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# KNOWLEDGE SHARING

## Challenges in Inter-Project Cooperation

# ABSTRACT

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Knowledge Sharing: Challenges in Inter-Project Cooperation / Hanna Rajala
Jyväskylä, Finland: University of Jyväskylä, 2000.
116 pages.
Master's Thesis

In the current, ever-intensifying competition of the information society, organizations are forced to manage their knowledge to be able to gain favorable competitive status. The success — or failure — is often dependent on how efficiently an organization utilizes its knowledge. This thesis discusses the concept that every business manager faces these days, knowledge management. Moreover, the research discusses the challenges of knowledge sharing between contemporary information systems (IS) projects. The research focuses on different technological solutions and organizational means that assist knowledge sharing and aims at finding efficient ways of utilizing them.

The research was conducted in two parts supporting each other; first, there was a literature study focusing on the theories of knowledge management and especially knowledge sharing, and then, there was a case study that focused on discovering possible problems in knowledge sharing in an actual organization. The case study was completed with interviews and observations to ensure a reliable result. To support the case study and the analysis of the results in whole, a knowledge sharing framework was introduced. This framework combines two viewpoints: it confronts the problems by dividing the solutions into organizational means and technological tools and by dividing the concept of knowledge sharing into overlapping parts of communication, collaboration and coordination.

The study proved that organizations do not yet know how to manage their knowledge. The study also showed that they should put effort also in developing intra-organizational communication culture; it should be more open and supportive and encourage knowledge sharing. Technological solutions are an important part of knowledge management and knowledge sharing but their role is merely supportive; technological tools alone cannot make knowledge sharing more efficient if the organizational factors are not considered and put in order to support it.


Key words:    knowledge management, knowledge sharing, communication,
              collaboration, coordination, information systems development,
              project work

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# 1 INTRODUCTION

All companies today, regardless of size or business area, are using information and knowledge in their business. When organizations interact with their environments, they absorb information, modify it to suit their purposes and use it in combination with their experiences, values and internal rules. As Davenport and Prusak (1998b) suggest, it would be impossible for any organization to maintain itself as a functioning enterprise without knowledge. Information, knowledge and their utilization have become critical success factors for all industries and organizations.

In addition, today's companies are not only valued by the actual value of products or services they provide but also by their intangible assets like intellectual capital and growth possibilities. As growth possibilities are dependent on the amount and quality of intellectual capital, most of the company's value walks out of the company doors in the evening and hopefully comes back next morning. Therefore the challenge in today's business is – in addition to acquiring the needed knowledge – to keep the employees motivated and committed to the company and in that way to keep the knowledge within the company. As early as in February 1994, Nonaka (1994, 14) suggested that while individuals develop new knowledge, organizations have a critical role in articulating and amplifying it. This means, that to be able to utilize the knowledge the employees have, organizations have to know what kind of knowledge they have and then try to modify it to better suit organizations' needs. In this work, recognition of organizations' missions and visions is crucial.

To support organizations' in their challenging task of competing in the information society there are several theories and techniques. One of the most used concepts today is knowledge management. This concept has been used in many different contexts and divergent meanings but basically, as Davenport and Prusak (1998b) suggest, the concept includes finding and acquiring the needed knowledge, modifying, storing and sharing it.

This research focuses on knowledge sharing in expert organizations. The objective is to find technological and organizational means that assist knowledge sharing between information systems (IS) development projects. The research questions are:

*(1) By which technological and organizational means can knowledge sharing between contemporary information systems development projects be assisted?*

*(2) How can these means effectively put into operation?*

The thesis is divided in two main sections: literature research and case study. The literature research focuses on knowledge management and knowledge sharing theories as well as shortly on expert organizations and theories concerning information systems development. The case study was carried out to be able to test the theories of the literature research in practice. The study as well as the results of it are presented and analyzed in the latter part of the thesis.

Chapter 2 describes the basic concepts of knowledge management, introduces key sources for information and knowledge, and brings up both benefits and challenges concerning knowledge management. The purpose of the chapter is to introduce the concept of knowledge management as seen in this thesis. Chapter 3 begins with definitions of the basic concepts of knowledge sharing. After that, the special features of expert organizations and their management are presented as well as characteristics of information systems development projects described. Furthermore, the chapter presents means for knowledge sharing and introduces a knowledge sharing framework. Both chapters 2 and 3 are based on theories and other literature on the subject area found in books and academic articles.

The empirical research, presented in chapter 4, was carried out as a case study that focused on a large Finnish company working in the rapidly changing field of telecommunications. The empirical research method was chosen to allow the theories, presented in the earlier chapters, to be tested in practice. First, the chapter legitimizes the case research, describes the case company and presents the research methods. Then,

the actual case study results are presented and analyzed, and the results aligned in the knowledge sharing framework that was presented in the end of chapter 3.

Chapter 5 draws conclusions from the whole research. First, the chapter answers the research questions and compares the study to earlier research that has been done in the field of knowledge management and especially those done of knowledge sharing. Then, the reliability of the results of this study is analyzed. The possible ways of utilizing the research results are also considered in this chapter before suggesting further research areas.

Chapter 6 summarizes the entire study by presenting the central perceptions of the research.

# 2 KNOWLEDGE MANAGEMENT

In recent years organizations have applied various means to increase their efficiency and profitability (Belanger & Webb Collins 1998, 137). Knowledge management is the current buzzword to all business managers around the world trying to stay on or to reach the top of the ever-intensifying competition. Changes in organizations' environments force the organizations to seek new ways to act and think to be able to cope with the new challenges. Knowledge has become a critical resource for all business activities (Bohn 1997, 77; Chait 1999, 23; Lotus Development 1995, 5; Malhotra 1998; Nonaka & Takeuchi 1995; Raivola & Vuorensyrjä 1998, 3). Almost all organizations realize that they have to manage their knowledge at some level but the actual content of knowledge management has, until now, been unclear. (Davenport, De Long & Beers 1998, 43—44; Eisenberg 1998, 78; Greco 1999, 20; Radding 1998, 7—8; Ståhle & Grönroos 1999, 18)

This chapter clarifies the basic concepts of knowledge management, presents sources for information and knowledge, and discusses the benefits of and challenges in knowledge management.

## 2.1 Basic Concepts

Knowledge management is still quite a new concept for many business managers. Yet they should all have heard of document management, electronic communication, computer-supported cooperative work (also known as CSCW) and groupware, which all are connected to knowledge management in one way or another.

The terms that form the basis for knowledge management – *knowledge, information, data* – are often confused in everyday conversations. People do not realize or are unaware of the distinction between these concepts; however, there are no straightforward definitions for them. This causes a need for the concepts to be defined

according to the particular context in which they are used to ensure that the receivers get the message that the sender implies. In this study the researcher has consciously limited the literature study to rather recent materials written by authors of the time of knowledge management. The reason for this limitation is that the amount of definitions available is so vast that it would be impossible to include all the significant authors through time defining the concept information or knowledge in one study or the whole study should have been devoted for that purpose.

### 2.1.1 Data, Information and Knowledge

According to *The Finnish Dictionary of International Words* data means information and material, especially in automatic data processing. They do not define the concept information. (Nurmi, Rekiaro & Rekiaro 1996, 54) *The Finnish Dictionary of Information Technology* defines data as information that can be read, communicated or modified. Information is defined as a personal idea or understanding of the meaning of data (Tietotekniikan liitto 1997, 23&46). *The Great Dictionary of Computer Technology* (Jaakonhuhta 1996, 147) defines data as information used and modified by computer. It has not got any separate definition for information. [1]

As these concepts, together with knowledge, have to be compared in this study, the definitions offered by different dictionaries cannot be accepted as they are. The concepts have to be defined in a way that there will be no misconception of what they mean. That is why different authors' opinions of the concepts data, information and knowledge as well as the relationships between them are presented here.

Bohn (1997, 77) offers a definition that includes all of these three concepts. He defines data as something that is obtained directly from sensors reporting on the measured level of some variable. Information is data that has been placed in context and thus enriched with meaning whereas knowledge enables making of predictions, causal associations and decisions. Bohn views these concepts from a production processes viewpoint. The

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[1] The definitions used here were all written in Finnish; they are not translated word-for-word but in such a way that the basic idea of the original definitions would be transmitted as precisely as possible.

definitions are at some extent similar to other authors' definitions of information and knowledge but quite narrow and lightly justified.

One of the most quoted authors of knowledge management and the first ones to introduce the term 'knowledge management', Ikujiro Nonaka, defines information as a flow of messages or meanings that might add to, restructure or change knowledge. Knowledge is created and organized by the information flow and anchored on the commitment and beliefs of its holder. (Nonaka 1994, 15) Another commonly accepted author, Davenport, and his associates De Long and Beers (1998, 43) as well as Radding (1998, 15), define knowledge as information that is combined with experience, context, interpretation and reflection. Malhotra (1998) emphasizes that knowledge is embedded in people, and knowledge creation occurs in the process of social interaction; in his opinion only human beings can take the central role in knowledge creation while computers are merely tools. Davenport and Prusak (1997, 8—10) propose the same; in addition they suggest that data is easily structured and transferred. Information, on the other hand, requires human mediation whereas knowledge is hard to structure and to transfer.

Hendriks and Vriens (1999, 114) as well as Davenport and Prusak (1998b) emphasize that without knowledge organizations will not survive: knowledge is needed in everyday routines, for reflecting them and changing them. The relevance of knowledge differs between organizations and changes over time.

In this study *data* is regarded as a basic unit of information. Data can be acquired from different sensors and indicators and it typically shows the values of objects. As such, data does not have a value to a person but when it is put into proper context, it becomes *information* that can be used and in that sense, it has a value. *Knowledge* is considered as applied information, which in practice means that information is combined with individual interpretation and reflection based on personal experiences. This easily leads to a notion that knowledge is personal; each individual has one's own knowledge, which is located in a person's mind. Yet, there is knowledge that can be transmitted among individuals. Nonaka (1994) was the first one to define two types of knowledge: tacit and explicit. *Explicit* (or formal) *knowledge* refers to knowledge that can be articulated in formal, systematic language and transmitted among individuals. Explicit knowledge is

discrete or digital and stored in places, such as libraries, archives and databases. *Tacit* (or informal) *knowledge* has a personal quality, which makes it hard to formalize and communicate; it is a continuous activity of knowing. Tacit knowledge includes personal beliefs, perspectives and values, and it is embedded in individual experience; it is often viewed as the real key to getting things done and creating new value. In addition, it is often recognized that explicit knowledge is only a drop in the sea as most of all knowledge is tacit; this fact emphasizes the importance of employees and their personal, tacit knowledge for all organizations as the most valuable assets of the organizations are embedded in people. (Nonaka 1994, 16—17; Hendriks & Vriens 1999, 114; Barclay & Murray, 1997). This is why organizations are – or at least should be – interested in capturing at least a part of the tacit knowledge their employees have into the organization. The processes of transforming tacit knowledge into explicit and explicit knowledge into tacit are discussed later in chapter 3.4.

Data, information and knowledge differ from one another significantly. The most important attributes of these concepts, originally introduced by Radding (1998, 32), are presented in Table 1.

**Table 1.** Attributes of Data, Information and Knowledge. (Radding 1998, 32)

| Attribute | Data | Information | Knowledge |
|---|---|---|---|
| Context | no context | full context | extended context |
| Level of Detail | low level of detail, atomic detail | integrated, aggregated detail | highly abstracted, detail removed |
| Scope | very narrow scope | scope limited to the particular context | extends beyond the scope of information |

The table shows the basic differences between the concepts data, information and knowledge. A very simple example could be used here: *-29* is data that has no context. If that data was placed in context of Celsius-scale we could easily tell that now we have information of temperature. But if we do not know how to apply that information – what kind of weather it actually is, how to dress ourselves etc. – we do not have knowledge

about it. If we are able to combine earlier knowledge (information, earlier experiences, beliefs, etc.) we have about temperatures we know that it is freezing cold when the temperature is -29°C and it is probably not wise to go jogging outdoors.

## 2.1.2 Organizations' Capitals

A commonly used term, quite often discussed at the same time as knowledge management, is *intellectual capital (IC)*. According to the Intellectual Capital Management (ICM) Group (1998a; 1998b), this is knowledge that can be converted into profit. They suggest that intellectual capital include inventions, technologies, ideas, computer programs, designs, data, skills, processes, creativity, publications and general knowledge.

When this definition is observed at a higher level of abstraction and merged with Ståhle's and Grönroos's descriptions of organizational capitals (Ståhle & Grönroos 1999, 40—41), the result can be drawn as in Figure 1. Also Raivola and Vuorensyrjä (1998, 70) use same kind of figure to define intellectual capitals.
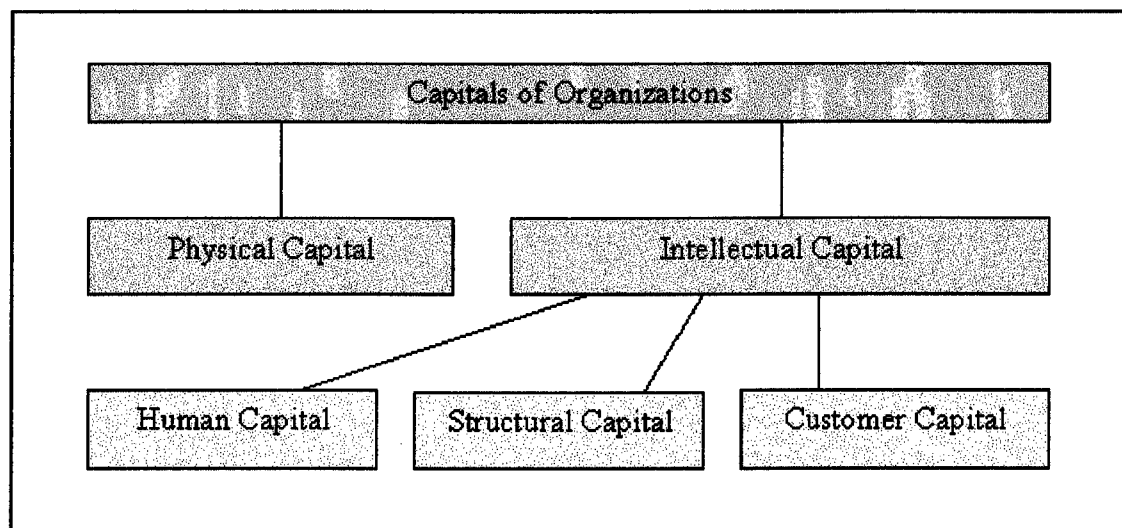


**Figure 1.** Organizations' Capitals. (Combined: Ståhle & Grönroos 1999, 40-41; ICM Group 1998a; ICM Group 1998b; Raivola & Vuorensyrjä 1998, 70)

Organizational capitals can be divided into two parts: physical and immaterial. *Physical* (or material) *capital* is money and other capital that can be seen or otherwise detected and liquidated. *Immaterial capital* is organizational knowledge that can be converted into profit; in other words, it is organization's intellectual capital. Intellectual capital can be separated into three sections: (1) *human capital* that is skills, know-how and individual abilities, (2) *structural capital*, which includes organizational structure and the image of the organization and (3) *customer capital*, which includes for instance customer relationships and an organization's customer structures. (Ståhle & Grönroos 1999, 40—41; ICM Group 1998a; ICM Group 1998b; Raivola & Vuorensyrjä 1998, 70)

### 2.1.3 Knowledge Management

Probably the greatest problem in defining knowledge management is that the concept *knowledge* is so broad and its meaning and use have not yet stabilized (Radding 1998, 25). *Knowledge management* can be viewed as a business discipline or practice; it is an organization's way of trying to utilize its employees' individual knowledge as efficiently for the organization as possible. In other words, it is a matter of managing organizations' immaterial capitals. Basically, it includes managing the processes of gathering, organizing, refining and disseminating knowledge. (Newman 1996a; Barclay & Murray 1997; Radding 1998, 26) This study focuses mostly in disseminating organizational knowledge or knowledge sharing.

As a term, knowledge management may be new but as a concept it is actually quite old (Hansen, Nohria & Tierney 1999, 106). Knowledge management is based on many divergent disciplines and technologies, such as:

- document management
- computer-supported collaborative work and group work
- cognitive science describing how we learn and know
- decision support systems unburdening managers' workload in supporting qualitative analysis
- organizational science
- relational and object databases to representing and managing knowledge resources
- and many others.

This list is not complete but it gives an idea of how broad concept knowledge management is. (Barclay & Murray 1997; Radding 1998, 47) Knowledge management may, depending on the realized strategies, include some or all of the mentioned functions. Knowledge management strategies are discussed more closely in chapter *2.3 Implementing Knowledge Management.*

One thing that has to be remembered while discussing knowledge management is that especially tacit knowledge is bounded to individuals and it cannot actually be owned by the organizations (compared to machines, for example). The knowledge – that is embedded in people – can be utilized for a limited period of time but it cannot be bought in a way that its owner would actually change. (Raivola & Vuorensyrjä 1998, 73) Organizations should focus in getting also the tacit knowledge shared inside them to be able to keep at least some of it benefiting the organization even though the employees inevitably leave the organization at some point and take their personal, tacit knowledge with them. Process of transforming tacit knowledge into explicit is described shortly in chapter 3.4. In addition, knowledge management should be considered as a continuous process, not a one-time project (Chait 1999, 26). Technologies evolve and organizations' environments change; also knowledge management has to respond to these changes.

It should also be noted that the traditional management and its importance have not diminished although knowledge's importance as organizations' critical success factor has been noted; effective knowledge management is only one of many components of good management. The importance of organizational knowledge increases significantly in situations where there are several competitors performing well in traditional fields of business management; the difference between success and failure may then depend on how effectively an organization manages its explicit but especially tacit knowledge. (Davenport et al. 1998, 56)

### 2.1.4 Knowledge Companies and Knowledge Workers

As productive work today is increasingly interacting with information and creating new information rather than something accomplished by physical or mechanical strength (Ståhle & Grönroos 1998, 30), the society is changing to become more and more

dependent on information, methods of working change simultaneously. This fact forces the organizations to manage their immaterial capitals and makes the business managers to wonder how to best utilize the tacit knowledge that is rooted in the minds of their employees. Companies that use knowledge as the main source for competitive advantage can be called knowledge-based or *knowledge companies* (ICM Group 1998c).

*Chief Knowledge Officer* (CKO) is a new employee in an organization where knowledge management has been taken seriously. Unfortunately for the CKOs, there are not any clear job descriptions for them but they have to discover and develop the company managers' implicit visions of knowledge management. Yet there are two main competencies that a Chief Knowledge Officer should have: they should be both technologists and environmentalists. The technologist would be able to understand which technologies can be applied and the environmentalist would know how to create social environments that stimulate and facilitate conversations. The environmentalist would also be able to develop events and processes to encourage deliberate knowledge creation and exchange. (Earl & Scott 1999, 31—33; Greco 1999, 20)

Newman (1996b) uses the concepts knowledge manager and knowledge engineer. He refers to knowledge manager while he discusses person who establishes the direction the knowledge management process should take, and to knowledge engineer while he discusses person who develops the means to accomplish the desired direction. The difference is that Earl and Scott (1991) suggest that both of these competencies should be there in one person, the Chief Knowledge Officer, as Newman (1996b) suggests that two different persons should take care of these divergent functions. As in modern countries it is possible to take varied, many-sided examinations and thus educate oneself to think more freely and as it is an enormous challenge – possibly even a risk – to split a task that has not been clearly defined, it would possibly be best for the organizations if they had one person responsible for managing knowledge; more people are of course needed for creating new ideas and then implementing them.

