong 2004, Rothwell & Poduch 2004) can be achieved with the senior–junior pairs in which the junior talks about his work as maintenance work. With these pairs the knowledge existing in the organisation is transferred from one individual to another, and when the senior retires, his knowledge has been transferred to the junior (bottom left segment in Figure 11). The possible goal from the perspective of this study in knowledge transfer between generations or knowledge sharing, building new knowledge to the organisation is achieved with the senior–junior pairs in which the junior speaks of his work in the context of development work. These pairs build new knowledge, and the junior disseminates this built knowledge to the organisation accessible to all those that need it (top right segment in Figure 11).

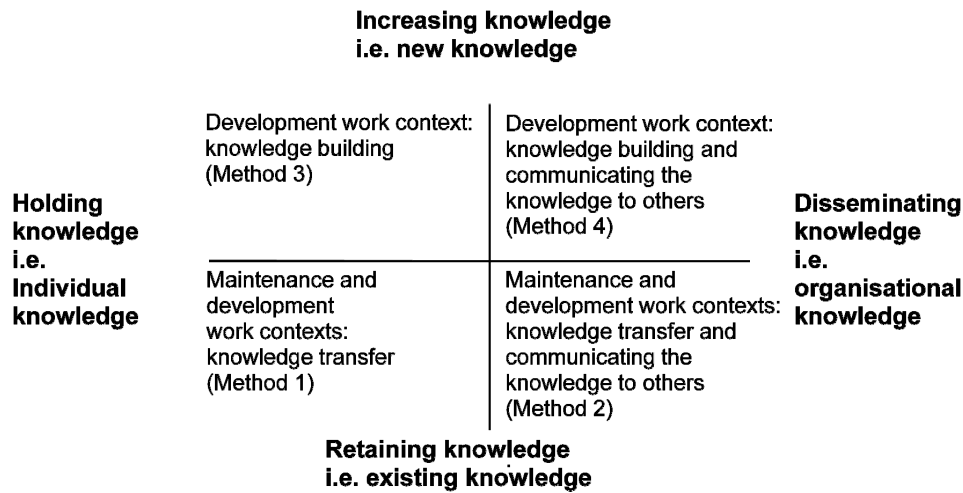


Figure 11. Methods of knowledge sharing (1–4) between generations in the contexts of work and their effects on knowledge in the organisation.

The findings of this study show that the junior’s conception of his own work either as maintenance or development work explains the knowledge transfer and building between the senior and the junior. The pairs in which the junior assumes the context of maintenance work, either transfer no knowledge or only transfer knowledge but do not build it. The junior’s understanding of his work as maintenance is, therefore, not a sufficient prerequisite for either knowledge transfer or knowledge building. All the pairs in which the junior talks in the context of development work build knowledge. These pairs also transfer knowledge because knowledge transfer underlies knowledge building (Sub-chapter 4.1.4.). Thus, the junior’s conception of his duties as development work is a sufficient prerequisite for knowledge transfer and an essential one for knowledge building.

The different knowledge needs in maintenance and development work explain why the juniors talking in the context of maintenance work do not necessarily transfer knowledge with their seniors, whereas in the context of development work transfer is present (Table 13, Sub-chapter 4.2.3.). Maintenance work does not necessarily require the knowledge available from the senior in knowledge transfer; rather the knowledge required in work can be acquired from other sources. However, development work necessitates knowledge available from the assigned “own” senior which makes knowledge transfer essential; otherwise the junior cannot conduct his duties.

Why the juniors talking in the context of maintenance work do not build knowledge and those talking in the context of development work do is explained by the different nature of the work or the different functions and purpose of the work (Table 11, Sub-chapter 4.2.2.). In the context of maintenance work, the basic functions of work build on routines and concentrate on acting in the present. The purpose of work is to achieve the set goals by maintaining efficiency. These goals and functions of work do not give rise to building knowledge, that is, to assessing the prevailing situation and developing new knowledge. However, in the context of development work, the basic functions of work build on a deep understanding and orient toward the future. The purpose of work is to develop the company's know-how and one's own skills. These goals and functions of work provide a starting point for building knowledge, that is, for assessing the prevailing situation and for transforming it when necessary by developing knowledge.

In both maintenance and development duties, juniors communicate the knowledge transferred or built along in the company. A junior, performing maintenance work, communicates the knowledge transferred to other members of the organisation and, thus, disseminates existing knowledge in the organisation. A junior, performing development work, however, communicates the knowledge built (and transferred) to other members of the organisation and, thus, disseminates new (and existing) knowledge throughout the organisation. Nevertheless, disseminating both transferred and built knowledge is coincidental, varying between individuals and from one situation to another. One reason for this may be that the company has not issued terms of reference about knowledge dissemination (Sub-chapter 4.1.2.).

The circumstances related to knowledge transfer, the busy schedules and the physical distance at the workplace between the senior and the junior, cannot fully explain why some senior-junior pairs transfer knowledge while others do not (Table 13, Sub-chapter 4.2.3.). In the pairs, in which the junior speaks in the context of development work, busy schedules and physical distance do not prevent knowledge transfer. In the pairs, however, in which the junior assumes the context of maintenance work, busy schedules and physical distance can prevent the transfer if both members are confronted with these circumstances at the same time. The findings show that busy schedules alone do not prevent knowledge transfer. Based on the findings, I could not describe the effect of physical distance on knowledge transfer in the context of maintenance work, because no pair, in which the junior talks in the context of maintenance work, is confronted with the circumstance of physical distance only.

The different effects of the circumstances of knowledge transfer on the transfer with juniors communicating in the context of maintenance and development work becomes manifest in how they react when the senior *withholds his knowledge* (Table 13, Sub-chapter 4.2.3.). Juniors, in both the maintenance and development work context, see the senior's withholding knowledge as a factor hampering the knowledge transfer. Among those speaking in the context of maintenance work, however, withholding knowledge completely prevents the transfer, whereas those talking in the context of development work find it only hampers it. The juniors assuming the development work context, thus, transfer knowledge despite the senior's withholding of knowledge. In development work, the senior's knowledge is essential so the junior must overcome the difficulties in the transfer, with regard to the above-mentioned busy schedules and physical distance as well. In maintenance work, however, the junior can use knowledge sources other than the senior if he so wishes.

The findings of this study show that the juniors who talk of their work as maintenance work possibly transfer expert work-related knowledge with their seniors. These juniors do not build new knowledge based on the knowledge transferred. The juniors, however, who talk of their work as development work transfer expert work-related knowledge with their seniors. These juniors also build new knowledge based on the knowledge transferred.

4.3.2. Phases of Knowledge Sharing in the Contexts of Work

In connection with the findings of the thematic analysis, I have presented the phases of expert work-related knowledge sharing, that is, knowledge transfer and building, between the senior and the junior (Sub-chapter 4.1.5., Figures 8 and 9). In this sub-chapter I supplement these findings by adding the context, maintenance or development work, in which the juniors talk when going through the different phases of knowledge sharing.

In the four phases of knowledge transfer, familiarisation, deliberation, corroboration and use, there were only differences in the phase of knowledge use between those talking in the context of maintenance or development work. However, the means of knowledge transfer involved in the phases of familiarisation and corroboration, documents, dialogue and work situations, are differently employed in the different contexts: in the context of development work dialogue and work situations are deemed to be better and more useful means than documents, whereas in the context of maintenance work, documents are considered a suitable and functional means of transfer (Sub-chapter 4.2.3.). As I stated in the previous

sub-chapter, none of the senior–junior pairs whose junior talks of his work in the context of maintenance work builds new knowledge. These pairs, thus, do not engage in the phases of knowledge building. On the other hand, all the pairs in which the junior talks in the context of development work build new knowledge. This distinction in knowledge building between the juniors talking either in the context of maintenance or development work is explained and understood by how they describe knowledge use in the contexts of work.

Knowledge transfer (as well as knowledge building) includes a phase of knowledge use in which the knowledge transferred is put into practice (Sub-chapter 4.1.5.). Whether talking in the context of maintenance or development work defines how the juniors describe this phase or using the knowledge transferred (Sub-chapter 4.2.3., Table 13, Theme 4). In maintenance work the knowledge transferred is used as such or applied as *standard practice*. In development work, the knowledge transferred is used as in maintenance work, and, moreover, as the basis for developing new knowledge. These different descriptions of using the knowledge transferred are supported or explained by where the juniors overall use the knowledge in their work in the contexts of maintenance and development work and how they see the nature of their work (Sub-chapter 4.2.2., Table 11, Theme group 1). In maintenance work, knowledge is used and routines are upheld to “keep the wheels turning” and to efficiently achieve the set goals, whereas in development work it is used to thoroughly understand phenomena, as well as to develop the company’s know-how and one’s own skills. Maintenance work, thus, does not involve searching for new knowledge and procedures which is why it does not give rise to assessing the knowledge transferred and further building new knowledge, whereas in development work new knowledge and procedures are sought by *questioning* and assessing the knowledge transferred which provides a setting for building new knowledge (Sub-chapter 4.1.5., Figure 9).