*Experts*, as they are seen today, are a result of the information society and their role is emphasized in the ever-evolving business area of information technology. Today, there are innumerable points to be considered and understood in order for somebody to

handle the whole area of information technology or even a fraction of it, like computer systems development. This fact forces people to specialize in a specific segment of a business area or organization's function and to become an expert in that segment. Experts and expert organizations are more precisely described in chapter *3.2 Expert Organizations*.

## 2.2 Sources for Information and Knowledge

Today, there is more information available than ever. It is impossible for any person to receive or even to be aware of it all – one is forced to select which information to accept and which to reject. In addition to the fact that humans have limited cognitive space for processing information (Kreps 1990, 30), more information does not guarantee more knowledge (Radding 1998, 7). To be able to make the best selections for an organization, one has to be aware of all the possible sources of information and knowledge.

### 2.2.1 Ways to Acquire Information

One of the biggest problems today is how to find the right information. In the *information age*, as it is called, the amount of information is so vast that it is impossible for individuals and even organizations to absorb all the information and knowledge available; the process has to be consciously selective and well thought-out. (Andrews & Herschel 1996, 2; Kreps 1990, 30)

Uusitalo (1995, 10—13) presents four long-established ways of acquiring information: tradition, authority, personal observations and experiences, and research. He points out that most important factor in becoming an adult in society is learning to accept what is commonly known and accepted. The power of tradition as a source of information is enormous, as it is not possible to personally test or assume false all the information humans have. Still, many inventions originate at the moment when questions, which tradition has ignored, are stated. (Uusitalo 1995, 10—11)

A lot of the information people have is based on authority: a person or an institution whose word people are used to taking seriously. Authorities are believed to have based their information on scientific facts and to have given a truthful picture of it. As well as tradition, authority can also be a burden if the information is accepted without any critique. It is easy to defer to authority and withdraw from the responsibility of opinions, although many new ideas have been formulated when the information provided by authorities has been questioned. (Uusitalo 1995, 11—12)

A great deal of what humans know is based on tradition and authority and only a fraction on personal experiences and discoveries (Uusitalo 1995, 12). Still, humans tend to trust their own observations and experiences more than they trust authorities and traditions, as personal experiences and observations seem more reliable being more concrete than all the wisdom written in books. Yet, humans tend to make false observations, interpretations and conclusions (Kreps 1990, 30). Humans have a disposition to selecting information on personal beliefs and then rank the selected information to be able to give more cognitive space for the information human considers more important. As humans tend to create own criteria for perceiving information, it is likely that different people select different messages on which to focus. (Kreps 1990, 31) Personal discoveries and experiences are an important but narrow, limited and inadequate source of information (Uusitalo 1995, 12).

Science provides a more reliable way of acquiring information as it consciously tries to avoid the weaknesses that personal observations have. Science counters unreliable, selective observations with systematic, repeatable ways of making them and with critical, open discussions about the reliability of the research. Generalizing is done in a certain, given way, and scientific research is always based on or compared to earlier research. (Uusitalo 1995, 12—18)

## 2.2.2 The Information Product

Wang, Lee, Pipino and Strong (1998) suggest that information should be managed as a product. They allude to the costs of decisions based on defective information, which easily lead many business managers to claim for information of good quality. Still,

organizations often treat information as by-product instead of focusing on the information content. (Wang et al. 1999, 95)

Wang et al. (1999, 95—98) present four principles that the organizations should follow to be able to manage information as a product. First of all, organizations should understand their customers' needs for information. It should also be noted that there would probably be both external and internal customers whose needs have to be determined. Second, organizations should manage information as a result of a well-defined production process. All the information in an organization should go through an internal development process where the information is being analyzed and modified to better suit the needs of the organization. Third, organizations should recognize information's life cycle, which can be divided into four stages: introduction (or creation), growth, maturity and decline (Wang et al. 1999, 97). This principle encourages organizations to maintain the quality of information over time. The last principle suggests organizations to appoint an information product manager whose responsibility would be managing the information processes and the resulting product, the information. This way, organizations' would have somebody whose responsibility is to make sure that information is used in the most useful and profitable way. (Wang et al. 1999, 95—98)

Managing information as a product is, according to Wang et al. (1999, 104), the only way to remain competitive in the information technology business. To be able to deliver high-quality information to customers consistently and reliably, the information needs to be managed like any other product in the organization. Otherwise, organization will in the twenty-first century meet lower margin, missed opportunities and tarnished images. (Wang et al. 1999, 104)

### 2.2.3 From Information to Knowledge

As defined in the beginning of this chapter (pages 4—6), knowledge is information combined with individual interpretation and reflection based on personal experiences. As organizations need knowledge that can be converted into profit (ICM Group 1998c), the challenge is to transform the information into personal knowledge and the personal knowledge into organizational knowledge.

Figure 2 presents a knowledge creating process that is an expanded version of how Radding (1998) presented it in two separate figures (Radding 1998, 16&24). First, organizations need to capture and store data, which becomes information after processing, filtering and organizing it. As the information is transformed, abstracted and extended, it becomes individual knowledge. Kreps (1990, 29) refers to human *perception* as a process by which people can become aware of information and then interpret it into meanings and knowledge. Individual knowledge can be transformed to organizational, profitable knowledge only by communicating and sharing it (Radding 1998).

The amount of knowledge and its value for organizations increases considerably, as the knowledge is being shared (Ståhle & Grönroos 1999, 75). The fact is that two or more people can together create new knowledge such as they would not be able to create separately. Knowledge sharing is more specifically discussed in chapter *3 Knowledge Sharing in Expert Organizations.*
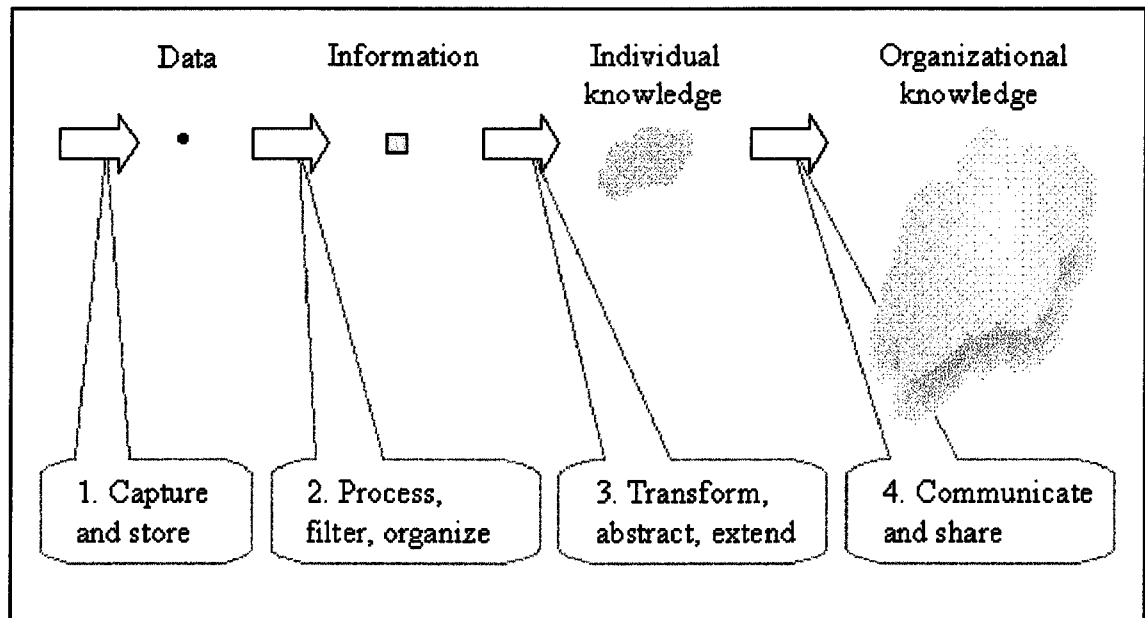


**Figure 2.** The Knowledge Process. (Expanded: Radding 1998, 16&24)

Davenport and Prusak (1998a, 52—67) suggest five different modes of generating knowledge for organizations: acquisition, dedicated resources, fusion, adaptation and knowledge networking.

When an organization *acquires knowledge*, it either buys, leases or rents it. The knowledge does not have to be newly created, only be new to the organization. Buying knowledge means buying organizations or hiring individuals who have the knowledge the organization requires. (Davenport & Prusak 1998a, 53—58) When buying organizations – or hiring individuals – the key to success is, ultimately, knowing the maximum price you can pay and having the discipline to stick with it (Eccles et al. 1999, 139—141).

When leasing knowledge, organizations give financial support to a university or another research institute for the right to be the first one to use possibly promising results commercially. The problem in leasing knowledge is that it is not easy to predict if the research supported will actually pay off – and if it does, when. Renting knowledge refers to hiring a consultant for a project or another specific task. In these kinds of rentals, some knowledge is likely to stay within the organization even when the source of the knowledge (the consultant) leaves the organization. (Davenport & Prusak 1998a, 56—58)

An organization can also *dedicate resources* for generating knowledge by establishing units or groups for that purpose (for example department of R&D). Separating these groups from other parts of the organization gives the group members freedom to generate and explore ideas without any additional restrictions. This distance may, however, be difficult to bridge when the results should be transferred to the wide organization. (Davenport & Prusak 1998a, 58—59)

*Fusion*, as a way of acquiring knowledge, intentionally introduces complexity and conflicts to generate new synergy. The idea of fusion, in this case, is to bring together people with different perspectives and divergent values to work on a common project or a problem, forcing them to come up with a joint answer. This method is many times referred also as creating chaos that facilitates innovating (Ståhle & Grönroos 1999, 69). This way of generating knowledge, even though it can be powerful, takes a lot of time and effort before the people in the group have a common language they can work with, and before they are able to achieve a positive level of collaboration and not be merely confrontational. (Davenport & Prusak 1998a, 59—62)

Organizations can also *adapt* knowledge as competitors as well as social and economic changes drive knowledge creation; organizations that do not respond to shifting conditions will fail (Davenport & Prusak 1998a, 63). Organizations have to be open to change and have resources for it. Davenport and Prusak (1998a) suggest that the most adaptive resources are those employees who can acquire new knowledge and skills easily.

Another context where the term adaptation is mentioned quite often in the literature of knowledge management is for describing the process of what happens to the information after it has been acquired by an organization. Adaptation in that sense refers to making the information suit organizations' needs better.

*Knowledge networks* within and between organizations can also create knowledge. These informal communities are usually brought together by a will to share thoughts on a common interest. When these groups of knowers share their ideas and knowledge with each other, they at the same create new knowledge. Many times the new knowledge is tacit and thus hard to structure or codify but it is still possible to utilize that knowledge for the benefit of the organization these individuals work for. (Davenport & Prusak 1998a, 65—67)

The main problem in knowledge acquisition is that more information does not necessarily translate into more knowledge. On the contrary, it has become rather obvious that extra knowledge may obscure the reality and make it harder to value which knowledge is really useful or even valid (Davenport & Prusak 1998a, 7). To be able to translate information into knowledge, mechanisms are needed to interpret the information and to put it into a proper context. (Radding 1998, 7—8)

The concept of *learning organization* or *organizational learning* is frequently attached to conversations about knowledge as a competitive advantage. Learning is a process of acquiring and applying new information and skills (Radding 1998, 16) and there lies an opportunity for organizations to achieve competitive advantage if they can acquire and apply new knowledge before the competitors do. This concept is closely related to

experts and expert organizations and is therefore discussed more in chapter *3.2 Expert Organizations.*

## 2.3 Implementing Knowledge Management

There are several reasons to manage organizational knowledge. One of the most obvious ones is the fact that markets are increasingly competitive and the products and services are ever more complex (Barclay & Murray 1997). This causes a continuous rise in the needed rate of innovation; most of the work done today is information-based and organizations compete on the basis of their knowledge. Managing knowledge seems to be the only way to stay at the top in business – or reach it (Barclay & Murray 1997; Davenport & Prusak 1998b; Ståhle & Grönroos 1999, 18)

### 2.3.1 Managing Knowledge

According to Barclay and Murray (1997), knowledge management in practice encompasses five tasks:

- identifying and mapping organization's intellectual assets
- generating new knowledge within the organization
- making corporate information accessible
- sharing knowledge and
- establishing technology that enables this all.

These tasks are quite easy to identify but implementing them in practice is much more complex. First an organization should analyze what kind of knowledge it needs to successfully run its business and reach its goals. Identifying organization's intellectual assets and trying to map where the assets are located can be extremely complicated, as the intellectual assets are immaterial and hard to evaluate. On the other hand, being innovative and creating new knowledge that is useful and valuable for the organization is not easy either. Innovations need to be formed inside the organization to achieve competitive advantage with them – otherwise they are public property and available to

the competitors as well (Ståhle & Grönroos 1999, 45). One would imagine knowledge sharing was easy to achieve but instead, it requires a positive, supportive and open organizational culture where people are eager to share their expertise and commitment to the knowledge sharing culture at all levels of the organization. Individuals should be made to understand that by sharing knowledge they actually get more than by holding back their knowledge thinking that knowledge is power. Technology that supports knowledge management is probably the easiest part to accomplish once the other aspects have been set up. Information and communication technologies are essential parts of knowledge management but they have merely a supportive role in it. (Davenport et al. 1998, 52)

Davenport, De Long and Beers studied several knowledge management projects in 1998 and suggested four indicators that together are some kind of proof of success in establishing knowledge management in an organization (Davenport et al. 1998, 49). These indicators were:

- growth in resources attached to knowledge management, such as money and people
- growth in volume of knowledge content and usage, for example number of documents, accesses for repositories and participation in on-line discussion
- the likelihood that the project would survive without support from an individual, that is, the project is an organizational initiative, not an individual project
- some evidence of financial return, either direct or indirect, for the whole organization or for the knowledge management function.

The success in managing knowledge requires, according to Davenport et al. (1998, 50), for example senior management support, multiple channels for knowledge sharing and transfer, standard but still flexible knowledge structures, knowledge-friendly culture, clear purpose and language as well as both technological and organizational infrastructures that support the knowledge management function.

## 2.3.2 Knowledge Management Strategy

As knowledge management as a conscious practice is a new thing, there are no formal knowledge management activities or models business managers could use in their businesses (Barclay & Murray 1997; Hansen et al. 1999, 106). On the other hand,

knowledge management should be designed individually for each organization considering the area of business, organization's vision, mission, goals and values. In that sense no book can give straight answers what should a knowledge management strategy be. However, as there are some organizations that have started to manage their knowledge, there have been done a few studies of successful knowledge management implementations and strategies (e.g. Davenport et al. 1998; Hansen et al. 1999).

Davenport, De Long and Beers studied twenty-four companies in 1998 to achieve a better understanding of how companies manage their knowledge. They identified four types of objectives these organizations had for their knowledge management: they aimed at creating knowledge repositories, at improving knowledge access, at enhancing their knowledge environment, and at managing their knowledge as an asset. While there were a few organizations that tried to achieve them all at once, most of them had primarily one objective. All the companies studied had an individual responsible for knowledge management and all the organizations showed some commitment to their intellectual capitals. The investments on knowledge management ranged from no formal budget to an annual budget of 10 million US dollars. (Davenport et al. 1998, 44—45) The researchers suggested that it would be more profitable to aim at some or preferably all of the mentioned four knowledge management objectives. (Davenport et al. 1998, 48). The researchers do not share their thoughts on whether organizations should start striving for these objectives all at once but if an organization is only beginning to manage its knowledge, it does not seem rational to rush into various knowledge management implementations at once. The organizations should first recognize what kind of knowledge it has, what kind of knowledge is vital for its business and only then it would be reasonable to start creating strategies for knowledge management. Area of business and organization's visions and missions are extremely important in this process and knowledge management strategy should also be aligned with the organization's general business strategy.

Hansen, Nohria and Tierney (1999) introduced the idea that knowledge management strategies can be divided into two groups: codification and personalization strategies (see Table 2).

**Table 2.** Knowledge Management Strategies (Hansen et al. 1999, 109)

| | CODIFICATION | PERSONALIZATION |
|---|---|---|
| Competitive Strategy | Provide high-quality, reliable and fast information systems implementation by reusing codified knowledge. | Provide creative, analytically rigorous advice on high-level strategic problems by channeling individual expertise. |
| Economic Model | Reuse economics<br><br>Invest once in a knowledge asset; reuse it many times.<br><br>Use large teams.<br><br>Focus on generating large overall revenues. | Expert economics<br><br>Charge high fees for highly customized solutions to unique problems.<br><br>Use small teams.<br><br>Focus on maintaining high profit margins. |
| KM Strategy | Person-to-documents<br><br>Develop an electronic document system that codifies, stores, disseminates and allows reuse of knowledge. | Person-to-person<br><br>Develop networks for linking people so that tacit knowledge can be shared. |
| Information Technology | Invest heavily on IT; the goal is to connect people with reusable codified knowledge. | Invest moderately on IT; the goal is to facilitate conversations and the exchange of tacit knowledge. |
| Human Resources | Hire new college graduates who are well suited to the reuse of knowledge and the implementation of solutions.<br><br>Train people in groups and through computer-based distance learning.<br><br>Reward people for using and contributing to document databases. | Hire MBAs who like problem solving and can tolerate ambiguity.<br><br>Train people through one-on-one mentoring.<br><br>Reward people for directly sharing knowledge with others. |
| Examples | Andersen Consulting, Ernst&Young | McKinsey & Company, Bain & Company |

Hansen, Nohria and Tierney (1999, 107—109) described codification as a strategy where knowledge is codified with certain rules and procedures and then stored in databases where it can be accessed and used easily be anyone in the organization. Davenport, De Long and Beers referenced these databases as knowledge repositories. They recognized three types of knowledge repositories in the companies they studied: one for storing external knowledge such as competitive intelligence; one for structured

internal knowledge meaning mainly documents and one for informal internal knowledge such as discussion databases. (Davenport et al. 1998, 45) The codification strategy could be described as a people-to-documents strategy.

Another type of strategy introduced by Hansen and associates is the personalization strategy; it refers to action that emphasizes sharing knowledge through direct person-to-person contacts. Technology is merely a tool that helps people to communicate more efficiently. (Hansen et al. 1999, 107—109)

The most interesting idea in the article of Hansen, Nohria and Tierney is that storing knowledge in databases is not by far the only solution for managing knowledge, although many articles on knowledge management seem to state so. What is noteworthy in this study, however, is that it suggests that organizations should focus on either of the mentioned strategies, not both (Hansen et al. 1999, 107), while Davenport et al. (1998) recommend the exact opposite. One important point that has to be considered in this comparison is that the codification-personalization framework is more general, on a higher level of abstraction, while Davenport's and his associate's categories of knowledge management strategies could well be placed in the codification-personalization frame. Yet, it does not explain all the difference between these opinions.

As Hansen et al. (1999, 107) suggest, an organization's choice of knowledge management strategy should depend on the organization's area of business and its vision, mission and goals. Different strategies suit organizations dissimilarly; as any other business strategy also knowledge management strategy has to be designed in such a way that it will support organization's goals and visions. And although the authors (Hansen et al. 1999) suggest that organizations developing information systems would fall into the category of codification strategy, that is not necessarily – and definitely not always – the right or the best solution. It depends for example on whether the organization tailors a certain kind of information systems to their customers or whether they develop totally new kind of information systems every time. The strategy should also depend on the size of the organization and on how dispersed the employees are located. If an organization is only starting to build a knowledge management strategy, one could use the frame introduced by Hansen et al. (1999, 109) as a basis and consider it from a viewpoint where the organization and its vision and values are in focus. The

frame is still merely a tool and requires use of common sense; what suits one organization does not necessarily suit another – at least not without modifications. One important factor that needs to be kept in mind when designing a knowledge management strategy is that each division or department of an organization might have different needs for knowledge management and thus need differing strategies (Ståhle and Grönroos 1999, 65—71; 81—107). For example a production unit is at its best when it produces exactly the same result every time while a research and development unit needs to innovate new things continuously. Obviously they need different kind of knowledge to achieve their goals and different strategies to manage it.

## 2.4 Benefits and Challenges

All the organizational concepts and methods are usually legitimized by referring to competitive advantage that the organization will achieve. Knowledge management does not make any exception; there are several benefits, including competitive advantage, that are claimed to be available for all organizations that manage their knowledge.

It is claimed, and at some extent even realized, that knowledge management enables the organizations to better understand their customers, prospects, markets and the competitor as well as it enables the identification of competitive gaps and opportunities (Radding 1998, 60). Yet, there are several issues that need to be encountered before the benefits can be reached. This section takes an objective stand to both of these viewpoints.

### 2.4.1 Motivated Employees

Today, when all the organizations are vying for the experts and their loyalty and the experts are easy to induce to change the organization they work for, motivated and committed employees provide organizations with a stronger competitive edge. Employees, who have challenging and motivating jobs, who feel important in the organization and who have a feeling that their opinions count, are more committed to

organizations than employees, whose knowledge and expertise are not utilized as extensively as they would be able and possibly even eager to allow. In contrast, if the intellectual assets provided by the employees are wasted, it does not only show in decreased motivation for work but also as increased production costs as more resources, such as time and working hours, are needed to complete the production process. If the human resources, the employees and their knowledge, were used more efficiently and taken care of, the organizations would get more value for their investments in the employees.

To be able to utilize the employees' intellectual assets, organizations need to be aware of what kind of knowledge they have in the organization and where it is located. This would make it possible for the organizations to facilitate learning in the organization and to support flexible flows of work contributions (Radding 1998, 57—61) as the organizations would know that they know and what kind of knowledge they need in order to facilitate reaching their goals.

### 2.4.2 Savings and Efficiencies

One of the biggest advantages that can be achieved through efficient knowledge management is avoiding the wheel reinvention. Organizations are willing to know where they have done right to be able to reduce cycle time and thus achieve some competitive advantage. (Greco 1999, 21)

Malhotra (1998) points out, that there is no direct correlation between IT investments and business performance or knowledge management. Davenport et al. (1998, 49) formulate the same idea in a somewhat different way: "economic returns on knowledge management are difficult to quantify and compare across organizations". Also Greco (1999, 22) believes that knowledge and its impact on organizations' performance cannot be reliably calculated in the traditional ways but he also believes that a way to calculate the money 'under the line' is needed for the top managements' needs. The most descriptive key factor for high return on invested capital seems to be effective utilization of information and knowledge, not just investing on technology and then assuming that the problems are solved (Davenport & Prusak 1997, 6). If the investments made in computer technology do not improve organizations' efficiency, the problem is

probably that the organization has ignored the ways in which knowledge workers communicate and operate through the social processes of collaborating, sharing knowledge and building on each others' ideas (Malhotra 1998).

Davenport et al. (1999, 50) note that the economic returns of knowledge management, if detectable, can be both direct and indirect. They suggest that knowledge management can benefit organizations by helping them to save or earn money. The returns can also be saved through reduced cycle time or increased customer satisfaction, for example. Radding (1998, 57—61) suggests that the efficiencies achievable by competent knowledge management implementation are more efficiently performed and managed processes that eliminate the need to invent the wheel repeatedly. He suggests that this can be achieved by gathering best practices of the organization's processes and by documenting also the business processes.

## 2.4.3  Change and Innovation

Knowledge management can assist the organization in responding to the environmental changes and in creating innovations. Radding (1998, 57—61) suggests that managing knowledge may assist organizations to identify the forthcoming changes and to facilitate responding to these changes. As changes in organizations' environments are inevitable and ever more unpredictable and furthermore they happen faster than ever, all organizations should be prepared for them and knowledge management may offer one approach to the problem.

As organizations know their competencies and capabilities, it is easier to identify new markets and business opportunities; organizations have more knowledge on their markets and customers when the individual knowledge of the employees' is utilized efficiently for the benefit of the organization (Radding 1998, 60—61). Also decision making is easier as managers are aware of the facts and know where the organization truly stands (Radding 1998, 9—10).

Many researchers, for example Ståhle and Grönroos (1999, 45), claim that the most important mean for competition is the organizations' ability to continuously innovate. But to be able to achieve competitive advantage with the innovations, they have to be

developed inside an organization – otherwise they would be available to the competitoss as well. The innovations do not necessarily have to have anything to do with the actual products or services the organization produces, but the innovations can be related with organization structure, processes or strategy (Ståhle & Grönroos 1999, 46).

Creation of organizational innovations can be facilitated for instance by bringing together people with divergent knowledge and to be able to do that, organizations haye to be aware of the knowledge they have.

### 2.4.4 Organization Culture

All the benefits mentioned earlier in this chapter are available when organizations manage, in addition to more conventional business management, also their intellectual capital; their knowledge. To be able to effectively manage organization's intellectual capital, the organization needs to have a positive, knowledge-friendly culture (Chait 1999, 25). This type of organizational culture is achieved, according to Davenport, De Long and Beers (1998, 52), if the employees have positive orientation knowledge and are bright, intellectually curious and not inhibited in sharing knowledge. Organizations that highly value learning and in which experience, expertise and innovation supersede hierarchy are those who have positive orientation towards knowledge. The challenge, however, is that this kind of positive culture is difficult to create if it does not already exist in the organization. (Davenport et al. 1998, 52—56)

Partly because of downsizing during the last decade in several Finnish as well as other European organizations, many individuals have negative attitude towards knowledge sharing. They may believe that their knowledge is vital for their position in the organization they work for and, therefore, they might be unwilling to share their knowledge with others. This is the case, despite of the fact that especially knowledge about mistakes and failures and their causes would be highly valuable to organizations as they could prevent the same mistakes to be done again (Davenport et al. 1998, 52). In addition, Davenport et al. (1998, 52) found out in their study that some experts even saw the use of existing knowledge as a sign of weakness or inability to do the job by themselves.

## 2.4.5 Quality Issues

Information and knowledge quality are subjective matters; every organization has its own standards for what is of good quality and what is not. One thing that can be assured is that poor information quality cannot lead to great quality of knowledge; if decisions are made based on erroneous or maybe even false information, the results cannot be expected to be brilliant. That is why quality issues have to be taken seriously.

Although there are no straightforward definitions of what is good quality for everyone, a framework for information quality dimensions can be defined. Wang et al. (1998, 101) suggest that information quality should be presented in four categories: intrinsic, accessibility, contextual and representational information quality. Each of these categories has different dimensions that the organizations evaluate and prioritize individually – depending on the uses of information and the values of the organization. (See Table 3) The quality attributes should be used as vehicles for describing, measuring and discussing problems. (Wang et al. 1998, 101)

**Table 3.** Information Quality Categories and Dimensions. (Wang et al. 1998, 101)

| INFORMATION QUALITY CATEGORY | INFORMATION QUALITY DIMENSIONS |
|---|---|
| Intrinsic information quality | accuracy |
|  | objectivity |
|  | believability |
|  | reputation |
| Accessibility information quality | accessibility |
|  | ease of operations |
|  | security |
| Contextual information quality | relevancy |
|  | value added |
|  | timeliness |
|  | completeness |
|  | amount of information |
| Representational information quality | interpretability |
|  | ease of understanding |
|  | concise representation |
|  | consistent representation |

Redman (1998, 82) suggests that poor quality of data and information has operational, tactical and strategic impacts on organizations.

At the operational level, poor data quality leads to customer dissatisfaction if the data corrupted concerns customer information such as names, addresses, orders and billing; increased cost for the precious time and other resources that are spent on finding and correcting the errors; and lowered employee job satisfaction if the information one works with is corrupted or otherwise incorrect (Redman 1998, 80—81).

At the tactical level poor information and data quality compromises decision-making for one cannot be expected to make the best decisions if one has not got information good enough for decision-making – the decisions cannot be any better than the data and information they are based on. Additionally, poor data quality also makes it more difficult to re-engineer and it may increase mistrust between different organizational divisions or units.

At the strategic level, the evidence of the impact of poor data and information quality is less clear. (Redman 1998, 81) However, they both – directly or indirectly – make it more difficult to set and execute strategies as they divert management attention to less important or even false data.

The quality issues are very important when discussing knowledge management and its success but, due to the richness and extent of the area, they are not discussed any further in this research. Instead, the researcher suggests that the quality issues affecting especially the success of knowledge management would be studied further in future research.

### 2.4.6   Availability and Usability

In addition to the quality issues, there are other qualifications for knowledge that need to be met before it is really useful for the organization. The needed knowledge has to be available and the individual requiring the knowledge needs to be aware of the existence and the location of it in order to be able to find and then to exploit it (Pankakoski 1998).

However, the processes of finding the needed knowledge and then transferring it from a person to another are usually extremely difficult (Davenport et al. 1998, 46).

The challenges and benefits regarding knowledge management are not discussed any further here as the study focuses on inter-project knowledge sharing. Many articles and books on knowledge management discuss at least some of the challenges and benefits; for example Radding (1998) presents quite an extensive set of knowledge management benefits. A more wide-ranging research on the challenges could, however, be done in the future to give a more reliable portrait of knowledge management. This kind of research would also help the organizations in their task of implementing knowledge management, as they would be aware of the challenges and thus capable of confronting them.

# 3 KNOWLEDGE SHARING IN EXPERT ORGANIZATIONS

Tacit knowledge is a personal property, located in employees' minds, and as such it has no value to any organization. Instead, it is when this informal knowledge is being shared that it becomes valuable for organizations for then it can be utilized to their benefit. (Malhotra 1998; Nonaka & Takeuchi 1995; Radding 1998, 20)

As this study focuses on knowledge sharing between contemporary information systems development projects, and as experts mainly develop the information systems, this chapter presents knowledge sharing theories from the expert organizations' point of view. First, this chapter describes some of the special features of expert organizations and information systems development. Then, the means for knowledge sharing are presented and finally, the chapter introduces a research frame that will be used in the case research.

## 3.1 The concept of Knowledge Sharing

Knowledge management consists, as presented in chapter 2, of gathering, organizing, refining and sharing of knowledge. As this study focuses especially on knowledge sharing, and as knowledge sharing is mostly communicating, this chapter defines the concepts *communication* respectively *knowledge sharing*; awareness of these concepts is essential for understanding the rest of this thesis.

### 3.1.1 Communication

*Communication* is a process of creating and sharing meanings through the transmission and exchange of different kinds of signs, such as words, gestures, expressions and intonation (Andrews & Herschel 1996, 1; Dimbleby & Burton 1992, 222; Ikävalko

1998, 11; Åberg 1993, 11). This process requires interaction within oneself, between people or between people and machines (Dimbleby & Burton 1992, 222).

Communication can be divided into four categories: (1) *intrapersonal communication* is communication with oneself, (2) *interpersonal communication* is messaging between two people, (3) *group communication* is communicating in groups and (4) *mass communication* means communication to general public (Dimbleby & Burton 1992, 6; Kreps 1990, 49—53). Human communication is a dynamic, continuous process; as communicators, humans simultaneously send and receive several messages on many levels, and what is even more significant, no one can choose not to communicate (Kreps 1990, 26). These are reasons why some researchers talk about oversimplification when discussing definitions of communication; for example Kreps (1990, 26) states that nobody can be considered as merely a sender or a receiver of messages. Still, when discussing a single act of communication, someone does send a message and another receives it.

It is very easy to communicate, but extremely difficult to communicate effectively. Communication can be considered successful if the sender has modified the message in such way that the receiver understands it (Kreps 1990, 25). The challenge in making the communication successful lies in the fact, that the receiver usually does not know the original idea of the sender, which the message includes, but one tries to interpret it. Factors affecting the understandability of the messages include structures of sentences and choices of words, for example. (Åberg 1993, 11—20) Another challenge in successful and effective communication is that once you have communicated or in other words, sent your message, you cannot retract it; restating or changing earlier messages does not erase them but adds to them (Kreps 1990, 26—27).

Åberg (1993) considers the concept *informative message* from three divergent viewpoints: the sender, the channel and the receiver point of view. For the sender the message is informative if it transfers the sender's idea to the receiver as accurately as possible. Similarly, message is *valuable* for the sender when the original idea is transferred to the receiver. For the channel, message is informative when it is delivered as compactly and infesting the channel as little as possible. Further, if considering the receiver, the message is informative if it gives new information or helps the receiver to

create new ideas. The factors affecting the informative nature of messages are the contents of the messages, receivers' earlier knowledge and the actual situation of communication. (Åberg 1993, 11—17) The better the sender knows the receiver, the better are the chances in getting the message through as wanted (Ikävalko 1998, 11).

*Feedback* is receiver's response to the message; it can be a nod, a thank you letter and making one repeat the message as well as all the gestures and expressions of the receiver (Kreps 1990, 53; Åberg 1993, 18). Sender has the responsibility to collect the feedback, which should be as informative as possible; mere nod does not give information about if the receiver understood the message. Åberg (1993, 18—19) adds that positive feedback should be shared whenever there is a place for it whereas negative feedback should be shared in a constructive way to generate progress.

Communication is not all words; it is claimed that less than 10% of information received from human communication is from words and the rest is perceived from body language and voice (Harju 1992, 7; Tenhunen & Tšokkinen 1995, 9). (See Figure 3.)

**How To Affect Humans In Communication**

10%
By Words
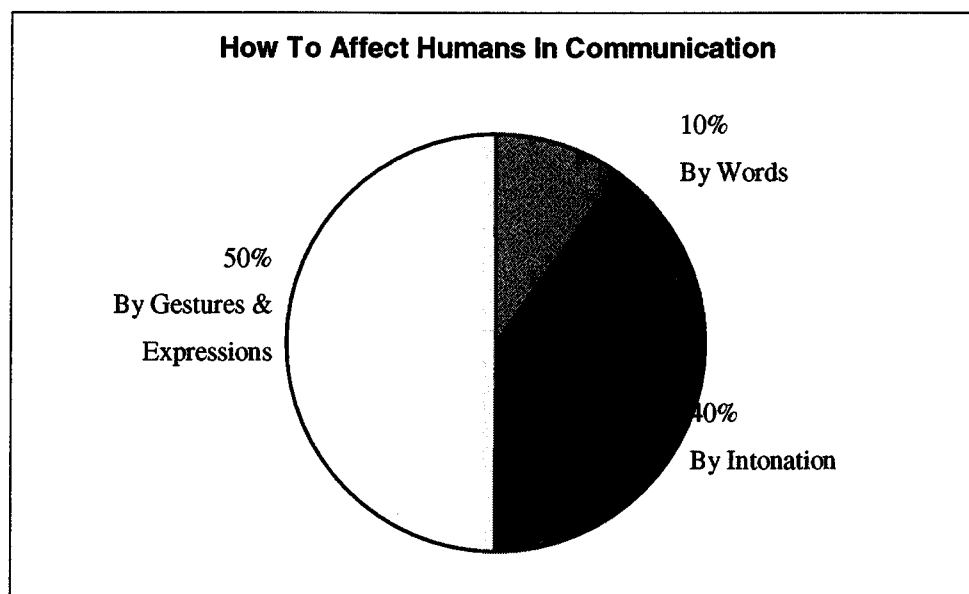
50%
By Gestures &
Expressions

40%
By Intonation

**Figure 3.** Power of Words and Other Factors in Communication. (Harju 1992, 7; Tenhunen & Tšokkinen 1995, 9)

This fact clearly states the importance of *nonverbal communication*, which includes artifacts (physical and personal appearances, objects that people carry), kinesics (the

ways people move their bodies and position themselves), occulesics (facial expressions, eye behaviors), paralinguistics (vocal cues accompanying speech), proxemics (distance between people and objects), and chronemics (effect of time on communication). (Kreps 1990, 42—47).

### 3.1.2 Knowledge Sharing

The concept *knowledge sharing* refers to sharing personal knowledge between individuals to make better use of that knowledge; sharing personal knowledge makes it valuable for organizations as it at the same time becomes more ennobled for the individual. The aim of organizations is to share knowledge between those who need it. (Andrews & Herschel 1996, 2)

Knowledge sharing can be based on a push technique, alerting or a pull technique. While *pushing* knowledge, the receivers have no chance to prevent the knowledge from being pushed at them; they receive it no matter if they want it – or if they need it – or not. On the other hand, push technique ensures that users have knowledge available and they do not need to interrupt their work to search for it. (Radding 1998, 53—54) It should, however, be noted that as today there is more information and knowledge available than ever, nobody can internalize or even scroll through all the available knowledge to find the knowledge that is needed. This is why the persons, to whom the knowledge is pushed, should be thoroughly considered and chosen.

Knowledge is acquired with *pull technique* when it is available only on request. In practice, it means that a person who needs certain knowledge has to first find it and then try to absorb it. (Radding 1998, 53) Unfortunately, to be able to find the knowledge, one should know quite specifically what knowledge is needed. Yet, sometimes – especially when trying to define causes for problems or to create new knowledge – it is impossible to specify the needed knowledge and, therefore, it is extremely hard to find the knowledge without any help of what kind of knowledge is available and where it is located.

Knowledge *alert* is a mean that lies in the middle of the push and pull techniques. It refers to alerts that are delivered to all members of an organization or a community

when new or modified knowledge is available. The aim is to inform people of the location of the knowledge so that it can be found whenever needed. In practice, this method can be implemented when knowledge is being stored in databases.

## 3.2 Expert Organizations

The challenge in business today is that information and knowledge becomes obsolete faster than ever, which makes learning a critical success factor; changing organizations need people who are disposed to and capable of continuous learning (Ruohotie 1998, 7). In addition, the information-intensive organizations need employees who have specialized themselves in a specific area that supports organizations' core competencies and helps the organizations to achieve their goals.

Organizations that develop information systems are more and more focused on a specific area; organizations develop information systems with a specific tool or technique or they develop information systems for a specific purpose. Ruohotie (1998, 21) suggests that awareness of organizations' core competencies is a possibility to strengthen and give direction to organizations' knowledge and know-how. To really get strategic advantage with the core competencies, the organization has to be the best in the business in one or more competitive areas (Raivola & Vuorensyrjä 1998, 6). As organizations' bases for knowledge and the core competencies change continuously, organizations need, to be able to develop and share the core competencies, meta-knowledge or meta-know-how. They include, according to Ruohotie (1998,29), for example learning, creating innovations and combining knowledge. Nonaka and Takeuchi (1995) suggest, as well, that success in business requires continuous creation of new knowledge, sharing it and its fast and efficient utilization as new tools, techniques, products and ways of working.

### 3.2.1 Experts in Organizations

Experts are those people who in problem solving situation are able to examine the circumstances from outside of the actual problem context, to apply several theories to the problem and then infiltrate the results into the original context — they are capable of successfully reanalyzing the current technical, normative and social rules to find the solution for each problem (Raivola & Vuorensyrjä 1998, 24). This is a way of creating new knowledge. It requires a culture that encourages the employees to question things, and ability to find alternative, more suitable solutions (Ruohotie 1998, 84). Expertise cannot be transferred to another person – not even in education – but it has to be learned through persistent training, practice and insights. Experts have to internalize new knowledge continuously to be able to solve modern problems as well as the past ones. As the amount of information increases at an accelerating rate, it forces the experts to study and internalize not only the information on the area of expertise but also more effective ways to acquire and absorb information – knowing the area of expertise is just not enough anymore (Ruohotie 1998, 10). Knowledge and learning are critical success factors for today's organizations. The changing working environments need individuals who have the ability and the desire to learn consistently; in the ideal situation the individual's personal development lasts one's whole working age  (Ruohotie 1998,7).