The differences in knowledge use between the juniors talking either in the context of maintenance or development work, therefore, explain why all the pairs do not proceed from knowledge transfer to building. The pairs in which the junior communicates in the context of maintenance work remain in the knowledge transfer cycle (Figure 8): the cycle of transfer begins anew whenever the senior gives new knowledge to the junior. It is also possible that these senior–junior pairs do not go through the cycle if there is no knowledge transfer. However, the pairs in which the junior talks in the context of development work proceed from knowledge transfer to building knowledge, going through the cycles of both knowledge transfer and knowledge building (Figures 8 and 9). After the phase of knowledge use in the

cycle of transfer (Phase 4), the juniors in these pairs move on to the cycle of knowledge building to the assessment phase (Phase 5). The juniors speaking in the context of development work, therefore, go through all the eight phases of knowledge transfer, consequently proceeding from the cycle of transfer to that of building. Those talking in the context of maintenance work merely go through the four phases of knowledge transfer and repeat the first cycle of knowledge sharing.

The findings of this study show that existing knowledge is retained in the company in the first cycle of knowledge sharing between generations or knowledge transfer. The second cycle of knowledge sharing or knowledge building, however, concerns developing new knowledge to the company. When examined through the contexts of work, the juniors communicating in the context of maintenance work can implement the cycle of knowledge transfer in favourable circumstances, that is, transfer knowledge with their seniors and thus retain knowledge. The juniors talking in the context of development work, however, implement the cycles of both knowledge transfer and knowledge building regardless of circumstances, that is, they not only transfer, but also build knowledge with their seniors and thus both retain and increase knowledge.

Having studied the findings of the third analysis and hence the entire study, the managing director of the subject company gave his comments by e-mail (May 17, 2010). Reflecting on the findings, the managing director stated that the ways in which individuals understand their work are indeed a plausible explanation for how each of them transferred knowledge at the time during the company's "*succession project*". He also assessed the introduction of the knowledge transfer project in the company (in 2005) and specified, for example, that defining the content of knowledge to be transferred had to be left with the seniors and juniors because the management did not possess an understanding of this knowledge. With regard to the implementation of the transfer, however, the management should have prepared, together with the seniors and the juniors, an outline of the goals and timeline of the transfer for each pair. This would have facilitated the follow-up of the transfer. Moreover, the managing director felt that the juniors should have been allocated time for the knowledge transfer.

4.3.3. Summary: Knowledge Sharing in the Contexts of Work

Combining the findings from the thematic analysis and articulation method uncovers that the juniors' conception of their own work and performing it explains what shape the knowledge sharing between the seniors and juniors takes. Based on the findings, the juniors who talk of their work in the context of maintenance work may transfer knowledge, whereas the juniors who talk of their work in the context of development work not only transfer, but also build knowledge.

The findings, therefore, show that the senior–junior pairs in which the junior assumes the context of maintenance work, either transfer no knowledge or only transfer knowledge but do not build it. The junior's understanding of his work as maintenance is, therefore, not a sufficient prerequisite for either knowledge transfer or knowledge building. All the pairs in which the junior talks in the context of development work build knowledge. These pairs also transfer knowledge because knowledge transfer underlies knowledge building. Thus, the junior's conception of his duties as development work is a sufficient prerequisite for knowledge transfer and an essential one for knowledge building.

The different knowledge needs in maintenance and development work explain why the juniors talking in the context of maintenance work do not necessarily transfer knowledge with their seniors, whereas in the context of development work transfer is present. Maintenance work does not necessarily require the knowledge available from the senior in knowledge transfer; rather the knowledge required in work can be acquired from other sources. However, development work necessitates knowledge available from the assigned "own" senior which makes knowledge transfer essential; otherwise the junior cannot conduct his duties.

If the junior talks of his work in the context of maintenance work, he may in favourable circumstances transfer knowledge with his assigned senior but not build new knowledge. Maintaining efficiency and not trying to change the prevailing practices, he is oriented to the present and achieving the set goals in his work. These goals and functions of work do not give rise to building new knowledge.

If the junior speaks of his work in the context of development work, he builds new knowledge regardless of the circumstances. Oriented to the future and change in his work, he tries to gain a deep understanding of phenomena, assesses the knowledge transferred to him and

its suitability and wants to develop both the company's know-how and his own skills. These goals and functions of work create a setting for building new knowledge.

In both maintenance and development duties, juniors communicate the knowledge transferred or built along in the company, disseminating individual knowledge which becomes organisational knowledge (Tsoukas 1996, Tsoukas & Vladimirou 2001). A junior, performing maintenance work, communicates the knowledge transferred to other members of the organisation and, thus, disseminates existing knowledge in the organisation. A junior, performing development work, however, communicates the knowledge built (and transferred) to other members of the organisation and, thus, disseminates new (and existing) knowledge throughout the organisation. However, the findings show that disseminating knowledge both transferred and built is coincidental.

The commonly accepted goal of knowledge transfer between generations, the retention of existing knowledge in the organisation (DeLong, 2004; Rothwell & Poduch, 2004), is achieved with the senior–junior pairs in which the junior talks about his work as maintenance work. With these pairs the existing knowledge in the organisation is transferred from one individual to another, and when the senior retires, his knowledge has been transferred to the junior. The possible goal from the perspective of this study in knowledge transfer between generations or knowledge sharing, building new knowledge to the organisation, is achieved with the senior–junior pairs in which the junior speaks of his work in the context of development work despite the circumstances. These pairs build new knowledge to the organisation, and the junior disseminates this built knowledge throughout the organisation accessible to all those that need it.

Based on the findings of this study, the external circumstances of knowledge transfer, that is, a lack of time as well as the physical distance between the senior and the junior, when occurring concurrently, prevent the transfer in the senior–junior pairs in which the junior talks of his work in the context of maintenance work. However, a lack of time alone does not prevent knowledge transfer. In the light of the findings, I could not describe the effect of physical distance on knowledge transfer in the context of maintenance work, because no pair, in which the junior talks in the context of maintenance work, is confronted with the circumstance of physical distance alone.

5. Conclusions

5.1. Implementation of the Study

In this study I focused on knowledge sharing, that is, knowledge transfer and building, between generations. I investigated knowledge sharing between experienced experts about to retire and their successors, the novices.

The concept of knowledge transfer implicitly involves a notion that knowledge can be transferred or should be transferred as such from one person or situation to another. The goal is, thus, to retain the existing knowledge unchanged. The literature on knowledge transfer between generations, therefore, sees knowledge retention as the goal of knowledge transfer and does not mention the possibility of developing or creating knowledge (DeLong 2004, Rothwell & Poduch 2004). One starting point of this study, however, was that knowledge transfer between generations may entail the development of new knowledge which I study as knowledge building.

Knowledge building enables organisational renewal because the prerequisite for renewal is new knowledge development in the interaction between the members of the organisation (Tsoukas 1996, Stähle et al. 2002, Pöyhönen 2004). Knowledge building also provides the organisation with an opportunity to strengthen its competitiveness in the case that the knowledge built by individuals is spread throughout the organisation to all those that need it that the recipients understand the knowledge they have received and put it into practice (Tsoukas & Vladimirou 2001, Szulanski 2003).

My approach to organisation and knowledge management was knowledge-based. According to this approach, knowledge is constantly reconfiguring responding to situations, and, therefore, it is not possible to transfer it as such from one situation or individual to another (Sveiby 1996, Tsoukas & Mylonopoulos 2004, Spender 2006). The transformation of knowledge can, thus, be considered in-built in knowledge transfer. Consequently, the main question this research sought to answer is what happens in the knowledge transfer between generations and how knowledge is handled in the transfer.

Main Research Question:

How do shortly retiring employees and their successors transfer knowledge and possibly build knowledge between themselves in expert work?

According to the knowledge-based view, organisational knowledge is located in the members of the organisation and their interaction: knowledge is activity between the members, created and developed in interaction (Tsoukas & Mylonopoulos 2004, Spender 2006, Widén-Wulff 2007). Thus, the first sub-question looked to answer how interaction is related to knowledge transfer between generations and the possible building of knowledge.

Sub-question 1:

What is the role or task of social interaction in the transfer of expert work-related knowledge between generations and the possible building of knowledge?