Drucker (1999, 66—67) suggested that all knowledge-workers should consider their strengths and weaknesses to be able to build performance on the strong parts, and that they all should also analyze, how they are performing so that it could be improved. He emphasized also the importance of taking responsibility of the relationships inside the organization; as organizations today are built on trust between people, it is essential that the employees understand and appreciate each other and it requires knowing each other's objectives and values (Drucker 1999, 72).

As Davenport et al. (1998, 52) stated in their article, especially experts may find it difficult to lean on someone else's expertise and knowledge – they, in some cases, found it as a sign of incapability or professional weakness. This factor needs to be taken seriously while considering implementing knowledge management in organizations and especially in information-intensive, high technology organizations where experts form the basis of the business.

Experts often work in different teams. Teams are associated with providing additional strength or power; the whole is greater than the sum of the individual parts (Colenso 1997, 11). As teams are built they all go through a certain development process before they are able to fully perform. This development process has four phases, whose endurance and the strength of the signs varies from team to team. The phases are, in order of appearance, forming, storming, norming and performing. (Colenso 1997, 22; Stenlund 1988, 97—99) During the first phase (forming), the project group is getting to know each other and their ways of working; the communication climate is rather closed, as the participants are uncertain of their own roles and the others' expectations. After this phase of silence comes the storming phase; the group members test each other and try that way to find their place in the group. This important phase can hardly be passed without any load disputes. As the group members begin to know and trust each other, the project moves to the norming phase during which the members can agree on common rules and guidelines for the group. Yet, some decisions are made in the spirit of compromising although the solutions may not that way be the best possible. As the interaction increases, the group is able to fully perform; the group has a common goal and guidelines. (Colenso 1997, 22; Stenlund 1988, 97—99)

### 3.2.2 Managing Expert Organizations

Aging of information and knowledge is a real threat to experts and expert organizations (Ruohotie 1998,7). As the employees and their personal knowledge form the main source for organizations' core competencies, the organizations have to invest heavily in employees: their well being, motivation and permanence in the organization. This leads to inevitable changes in management styles, methods and techniques — educated personnel who know their value and importance for organizations cannot be managed and guided with authoritarian methods (Ruohotie 1998, 10; Pritchett & Pound 1996; Maunula 1991, 15; Zenger et al. 1995, 23). Renewing is essential and that is why learning and knowledge have achieved such a central status in organizations (Ruohotie 1998, 15); experts need time, space and freedom to innovate and to create new solutions (Maunula 1991, 15).

Efficient human relations' (HR) management is characterized by the functions encourage the individuals to maintain and add to their knowledge and expertise (Ruohotie 1998, 7). Motivating the experts is ever more important as the organizations need the experts more than the experts need the organizations (Raivola & Vuorensyrjä 1998). Learning should not be merely a result of organizational and environmental changes but learning should also lead to shifts in the ways organizations work (Radding 1998, 17; Ruohotie 1998, 7).

The consultants Pritchett and Pound, who wrote their book in a rather provocative and aggressive style, based their suggestions on a couple of good ideas. They suggested that as organizations are required to work more and more effectively, employees should be organized in teams to enable new and innovative working methods and knowledge sharing. Pritchett and Pound (1996) suggested as well that teams should be provided with a clear strategy or plan of action and explicit working and liability distribution to avoid redundancy and gaps in responsibilities. They found it also important to provide fair and well-defined indicators for valuing work and psychological and material rewards for a job well done.

Shonk (1994) points out that, in the current era of continuous change, employees need support and sincerity in their relations with their supervisors. Mutual trust between employer and the employees is needed, the thinking behind the decisions should be shared and the strategies and visions of the organization should be familiarized to all employees (Shonk 1994, 156—158). Zenger et al. (1995, 28) would see this 'explaining decisions' as a sign of a traditional organization monitoring its employees. They suggested that expert organization could, more easily than many traditional organizations, be organized as teams with power of decision-making. Where the traditional manager focuses in monitoring the employees, the team manager builds trust, encourages teamwork and aims at making the whole organization more flexible. (Zenger et al. 1995, 23—28)

## 3.3 Information Systems Development Projects

This section describes the characteristics of information systems development projects, as there are general models that these kinds of projects, at least to some extent, follow. In this section, as project or project work is mentioned, it refers specifically to information systems development projects, not project work at large. The first subsection *3.3.1 Project Work* clarifies some basic facts of the concept project work and the second subsection *3.3.2 Information Systems Development* describes basic models of developing information systems.

### 3.3.1 Project Work

Project is work that is done in order to complete a defined task with limited resources (Pelin 1999, 40; Sell 1975, 12; Virkki & Somermeri 1992, 13). The definition of the concept *project work* has remained unaltered for at least the last 25 years; in 1975 Sell defined project work as something unique, that has a well-defined mission and goals, is to be carried out with limited resources, and which is done with particular methods characteristic to project work (Sell 1975, 12).

Virkki and Somermeri (1992, 13) separate the concepts of development program, program and project. *Development program* defines the guidelines for all the development work done in the organization or in the specific part of it in the next 3—5 years and it might include several, even overlapping, programs. It defines how an organization's human, financial and technical resources are to be used and developed during a particular period of time. *Program* lasts for a year or two and it is a part of the development program. *Project*, instead, lasts only 9 months or less and its goal is to implement a specific part of the program. (See Figure 4.) Unfortunately, in many cases, this is not reality. In organizations, there are usually numerous amounts of different projects but hardly any programs to guide them. The projects usually last far more than a year. At the top level of the organization there is probably a development plan but a development program that would more specifically define the schedule for the development needs for the following three to five years is absent. This leads easily to

uncontrolled flow of projects, which does not support organization's strategies as well as more controlled project work could support.

Sell (1975, 111—117) points out that projects should also be systematically finished. The organization should take a clear attitude towards the results of the project and after accepting them it should absolve the project members of the responsibility.
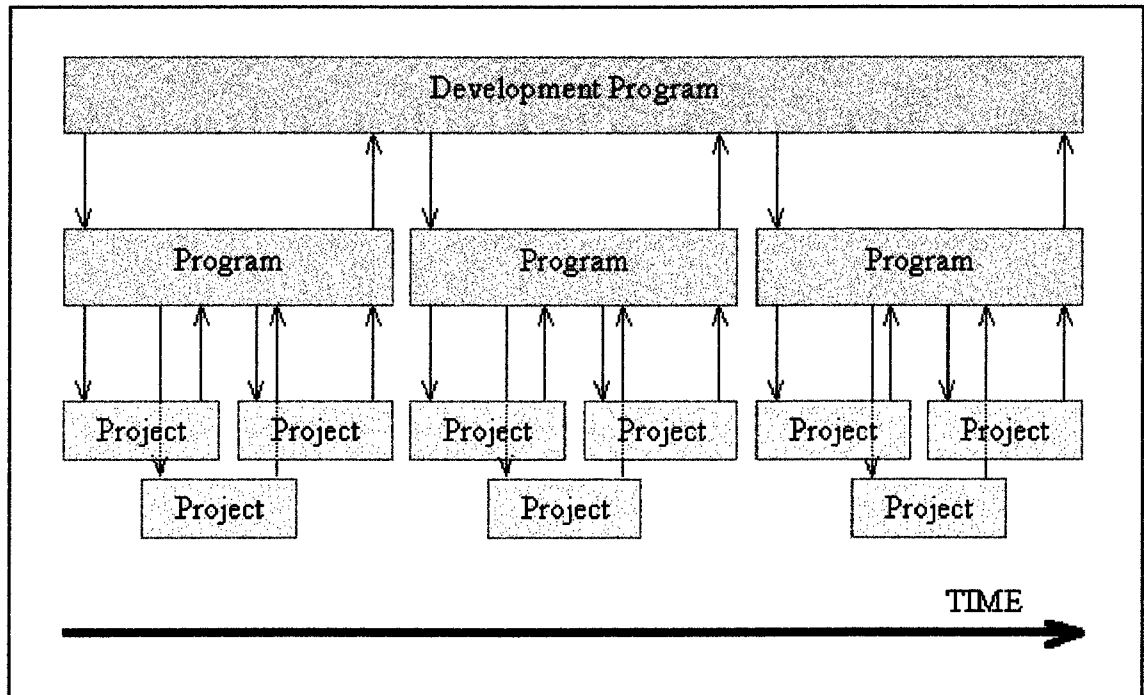


**Figure 4.** Positioning Projects into Organizational Development (Virkki & Somermeri 1992, 13).

### 3.3.2 Information Systems Development

As Robillard (1999, 87) as well as Walz, Elam and Curtis (1993, 63) point out, software development is knowledge-intensive. The workers are all experts of their own areas of specialty and they need to be treated as such. Information systems development projects are organized in project groups, groups of experts, which are usually lead by project manager, who communicates and makes decisions about the project in co-operation with the project's steering group (Sell 1975, 42—43). Steering group is the highest decision-making organ in the project organization and its mission is to guide the project;

areas that need to be controlled regularly are the contents and its quality, schedules and use of resources (Sell 1975, 92).

However traditional, the organization can be organized differently; Constantine (1993, 36—38) presents four different paradigms for project organization. They are traditional hierarchy, innovative individualism, adaptive collaboration and harmonious alignment. These paradigms are all useful – none of them is either good or bad, and no one paradigm is a guarantee of success. The selection of the paradigm for an organization should be based on the organization's needs, its area of business and the strengths and weaknesses of the paradigm itself.

Traditional hierarchy is stabile and it provides predictable performance; on the other hand it is not supportive for genuine innovations. Innovative individualism encourages making creative inventions but the organization is far from being stabile or efficient. Adaptive collaboration would be a proper organization structure for somebody preferring complex problem solving; however, this paradigm may lead to waste of time as things are discussed over and over again without any contribution. Harmonious alignment, on its part, provides efficiency in smoothly performing established procedures but no support for quick changes in the organizational environment. (Constantine 1993, 36—38)

The need for a combination of technical and human elements is what information systems projects and knowledge management have in common (Davenport et al. 1998, 56). Also information systems developers need to understand different human factors in order to be able to know what the customer actually desires and what is expected.

Many studies (e.g. Walz, Elam & Curtis 1993; Weiser & Morrison 1998) show that information and knowledge are rarely captured from IS development projects so that they could be retrieved and applied in future tasks. To ease the pressure in storing all the project files, Mäkelin and Seppänen (1991, 97) suggest that projects should update their files continuously, from the very beginning, to avoid a situation where no one has the resources to store all the information to a commonly agreed place.

## 3.4 Means for Knowledge Sharing

If knowledge is not used, it has no value (Radding 1998, 20). To be valuable for organizations, knowledge has to be shared. To quote Dimbleby and Burton (1992, 103), "someone who communicates nothing, gives nothing to the group".

If compared to many other assets in organizations, explicit knowledge has a special value as it can be used simultaneously all around the organization and it has the same basic value for every person utilizing it. Still, it needs to be remembered that everybody interprets the exact same knowledge based on his or her earlier knowledge, experiences and values and thus, the formal knowledge that can easily be shared, potentially has different meanings to different people. (Ståhle & Grönroos 1999, 53) Still, when knowledge is being shared, its amount or value does not diminish – the person who sends information or knowledge does not lose anything. On the contrary, as knowledge is being shared it increases and, little by little, becomes ennobled. (Ikävalko 1998, 11)

Organizational knowledge sharing is based on the idea that the whole is greater than the sum of its parts; individuals put together can create such they never would if alone (Ståhle & Grönroos 1999). It also includes an idea that by sharing knowledge individuals actually get more than they give. (See Figure 5)
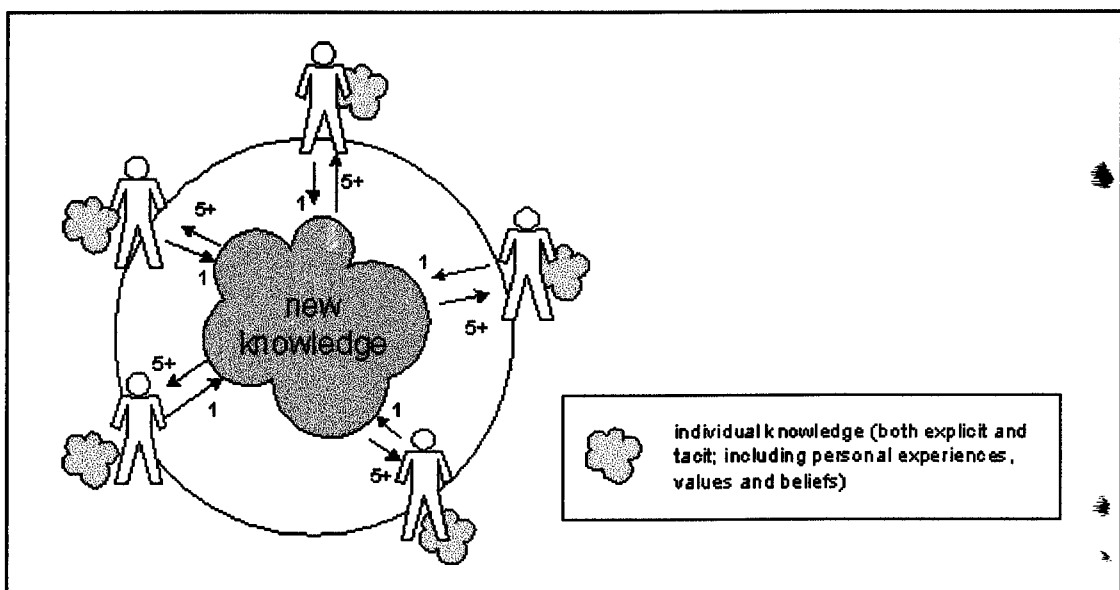


**Figure 5.** The Idea of Organizational Knowledge Sharing.

In the process of sharing knowledge individuals potentially get new explicit knowledge in addition to the tacit knowledge they get for example about the issue, the participants, the organization or the environment involved. Although numeral values in Figure 5 are merely hypothetical they give a good impression on the relation between giving and receiving knowledge.

Nonaka, by himself (1994, 18—19) and with his colleague Takeuchi (1995, 62—70), presented four modes of knowledge creation. The basic idea behind the four modes was that knowledge is being created through conversion between tacit and explicit knowledge. Nonaka suggested that converting knowledge from tacit to explicit and vice versa is a continuous process and that is why his table presenting the four modes of knowledge creation is drawn here in a circle. (See Figure 6)
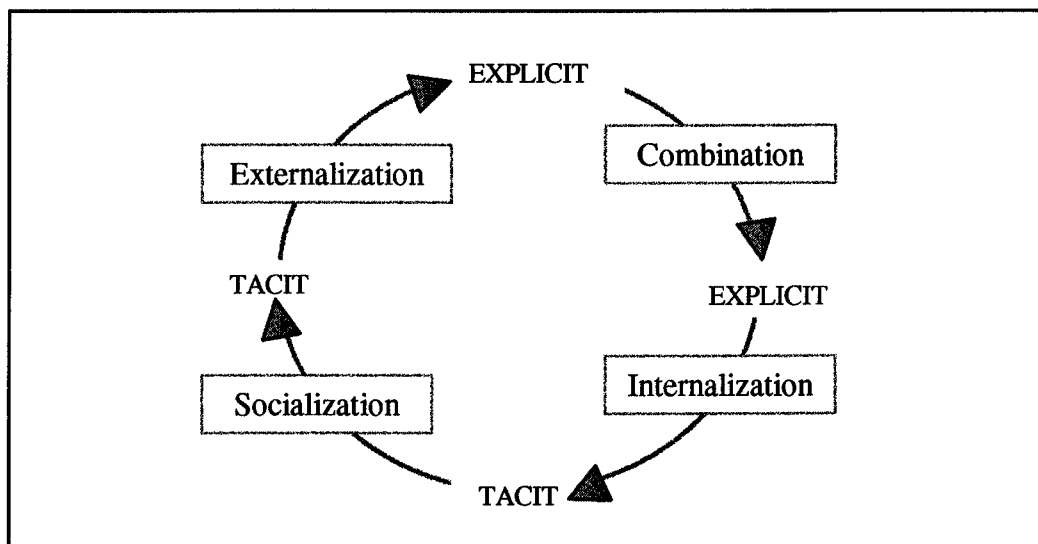


**Figure 6.** Four Modes of Knowledge Creation. (based on Nonaka 1994; Nonaka & Takeuchi 1995)

Knowledge can be converted from tacit knowledge to tacit knowledge, from tacit knowledge to explicit knowledge, from explicit knowledge to tacit knowledge and from explicit knowledge to explicit knowledge. According to Nonaka (1994) as well as Nonaka and Takeuchi (1995), *socialization* (tacit knowledge to tacit knowledge) is a process of sharing experiences and thereby creating new tacit knowledge. The process does not require use of language; tacit knowledge can as well be acquired through

observing, imitating and practicing. The key to acquiring tacit knowledge is experience; without some form of experience it would be nearly impossible to understand the other person's thinking processes. *Externalization* is a process of articulating tacit knowledge into explicit form. Many organizations are very eager to learn this discipline to be able to store their employees' ideas for the benefit of the organization but the process has not yet been well developed. *Combination* (explicit knowledge to explicit knowledge), on the other hand, is the most traditional part of knowledge creation and rather easy to organize with today's technology; it is a process of systemizing concepts into a knowledge base or system. It requires reconfiguring the existing knowledge through various kinds of sorting and combining and it might lead to new knowledge. (Nonaka 1994, 19; Nonaka & Takeuchi 1995, 64—68) *Internalization* (explicit knowledge to tacit knowledge) is, as described by Nonaka & Takeuchi (1995, 69), closely related to "learning by doing". The knowledge embedded in documents, manuals and oral stories help the individuals to internalize their experiences and thus, it enriches their tacit knowledge.

As organizational knowledge creation is a continuous and dynamic interaction between tacit and explicit knowledge, Nonaka & Takeuchi (1995, 71) drew, furthermore, a spiral on this table of the knowledge conversion modes to better portray the actual knowledge creation process.

The following sections present technological and organizational means that assist communication, collaboration and coordination, which, in their part, are all part of knowledge sharing.

### 3.4.1 Communication

There are several technological tools that support knowledge sharing and a variety of organizational means that assist it. The technological tools, for example e-mail, traditional and mobile telephones, telephone and video conferencing and different organizational networks, have dramatically changed the way people communicate and the speed with which the information is transferred from a person to another (Andrews & Herschel 1996, 18). Variables, such as time and place, influence the decisions on the most suitable communication system or tool for each occasion. Communication culture,

on the other hand, is an organizational factor that assists – or at least affects – organizational knowledge sharing.

Electronic mail (e-mail) enables communication even if people are physically and temporally absent. It does not, however, transfer gestures; e.g. facial expressions, vocal intonation and indications of social position are obscured or minimized. (Sarbaugh-Thompson & Feldman 1998, 685—686) This lack of cues limits the range of communication; for example sarcasm is not well expressed on e-mail. Yet, these limitations are, according to Sarbaugh-Thompson and Feldman (1998, 686), compensated by using more words than normally in face-to-face communication and by adding special symbols, such as smileys [e.g. :-) or :-( ] and exclamation marks, to demonstrate mood and intensity. However, the contents of e-mail messages should be thoroughly considered, especially in organizational use; it should be remembered that e-mail messages are legally as official and binding as traditional business letters and they can be used as evidence if needed (Aittoniemi, Salminen & Yliniemi 1999, 27).

The ease of use and the widespread adoption of e-mail have lead to a couple of quite severe problems with it. First, users are no longer capable of handling the ever-growing volume of messages. Second, there are no efficient tools for managing the information contained in the e-mail messages. E-mail certainly has solved the distribution problem for the sender but it has also created information management problems for the receiver. These factors inevitably lead to waste of resources as individuals spend valuable time on examining the vast amounts of messages. (Lotus Development 1995, 15—17)

Increase in the use of e-mail may bring about decreased use of face-to-face communication (Sarbaugh-Thompson & Feldman 1998, 695) as the individuals do not have to go meet somebody but they can send e-mail and possibly some documents as attachments. On the other hand, face-to-face contacts are not always possible as the organizations' places of business are widely dispersed. Aittoniemi et al. (1999, 27) suggest that e-mail should be used only for positive matters while negative and unpleasant issues should be shared personally, either face-to-face or over phone. This suggestion can easily be argued by the fact that the sender cannot sense the receiver's feelings or predict his or her reaction; a personal contact would enable the sender to react to the receiver and his emotions. Just as well the receiver cannot, by reading the e-

mail message, know how the sender meant the words to be understood; with e-mail the intonation disappears and this fact makes it harder to sense the original feeling and tone behind the message. There is no guarantee that the receiver will interpret the message as the sender meant it and especially with negative messages this problem has to be taken seriously – nobody wants the negative message to be interpreted even more negatively. These same arguments apply to long and complicated matters; they should also be discussed over phone or preferably in face-to-face meetings (Aittoniemi et al. 1999, 23). At least if long and complicated issues are sent by e-mail they should afterwards be completed by personal contact, for example over phone.

The telephones are also technological tools that assist knowledge sharing. However familiar they are to people, especially to the Finns, organizations should have an intentional telephony culture (Aittoniemi et al. 1999, 24—25). For example, all the employees should answer the phones similarly, at least at some extent, to help the callers to know whether they called the right organization. Even more importantly, all the messages received over phone should be transferred immediately (or as soon as possible) to the persons they were meant for and all the call requests should be answered as soon as possible. While discussing matters over phone, it would help to have a list of the issues that need to be taken up, preferably in order of importance; choices of words considered beforehand sound more convincing than matters presented indefinitely (Aittoniemi et al. 1999, 25).

As the mobile phone penetration has increased considerably in recent years, many kinds of organizations and associations have to consider what kind of use of mobile phones is proper in their premises (Aittoniemi et al. 1999, 25—26). In Finland, most people today appreciate the meetings enough to shut their mobile phones; in hospitals and airplanes it is a matter of security.

In addition to the phones and e-mail, different networks can facilitate organizational communication by providing possibilities to share documents or software. For example LANs (Local Area Network) and WANs (Wide Area Network) connect the users anywhere in the organization. Also intranets and extranets are important communication and collaboration channels for many organizations. Extranets are extensions of organizational intranets and they are usually provided for the key customers or partners

and suppliers. The idea is to provide the users extra value and thus bind them to the organization. In addition, these kinds of communication channels potentially increase the organizations' knowledge as the knowledge is shared with the co-operators. (Radding 1998, 51-52)

Communication culture is the greatest organizational factor affecting knowledge sharing (Greco 1999, 20). It can either support or discourage the sharing of personal belies, best practices, success stories, failures and customer information. If the employees find the communication culture to be closed and they think they are not getting anything back to themselves by sharing their own knowledge, they will not share it and the organization potentially loses important knowledge. Communication culture is based on the organization members' shared perceptions about the emotional tone of the organization and that is why the individual's feelings about the communication climate in the organization is so very important and should be taken seriously. (Kreps 1990, 193—196). Especially here management support and example is needed – with their own example management can improve the atmosphere and the willingness to share knowledge inside the organization.

### 3.4.2 Collaboration

Collaboration is working together to achieve a common goal. Technological tools assisting this function include for example groupware and document management software. The organizational means, on their part, include mostly different skills, e.g. negotiation skills.

Lotus Development (1995, 19) points out that collaboration is based on shared space, whether it is a room, a whiteboard or an on-line space. Collaborating is working with others to achieve a certain goal; the method of working can be anything from problem solving to brainstorming, and it can be facilitated with shared databases and electronic conferencing, for example. The same networks that supported communication (LAN, WAN, intranet, extranet) also support collaboration as they provide the users with a possibility to share documents or software (Radding 1998, 51—52). Andrews and Herschel (1996, 18) formulate the idea more clearly and on a higher level of abstraction;

they suggest that "collaboration includes the use of technology to facilitate the communication of information for the purpose of shared creation and/or discovery".

As mentioned earlier, organizational culture is based on organization members' shared perception of organizational reality (Kreps 1990, 196—197). This is why the individual's experience of the working climate is so important; the employees – as well as the managers and the customers – are affected through words, intonation and different expressions and gestures (e.g. Galvin 1999, 75) but the distribution of their power is rather surprising. Many researchers of organizational communication, for example Harju (1992, 7) and Tenhunen and Tšokkinen (1995, 9), claim that only 5— 10% of the effect is made by words and 35—40% by intonation while 50—55% of the effect is made by gestures, expressions and motions (see Figure 3 on page 33). These factors should be taken seriously and everybody should consider every now and then how efficiently they communicate – if the gestures, expressions or tones of voice tell a different story than the words, the message is very indefinite and often difficult to believe (Harju 1992, 7). As eyes receive the biggest part of the messages, gestures have a critical role in creating first impressions, which are rather difficult to set aside later.

Productive collaboration requires also negotiation skills. An effective negotiator concentrates on the matters that are supposed to discuss during the meeting, listens carefully, expresses one's opinions clearly and briefly and takes a positive attitude towards other, possibly opposite, opinions and statements. This includes also that the negotiator should never embarrass a participant no matter how bad his opinions seem. A good negotiator should also discuss matters, not the persons involved. Possible strains in the negotiations are best worked out by formulating questions that help the participants to see other viewpoints to the issue; excitement and anger do not assist the negotiations in any ways. (Harju 1992, 107; Tenhunen & Tšokkinen 1995, 78—79) Yet it should be remembered that opposite or divergent opinions and viewpoints are not indicators of problems inside the group – they are merely divergent opinions that should be observed. Divergent opinions may, in fact, bring about better ideas as different associations of ideas are made in people's minds. (Zenger et al. 1995, 58) Still, disturbing behavior and divergent opinions should not be confused; disturbing behavior has to be ended peacefully. Even then the focus should be in the actual behavior, not in the person's character. (Dimbleby & Burton 1992, 122-123; Zenger et al. 1995, 58—59)

Vainio (1986) suggests that the person leading the negotiation should consider three divergent tasks for oneself. For one, the leader has to keep the goal clear and in everyone's mind; otherwise the negotiation does probably not stay focused and it does not achieve its goals. Second, the leader of the negotiation should take care of each and everyone taking part in the negotiation; everybody should participate and share their opinions to reach the common goals. Third, the leader should usually also participate in the negotiation as an equal participant. To be able to do this, the leader may set up questions and sketches that describe the situation as the leader sees it. In addition, the leader needs negotiation skills, ability to assess the situation, flexibility and freedom of prejudice. (Vainio 1986)

In addition, to be able to collaborate, one has to be capable of listening efficiently. Dimbleby & Burton (1992, 192) suggest that an effective listener should concentrate on the content, not the delivery of the message. An effective listener focuses on understanding the ideas the speaker is trying to transmit and asks questions if the idea seems unclear. One should also keep an open mind and consciously work at the listening and resisting possible distractions. (Dimbleby & Burton 1992, 192)

### 3.4.3 Coordination

Coordination is, if simplified, organizing the organization's goals in smaller sub-goals, and thus enabling achieving them, and monitoring the execution of the specified tasks. As there are several things that have to be done in order to be able to reach the objectives, a complete coordination includes, in addition to the traditional monitoring of the employees and the results of their work, also support for informal communication that is one major source of new knowledge and innovations. (Ståhle & Grönroos 1999; Lotus Development 1995, 31—32) In project work, coordination includes monitoring projects that are dependent on each other as one bigger project (Sell 1975, 17). This helps to perceive the entity of the projects and to see the possible gaps in planning.

Radding (1998, 56) suggests use of workflow systems that capture and codify knowledge embedded in organizations' business processes. He uses an example of loan application approval process that taps the knowledge embedded in the sub-processes

that are included to the main process of either approving or discarding the application. These kinds of solutions could be connected to document management software, as the knowledge, in every case, has to be codified and stored somewhere. (Radding 1998, 56)

Appreciating the employees creates positive working place morale (Harju 1992, 109). It is important for all to receive positive and honest feedback of their jobs; remarks should be given privately to avoid embarrassing anybody. The working place morale can also be improved by open decision-making process and by clarifying the mission and vision of the organization for all the employees; these factors would help the employees to realize why things are done in a certain way and that way they could know their importance for the organization.

### 3.4.4 Summary

Knowledge sharing can be facilitated by a number of tools and methods. The aim of this study was to find technological tools and organizational means assisting knowledge sharing. The concept *technological tools* is easy to understand but *organizational means* requires a bit more profound definition. In this study, the organizational means refer to all those things an organization can facilitate that do not fall into the category of technology, for example the communication culture of the organization.

The literature study showed several technological tools and organizational means facilitating knowledge sharing. Technological tools include for example e-mail, telephones and telephone conferencing, videoconferencing and different organizational networks. As well, solutions enabling document and application sharing assist organizational knowledge sharing. Coordination tools are needed for the organization to be able to efficiently strive for its goals. The processes could be assisted with tools monitoring the projects and the employees, as well as with tools that taps the workflow processes and codifies the knowledge from them to later be able automate the process or to be able to give support for the employees, for example the new employees who do not yet know all the procedures of an organization. Organizational means facilitating knowledge sharing include the organization's communication culture, negotiation and collaboration skills of the individuals and their ability to listen. In addition, a positive,

supportive atmosphere is needed so that people would know the organizati**n appreciates knowledge sharing.

**Table 4.** Means for Knowledge Sharing (Built on Nonaka 1994, 19)

|  | **To Tacit** | **To Explicit** |
|---|---|---|
| **From Tacit** | <u>Socialization</u><br><br>Requires positive atmosphere and supportive communication culture as well as communication and collaboration skills. Can be assisted with telephones, telephone and video conferencing; requires a person-to-person contact. | <u>Externalization</u><br><br>The most difficult section of the frame; there are no fixed procedures through which tacit knowledge could reliably be transferred to explicit knowledge. The workflow process recorders may in the future provide help in this sector; an encouraging knowledge sharing culture is needed in every case. |
| **From Explicit** | <u>Internalization</u><br><br>Requires communication skills and supportive communication culture. Can be assisted with e-mail and organizational networks supporting document and software sharing. | <u>Combination</u><br><br>Requires especially ability to express oneself clearly. In addition, it requires a positive culture that encourages knowledge sharing at all levels. Can be assisted best with solutions providing possibility to share documents and applications. |

Knowledge sharing could also be approached from the viewpoint introduced by Nonaka (1994). The means could be divided into means that support tacit knowledge to be transformed to tacit knowledge of another individual or to explicit knowledge available to all. Furthermore, the means should also consider how explicit knowledge can be transferred into explicit and, on the other hand, tacit knowledge. If the means mentioned above were placed in Nonaka's frame, it could be as described in Table 4.

## 3.5 Knowledge Sharing Framework

This section presents the knowledge sharing framework that was developed especially for this study. The framework is based on Lotus Development's 3-C model, which has been expanded for the use of this study.

A widely recognized commercial organization focusing mainly on developing information systems that support the work of groups, Lotus, presented a 3-C model that is used for describing and defining the concept of group work (Lotus Development 1995, 11). The model provides three approaches to group work: it suggests that information and knowledge are being shared in support of communication, collaboration and coordination. In addition, they propose that a complete groupware infrastructure, in addition to supporting these three modes of group work, also creates synergy between them.

Although the 3-C model is presented to promote Lotus's groupware products, there lies a great amount of research on the background; that, and the fact that knowledge sharing is closely related to group work, is why the model is seen as a good basis for developing a more extensive framework for knowledge sharing.
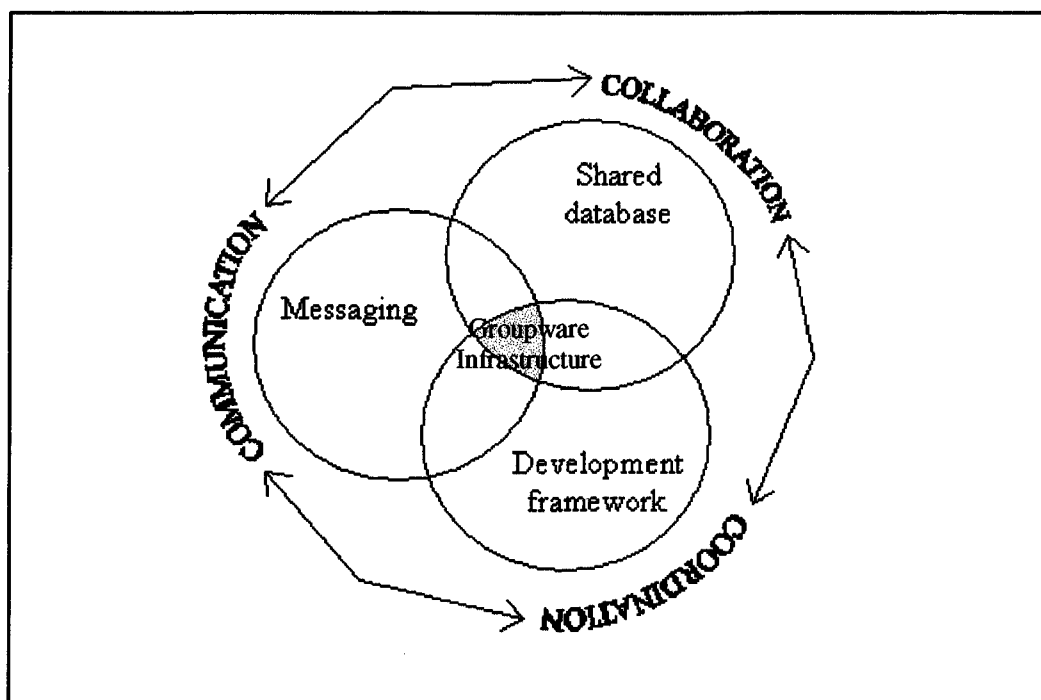


**Figure 7.** The 3-C Model. (Lotus Development 1995, 9)

The 3-C model (see Figure 7) consists of communication, collaboration and coordination. Their areas of application are, although they are distinct, also increasingly

overlapping. Lotus Development (1995, 2) suggests that communication mainly consists of electronic messaging whereas collaboration includes information management and facilitating rich, shared virtual workplaces. Coordination, on its part, is about automating the workflow processes and about adding the structure of business processes to communication and collaboration to better implement the organizations' policies (Lotus Development 1995, 2).

But knowledge is much more than just technologies and a bunch of technological solutions; in fact, technology is only capable of supporting knowledge sharing and knowledge management – it requires a lot of organizational effort before organizations are able to really manage their knowledge. This viewpoint can easily be argued as the thing being shared, knowledge, is practically always embedded in people (e.g. Nonaka 1994; Malhotra 1998; Davenport et al. 1998). People are affected by their surroundings and working environments and knowledge sharing largely depends on how the individuals experience the organizational climate around them.

As the model created by Lotus Development (1995) considers only the technological factors, and as this study aims at finding both technological and organizational means to assist knowledge sharing, the 3-C model was expanded to better suit this study. While the technological solutions include electronic messaging, data and information management and workflow process automation, the organizational expedients include for example organizational and communication cultures and the management and control of the organization.

The idea of this particular research framework, introduced in Table 6, is to provide two viewpoints to knowledge sharing – the technological and the organizational point of view – at the same time as examining the different dimensions of knowledge sharing. This way, the study will have a more precise and suitable framework to rely on. The framework will be used both before and after the case study to support the planning of it and then analyzing the acquired research results. The interviews were designed to cover all the dimensions of the framework. After the interviews, the results were placed in the framework and then analyzed.

**Table 5.** Knowledge Sharing Framework.

| | Technological solutions | Organizational expedients |
|---|---|---|
| Communication | | |
| Collaboration | | |
| Coordination | | |

The framework is quite general and could probably be utilized in later studies focusing on knowledge sharing. The framework provides a great help for example while planning the interview question areas and, in addition, it facilitates analyzing of the results. Even more significantly, the framework could be expanded to study the whole area of knowledge management; after all, it is all about the organizational expedients that are assisted by technological solutions, just like knowledge sharing.

If the framework was used for studying the whole concept of knowledge management, it would probably be reasonable to divide the study so that each part of knowledge management (gathering, organizing, refining and sharing of knowledge) would be examined through the framework individually; otherwise the resulting table will most likely be too large to utilize efficiently.

# 4 CASE STUDY: SONERA LTD

To make this study more tangible and concrete, the theories presented in previous chapters were put into practice by realizing a case study. The purpose was to find out what kind of technological and organizational means assist knowledge sharing and how they can be effectively put into practice; this was carried out by studying an actual organization and recommending technological and organizational improvements that should facilitate knowledge sharing between IS projects.

In Finland in December 1998 the mobile penetration rate was nearly 60% while the rate in EU countries was on average less than 30% (Sonera Group 1999, 45). Finland is the leading country in Europe in mobile communication services and at the top also in information technology and its utilization. As Sonera is Finland's leading mobile communications provider, it makes an interesting research subject irrespective of the fact that the study is not focused on mobile communications. In addition, Sonera creates continuously numerous information systems for internal use that support their businesses and they have almost equally as many IS projects running the whole time. It was also interesting to study an organization who had approximately a year ago appointed Finland's first CKO (Chief Knowledge Officer) and to find out whether there already were knowledge management standards or strategies implemented in the organization.

First, the company used in the case study will be presented. Then, this chapter will describe and legitimize the used research methods. Finally, the chapter will present and analyze the actual research results.

## 4.1 Company Description

The company used in this case study, Sonera Ltd (hereafter: Sonera), is an international, growth-oriented telecommunications company whose strategic areas are mobile, data and media communications. Sonera is the leading mobile communications provider in Finland with a 67% market share of GSM services. It is an innovative provider of advanced data and media communications and has a strong position in domestic fixed network services, such as long-distance and international calls. (Sonera Group 1999, 4)

According to Sonera's annual report, 49% of its revenues in 1998 were acquired from mobile communications and the rest from fixed network and other operations (Sonera Group 1999, 2). Sonera currently employs approximately 9 000 people (Sonera 1999).

Sonera's objective is to further develop its position as the premier provider of mobile, data and media communications services in Finland and to utilize its expertise to break into selected international markets. Sonera is looking for growth from targeted international investments it has made in rapidly growing markets such as in Turkey, Hungary and the United States. Sonera intends to make its operations more efficient through introducing new information systems and recruiting highly educated technical and business professionals. (Sonera Group 1999, 4—5)

Sonera has based its business on five values: respect for the individual, reliability, leadership, customer orientation and performance (Sonera Group 1999). The values and their implementation are important for the organization as it tries to continuously evolve in mobile, data and media communications.

### 4.1.1 Information Management Department

The Sonera Information Management is organizationally located in Sonera Group's central administration[2]. It is responsible for information management policies and coordination as well as for cooperation with vendors and subcontractors. Information Management serves and supports Sonera's business activities and takes part in enforcing Sonera's business strategies. Information Management's goals are to provide world-class information systems that are also cost-effective, and encourage and support business opportunities.