When examining organisational knowledge from the knowledge-based view, knowledge is formed of the individual characteristics, experiences and skills (Polanyi 1961, Tsoukas 1996, Tsoukas & Vladimirou 2001), as well as bound to the practice and the setting (ibid., Carlile 2002, 2004). Thus, the second sub-question aimed to answer how work is related to knowledge transfer between generations and the possible building of knowledge.

Sub-question 2:

Why and how does carrying out duties direct or define expert work-related knowledge transfer between generations and the possible building of knowledge?

Expertise builds from knowledge and experience which are accumulated over time and intuitively combined depending on the changing situations (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995, Pyöriä et al. 2005). Hence, it cannot be acquired at once; it develops gradually guided by knowledge, experience and circumstances. So, the third sub-question proposed to answer how expertise-related knowledge transfer between generations takes shape over time.

Sub-question 3:

How does expert work-related knowledge transfer between generations and possible knowledge building between an experienced employee and a novice change over time and how long does it last?

In the study I examined knowledge transfer and the possible building between expert employees, soon to retire, and their successors. Therefore, it was not a question of studying succession related to the company's ownership or management (e.g. Giambatista et al. 2005, Hautala 2006). In the literature the knowledge transfer between employees is also called technical succession. To the best of my knowledge, it has not been the object of

scientific empirical research (DeLong 2004, Rothwell 2007), and, therefore, there was no previous scientific knowledge available directly related to the topic of this study.

Established in 1957 in Finland, the company involved in this study designs and manufactures electrical equipment and systems. It is the only business of its kind in the Finnish market, and 90% of its production is exported. Its global competitiveness and success are based on knowledge and know-how which has been built up over decades by its experts and which was being transferred to the next generation at the time of the study. The turnover of this limited liability company was approximately €51 million in 2006 with 270 employees.

The primary empirical data consisted of theme interviews with twelve employees involved in knowledge transfer in the company and five follow-up theme interviews. Six of the interviewees were shortly retiring expert duty employees, and six were their successors. All those participating in the follow-up interviews were successors of those soon to retire. The research philosophical basis of the study was constructionism (Alvesson & Sköldböck 2009) and the research method was organisational ethnography (Rosen 1991, Schwartzman 1993). I conducted the data analysis by using thematic analysis (Hirsjärvi & Hurme 2004) and the articulation method (Hall 1992, 1997, Grossberg 1995, Lehtonen 2004).

In the study I illustrated, clarified and explained knowledge transfer between generations and the possible knowledge building from the participants' conceptions and experiences. Instead of organisational functions, I focused on individuals, their work and the related knowledge use.

The data analysis proceeded in three phases. In the first phase I classified and combined data in the thematic analysis which resulted in a description of the phenomenon being studied. In the second phase I interpreted the data with the articulation method which revealed the contexts of the interviewees' accounts in which they signify knowledge transfer and building or knowledge sharing. In the third phase I linked the findings from the first two phases which produced an explanation of how the phenomenon being studied, that is, knowledge sharing between generations, takes shape.

5.2. Study Results

In this sub-chapter I present the central results of the study categorised according to the research questions. Finally, I briefly elaborate on the use of the articulation method in this study and the results I achieved.

Knowledge Transfer and Building or Knowledge Sharing between Generations

Main research question: How do shortly retiring employees and their successors transfer knowledge and possibly build knowledge between themselves in expert work?

The findings of this study show that the knowledge transfer between generations, that is, between an expert and a novice, may lead to knowledge building. Knowledge transfer and building together form the process of knowledge sharing between generations in which knowledge transfer underlies knowledge building. Thus, knowledge sharing consists of two cycles: in the first cycle, that is, the cycle of knowledge transfer, existing knowledge is transferred in the organisation, and in the second one, that is, the cycle of knowledge building, new knowledge is built based on the knowledge transferred. Both cycles proceed through four phases, and, hence, knowledge sharing comprises altogether eight phases.

Based on the results, the expert–novice pairs sharing knowledge can go through the cycles of transfer and building several times because all the knowledge to be transferred is not transferred "at once" but rather the transfer proceeds following work practices and tasks. In other words, having transferred some knowledge, the pair moves on to transfer some other knowledge, or possibly builds new knowledge on this transferred knowledge and, thus, proceeds from the cycle of knowledge transfer to that of knowledge building.

In building knowledge, the expert and the novice integrate the new knowledge brought to the organisation by the novice into the existing knowledge possessed in the organisation by the expert. In this study, the new knowledge introduced to the company by the novice consists, for example, of knowledge related to IT and computing software. When this knowledge is combined with the expert's knowledge and experience of the company's products, clients' needs and preparing tenders, the result is a new computing program tailored to the

company. The novice makes the program he has devised available to all those that need it, and, thus, the program increases the efficiency of the entire company's computational product design and tender preparation. Based on the findings, sharing the experts' work-related knowledge between generations involves not only the transfer of knowledge existing in the company, but also building new and meaningful knowledge for the company. The knowledge built is then passed along in the company to be employed by others, that is, it is disseminated to become organisational knowledge which enhances the entire organisation's operations.

The methods of knowledge sharing between generations are formed either of knowledge transfer or knowledge building which possibly involves communicating the knowledge within the company. Linking these methods produces the effects of knowledge sharing on knowledge in the organisation: (1) retaining and holding knowledge follows from knowledge transfer and storage as individual knowledge; (2) retaining and disseminating knowledge follows from knowledge transfer and communicating it to others in the organisation; (3) increasing and holding knowledge follows from building and storing knowledge as individual knowledge; and (4) increasing and disseminating knowledge follows from building and communicating the knowledge to others in the organisation. The commonly accepted goal of knowledge transfer between generations, the retention of existing knowledge in the organisation (DeLong 2004, Rothwell & Poduch 2004) is achieved in point 1 in which the existing knowledge is retained in the organisation by keeping it as individual knowledge or by transferring the knowledge from one individual to another. The possible goal of knowledge transfer between generations or knowledge sharing according to this study, that is, building new organisational knowledge (Brown & Duguid 1991, Tsoukas & Vladimirou 2001, Carlile 2002) is achieved in point 4 when organisational knowledge is increased by building new knowledge and disseminating the built knowledge accessible to all those that need it to become organisational knowledge.

The means of knowledge transfer between generations are activities or processes with the help of which or during which the novice and the expert transfer knowledge between themselves. Based on the findings, these means are orientation with documents, dialogue and work situations. When transferring knowledge in documents, the experienced expert primarily chooses the documents and hence the knowledge to be transferred. In dialogue, the novice and the expert together define the knowledge to be transferred and how to orient with it. Work situations help the novice to notice the deficiencies in his knowledge, and, thus, work

situations prompt new questions and further dialogue. The significance of work situations for knowledge transfer is, however, much greater than the mere prompting of questions: understanding the knowledge read from documents and arisen in discussions becomes easier when making concrete observations. In particular, work situations facilitate knowledge transfer when the situation involves several factors, all the combined effects of which are impossible to take into account based on mere theory, without making observations.

Based on the findings, the knowledge being transferred between generations involves the explicit, implicit and tacit dimensions of knowledge (Polanyi 1966, Tsoukas 1996, Eraut 2004). The novices have acquired the explicit dimension or formal knowledge (Barley 1996) by completing their Master's degrees already before joining the company. This knowledge comprises the theory of physics and electrical engineering which is applied to the company's needs and working there in the knowledge transfer. The implicit dimension of the knowledge being transferred (Barley 1996, DeLong 2004) includes, for example, rule-based product measuring and situation-bound product testing which are partly constructed on theoretical or explicit knowledge. The tacit dimension of the knowledge being transferred (Dreyfuss & Dreyfuss 1986, Leonard-Barton 1995) consists of the experts' wide and extensive knowledge and experience not only of electrical engineering, but also of the company's products, production and clients acquired over decades. This tacit knowledge is the expertise that the novices want to receive and absorb.

Based on the findings, the means of knowledge transfer between generations, that is, documents, dialogue and work situations, are connected to the dimensions of knowledge. In documents, the explicit dimension of the knowledge being transferred is formal and universal knowledge produced by the experts or other members of the organisation. In dialogue, the novices can acquire knowledge related to the implicit dimension, instead of the formal and universal knowledge, and try to receive knowledge that is applied to their own needs and enables them to perform the experts' work. The transfer of tacit knowledge in work situations involves seeing phenomena and experiencing them in practice which helps the novices to understand several factors related to the knowledge being transferred and simultaneously influencing it, as well as to create links between them. When looked at through the dimensions of knowledge, however, the means of knowledge transfer are not mutually exclusive because the dimensions cannot be distinguished when employing the knowledge (Polanyi 1966, Tsoukas 1996, Spender 2006). In other words, for example, transferring explicit knowledge in documents as a means is the "minimum requirement" which does not

mean that explicit knowledge could not be transferred by some other means. The findings show that explicit knowledge is handled and used not only in documents but also in dialogue and work situations, and that implicit knowledge is “present” in both dialogue and work situations.

The results of this study show that the knowledge transfer between generations in expert work involves four factors. These are interaction, external expectations of the expert and novice, their personal dispositions, as well as external circumstances, that is, a lack of time and the physical distance between the expert and the novice at the workplace. Influencing how knowledge transfer is implemented in each expert–novice pair, these factors are intertwined in the transfer, and, therefore, it is impossible to assess their weighting or significance in knowledge transfer.

Interaction in Knowledge Sharing between Generations

Sub-question 1: What is the role or task of social interaction in the transfer of expert work-related knowledge between generations and the possible building of knowledge?

The results of this study show that the expert and novice cannot transfer or build knowledge without dialogue and working together involved in work situations. Interaction is, hence, an essential part of sharing the experts’ work-related knowledge.

Knowledge sharing, or transfer and building, proceeds in altogether eight phases between the expert and the novice. These include (i) familiarisation, (ii) deliberation, (iii) corroboration and (iv) use; and the phases of knowledge building comprise (v) assessing, (vi) modifying, (vii) honing and (viii) use. In some phases the expert and the novice act together, and in some the novice acts alone. In the phases of (i) familiarisation and (iii) corroboration in knowledge transfer, the expert guides the novice in understanding the knowledge being transferred and applying it in practice. In (vii) the honing phase, the expert helps the novice to apply the built knowledge to the company’s needs. In (ii) deliberation, however, the novice tries to independently comprehend the knowledge being transferred. In the phases of (v) assessing and (vi) modifying, the novice independently develops new knowledge based on

the knowledge transferred. In the phases of (iv and viii) knowledge use, the novice then utilises the transferred or built knowledge.

In the course of knowledge sharing, the expert, thus, checks and ensures that the novice has understood the knowledge, as was meant, and that the knowledge absorbed by the novice is applicable and suitable for the company. When necessary, the expert steers the novice to assimilate the knowledge. The novice, for his part, checks with the expert that he has understood the knowledge as the expert meant. Therefore, it is not sufficient for knowledge transfer or building that the expert gives the knowledge to the novice, but rather they must familiarise themselves with the knowledge and its use in interaction. Knowledge transfer and building end when the novice is capable of independently using the knowledge transferred or built. Expert work-related knowledge sharing between generations, thus, proceeds in interaction in the course of which the novice receives the knowledge, understands it and takes it to use.

Knowledge Sharing between Generations in Maintenance and Development Work

Sub-question 2: Why and how does carrying out duties direct or define expert work-related knowledge transfer between generations and the possible building of knowledge?

The experts' work-related knowledge to be transferred between generations in the company of this study is divided into four elements based on the findings: products, production, sales and computer simulation. These elements of knowledge, however, comprise only basic or theoretical knowledge which alone is not sufficient to accomplish the work. Therefore, in knowledge transfer these elements must be connected to work tasks: employing only theoretical knowledge shows from which "perspective" this knowledge must be approached in work and how it is best applied in work or facilitates work. In other words, the goals and knowledge needs of work guide what knowledge is used and how.

Based on the findings, the novice's knowledge needs steer the expert work-related knowledge transfer and building between generations between the expert and the novice. The novice's knowledge needs are determined by the work goals and tasks, but they are not only based on an official definition of the work or responsibility, but also on how the novice sees his work: how he prioritises the goals set and what functions he considers most

important in work. According to the results, the novices consider and perform their work primarily either as maintenance or development work.

The findings show that the pairs in which the novice speaks of his work as maintenance work, either transfer no knowledge or transfer knowledge but do not build it. The novice's understanding of his work as maintenance is, therefore, not a sufficient prerequisite for either knowledge transfer or knowledge building. All the pairs, in which the novices talk of their work as development work, build knowledge. These pairs also transfer knowledge because knowledge transfer underlies knowledge building. Thus, the novices' conceptions of their duties as development work is a sufficient prerequisite for knowledge transfer and an essential one for knowledge building.

The different knowledge needs in maintenance and development work explain why the novices involved in maintenance work do not necessarily transfer knowledge with the experts assigned to them, whereas in the development work they do. Maintenance work does not necessarily require the knowledge available from the expert in knowledge transfer; rather the knowledge required in work can be acquired from other sources. However, development work necessitates knowledge available from the assigned expert which makes knowledge transfer essential; otherwise the novice cannot conduct his duties.

Why the novices performing maintenance work do not build knowledge and those in development work do is explained by the different nature of their work or the different functions and purpose of the work. In maintenance work, the basic functions build on routines and concentrate on acting in the present. The purpose is to achieve the set goals by maintaining efficiency. These work goals and functions do not give rise to building knowledge, that is, to assessing the prevailing situation and developing new knowledge. However, in development work, the basic work functions build on a deep understanding and orient toward the future. The purpose is to develop the company's know-how and one's own skills. These work goals and functions provide a starting point for building knowledge, that is, for assessing the prevailing situation and for transforming it when necessary by developing knowledge.

The circumstances related to knowledge transfer, that is, the novice or the expert's busy schedules and the resulting lack of time, as well as their physical distance at the workplace, according to the results do not alone explain why some pairs transfer knowledge while others do not. In the pairs, in which the novice speaks of his work as development work, busy

schedules and physical distance do not prevent knowledge transfer. In the pairs, however, in which the novice speaks of his work as maintenance work, busy schedules and physical distance can prevent the transfer if both members are confronted with these circumstances at the same time. The findings show that busy schedules alone do not prevent knowledge transfer. The results provide no basis for describing the effect of physical distance on knowledge transfer, because no pair, in which the novice talks of his work as maintenance work, is confronted with the circumstance of physical distance only.

With regard to the means of knowledge transfer, the results show that the novices involved in development work consider dialogue and work situations to be better and more useful means of knowledge transfer for them than documents. The novices primarily doing maintenance work, however, deem documents to be a suitable and functional means of knowledge transfer for them.

The methods of knowledge sharing between generations consist of knowledge transfer and knowledge building, which may lead to communicating the transferred or built knowledge to the other members of the organisation. As I stated above, the novice in maintenance work may transfer knowledge with an expert, and, thus, retain existing knowledge in the organisation, but he does not build new knowledge. The novice conducting development work, however, not only transfers knowledge with an expert, but also builds new knowledge with him and thus increases knowledge in the organisation. In both maintenance and development duties, novices communicate the knowledge transferred or built along in the company. A novice, performing maintenance work, therefore, communicates the knowledge transferred to other members of the organisation and, hence, disseminates existing knowledge in the organisation. A novice, performing development work, however, communicates the knowledge built (and transferred) to other members of the organisation and, thus, disseminates new (and existing) knowledge throughout the organisation. Nevertheless, disseminating both transferred and built knowledge is coincidental, varying between individuals and from one situation to another as established by the findings.

The novices doing maintenance work can, thus, achieve the goal considered common in knowledge transfer between generations, that is, retention of knowledge in the organisation (DeLong 2004, Rothwell & Poduch 2004) when they transfer knowledge in favourable circumstances. Those involved in development work, however, achieve the goal of knowledge transfer between generations presented in this study, that is, knowledge building.

According to the findings, this knowledge building increases the efficiency of organisational functions and improves its competitiveness.

When describing maintenance and development work, my purpose is not to prioritise between the types of duties in maintenance and development work or the conceptions and interpretations connected to them by the employees, but rather to investigate these conceptions and their differences to understand the effects of work on knowledge transfer and building. I, therefore, consider both types and conceptions of work and performing it equally “correct” and acceptable, and they are both equally important and beneficial to the organisation’s operations.

Development of Expertise and Knowledge Sharing between Generations

Sub-question 3: How does expert work-related knowledge transfer between generations and possible knowledge building between an experienced employee and a novice change over time and how long does it last?

The findings from the comparison between the research interviews (2006) and follow-up interviews (2007) conducted with the novices establish that the knowledge transfer between the expert and the novice has partly ended after a year. According to the results, expert work-related knowledge transfer between generations diminishes or gradually ends when the novice starts to master the knowledge needed in various work tasks. Transferring knowledge about a specific work task ends when the novice is able to perform the task independently, to acquire and assimilate the related knowledge from different sources, as well as possibly build new knowledge without the assistance of an experienced expert. When the transfer has ended, the knowledge building of the “former novice” doing development work reconfigures to become part of independent working: the novice has accumulated company-related knowledge necessary in building knowledge sufficiently, and, therefore, he no longer needs the expert’s help in the knowledge building.

The novice’s expertise, however, is not “complete” when the knowledge transfer ends, but it increases and strengthens continuously when working and accumulating experience. Moreover, even though the “former novice” is able to work independently, it does not mean that interaction in the knowledge sharing pair is completely over. It merely decreases and reconfigures: the experienced expert becomes just one source of knowledge among others

for the novice, and the interaction transforms from giving and receiving knowledge to a more equal exchange of knowledge.