### 4.1.2 Customer Information Systems Unit (CIS)

The Customer Information Systems unit is a small organization inside Sonera's Information Management; it has only approximately 30 employees. In addition to the employees that are on Sonera's payroll, CIS continuously leases programming knowledge from consultants representing several consulting firms. CIS develops and acquires information systems that support Sonera's business activities, their sales and customer relation management processes. They have continuously several information systems development projects going on. On the ground of the mentioned factors (small size, develops information systems in several projects), the unit made a good object as a case organization of this study.

CIS only serves Sonera's business units; it creates the processes and organization for customer information management for the whole of Sonera. CIS's task is to implement information systems, which will manage – or in some cases utilize – customer information. The people who maintain customer information, typically customer service personnel, are the main users of these systems. The information systems of CIS are usually used indirectly; the end user does not know the actual CIS information systems – it has probably never been seen – but has an interface where the information is ushered in from different information systems.

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[2] Sonera's organization structure was radically rebuilt on January 1, 2000. The structure of Information Management and the CIS unit described in this chapter are based on the earlier situation that was current during the case study period.

The CIS organization, as it has been since September 1999, is presented in Appendix 1. It is basically a matrix organization, where responsibilities are divided in both horizontal and vertical dimensions. Before September, the organization was quite clearly a project organization; the organization was founded from Unit Management (which included two persons: the unit manager and his deputy) and six (6) information system projects (see Figure 8). All the projects were of equal value although the figure shows the projects on different levels. The projects reported, and still do, straight to the Unit Management; the actual decisions concerning the projects were made in steering groups that consisted of representatives from all the business units that have committed to the information system and a representative from CIS management.
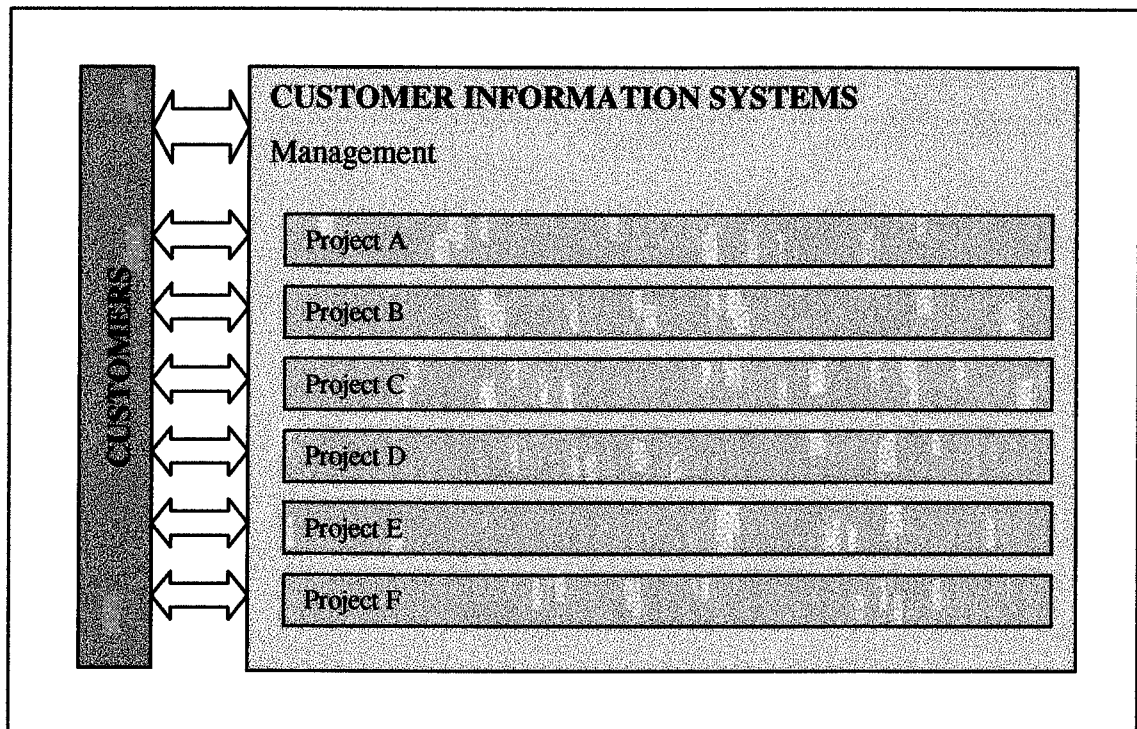


**Figure 8.** CIS Organization until September 1999.

## 4.2 Research Method

As there were no research materials at the ready (e.g. statistics) that could have been utilized in the study, it was decided to gather the materials as a part of the study. The

research was carried out as a cross-sectional study, which suited the research and the solving of its questions better than a follow-up study would have.

The study was carried out in a qualitative way; the objective was to describe the real functions of the research object as comprehensively as possible and to find actual problems based on the theories collected in the literature study and with help of the knowledge sharing framework. To be able to describe the functions of the CIS unit as it is, the researcher interviewed nearly half of its employees and observed the daily functions inside it.

### 4.2.1 Semi-Structured Interviews

As the business unit under observation was relatively small, it was possible to conduct the interviews in a semi-structured fashion (known as semi-structured interviews). This interview type is known for its discussion-like interview settings; the interviewer does not have strict questions or a strict order in which the questions should be asked. The interviewer creates only trend setting questions for every topic area and applies his or her personal knowledge of the particular topic area to each interview situation individually. These kinds of interviews give more profound information about the object than quantitative research methods, but they also require much more time, effort and involvement in the research and its subject field.

**Implementation**

In this particular case study the semi-structured interviews were appropriate because of the small size of the research object, the CIS unit. The interview topics were designed to cover the research question areas as extensively as possible. The topics included background on the interviewees, project work methods and tools, organizational and technological means that assist knowledge sharing in CIS, interviewees' personal experiences and their development ideas to improve knowledge sharing inside the unit (see Appendix 2). Table 6 shows that some of the topic areas meet many knowledge sharing research frame areas. One major reason for this is that the dimensions of the three 'C's (coordination, communication, collaboration) overlap (Lotus Development 1995) and it is extremely difficult – and probably even irrational – to separate these

areas with exclusionary questions. With the help of the interviews, the research questions were expected to be answered thoroughly.

The interviewees were selected randomly from the CIS project managers and project members so that a total of seven (7) project managers and seven (7) project members were interviewed. The interviewees were rather easy to coax into taking part in the study; as all of them worked in the same office as the researcher, they were easy to contact and the interview schedules were easy to settle.

**Table 6.** Interview Topics Aligned in the Knowledge Sharing Framework.

|  | Technological solutions | Organizational expedients |
|---|---|---|
| **Communication** | Technological solutions<br>Experiences<br>Development ideas | Organizational means<br>Experiences<br>Development ideas |
| **Collaboration** | Technological solutions<br>Experiences<br>Development ideas | Project work<br>Organizational means<br>Experiences<br>Development ideas |
| **Coordination** | Technological solutions<br>Experiences<br>Development ideas | Project work<br>Organizational means<br>Experiences<br>Development ideas |

All the persons who were asked to be interviewed were willing to take part in the study. They were all eager to improve knowledge sharing inside CIS and to do so, they were also willing to share their anonymous opinions of the current situation of CIS. [3] The first interview of a project manager was designed to be a pilot interview that allowed the researcher to test the question areas, which then could have been improved for the later interviews. However, as the results obtained from the pilot interview were considered

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[3] All the interviewees were guaranteed total anonymity; their personal opinions and other comments will not be published with any information that could link the comments to their owners.

important and still quite similar compared to the other interview results, and as the question areas were not changed significantly after the pilot, the results from the pilot interview were taken into the analyzing phase as equal to the other interview results.

**Support for the interviews**

Approximately two working days before the interviews, all the interviewees were given a form that they were supposed to fill in before the interview. The form covered question areas like the interviewees' earlier working experience and educational background as well as basic questions about their current tasks. (See Appendix 3) This form was supposed to reduce the time needed for each interview, as it was possible to focus on the actual subject areas instead of basic background information.

### 4.2.2 Observations

Interviews provide the researcher with information of how the persons under observation feel and how they observe their environments. However, the interviews do not provide the research with information of how things really happen. Observations give information whether the persons under observations act as they claim to. (Hirsjärvi, Hurme & Sajavaara 1998, 209)

One of the greatest benefits in using observations as a research method is that it allows the gathering of direct information on the unconscious behavior and functioning of individuals, groups and organizations (Hirsjärvi et al. 1998, 209). It is most useful in rapidly changing environments and in situations that are hard to predict. Observations are also very useful if the observed people have linguistic problems or are unwilling to share the desired information. (Hirsjärvi et al. 1998, 210)

As suggested by Hirsjärvi and Hurme (1991, 50—51), the interviews were completed with the researcher's personal observations about the interviewees during the actual interview situations. To help to make the observations, a support form for the researcher was developed (see Appendix 4). These observations gave the interviewer more information than the interviewee put in words and made it possible to compare simultaneously words and behavior as well as their possible incongruities. At the same time it was possible for the interviewer to keep an appropriate distance from the

interviewee by writing down the observations and in that sense analyzing the interviews was easier.

There are also some restrictions concerning the use of observations as a research method. It is claimed that the researcher doing observations may change the actual process as the persons that are being observed try to act according to the standards and values they think the researcher presents. This factor can be reduced if the researcher is present more than just once or twice; that way the persons under observation can get acquainted with the researcher and, in a way, forget the researcher's presence. This may, however, lead to reduction in objectivity if the researcher commits emotionally to the organization or unit he or she is observing. (Hirsjärvi et al. 1998, 210)

In this case, the observations were quite easy to perform as the researcher got a personal place of work from the office of all the other members of CIS; the observations included observing daily work and its patterns inside the unit. As the researcher was a part of the community, she could easily observe it without affecting the behavior of the other members. Objectivity was maintained by the researcher's continuous awareness of the research objective and made easier by the fact that the researcher had a fixed contract with the unit; she was supposed to be researching the organization for exactly six months. The observations, together with the interviews, were supposed to give a more reliable picture of how things really were done and what should be improved.

### 4.2.3 The Research Process

The preliminary plans for the research were made and the focus area for the study was roughly outlined in January 1999. From January to May 1999 the research was more or less a background process; the researcher put most of her efforts in finishing her studies at the university of Jyväskylä and only searched for articles and other literature on knowledge management (especially knowledge sharing), and focused on narrowing off the research scope. The actual research was started in the beginning of May 1999, and the research frame was outlined during the first weeks. The interviews were conducted between June 14th and July 1st. Most of the interviews lasted a bit over an hour; the quickest interview was completed in 45 minutes while many interviews lasted 90 minutes. The interviews were recorded on tape with the interviewees' permission and

the researcher's guarantee that the tapes would be destroyed after the research project. The interviews were transcribed from the tapes from July 5th to July 9th and analysis of the results began on July 12th. The observations were done during the whole research period from May to October 1999. The researcher observed several weekly project manager meetings and all the monthly and weekly unit meetings, participated in hallway discussions and heard most of the rumors spinning around the unit.

The theoretical part of the research was formulated between May and July 1999 and completed during October 1999. In July the interview results were organized in the research frame and between July and September 1999 the results were analyzed with help of the theories. The completion of the first version this thesis was done between October and November 1999. The final version was completed in the beginning of year 2000 after a small break in the whole writing process. Table 7 presents roughly the progress of the research process in year 1999. The columns refer to months (1=January, 2=February, etc.) and the rows describe the tasks and their realized schedule.

**Table 7.** The Research Process

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Decision of starting the study in May | ■ |  |  |  |  |  |  |  |  |  |  |
| Searching for articles and literature | ■ | ■ | ■ | ■ | ■ | ■ |  |  |  |  |  |
| Starting the actual research and generating the research framework |  |  |  |  | ■ | ■ |  |  |  |  |  |
| Formulating the theoretical part |  |  |  |  | ■ | ■ | ■ | ■ |  |  |  |
| The interviews and their analysis |  |  |  |  |  | ■ | ■ | ■ | ■ |  |  |
| The observations |  |  |  |  | ■ | ■ | ■ | ■ | ■ | ■ |  |
| Completion of the thesis |  |  |  |  |  |  |  |  |  | ■ | ■ |

## 4.3 Research Results and Analysis

The complete case research results are presented and analyzed in the following subsections. The results are divided into two groups: technological and organizational means and they are summarized in the end of this section. The results are enlivened with quotations from the interviews. As the interviews were made in Finnish, the quotations are the researcher's translations of what the interviewees have said; they are not translated word-for-word but to bring out the original idea of the comments as accurately as possible. The quotations are written in italics and marked with double quotation marks in the research results.

### 4.3.1 Technological solutions

As a telecommunications company, Sonera would be presumed to be able to provide its employees with an extensive set of technological tools supporting knowledge sharing inside the company. Still, some of the interviewed employees seemed to think that there were several things that could be improved.

The technological solutions available to the employees of CIS can easily be divided into groups that support communication, collaboration and coordination although some solutions or tools that support collaboration or coordination could also be associated as tools supporting communication. Although they probably do support both coordination, or collaboration, and communication, the tools are presented only in one of the following sections, which are named as communication, collaboration and coordination.

### Communication

CIS provides its employees with both traditional and mobile phones as well as personal e-mail accounts. Telephone and e-mail were, in fact, the tools the interviewees mentioned as the most important ones in communicating both inside and outside CIS. Other technological tools supporting communication, which were mentioned in the interviews, were facsimile and videoconferencing.

Telephones were the tools every interviewee mentioned to be the most important tool for communication, in addition to e-mail. Traditional one-to-one discussions were important, but also telephone conferencing was considered as important a method for communicating short and pre-prepared issues. According to those interviewees, who had participated in telephone conferences, it is not the right media for presenting or creating new ideas. Telephone conferencing is powerful when the meeting is about making a rapid decision, preferably on a minor matter. In addition, the interviewees thought that the issue that is to be discussed, as well as all the factors having an impact on the sought decision, needs to be introduced to the participants prior to the actual telephone contact. If the participants are physically in divergent places, it is possible to save money and human resources if using telephone conferencing; the participants do not have to travel to get to the meeting and this saves money, as there is no trip to be paid for, and it saves human resources, as the participants do not need to make several grueling trips in a week, for example.

Two (2) of the fourteen (14) people interviewed mentioned that mobile phones provide extra value with the text message functions. They were used to communicate informative, short matters. The small number of these opinions probably is caused by the fact that not all use text messages for business purposes but they are mainly used to send brief greetings or other messages to friends; or there might be persons who do not consider brief text messages as a separate communication tool – it is a fixed part or function of mobile phones. Still, the text messages are probably not yet used too widely in business. For example, text messages could be used to confirm participation in a meeting or to state that somebody is late for one.

E-mails were, as would be expected, the technological tools most used in communicating between different interest groups. Ease of use and independence of time and place are, according to this study, the biggest reasons for e-mail's success. E-mail messages can be formulated and considered thoroughly before sending them. One of the interviewees formulated it as follows:

*"It gives you a possibility to think before you press the send-button,*
*which is not possible with phones."*

Many interviewees also said that e-mail and the use of it is so obvious to the employees these days that it is really not discussed. There are no policies for the use of it and nobody has ever asked whether e-mail suits the employees and their work. On the other hand, if there were no alternatives to choose from, the employees would probably be unable to formulate what they need or what kind of communication tool would serve them better.

*"E-mail seems to be a certainty to everyone – nobody has opinion about it."*

Yet, there are a few problems facing e-mail that are common to most of the organizations, not just CIS. First of all, as it is as easy to send a message to one person as it is to send it to a dozen or hundred people, the distribution lists of e-mails can be a burden. The mail servers of organizations get overloaded and the persons, who have such a position in the organization where they end up in numerous distribution lists, have difficulties in spotting the important and urgent messages as their e-mail boxes are filled with so many varying types of them. Most of the interviewed project managers estimated they use ten (10) or more hours a week (over two (2) hours a day) reading and writing e-mails. Project members estimated they use no more than 1.5 hours a day for e-mail; still, it makes one whole working day in a week for e-mail.

The distribution lists are often used to discuss matters that concern only a fraction of the members on the list. The use of wide distribution lists – and especially replying to one – should be considered extremely thoroughly before sending e-mail. The unnecessary use of wide distribution lists makes many users of e-mail to think that *"a lot of junk travels in the e-mail"*, although one major cause for those kinds of opinions are the bulk e-mails that are sent by several commercial institutions and organizations on the Internet. These institutions either collect e-mail addresses from their own websites or they buy lists of e-mail addresses from some commercial organization.

Another common problem of e-mail is the attachments. Often they are too big and there are too many of them. Especially when sending a message inside an organization, attachments are usually unnecessary and could be replaced with sole information of where, in the organization's network, the documents could be found. In addition, some

of the interviewees pleaded for more descriptive subject headings for e-mail messages as well as more consideration of what kind of messages should be transferred through e-mail and what should be transferred personally in one-to-one discussions. More descriptive message subjects would help the receiver to determine some order of importance for the messages, as the receiver would, by the subject, be able to guess what the message concerns. There were a few interviewees who especially mentioned that negative messages should be transferred through one-to-one (preferably face-to-face) discussions to avoid misunderstandings and futile embittering.

In addition to telephones and e-mail, the interviewees mentioned the fax machine as quite an important tool for communication. However, it is mostly replaced by e-mail messages and attachments; usually only documents that the sender does not have in digital format are sent by fax.

All the above-mentioned tools (telephone, e-mail, facsimile) serve CIS rather well as communication tools. The interviewees mentioned videoconferencing as a communication tool that was not used as efficiently as could be possible. Videoconferencing is, according to the interviews, used occasionally in some of the CIS projects. The interviewees perceived that videoconferencing would be a rather good medium for many-to-many communications if the participants were familiar with each other.

Another technological solution supporting communication in CIS rather poorly is Sonera's intranet that is called Sonet. There lies a wide variety of information, although rather little knowledge. Sonet has basic information about the company, its divisions and units as well as information about coming events, open vacancies and many other subjects all concerning Sonera's employees in one way or another. The problem with the intranet is that the amount of information is so enormous that it is quite difficult to find the needed information if it does not clearly affiliate to any of the main topics linked to the main page of Sonet. Efficient use of Sonet requires time and inventiveness, which might be hard to find in an urgent or otherwise demanding situation.

> *"There is too much information in the intranet."*
> *"It's impossible to find the needed information there!"*

**Technological tools supporting/affecting communication**

- Most important tools for one-to-one communications are telephones and e-mail.
- Facsimile is used every now and then.
- Videoconferencing and telephone conferencing are occasionally used for one-to-many and many-to-many communications.
- Corporation's intranet (Sonet) includes a lot of general information and possibilities for internal information sharing but it is considered too multi-leveled to be able to use it smoothly.

## Collaboration

Technological tools used in CIS that support collaboration are, in short, a shared network drive, Saros Document Manager software, the information systems database and MS NetMeeting software.

CIS's documents are managed with two divergent tools: Saros Document Manager and a shared network drive. Saros Document Manager is software that, basically, provides its users with the possibility of saving and retrieving documents. The software is based in the network so that it can be used anytime anywhere. Yet, there are some problems with the software. The interviewees claimed that it has a difficult, old-fashioned user interface, which can be easily explained by its age – the 16-bit software is totally outdated. Additionally, the software's availability is rather poor; many interviewees said that it is difficult to establish a connection to the database where the actual documents are located. If the connection is established, the software often makes the client computer stumble or crash. In addition, as getting the user's ID for this software usually takes more than two months and its search options are rather weak, the users are quite unsatisfied with the software and the use of it is exiguous.