Contexts, Themes and Discourses in the Interviewees' Speech

In the data analysis of this study, I employed the articulation method (Grossberg 1995, Hall 1997, Lehtonen 2004). It took me beyond the interviewees' explicit verbal accounts related to knowledge sharing to interpret how they understand the sharing and its implementation in the contexts of work. The findings from this interpretation led me to explain how knowledge sharing takes shape.

The interpretation of the data, conducted by the articulation method (Grossberg 1995, Hall 1997, Uotinen 2005), revealed that the interviewees' accounts consisted of three contexts: those of maintenance and development work and that of the company. These contexts comprise altogether thirteen themes (Uotinen 2005). In the contexts of maintenance and development work, the contents of the themes vary according to the context of the interviewee's account.

Of the interviewees, one of the experts talks in the context of maintenance, whereas five assume the context of development work. However, with the novices, three talk in the context of maintenance work and three in that of development work. None of the interviewees talks in the contexts of both maintenance and development work during one interview. Moreover, all the five novices interviewed twice talk about their work in the same context both in the research interview (in 2006) and the follow-up interview (in 2007).

In the interviews, both the experts and the novices talk in the context of the company and in two different contexts of work. In these contexts they also communicate about the same themes. However, in the context of work the experts do not give accounts of knowledge transfer, that is, they do not attach themes of transfer to the contexts of work, as the novices do. The experts, therefore, do not interpret or signify knowledge transfer or the knowledge to be transferred as part of their work in the interviews. One explanation may be that they already master the knowledge to be transferred. They also have a "ready" reason or justification for knowledge transfer in securing the company's future and the continuity of one's work which they speak about in the context of the company. Based on this it seems that the experts see the knowledge transfer as a clearer or "simpler" issue or process than the novices, and this is why the experts do not need to interpret or explain the transfer as part

of their work. However, the novices must absorb the knowledge being transferred and connect it and the knowledge transfer to their work. Furthermore, they are perhaps still learning to operate in an unfamiliar environment, embarking on a new career in a new company.

In the themes in the context of the company, the interviewees speak about the knowledge being transferred and knowledge transfer on a universal or company level, without describing practical activity. In the themes in the contexts of work the interviewees talk about their work in the context of either development or maintenance work. In the themes of knowledge transfer involved in the contexts of work, the novices connect the knowledge transfer and using the knowledge being transferred (i.e. possible knowledge building) to their own work, and, thus, the knowledge being transferred or the transfer situation described generally in the context of the company receives its meaning in practice, as part of one's work.

When analysing the interviewees' verbal accounts I interpreted the accounts in the context of the company to be part of a discourse in the subject company related to the entire company and its success. I refer to this discourse as the discourse of the company's success. Within this discourse, the interviewees "present" knowledge transfer to an individual coming from outside, that is, the interviewer, in a very positive light: knowledge transfer is essential to the company and its necessity or implementation is not doubted or questioned. The accounts in the contexts of work are related to a discourse which I call the discourse of practice. Within this discourse the interviewees also talk about the negative matters related to knowledge transfer and admit its failure.

5.3. Theoretical Implications

To the best of my knowledge, there is no previous scientific knowledge available on the subject of this study specifically, that is, knowledge transfer between generations among the employees of an organisation or technical succession (Rothwell & Poduch 2004, Rothwell 2007). Furthermore, it has not been proposed in the literature that knowledge transfer could lead to knowledge building, but rather the goal of knowledge transfer has been the retention of knowledge in the organisation (DeLong 2004, Rothwell & Poduch 2004). DeLong (ibid.; 86, 225) states that the strategic focus of knowledge transfer between generations should be in particular such knowledge that is important for the organisation's future operations and

competitiveness. Therefore, he does not propose that knowledge transfer between generations could mean the development of new organisational knowledge, but rather he considers knowledge retention to be the particular goal of the transfer. Based on the findings of this study, however, knowledge transfer between generations can mean knowledge building. Therefore, in this study I apply the concept of knowledge sharing between generations instead of knowledge transfer because the process can entail either knowledge transfer or both knowledge transfer and building. In knowledge sharing, transfer is the prerequisite for knowledge building.

Knowledge Transfer and Building or Knowledge Sharing between Generations

In findings of this study show that while building knowledge the expert and the novice reconfigure existing knowledge in the organisation by supplementing the expert's knowledge with knowledge from outside the organisation, that is, the novice's knowledge. The built knowledge is, thus, a combination of existing organisational knowledge and new knowledge introduced to the organisation. The findings support previous research results according to which organisational knowledge evolves when individuals integrate new knowledge from outside into existing organisational knowledge in their interaction (Brown & Duguid 1991, Tsoukas & Vladimirou 2001, Zahra & George 2002, Carlile & Rebentisch 2003).

Knowledge building is the enabler and sustainer of organisational renewal which is based on continuous knowledge development in social processes (Stähle et al. 2002, Pöyhönen, 2004). The organisation renews itself by retaining its previous knowledge (here the expert's knowledge) by allowing the development of new knowledge (the novice's knowledge) and by combining these two in a way that is meaningful for the future (in knowledge building between the expert and the novice) (Tsoukas 1996, Stähle et al. 2002). In addition to renewal, knowledge building enables improving organisational competitiveness (Zahra & George 2002). Against this background, sharing expert work-related knowledge between generations is an opportunity for the organisation to renew itself and strengthen its competitiveness provided that the transfer of existing knowledge between the novice and the expert is followed by building new knowledge.

Based on the findings of this study, the means of knowledge transfer between generations are orientation with documents, dialogue and work situations. DeLong (2004; 84) also

mentions these three means or methods of knowledge transfer which he relates to explicit, implicit and tacit knowledge transfer: explicit knowledge is transferred in documents, implicit in dialogue and tacit in work situations. In this study, however, these types of knowledge proved to be knowledge dimensions which are indistinguishable while using the knowledge (Polanyi 1966, Tsoukas 1996, Eraut 2004). This means that the means of knowledge transfer when examined through the dimensions of knowledge are not mutually exclusive.

Based on the findings of this study, the knowledge transfer between generations in expert work involves four factors: interaction, social expectations of the expert and novice, their personal dispositions and external circumstances. Szulanski (2003) also finds the sender and recipient's personal qualities to be factors influencing knowledge transfer. He sees interaction as being the "channel" not only affecting the transfer, but also being affected by the prevailing situation, such as the external circumstances shown in this study. Tsoukas (1996; 11), for his part, defines the above-mentioned four factors as forming the individual's "stock of knowledge" in the organisation: an individual's knowledge consists of his or her dispositions, external expectations and different interactive situations specific to circumstances. In the light of the factors of knowledge transfer and individual knowledge, as defined by Tsoukas (*ibid.*), knowledge transfer between generations is also a process in which the individual or the novice creates knowledge for him or herself.

Based on the findings, the external factors or circumstances affecting the knowledge transfer between generations are a lack of time or busy schedules and the physical distance between the novice and the expert at the workplace. This finding finds support from Davenport and Prusak (1998; 101) who mention the same aspects as factors inhibiting knowledge transfer based on interaction.

Interaction in Knowledge Sharing between Generations

The findings of this study support DeLong's (2004) view of interaction being imperative in knowledge transfer between generations—DeLong, however, does not relate the possible building of knowledge to the transfer as this study does. The findings demonstrate that expert work-related knowledge cannot be transferred or built between generations without the interaction of the expert and the novice; interaction therefore underlies knowledge sharing between generations in expert work. This finds support in the views of Pyöriä (Pyöriä et al.

2005), Parviainen (2006) and Widén-Wulff (2007) according to which using and developing knowledge in expert work requires a social setting.

DeLong (2004) sees that knowledge transfer between generations ends when the novice is able to employ the knowledge transferred. This view receives support in the findings of this study which establish that the knowledge has only been transferred, or built, when the novice utilises the knowledge transferred, or built. The findings show that expert work-related knowledge sharing between generations proceeds in interaction in the course of which the novice receives the knowledge, understands it and employs it. The research results of Szulanski (2003), as well as the notions proposed by Davenport and Prusak (1998) about knowledge transfer support this finding. According to Szulanski (*ibid.*), understanding and employing the knowledge are inherent in the knowledge transfer between individuals in an organisation because individuals understand and employ the knowledge in different ways from their personal capacities. Therefore, individuals have to make the knowledge to be transferred understandable and usable to themselves, and only then has the knowledge been transferred from one individual to another.