*"I wouldn't say it's difficult but it isn't practical either."*
*"I haven't heard anyone praise it."*
*"Does anybody use it?"*
*"It's so slow and awkward to use."*

*"We gave it up!"*

*"Many times it's impossible to get connected with it or if you do, it jams your whole computer."*

As Saros does not benefit the organization as document management software, there is a project evaluating other document management software. They were, during the study, focusing on Documentum that is mainly a document management platform that does not determine the document formats. One big advantage with this software is that, for example, traditional contracts written with pen and paper can be scanned into a common database.

The other document manager in CIS, the shared network drive, was considered a good solution. The network drive is available to all who need it whenever needed, it is easy to use and authentication can be managed by the unit itself. These are important factors for an organization when selecting a tool for managing documents; nobody wants to spend any extra time or effort on saving the files on computer or finding them there. The network drive's weaknesses, however, are poor search possibilities and the fact, that while all the files and folders are organized and named by projects themselves, each project can build its own file tree structure and name its files as it pleases. The poor search options make it hard to find the needed information or a specific file and the problem only increases as the amount of files increases daily. For example, one CIS project had nearly 12 000 files in their shared network drive folder in June 1999; the number of folders was nearly 2 000 and there was 2.7 gigabytes of data in these folders altogether. As the amount of files is still increasing daily, it is easy to understand that these files would need more flexible and versatile document management software. There is also a need for a unit-wide standard for naming the files – it would help to find a specific file although it does not solve all the problems facing shared network drive as a document manager. When trying to find a certain type of knowledge, a shared network drive is not the best solution – it takes far too much time and effort. Still, it is the main document management solution in CIS at the moment.

In addition, Sonera has a database where all its information systems (IS) are described in one or more documents. These documents include hardware and software descriptions in addition to the system description that introduces the whole system and

its functions generally. The database should be updated by the IS responsible; there should be information about all the currently used and soon to be used information systems. By the time of the interviews, the IS database was being updated by Sonera corporation as it had turned out that the database was outdated. On account of this, the database was not used as planned, as it did not offer any extra value to projects setting up interfaces between different information systems.

MS NetMeeting is software that provides its users with a common interface for chat, video connection, and application and document sharing, for example. The problem with this software is that it is based on rather new technology and it requires an open mind, positive attitude and a lot of practice from the employees to be able to take the best out of it; at the time of the interviews not many of the CIS employees had even familiarized themselves with it. The threshold for starting to use new tools and technologies is not diminished if the tools are not easy to use; the interviewees reported several technical problems especially with establishing videoconference connections.

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**Technological tools supporting/affecting collaboration**

- Documents are in practice managed and shared by a shared network drive although the corporation expects the document management to be done with Saros Document Manager software.
- IS database was not up-to-date by the time of the interviews and it was not utilized.
- MS NetMeeting is software that could serve CIS well as a communication and collaboration tool but it requires a lot of practice.

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**Coordination**

There are two main technological solutions in CIS used for coordination: Result Management Suite (RMS) and network calendar. RMS is updated by project managers and controlled by unit management; project members do not have access to this software. All Sonera employees have their own network calendars for managing their working days.

RMS is software that supports scheduling and planning projects and their resources as well as tracking the use of them. The software helps the project managers in making project plans but its functions are not utilized nearly as efficiently as one could expect. RMS is used with varying levels of precision – for example some project managers divide their projects into four tasks while other use four hundred smaller tasks to describe their projects and to divide their resources. This makes it more difficult for unit management to compare the projects as it makes it more difficult for project managers to learn from other projects how to build these resource reports.

Some of the project managers claimed that RMS had severe problems or it did not suit their purposes in information systems development while some presumed that nobody in CIS actually knows how to use it efficiently.

*"I think we just don't know yet how to use it. It can't be THAT incompetent piece of a software, it just can't!"*
*"We don't have anybody who would really know how to use it."*
*"There must be software that would be easier to use."*

As the software is difficult to use and there is no help available at the moment it is needed, the use of RMS takes extra time and effort. Some project managers see this as a costly waste of time and it causes frustration, which on its part, inevitably leads to varying levels of precision and other differences in the use of the software. If the unit finds RMS an important tool for tracking the use of project resources, it has to take a clear stand on this issue and then make sure that all the project managers follow the decision. At the moment, most of the project managers monitor the resources with Microsoft Excel as well – they find it to be more suitable and flexible for their needs.

Another tool that supports coordination is the network calendar, which allows making reservations on other people's calendars without directly contacting the person whose calendar it is. This opportunity makes it easier to reserve time for meetings as the one making the reservations can check other people's calendars and try to find the most suitable time for all.

> **Technological tools supporting/affecting coordination**
> – The project managers use Result Management Suite (RMS) as it helps to create project plans but no one in CIS actually knows how to really utilize it.
> – Network calendar provides the employees with a possibility to easily make reservations for different meetings and to invite persons to them.

## 4.3.2 Organizational means

Organizational means are not as easy to divide into groups of communication, collaboration and coordination as technological solutions; the differences between the entities inside the area of organizational means are not all that obvious. The three C's (communication, collaboration, coordination) strongly overlap especially at the organizational dimension.

### Communication

The communicative processes that an organization supports or is expected to support in CIS are communication culture, established meeting practices, hallway discussions and certain meetings focusing merely on sharing information and knowledge.

One of the reasons CIS wanted a person to do research on knowledge sharing inside the unit was that they thought the current status of their knowledge sharing and especially inter-project communication was not as efficient as one could expect from a small organization. According to both the interviews and observations, communication culture seemed to be one of the greatest causes for communicational problems in CIS; it is difficult to share knowledge if the organization does not have an open and supportive communication culture. A couple of the interviewees even said it feels like nobody in CIS sees anything else but the negative sides of things. This might be a result of the uncommunicative culture; people feel like their opinions do not count and only those matters they find personally significant, for example things that negatively affect their daily work or the working environment, are communicated and shared.

The communication in CIS is mainly based on personal activity and enthusiasm to find and acquire the needed knowledge and information. Knowledge sharing is not yet a firm part of it; knowledge sharing is not an internalized and commonly accepted way of contributing to the work community.

> *"If you ask, you get an answer but if you don't realize to ask, you know absolutely nothing."*
>
> *"You have to be active and dig up the things you need to know."*

In addition to realizing to ask, one has to know who to ask and realize to ask it early enough to avoid redundant work. There are people who find this method suitable for themselves and others who remain unaware of ongoing matters as they are not given the information. This difference might be somehow dependent on a person's educational background, at least if talking about rather young people that have had greater possibilities to educate themselves. Highly educated people are often more eager to find new information and receive knowledge than those who are not interested in educating themselves.

Communication of different problems facing the projects has, according to the study, been quite dependent on personal relations inside the unit and information is many times received from external sources, usually from friends that may work either in other business units of Sonera or in entirely different organizations. This fact increases the employees' feeling that information is being covered up in CIS, as it probably in some cases is; if information and knowledge were freely shared, nobody would receive news from a third party.

Another problem in communication inside CIS was the established meeting practices; nearly all the interviewees reported that they had experienced several ineffective meetings where expensive people are brought together without any clear agenda or preparations. It seemed that all the interviewees resisted meetings that do not have a clear structure and objectives to work for; they did not deny the role of meetings as an efficient medium of communication.

*"There have been meetings held with twelve high-priced persons where*
*nobody has prepared anything – people just sit and marvel. Those are*
*especially frustrating occasions."*

*"In many meetings the participants keep going on and on about the*
*same issue and when the time is up, nothing has been accomplished."*

According to the study, project managers spend at least half of their working time in different meetings. As time is a limited and costly resource, project managers appreciate effective meetings that focus on their mission and are productive. Five of the interviewed seven project managers found themselves over-employed; they wished for a "stooge" or a "right hand" that could participate in even some of the meetings. Even some of the project members had noted that the project managers have far too many things to do and too many meetings to attend; there were a couple of project members that were willing to take a little more responsibility in their projects to ease the project managers' workload.

Many interviewed persons desired clear agendas for meetings; there were persons who thought meetings are not needed if an agenda cannot be made. An agenda certainly gives a structure for a meeting and helps the participants to prepare themselves for it. An agenda should also show what kinds of decisions have to be made during that meeting; possibly that kind of information also assists the participants to invite persons who have the power to make those decisions to the meeting. In the meetings, clear decisions should be made and the persons responsible for the execution named. If these decisions and the persons in charge were written in a memo, the responsibilities and their execution could easily be controlled.

*"Meetings should be rationalized. Now we have meetings just for the*
*meetings."*

*"There usually is nobody who writes down the decisions made."*

*"There are no decisions made in the meetings."*

Almost all project members said they would like to be able to meet the unit management more often. Before August 1999 they met with the unit management only once a month or even less frequently. Since August 16th there have been weekly

Monday morning meetings for the unit, which have proved to be very popular and important as an information-sharing medium; good bait might be that breakfast is served to all participants. The meetings are informal and the idea is to share experiences of the past week and inform other projects about the following week's tasks. The researcher has participated in all but one of these Monday meetings and the unit manager has managed them all. Although the meeting serves the unit well as an information channel, the meeting could be even more communicative and creative if the unit manager would not control it by giving turns to speak and by lurching from one issue to another. The unit manager certainly has a right to begin the meeting with his own comments and affairs but then, the turn could for example go round the table; everybody would get an opportunity to say a few words about the current tasks and possible problems or achievements in them.

The larger matters that cannot be discussed in the short Monday meetings justify the monthly meetings of CIS. During the six-month research period, there were four three-hour unit meetings that discussed various issues from budget to knowledge sharing. The researcher found these meetings a mediocre communication channel, which should be utilized efficiently for the benefit of the whole unit.

Coffee room and hallway discussions should, in this kind of a small unit, be the most important means for knowledge and informal information sharing. The interviewees all considered these informal discussion channels very important but noted that usually the project managers do not have the time to sit in the coffee room, even for ten minutes a day. According to the observations, the informal discussions concerned more personal matters than work related issues. On the other hand, the interviews also demonstrated that small problems are often solved by going to discuss them with another project manager. This has probably a lot to do with the small size of the unit – it is easier to go discuss problems with a person you know than with a total stranger.

The interviews and the observations proved that the employees are quite willing to share knowledge and they understand the importance of it; all the interviewees thought the unit members should be able to meet more regularly in coffee room or otherwise unofficially. Some of the interviewees noted that many problems and the reinventing of

the wheel would have been avoidable if people would have discussed more with each other.

*"If everybody just fusses independently, many things will be done several times."*

*"People assume far too much."*

*"We would have avoided many problems if people had discussed with each other."*

Although all the interviewees seemed to understand the importance of sharing knowledge nobody really realized the change would have to start from individuals themselves. Of course, commitment and guidelines from the management are needed, but equally important is individuals' willingness to change and learn new ways of working.

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**Organizational means supporting/affecting communication**

- In a small organization like CIS, hallway and coffee room discussions – including rumors – are the most efficient and most used ways of organizational communication.

- Communication culture is mainly based on personal activity on finding the needed knowledge.

- Information of problems is often held back although sharing the 'lessons learned' would be very valuable for the organization.

- Established meeting practices seemed and were reported (by the interviewees) inefficient.

- Monday meetings (since August 1999) have proved to be important and popular medium for information sharing.

- The importance of knowledge sharing is understood but it has not yet been put into practice.

## Collaboration

The CIS organization is flat and there are a small number of employees, which both support collaboration and informal knowledge sharing; everybody knows each other and it is always easier to collaborate with people whose ways of working and thinking are familiar. Besides, there are no formal discussion channels that should be followed but anyone can directly go to discuss with the unit manager – even without an appointment, if the manager is available. Another positive thing for collaboration is that the employees are all rather young (the average age in CIS is 33,9 years) as in many other organizations that compete in rapidly changing areas of information technology.

The organization structure in CIS (a pure project organization at the time of the interviews), however, did not support communication adequately; all the resources were committed to a certain project and were not available to others. This was not a good solution from knowledge sharing point of view, as the employees and their expertise were not available for those who need it. In September 1999 the organization structure was officially changed to a matrix organization to better support internal knowledge sharing. The new structure has potential but it has not yet completely been put into operation; as there are a limited number of employees in CIS and they all were already closely tied to a certain ongoing project and recruiting new educated and competent employees is very difficult, the new tasks were left without sufficient contribution.

To facilitate knowledge sharing between contemporary IS projects in CIS the unit management had suggested that each project manager should visit other projects' weekly project meetings. This suggestion would not lead to extensive knowledge sharing largely because the project managers would not have time to do anything else but sit in different project meetings. As the weekly project meetings mainly consider current detailed affairs of the project in question, it is probably not even rational for another project manager to participate in such a meeting if he cannot contribute to it.

Some of the interviewees claimed that there were people in CIS who obviously have difficulties in outlining the entity formed by the projects and information systems of CIS. This problem is, according to the study, based on people's attitudes – if somebody is not willing of receiving information, it is impossible to force into one.

*"People don't see the unity or at least don't put much weight on it."*

*"People should see that everything affects everything inside this unit."*

*"We should see that we are not making these systems for ourselves but to the client, which is our business."*

Some of the project managers pleaded that every project manager should realize that other projects need information and knowledge from them. An important reason for this inter-project knowledge sharing is, or should be, that all the CIS projects affect each other – if not directly, then indirectly. In a small organization such as CIS it is a fair claim that all project managers would approximately be aware of what the other CIS projects are working with at the moment and what their goals are. As CIS is a non-commercial unit serving only Sonera's business units, it needs to prove its position and capabilities to the business units and one big step in this would be knowing what is going on in the unit.

*"Business units see us as fools if we are unaware of our own projects and their status."*

*"This is sales! We have to legitimize our actions as we don't make any money, we just spend it."*

Some of the interviewees felt that information and knowledge is being held back from them, even inside CIS, and that it felt like there were still persons who think knowledge is power. This does definitely not encourage people to share their knowledge and expertise but it creates a tense, competitive atmosphere. In the information society, knowledge as such does not give power or status to a person but sharing it does. People would also need to be reminded that 'no information' is also information that should be shared.

Project documentation was not, during the study, utilized efficiently enough. All the projects generate several documents but they are seldom referred later or utilized in other projects. The problem was most obvious with weekly project reports the project managers write for the project manager meetings; they were claimed to be far too trivial as they provide only a brief summary of the current status with no reflection to previous week's report.

*"Nobody refers to the documentation afterwards."*

*"They* [the documents] *don't really tell anything."*

*"Well, once I read one of our own weekly reports."*

The interviewees said they are not even willing to share documents that deal with technical or otherwise subject specific issues with other CIS projects, as the subject areas are totally divergent. More useful documents would be those discussing best practices and lessons learned.

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**Organizational means supporting/affecting collaboration**

- Flat structure and small size of the organization facilitates collaboration inside it.

- The mission and vision of CIS as well as the entity formed by the CIS projects are unclear to many employees.

- Existing project documentation is utilized poorly. On the other hand, technical specifications are not always useful in other projects in contrast to 'lessons learned' kind of documents.

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## Coordination

CIS projects are coordinated with weekly project manager meetings. The unit management tracks the schedules and budgets, and the project managers hear the status of other CIS projects. Majority of the interviewed project managers considered these meetings a very good source of information. The meetings facilitate knowing the state and situation of the other CIS projects, which is rather vital for intra-CIS collaboration. Instead, some of the project managers claimed that there is not enough time to go through all the aspects of the presented issues. A few project managers also claimed that the meeting's value was diminished by dishonesty; some of the project managers seemed, according to the interviews, to embellish or hold back information especially if it concerned problems with their projects. This withholding of the information is often rather obvious.

*"It many times feels like the negative matters are embellished."*

*"People would always like to brazen the image of their own projects."*

In addition, some of the project managers complained that there were no common project work instructions. On the other hand, it creates flexibility as each project can be managed as the project manager sees suitable but then again, there are no guidelines to lean to. There were interviewees who would have appreciated backbone-like instructions; for example some of the project members would have wanted to be aware of the process and its phases in advance to be able to predict what is going to happen next; some project managers wished for common procedures that all projects should follow.

*"On the paper we have a lot of various kinds of models but, as I see it, everybody manages their projects as they please."*

*"We have various models on how to work — we've had them for ages — but whether people use them... that's a totally different issue."*

*"This is my way of working. We all have our own ways of working, there's no project culture in this organization."*

The project focus of the CIS organization has been in performance, which has, according to the interviewed project managers, brought about competition at least between some of the projects. The projects have been competing of financial and human resources and this atmosphere has not yet totally disappeared.

*"Project managers are, at least at some level, in a competitive position between each other. There is this atmosphere like 'I can do this better than him...'."*

Out of curiosity, all the project managers were asked to prioritize which one is more important: to keep up with the budget or the schedule. Five (5) of the interviewed seven (7) project managers prioritized budget and only one (1) the schedule. One (1) project manager was unable to put them in order of importance; it was claimed that both budget and schedule have to be kept up with.

As there are not that many IS projects that really keep up with their budget, schedule and their goals, the first question was followed by another: what is being compromised

if both budget and schedule would have to be kept to the plans. The opinions were totally diverged: two (2) of the project managers said that the quality and the functions of the systems would be cut down while other two (2) assured that the quality of the systems will not be affected and that they would rather prolong the schedule. Three (3) project managers, which is nearly half of the interviewed project managers, had no opinion to this latter question.

As the focus has been on projects' performance, there has been no organizational support for open, inter-project communication and sharing of knowledge. Partly to improve the knowledge sharing inside the unit, a new organization structure was established on September 1$^{st}$ 1999. It is basically a matrix organization where there are head designers for a few main functions. As discussed earlier, the implementation of the organization structure has not been carried out yet.

The change in the CIS organization structure was not unpredictable or extremely hard to legitimize; project organizations many times evolve to matrix form as they have common resources to share (Pelin 1990, 90). Matrix organization provides possibilities of emphasizing the professional expertise; instead of knowing a little of everything, there are employees who know practically everything of a smaller sector. It also gives possibility to share the workloads as experts can smoothly be transferred from one project to another, and it ensures some stability as the supervisors stay the same even though projects change. The organization structure is likely to reduce overlapping development work and thus, reduce also costs. It also facilitates inter-project knowledge sharing as the knowledge acquired in an area of expertise is shared to the projects where the experts are currently located.

Yet, matrix organization has some problems. For example, projects may easily end up fighting about the resources and their rights to use them, as the resources are not committed to one project but available to all. These problems can be minimized if the time and other resource planning are done realistic and truthfully. (Pelin 1990, 91) This organization structure requires, however, little more employees than CIS had at the moment of the research. Pelin (1990, 91) suggests that the matrix organization structure is appropriate when the organization has more than one hundred (100) employees and over ten projects. Presumably, the matrix organization structure will suit CIS even

though they do not have the hundred employees but currently they have too few employees to be able to utilize all the benefits of this kind of organization structure.

There lies a possible gap in the decision making process; many of the interviewed project members felt the decisions were made in rather mysterious ways. They claimed that nobody legitimized the decisions nor discussed them with the unit members before the actual making of the decision. This might stem from the fact, that the unit manager has remained rather distant for the CIS employees; his sometimes inappropriate and even bizarre comments make people stay on their toes and on guard. Even if this was just a feeling some of the employees have, it is still a problem that has to be taken seriously. In a situation like this, the employees feel they are not trusted and that their opinions do not count; this does definitely not support or encourage sharing of knowledge.

Many project managers claimed they had a lack of time – they did not have enough time to do everything they were supposed to do. The researcher got a feeling that the lack of time was used as an excuse without any further consideration whether that really was the problem. There was one person, a project manager, who pertinently pointed out that the problem had more to do with prioritization than anything else; what things are seen as essential or important and what can be postponed or even cancelled.

> "We are all too busy."
> "The problem is that we don't have time."
> "The problem really isn't a lack of time – it is the use of time, the appropriate use of it."