Knowledge Sharing between Generations in Maintenance and Development Work

In the literature, approaches to knowledge transfer between generations among the employees of an organisation have been either knowledge-based or process-based. The knowledge-based approach has focused on the knowledge to be transferred, that is, what knowledge mastered by the experienced employee should be transferred on to his or her successor. The process-based approach, however, has concentrated on how or by what means knowledge is transferred between experienced employees and their successors. (DeLong 2004, Rothwell & Poduch 2004.) Neither approach, therefore, has taken the recipient of the knowledge nor his or her knowledge needs into account. However, the results of this study show that in the knowledge transfer and building between generations crucial is not only the recipient's or the novice's work-related knowledge needs, but also his ways of working. They define and determine what shape the knowledge transfer and building between the expert and the novice takes.

The findings of this study support the understanding that work goals and tasks are not only based on the official definition or description of the job, but also on how the employees find

their work: how they prioritise the goals set and what functions they concentrate on in their duties (Brown & Duguid 1991, Wenger 1998, Tsoukas & Vladimirou 2001, Spender 2006). Based on the findings it is, thus, fair to assume that work practices are created not only according to the formal definition and guidelines from the organisational management but also how the employees themselves see their work and performing it. In the light of the results, individuals' working is influenced by their personal qualities and their conceptions related to work situations (Tsoukas 1996, Tsoukas & Vladimirou 2001).

The results of the study show that knowledge necessary in work cannot be transferred or built "as such", detached from the context of work, but rather it is connected to work tasks—in this study, either maintenance or development work. The context of work endows the knowledge with a "practical perspective" which defines the necessity of the knowledge. The finding reflects the notions of Polanyi (1961, 1975), Tsoukas (1996), Tsoukas and Vladimirou (2001) and Spender (2006) about the practicality and realisation of knowledge in practice. In his studies, Carlile (2002) draws attention to the pragmatic perspective on organisational knowledge. His perspective coincides with that of this study because the pragmatic view sees individuals giving knowledge different meanings based on their different practical knowledge needs and ways of using knowledge.

The research results established by Kalling and Styhre (2003) and Widén-Wulff (2007) also lend support to this study. They acknowledge that the context of work is an essential factor that affects knowledge use in the organisation, and, therefore, this context should always be taken into consideration when studying organisational knowledge. Kalling and Styhre (*ibid.*; 161) call for detailed empirical research in knowledge management on the social contexts in which knowledge is generated, used and shared because these contexts define the knowledge and its meaning to its users—and further to the strategic utilisation and management of knowledge in the organisation. This study meets the research criteria set forward by Kalling and Styhre by investigating knowledge use, transfer and building with the meanings given by employees to the knowledge in the context of their work as its premise. Based on the findings, individuals' interpretation of knowledge in the context of their work steers their knowledge needs, acquisition and use in the organisation. Individuals' knowledge use in work further influences the generation of organisational knowledge by either sustaining existing knowledge or by building new knowledge for the organisation. According to the findings of this study, the field of knowledge management should try to understand the interpretations individuals make of their work because they guide their knowledge use in the

organisation and further the generation of wider organisational knowledge. The context of work, therefore, affects knowledge use in the organisation, as Kalling and Styhre (2003) and Widén-Wulff (2007) have previously stated.

Development of Expertise and Knowledge Sharing between Generations

The results of this study support previous research on expertise and its development. In the five developmental stages of expertise defined by Dreyfuss & Dreyfuss (1986), the experienced experts of this study have reached the highest stage because they work intuitively by combining explicit and implicit knowledge, as well as understanding brought by experience responding to a situation (ibid., Leonard-Barton 1995, Eraut 2000).

According to the results, the transfer of expert work-related knowledge between generations diminishes or gradually ends when the novice starts to master the knowledge needed in various work tasks. The novice's expertise, however, is not "complete" when the knowledge transfer ends, as proposed in previous research, but it increases and strengthens continuously when working and accumulating experience (Dreyfuss & Dreyfuss 1986, Pyöriä et al. 2005). When novices are able to act independently, they have reached the third stage in the 5-step skill acquisition process defined by Dreyfuss & Dreyfuss (1986), that is, they have become competent skill performers. At this level individuals are able to act independently and plan their action according to goals. Taking responsibility for their action and its outcome, they are not, however, acting intuitively as experts, but rather they assess situations and make related decisions based on conscious analysis. (Ibid.)

Articulation Method

When interpreting the data of this study I used the articulation method (Grossberg 1995, Hall 1997, Uotinen 2005). A method utilised in cultural studies, it has been applied to business economic studies only once before to the best of my knowledge (Moffitt 1994). In this study the method proved useful and fruitful because with it I was able to interpret knowledge sharing between generations as part of verbal accounts of work and further to explain it inherent in work. Without the articulation method, the study results would have been mere

presentations of the contents of the data when lacking the explanatory interpretation of the phenomenon being studied.

As stated above, Kalling and Styhre (2003) and Widén-Wulff (2007) maintain that the context of work is an essential factor influencing individuals' knowledge use in the organisation. The articulation method in this study proved to be a method that revealed the participants' context of interpretation involved in knowledge sharing between generations, that is, work, from the data. The method established the meanings formed in the context of work and related to knowledge, as well as the ways of using knowledge or working intertwined in them. Thus, the articulation method made it possible to comprehend and explain how individuals' knowledge transfer and building occurs. The individuals' verbal accounts of their work—and its content, goals and ways of working—and examining knowledge as part of these accounts proved to be a suitable and productive starting point to understand and explain individuals' knowledge use and further to describe how this use affects the generation of knowledge for the entire organisation.

5.4. Managerial Implications

The results of this study show that sharing expert knowledge between generations in work can consist of the transfer of existing knowledge or both the transfer and building of knowledge. Based on this, the goal of knowledge sharing between generations in a company can be defined either as knowledge transfer, that is, retention of existing knowledge, or both knowledge transfer and knowledge building, that is, development of new knowledge.

In the light of the results, knowledge sharing between generations is a process based on interaction, and, therefore, it is more important to focus managerial efforts on people and what they know than on the knowledge itself (Spender 2006, Widén-Wulff 2007). Based on the results and following the notions of Widén-Wulff (2007; 173), the premise in managing should be the unofficial context of activities (here working) in which the human and social processes (here knowledge sharing between generations) take place. These generate and influence the employees' individual and unofficial work-related interpretations which the company management should try to understand because based on them it can create a mutual framework for employees to promote cohesion (Stähle & Wilenius 2006; 137). In

practice this means that knowledge sharing between generations should be planned and managed from the needs and conceptions of its participants.

The results of this study can be utilised in companies when planning knowledge sharing between generations. This planning should be conducted in co-operation with those who share the knowledge, that is, the experienced expert and the novice, because they know both the knowledge to be transferred and their own work and its knowledge needs better than the company management. The results show that the novice's conceptions of his or her work determine what shape the knowledge transfer and building take between the two employees. Against this background, planning knowledge sharing between generations should primarily concentrate on the knowledge recipient's or the novice's work goals and tasks, as well as the knowledge necessary in them, particularly from the novice's perspective and through his experiences and understanding. The focus should, thus, be shifted from the knowledge to be transferred to using this knowledge and the knowledge user's perspective.

Naturally, experienced employees should also participate in planning the knowledge sharing, because before starting the knowledge transfer they may be the only ones that have the knowledge and know how it is intertwined in different work tasks. Moreover, they are the other party of knowledge sharing taking place in interaction. Even though experienced experts are a significant asset to the company, transferring and retaining their knowledge in the company requires taking their successor into account as well: the prerequisite for knowledge transfer is that the successors conceive the knowledge defined to be transferred as necessary in their work. The successors' or the novices' initiative or activeness also steer knowledge building because it begins only when the novices assess the knowledge transferred and start adapting it.

The results show that novices may feel that experienced experts withhold knowledge or are unwilling to communicate it to others. Therefore, when necessary experienced employees can be advised that the purpose of knowledge sharing is not only the retention of their valuable knowledge, but also building new knowledge which by no means makes their knowledge needless because the knowledge to be transferred is the essential foundation for knowledge building. The goal of knowledge sharing is, therefore, not to extract the knowledge from the experts but to build new knowledge with them based on their knowledge.

The results of this study establish that the content of the knowledge being transferred is impossible to fully describe or define because it is partly embedded in work practices (Brown

& Duguid 1991, Wenger 1998, Spender 2006). Since knowledge connected to practice is impossible to define completely, the management cannot fully control what knowledge is transferred. Moreover, since knowledge sharing occurs in interaction between the expert and the novice, the management cannot fully control how and when knowledge is transferred. It can, however, create and maintain an environment conducive to knowledge transfer, encouraging individuals to interact and work together (Tsoukas & Vladimirou 2001, DeLong 2004, Spender 2006).

According to the findings, knowledge transfer between the expert and the novice involves four factors: the company's expectations of them, their dispositions, their mutual interaction and circumstances. Of these factors, the management can concretely affect expectations imposed on the expert and the novice, as well as the prevailing circumstances.

Management can make their expectations of those participating in knowledge sharing concrete by preparing a plan about the sharing in co-operation with the participants. Including the goals, means, schedule and follow-up, the official plan can, based on the findings of this study, assist in particular the knowledge transfer of those involved in maintenance duties. Maintenance work builds on achieving goals set beforehand and proceeding according to schedule which makes a project-based approach to knowledge transfer a natural and fitting way of implementation in this type of work.

In knowledge transfer between generations, creating favourable circumstances means that sufficient time is allocated to the transfer and that the expert and the novice work in close proximity. If there is not enough time for knowledge transfer along one's duties, the transfer may be dismissed—at least when the novice does not consider the knowledge essential for his work. If the parties of knowledge transfer, because of physical distance, must seek each other's company to transfer knowledge, the transfer situations naturally occurring in work are left unexploited. Discussions and working together are imperative in expert work-related knowledge transfer, so physical distance may hamper or even prevent the transfer. According to the results, creating favourable circumstances facilitates knowledge transfer in particular among those performing maintenance work because the adverse conditions they face may prevent their knowledge transfer. Among those in development duties, taking care of circumstances facilitates or enhances knowledge transfer. However, circumstances are not as crucial in knowledge transfer as in maintenance work because those involved in development transfer knowledge regardless of the circumstances.

The means of knowledge transfer defined in this study, documents, dialogue and work situations, help companies in instructing knowledge transfer in practice. In connection with defining the means it is good to make sure that a sufficient amount of time is allocated to knowledge transfer along one's own duties and that the expert and the novice are located as close each other as possible at the workplace. Even though orienting with documents is the fastest and perhaps the most easily organised means in knowledge transfer, it cannot be the only one. According to the results, expert work-related knowledge cannot be transferred (or built) without interaction; that is the experienced expert must orient the novice leading him "by the hand" by discussing and working side by side so that the novice can first understand the knowledge and then use it independently.

The two cycles of knowledge, knowledge transfer and building, as well as their eight phases can be utilised in companies to set a schedule for knowledge sharing and to follow up its implementation. Schedules can be based on an estimate of how long one cycle of transfer or building and its different phases take. The implementation of the plan can be monitored based on when the novice proceeds from one phase to another. The progress is, therefore, not assessed based on what knowledge moves between the expert and the novice at any particular instance, but the goal is to be aware of how the novice's assimilation of the knowledge being transferred or new knowledge building proceeds. Accomplishing the phase of knowledge use in the transfer or building of knowledge is a sign that the knowledge is transferred or built, and the pair sharing knowledge can move on to transfer or build some other knowledge. When the novice begins to master knowledge necessary in various tasks or is able to perform them independently, the cycles of knowledge transfer are gradually fewer and farther between and eventually cease.

Since knowledge transfer and building between generations is interpersonal by nature, knowledge sharing should involve storing and disseminating the knowledge transferred and built along in the company for all those that need it: only when the knowledge is accessible to all those that find it necessary, it can enhance the entire company's operations. Disseminating knowledge is important in particular for the knowledge built because it is new to the company and mastered only by those that have built it. Disseminating knowledge transferred is not as essential because it is knowledge that already exists in the company.

5.5. Suggestions for Future Research

To the best of my knowledge, there is no previous scientific knowledge available on the subject of this study specifically, that is, knowledge transfer between generations among the employees of an organisation (DeLong 2004, Rothwell 2007). Therefore, the approach adopted here on the subject is explorative: the study acquired “basic knowledge” of the subject by investigating how knowledge transfer between generations takes shape, what phenomena and processes it involves and what effects it has. This knowledge acquisition resulted, for example, in producing a concept of knowledge sharing between generations which, according to the results, includes both knowledge transfer between generations and possible knowledge building.

The study examined knowledge sharing, or transfer and building, between expert employees. They were all, thus, employed in similar duties in the same company, so further studies could investigate how the results are reflected in different types of duties and organisations. The objective of expert work is to develop new knowledge (e.g. Pyöriä et al. 2005) which may partly explain the central result of this study that knowledge transfer between generations leads to building knowledge or developing new knowledge. (If knowledge building can be explained by the fact that expert work includes knowledge development, this study introduces an interesting result which is that not all those performing expert work develop knowledge.) Further research could ascertain whether knowledge transfer between generations leads to knowledge building in other than expert duties, for example, among professionals in different fields. Moreover, the contexts of work in the interviewees’ verbal accounts, that is, maintenance and development work, may be bound to expert employees in particular. The subject of further studies could, thus, be in what kind of contexts, possibly work-related, is knowledge transfer and building interpreted.

In this study, I could not analyse the content of knowledge being transferred and related to different work tasks in detail or thoroughly. A more versatile data collection, for example, by the observation of knowledge transfer situations or the researcher’s participation in knowledge transfer in participant observation, could yield more in-depth data on knowledge being transferred. Moreover, group interviews with those involved in knowledge transfer could shed more light not only on the content of the knowledge being transferred, but also on the transfer process. The resources of this study did not allow more comprehensive data collection or analysis than conducted. Furthermore, mastering the expert knowledge

transferred in this study requires an academic education in electrical engineering which the researcher does not possess. The subject of further research could, therefore, be the analysis of the content of work-related knowledge being transferred between generations, applying, for example, (participant) observation and pair and group interviews with the individuals involved in knowledge transfer as its methods.

In this study I could not provide a structured illustration or presentation of how individuals disseminate knowledge transferred or built to other members of the organisation. The subject company had no official terms of reference or established practices about storing and disseminating knowledge, either generally or for knowledge sharing, but rather it was random or varied from one individual and situation to another. This may explain why the research data remained fragmental for the part of knowledge dissemination. Further research could consider how individuals disseminate knowledge transferred and built to other members of the organisation and, further, how they utilise the knowledge.

Based on the results of this study I could not describe or define how the external circumstances of knowledge transfer, a lack of time and the physical distance between the experienced expert and the novice, influence the transfer between those performing maintenance work. Further research could, therefore, outline these external circumstances of knowledge transfer and delineate their effects.

In this study, experienced experts did not signify knowledge transfer or knowledge being transferred in the context of their work as the novices did. My interpretation of the cause of this was that the experts already master the knowledge being transferred, its use in their work and further its transfer as part of their work. The study established that the experts do not connect knowledge transfer to their work in their verbal accounts. It, therefore, seems that the novices' conception of their own work, its knowledge needs and practices, in particular, influence the process of knowledge transfer and building between generations. Hence, further studies could examine whether experienced employees connect knowledge transfer to the context of their work, for example, in different organisations and work tasks than here.

Of the six novices in this study, three had worked with the company for several years (4–18 years) before the knowledge transfer. Therefore, they were not new employees in the company as is generally the case in knowledge transfer between generations (DeLong 2004, Rothwell & Poduch 2004). In the two expert–novice pairs that did not transfer knowledge, the

novices had been employed with the company longer than in the other pairs. Based on the results, however, I could not infer if the absence of transfer was indeed caused by a long career in the company. Further research could, therefore, examine how the novice's career in the organisation before the transfer of knowledge between generations possibly affects knowledge transfer and building.

Further research could also involve a follow-up study with the novices who participated in this study (the follow-up interviews in this study were conducted in 2007). Its focus could be the development of expertise, its possible effects on working and knowledge building, as well as interpretations of one's own work.

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RESEARCH DATA

APPENDIX 1.

1. Documents

- archives 1977–2005
 - minutes from the Board of Directors and Management Group meetings
 - media texts
- annual reports 2000–2005 (not previously published)
- human resources strategy for 2006
- terms of reference
- internal working ability assessment 1994–2005
 - annual results
- personnel bulletins 2005–2006
- customer magazines 2005–2006
- product brochures
- Intranet
- the company web site
- jubilee publication for the 50th anniversary in 2007

2. Background Interviews

- Managing Director
 - in May and June 2006
 - topics: company's business, economics, human resources and knowledge transfer between generations
 - the duration of each interview approx. 2 hours
 - both were recorded
- Personnel Manager
 - in May 2006
 - topics: human resources, production, knowledge transfer between generations
 - the duration of the interview approx. 2 hours
 - the interview was recorded

3. Observation

- the intensity of co-operation with the subject company varied in 2000–2006 before the study
 - tours of the facilities: familiarising with production, products and premises
 - in 2000 before the study
 - in 2006 having launched the study

4. Research Interviews or First Theme Interviews

- six experts soon to retire and six successors assigned to them, altogether 12 interviews
- in June–August 2006
- the duration of one interview from 1 hour to 1.5 hours
- the interviews were recorded and transcribed
- there were 303 interview pages in text format

5. Follow-up Interviews or Second Theme Interviews

- five successors assigned to experts (the same individuals interviewed also in 2006) in June–August 2007
 - the duration of one interview from 1 hour to 1.5 hours
 - the interviews were recorded and transcribed
- there were 135 interview pages in text format

6. Comment Interviews

- interviews with the Managing Director to present the preliminary results and elicit comments
 - for the first analysis in April 2007
 - for the second analysis in May 2008
 - the duration of each interview approx. 1.5 hours
 - both interviews were recorded
- the Managing Director's comments on the results of the third analysis and the entire study by e-mail in May 2010

7. Research Journal

- topics: data collection and analysis
 - implementation: problems, their possible causes and solutions
 - reflection on theories
 - reflection on comments from supervisors and others and their development
- from August 2006 until May 2008
- taking notes once every two months on average

E-MAIL TO THE INTERVIEWEES

APPENDIX 2.

Dear Recipients,

Below is a short description of a research project by Maarit Virta in which Y [the company's name] has agreed to participate as a case company. We are not participating in the study purely out of sympathy, but rather I believe that the transfer of experiential knowledge improves our competitiveness and future opportunities. In this challenge we are now receiving remarkable expert assistance.

As Maarit states below, confidentiality is guaranteed. The individuals assigned have been chosen in particular for this research and not all cases involve working partners in the narrow sense of the word. Open discussion yields Maarit and Y the best result. Thank you for your time.

Yours sincerely, X [the managing director's first name]

Study on succession

The transfer of knowledge and skills related to succession is a topical problem in many Finnish companies. Y [the company's name] has for some years endeavoured to support and increase this transfer of know-how from one generation to the next. This pioneer spirit shown by Y captured my imagination because I am a researcher at Lappeenranta University of Technology preparing my doctoral dissertation on knowledge transfer related to generation change.

I need interview material for my research in which individuals participating in this kind of knowledge transfer share their experiences and views on the subject. The research focuses on one company, so my aim is to only use interviewees at Y. I have discussed with X [the managing director's name] and Z [the personnel manager's name], and they have helped to compile a list of the individuals I would like to interview: [the interviewees' names].

Participation is obviously voluntary. It is important for the research that I can interview both members in each work pair, however, each individual is interviewed separately. The interviews will be conducted at Y's premises and each session will take two hours at the most. All the interviews will be recorded to ensure their accuracy. All the research material, including the recordings, will be treated with complete confidentiality. The accounts of any individual interviewee will not be made available at Y or in the dissertation.

The session will be more of a conversation than an interview because the purpose is that the participants tell me in their own words about their work at Y, their knowledge and its transfer to others/learning new knowledge from others. I will, therefore, ask questions that have a right or wrong answer. The goal of the study is by no means to evaluate the interviewees and their work methods but to describe and understand how knowledge transfer between generations takes place from the perspective of those engaged in it.

I hope that as many as possible will take part in the study. I shall call each of you in the next couple of weeks, or after your vacation, and set an interview date. At that point you may express your unwillingness to participate if that is the case.

Feel free to contact me if you have any questions.

Have a pleasant summer!

Yours sincerely,
Maarit Virta, MSc, Doctoral Student
Lappeenranta University of Technology
School of Business, Knowledge Management
[contact information]

THEMATIC OUTLINES FOR INTERVIEWS

APPENDIX 3.

Interview Themes 2006/Seniors

Background information

Education, age

How long employed with the company, work history

Possible retirement plans

Duty and what it includes

The meaning of one's own work for the company's business

What opportunities to influence one's work

Standard practice/degree of freedom to make independent changes

What opportunities to influence

Is the interviewee happy with them

Past and present opportunities to influence

Has the interviewee developed his work over the years

What opportunities to develop one's professional skills and knowledge

Are they sufficient

In the past/present

How does the interviewee see his work

Is he happy in his job

Knowledge Transfer

What work-related things does he know/manage/master that need to be transferred to the junior

Why are these important

Is he transferring/has he transferred these

If not, why not

Some concrete knowledge/skill etc. that he has taught the junior

In what situation, how has he learnt it

How is he currently using it

How has he adopted this issue learnt years ago

Has he learnt something from the junior, if so what

Knowledge Transfer Situation

Who defines the knowledge to be transferred

In what situations is knowledge transferred

What happens

Is knowledge transfer always/generally successful

In what situations does it succeed, and is it rewarding

What factors influence the transfer

Why has knowledge transfer not always succeeded (if this has been the case)

What would he have done if he could have

Does he influence the knowledge transfer

Where: Schedule, who present etc.
If he does not influence it, why not
How does he see the knowledge transfer to the junior

About the Company

How available is knowledge related to issues about work and the company

Where and from whom is knowledge available, and what kind
Is there sufficient knowledge, and is it easy to obtain
What would the interviewee like to know more about and why
How does he see the company as an employer/workplace
In the past and present
What does he think about the company's vision and values (vision: one of the three major
forces in the chosen client segments; values: client, owner and personnel satisfaction,
openness, fairness) Do they guide their own work, how or why not
Would they require making changes, what and why
Where has he learnt them

Interview Themes 2006/Juniors

Background Information

Education, age, how long employed with the company
Duty and what it includes
The meaning of one's own work for the company's business
What opportunities to influence one's work
Standard practice/degree of freedom to make independent changes
What opportunities to influence
Is the interviewee happy with them
What opportunities to develop one's professional skills and knowledge
Are they sufficient
How does the interviewee see his work
Is he happy in his job

Knowledge Transfer

What knowledge is he receiving/has received from the senior
What kind of knowledge, skills; what do they pertain to etc.
Is the knowledge/skill sufficient, are they what he needs
Where does he use this knowledge
Has he made changes to the knowledge, how and why
Some concrete knowledge/skill etc. that he has learnt from the senior (*requires prompting
the interviewee to elicit the same response as from the senior*)
Where and how did he learn it
Did something remain vague
What questions did it prompt
What means did he use to elicit answers, who did he ask etc.

Did it become clear in the end
How did he find the learning
Feelings, easy/difficult, personal chemistry
How, where does he use what he has learnt
How has he adopted what he has learnt
Why
Has he shared what he has learnt with others in the company
Why, with whom

Knowledge Transfer Situation

Who defines the knowledge to be transferred
In what situations is knowledge transferred
What happens
Is knowledge transfer always/generally successful
In what situations does it succeed, and is it rewarding
What factors influence the transfer
Why has knowledge transfer not always succeeded (if this has been the case)
What would he have done if he could have
Does he influence the knowledge transfer
Where: Schedule, who present etc.
If he does not have influence on it, why not
How does he see the supply of knowledge from a "seasoned expert"

About the Company

How available is knowledge related to issues about work and the company
Where and from whom can knowledge be received, and what kind
Is knowledge supply sufficient, easy
What would the interviewee like to know more about and why
How does he see the company as an employer/workplace
Pros and cons
What does he think about the company's vision and values (vision: one of the three major forces in the chosen client segments; values: client, owner and personnel satisfaction, openness, fairness) Do they guide their own work, how or why not
Would they require making changes, what and why
Where has he learnt them

Interview Themes 2007/Follow-up Interviews with Juniors

Changes in duties after last summer or the previous interview
Effect on knowledge transfer (building) (dissemination)
Effect on the lack of time or busy schedules
Effect on happiness at work
What knowledge is now being transferred (built) (disseminated) between the senior and the junior
A concrete example

General characterisation
What hampers knowledge transfer (building) (dissemination)

What knowledge does he now need
(Same knowledge as above?)
How and where has he received it from his senior
Has he received tacit knowledge from his senior
 What kind of knowledge does this pertain to

 How does he know that he has received tacit knowledge
 Does he think that the senior knows that he has (also) transferred
 tacit knowledge
How much of the knowledge is...
 ...documented knowledge/undocumented knowledge
 ...the kind that only the senior knows in the company
 ...general knowledge about the company's business or pertaining
 to the job
How has he transformed the knowledge received
How has he spread the knowledge he has received and/or transformed to
others
Sources of knowledge other than his own senior

"Cutting corners" in knowledge transfer (building)
Is this possible, for example, in some practical situation: leaving theoretical
analyses and talk aside, because the issue becomes clear "just like that"
 An example in practice
 How clear is the issue having gained an insight: does it require
 "post-honing"
 How does it happen
 How is the issue/knowledge shared with others
Vice versa: is it possible to understand or learn something perfectly or well
enough for it to work without practical experience or based on mere theory
 How does it happen, an example

When has the knowledge transfer succeeded
 Has he succeeded or is he about to succeed with his senior, why

Is he ready to take the wheel when the senior retires
 When does this happen
 Why he is or is not

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