There were quite many project members who said that the project managers spent most of their time in different meetings being unavailable to the project members. Approximately half of the interviewed project members thought that they would have wanted to be able to see and talk to the project managers, as well as the unit management, more.

*"Do they all* [project managers and unit management] *always have to barge into all the same meetings?! Couldn't the information be shared otherwise, like through memos?"*

Another issue concerning coordination that came up in some of the interviews was the familiarization of the new employees. At the time of the study it was arranged rather poorly although Sonera provides the units with a corporate-wide instructions for familiarization; new employees were forced to find the information and knowledge they needed practically by themselves. This method has its benefits but it does not suit all people and it may, in worst cases, lead into cancellation of the new employment contracts either by CIS's or the employee's initiative. CIS might want to take the initiative if the new employee does not internalize the organization's procedures during his or her probationary period; the new employees, on the other hand, might lose their motivation for the work if they feel they are outsiders in the organization.

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**Organizational means supporting/affecting coordination**

- Weekly project manager meetings are important information channels for project managers.
- There are no common project work instructions or guidelines.
- The focus of CIS projects has long been in performance and, despite the recent change in organization structure, it still is.
- Project managers thought keeping the budget is more important than keeping up to the schedule.
- Decision making process is seen as unobvious.
- A better familiarization for new employees is needed.

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### 4.3.3 Summary

In a small organization like CIS, all the employees know each other and their working methods, even at some level, which makes the communications and collaboration a lot easier as well as it facilitates coordinating the work. Majority of the interviewees said that they had enough technological tools for knowledge sharing; they felt that the problems they had had with their internal knowledge sharing would be a result of different organizational factors, mainly human factors.

*"The problems concerning knowledge sharing between projects inside CIS are not caused by tools or by a lack of them but by people's attitudes."*

These comments lead to the communication culture of CIS, which has not, according to the study, been very open or supportive. As the organization's communication culture does not encourage its employees to continuous communication and knowledge sharing but requires a lot of personal activity and eagerness to find knowledge, there are people who do not know what information or knowledge would be needed in other projects and, on the other hand, they do not know what kind of knowledge would be available for them. In this kind of an organization the human relations and their influence get easily emphasized as the employees rather discuss only with their friends if not obligated to communicate with others by the work. Another factor weakening the communication culture was the organization structure, which until September 1999 was a project organization whose focus was merely in performance. The resources were all committed to a specific project, which restricted knowledge sharing inside the unit but also gave the employees a feeling of stability – at least for a while as projects are all temporary.

Some of the knowledge sharing problems inside CIS may be caused by the fact that not all employees of CIS feel comfortable with the unit manager; it seemed that despite of the small size of the unit the manager had remained rather distant to the employees. This may also be a part of the reason why some of the employees think decisions about the unit are made in mysterious ways.

A compact summary of the research results is presented in Table 8 on next page. The results are first divided into technological and organizational means that support communication, collaboration and coordination and then each of these areas is divided into two groups depending on whether the means assist knowledge sharing in a good or a bad way.

The most powerful factor affecting inter-project knowledge sharing inside CIS was, according to the interviews, the communication culture; many of the other factors

brought up by the interviewees were connected to it in one way or another. For example, established meeting practices are strongly affected by the ruling communication culture. Another generally mentioned problem affecting knowledge sharing, lack of time, is not mentioned in the summary table as the researcher viewed it as a result of and not a reason for communication problems. As brought up by an interviewee, it is mostly about prioritizing, which reflects the culture of the organization; what kind of things are seen as essential and what are less important.

The organization structure had brought up some competition between CIS projects, which on its part created difficulties in communicating and sharing knowledge between projects.

**Table 8.** Summary of the Case Study Results.

| | | TECHNOLOGICAL SOLUTIONS | ORGANIZATIONAL MEANS |
|---|---|---|---|
| **COMMU-NICATION** | Serves good or mediocre. | · Telephone discussions and conferencing<br>· E-mail | · Monday meetings<br>· Hallway discussions<br>· Monthly unit meetings |
| | Serves poorly or does not serve. | · Videoconferencing<br>· Intranet | · Communication culture<br>· Established meetings practice |
| **COLLABO-RATION** | Serves good or mediocre. | · Shared network drive | · Small organization; everybody knows each other |
| | Serves poorly or does not serve. | · Saros / Documentum<br>· IS Database<br>· MS NetMeeting | · Project organization; resources are committed to a specific project<br>· Project documentation and its utilization |
| **COORDI-NATION** | Serves good or mediocre. | · Network calendar | · Weekly project manager meetings |
| | Serves poorly or does not serve. | · Result Management Suite (RMS) | · Project work models and instructions<br>· Decision making process (unobvious)<br>· Project organization; focus in performance |

The most important technological tools supporting knowledge sharing were telephones, e-mail and the shared network drive. All the interviewees used them regularly in communicating and sharing knowledge inside the unit. Unlike the organizational factors, technological tools were not seen as factors that could weaken knowledge sharing between projects; there were only tools that did not support it as efficiently as possible or needed.

According to the case study, one of the most significant problems caused by poor knowledge sharing between CIS projects was the employees' exiguous knowledge about the contemporary projects running in CIS. The significance of this problem is increased in this particular case because the unit is not commercial; CIS is a unit developing customer information systems for Sonera's business units to help them manage their customer information and, because it is an internal support organization, it cannot make money at the expense of its customers.

# 5 CONCLUSIONS AND FURTHER RESEARCH

This study had two research questions to confront: *"By which technological and organizational means can knowledge sharing between contemporary information systems development projects be assisted?"* and *"How can these means effectively be utilized?"*. The previous chapters focused in finding answers for those questions – the answers will be presented compactly in the following sections. Section 5.2 compares the case study results with earlier research done in the research area while section 5.3 focuses on analyzing the reliability of the research and its results. Possibilities to utilize the research results more widely will be discussed in section 5.4. In section 5.5 further research focus areas are suggested.

## 5.1 Conclusions from the Research

This section draws conclusions from the case and literature study and suggests things the CIS unit could do to facilitate its knowledge sharing between contemporary IS development projects.

As many other organizations, also Sonera has taken the first steps to better utilize the knowledge of its employees. In the beginning of 1999 Sonera had employed Finland's first CKO whose mission was to establish a knowledge management program inside the whole organization.[4] In addition, CIS provided all its employees with personal e-mail addresses, mobile and fixed telephones, and personal computers with Internet and intranet connections and several tools facilitating storing and sharing of information and potentially also sharing of knowledge. However, there were no signs of systematic knowledge management in the CIS unit during the case study period although supporting this study shows that there was interest towards the area.

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[4] The role of a CKO was discussed more detailed in chapter 2.1.4

According to the interviews knowledge sharing was considered as an essential function in CIS to be able to execute the IS development projects in a best possible way but still the researcher observed some old-fashioned attitudes and approaches to the basic ideas of knowledge management and knowledge sharing. The importance of knowledge sharing was seen mainly in avoiding redundant work, which is important, too. But knowledge sharing also facilitates the employees to think differently and to combine their knowledge to create something new (Ståhle & Grönroos 1999); in the best case the result will be an innovation that gives the organization competitive advantage in the ever-evolving markets.

As CIS develops several information systems contemporarily and the systems are many times dependent on each other, continuous inter-project knowledge and information sharing is definitely needed. Davenport, De Long and Beers (1998, 50) proposed – based on their own case studies – that successful knowledge management requires for example
- senior management support,
- multiple channels for knowledge sharing and transfer,
- knowledge-friendly culture, and
- clear purpose and language.

When aligning CIS with these factors we can see that there were some rather big insufficiencies hindering the success of the utilization of its knowledge. Senior management support was available at the corporate level but at the unit level it was not at all that obvious. Without management commitment to knowledge sharing the employees do not risk their position in the organization by prioritizing knowledge sharing above the productive work. Unit management has also the power to direct the employees to participate in knowledge sharing. For example, they can reward the employees who have actively shared their knowledge and expertise and thus facilitated the creation of new knowledge.

If the management support was not that obvious, multiple channels for knowledge sharing and transfer clearly exist in CIS. All employees of CIS have both mobile and

fixed telephones, personal e-mail addresses, and also network calendars to support coordination of collaboration. They all have also access to shared network drive where they can store and share project files with other project members. The problem with the shared network drive was that not everybody in the unit had access to the project folders in it. CIS unit also has a possibility to use videoconferencing tools, document management software and different databases through intranet or Lotus Notes software. However, these last-mentioned tools are not used as widely and powerfully as they could. They potentially facilitate storing and sharing of knowledge to a great extent and should thus be used more efficiently.

The culture in the studied organization was not very knowledge-friendly. Attitudes like 'I mind my own business' do not encourage nor support sharing of knowledge. The excuses complaining the lack of time to be the reason for poor knowledge sharing are not valid either – it is a matter of prioritizing the tasks that need to be completed. If the communication culture in an organization encouraged knowledge sharing and valued it as the most important thing, the employees would find the time for it. This would, on the other hand, require management commitment to knowledge management and knowledge sharing. Knowledge sharing does not even necessarily require more time while it potentially eliminates redundant work. According to the study, documents containing best practices were not done because they require extra effort, which is once again a matter of prioritizing and the culture.

The repulsion the CIS employees seemed to have against knowledge sharing was probably mainly based on the fact that most the employees seemed to have too large workloads. They were most likely just trying to avoid any extra work but when considered thoroughly, it seems that if they had actively shared their knowledge, they would have had somebody to do even part of their jobs. During the case study period the CIS unit started to have weekly meetings to share current issues which — although it was not really sharing of knowledge but information — was a good sign that the management wanted to have an open, communicative atmosphere and culture in the unit.

Last one of the mentioned success factors of knowledge management was clear purpose and language, which were absent from the whole of Sonera during the case study

period. This was potentially caused by the fact that the whole concept of knowledge management was still under development in Sonera while the empirical part of this study was done. To be able to successfully manage knowledge the organization has to share its goals and means concerning its knowledge management the same way it should share its more general values and goals; this way the employees have the tools they need to be able to act according to management's wishes.

**Table 9.** Improving Knowledge Sharing in CIS.

| | TECHNOLOGICAL SOLUTIONS | ORGANIZATIONAL MEANS |
|---|---|---|
| **Comm.** | - e-mail and telephones<br>- telephone and video conferencing<br>- organizational networks (LAN, WAN, intranet, extranet)<br>- FAQ of information systems | - open communication culture<br>- negotiation skills<br>- established meeting practices<br>- open and direct feedback constructively<br>- negative rumors should be eliminated a.s.a.p. → sharing of success stories<br>- publish those who receive extra bonus; share also arguments<br>- obvious decision making process (share arguments when possible) |
| **Collab.** | - document management software and standards<br>- application sharing software<br>- organizational networks (LAN, WAN, intranet, extranet)<br>- standardized file names and structures for file trees<br>- descriptions of all information systems and their interdependencies | - supportive atmosphere<br>- negotiation and collaboration skills<br>- lessons learned and best practices type of documents<br>- project files and final reports<br>- make everybody understand mission and vision of the organization |
| **Coord.** | - tools for monitoring projects and employees (e.g. resource management software, network calendar)<br>- training and instruction for the use of the tools required<br>- project time tables on view to all unit members (software / whiteboard / etc.) | - organization structure<br>- regular project manager meetings<br>- project work instructions<br>- materials and standards for familiarization of new employees<br>- reward knowledge sharing and open communication |

Table 9 presents technological solutions and organizational means that assist knowledge sharing between contemporary IS projects; it summarizes the research results that were

obtained by the literature and case studies. Utilizing the table potentially facilitates the improving of knowledge sharing in organizations developing several information systems contemporarily, such as CIS. Those means that were not already discussed earlier in this chapter are confronted here.

## Communication

To support communication in the organization, the unit management should strive for establishing more open communication culture. This could be obtained for example by teaching the employees negotiation skills and by creating efficient meeting practices that facilitate knowledge sharing both in the meetings and after them. Open communication culture also requires commitment from the management. The unit management should do their part in facilitating communication and share information and knowledge whenever possible. In addition, giving direct and open feedback constructively, aiming at improving the situation rather than finding those who are "guilty" of establishing it, creates more open atmosphere where people feel more appreciated. The unit management should also eliminate especially negative rumors that potentially make the employees feel uncertain about their position or value in the organization. Instead, sharing of success stories would create more positive atmosphere and potentially generate more committed employees. Publishing those who receive extra bonus and the arguments why the bonus was given clears the air and lets the other employees know what kind of criteria needs to be met to earn the bonus. If the bonus is given secretly, it potentially makes the other employees wonder whether there are any real arguments in the first place and this potentially tightens the atmosphere and makes the intraorganizational communication more complicated. The unit management could do this all to start build a more solid ground for knowledge management and knowledge sharing. The whole decision making process actually falls into this same category. If all the decisions are made secretly the employees eventually begin to wonder the arguments and they potentially feel less important for the organization while sharing information about the decision making process makes the employees feel important and valuable for the organization.

To support the organizational means facilitating communication inside an organization, the employees should be provided with a variety of communication tools that the employees could choose from. These tools could be telephones and e-mail,

videoconferencing and organizational networks. An organizational network could include, for example, information of the information systems that are being developed inside the organization (basic information, technical facts, frequently asked questions, for example) to facilitate linking the information systems to one another.

However, it should be noted although it is rather obvious, that the technological tools do not facilitate or improve communication inside any organization if they are not used.

## Collaboration

Collaboration can be supported by the same negotiation skills as communication but in addition, the employees should be equipped with collaboration skills. These skills can be learned in different courses and training programs but also by doing; people need to interact with each other to see how different types of people react to certain situations. This is largely dependent on the individual itself whether he or she wants to develop one's own ability to co-operate and collaborate. The management's role here is more supportive: they should understand that this kind of training and learning-by-doing is important and therefore should support the execution of it. Effective collaboration requires also supportive atmosphere and open communication culture. Awareness of the mission and vision of the organization help the employees to position their tasks in the organizational space and thus be aware of their importance. But in addition and maybe even more significantly, individuals create the atmosphere and sole management commitment does not guarantee open, supportive and reliable atmosphere. Every single member of the organization, CIS in this case, should look at themselves and seriously consider whether they have been actively taking part in knowledge sharing and improving the atmosphere.

Documents containing information about lessons learned and other best practices are also part of collaboration – other members of the organization are informed about things that are good for the project or that should be avoided. The CIS employees have both document management software and an application for sharing software. This latter solution would be especially handy if the employees are located in divergent places and they would still need to work on a common project. Also different organizational networks assist collaboration between contemporary IS development projects as they facilitate the sharing of data and information.

## Coordination

Coordinating knowledge sharing is important if the organizations truly want to achieve something; if people are left alone to be creative and share their knowledge as they please, there is a risk that they end up not knowing what they are expected and therefore doing nothing. The study showed that many CIS employees longed for clear project work instructions. In addition, they were willing to know what are the organization's goals – why things are expected to be done in a certain way. Both of these comments claim for more information from the unit management. The employees want to know what is expected from them, what is the appreciated way of doing work and why that is. One way of sharing this information would be publishing those who receive extra bonus and by sharing also the arguments. This way the employees would know what kind of things and ways of working are really appreciated in the organization. The awareness of organization's goals motivates the employees as they know their role in the process of achieving those goals – everybody wants to feel important.

The weekly project manager meetings CIS had were important but many times they were far too short to give wide enough picture of the actual situations the projects were in. For example, project risks were introduced very shortly every week without comparing the situation with previous week and thus ignoring the actual risk progress.

A flat organization structure as CIS already has potentially facilitates knowledge sharing as the employees are mainly at the same level with each other. It is also important for the management to be open and as obvious in the decision making process as possible. If the decisions, no matter how small they are, are made without bringing them up with the employees, they easily feel like their opinions do not count and they are not important for the organization after all.

New employees should also every time be properly familiarized to the organization; that way the new employee knows where he or she belongs and how the organization generally functions. This would make the new employee feel more welcome, which is important if the organization wants to keep the employee committed to it. The familiarization was claimed to be too superficial in CIS. The new employees were given some information but most of the daily routines and fixed manners had to be learned the

hard way – by making mistakes and learning, which was not counted as being the right way to teach things to a new employee. The routines and ways of doing things could be attached to the project work instructions as separate files and notes that are available to those who need them but could be skipped if they were well known.

There are a few technological tools that might facilitate coordination in CIS and one would be a tool or software that enables attaching separate files to a specific document or picture. Workflow automation tools would provide support for decision-making and thus ease the possible pressure on an individual.

In addition, CIS already had resource management software although the use of it was relatively inconsistent and hence it was nearly impossible for the management to compare different projects. To be able to monitor even a single project, its tasks and uses of resources should be frequently updated. Due to the nature of developing or improving information systems it is rather difficult to estimate how many percentages of the total work has been done and how much time does doing the rest require – monitoring building a paper mill would be much easier in this sense. This is why the unit, CIS, should set up the way how projects in CIS are monitored with this tool and how the workloads are estimated.

## 5.2   Comparison with Earlier Research

There has probably not been done a similar study focusing on inter-project knowledge sharing. Yet, several researchers have studied knowledge management from divergent viewpoints. They all support the same idea this study showed: knowledge sharing, as well as the whole knowledge management, is not something that can be organized just by giving proper software or a set of them for the employees – it requires a lot of effort on the organizational front and with the human factors (e.g. Davenport et a. 1998; Ståhle & Grönroos 1999). This study supported also those earlier studies suggesting that organizations do not yet really know how to manage their knowledge (Davenport et al. 1998; Eisenberg 1998; Radding 1998; Ståhle & Grönroos 1999); as Radding (1998, 25)

suggested, knowledge management is a difficult concept as there is no one, fixed definition even for the term *knowledge*. In addition, as Chait (1999) suggests, knowledge management – and that way also knowledge sharing – should not be considered as a project that is done and then forgotten but as a continuous process.

Earlier research has not yet provided comprehensive knowledge management framework. Nonaka introduced, as early as in 1994, four modes of knowledge creation that are still very applicable today but after that, creation of knowledge management frameworks has been poor. Partly this might be caused by the fact that the whole concept is still being developed but on the other hand, a proper framework could ease the process of understanding the deeper meaning of knowledge management. This study provided a framework that might be helpful in later studies as well. It considered both technological and organizational factors affecting knowledge sharing and it could well be expanded to include the whole concept of knowledge management.

One thing that the earlier research has not confronted is that the size, structure and age of an organization probably have some affect on knowledge sharing. Changing procedures and ways of thinking would seem to be easier for organizations where these factors have not yet been rooted in the employees mind (a rather young organization), where the organization structure is more flexible (a flat organization structure) and where there are not too many employees whose ways of working need to be improved (a small organization). It is not impossible to share knowledge in old, hierarchical and large organizations either but it requires extra effort to make it really work.

Ease of use and independence of time and place are, according to this, as well as many other studies (e.g. Sarbaugh-Thompson & Feldman 1998), the biggest reasons for e-mail's success. The problems faced with the use of it, were also very similar to the studies made by Sarbaugh-Thompson and Feldman (1998) as well as by Lotus Development (1995).

This study also emphasized the importance of organizational communication and information sharing. As Ikävalko (1998, 61) points out, regular meetings are important as they provide the unit with an opportunity to deal with different matters when they

come up; otherwise the matters will swell to be too large and too widely influencing to be handled in a short meeting.

At whole, this study did not prove anything upsetting or overrule the results of the earlier research. Instead, it gave a fresh viewpoint to the area of knowledge management by focusing on knowledge sharing and challenges of it. One of the most important messages of this study would probably be that there is no article, method or tool that could solve an organization's knowledge sharing problems; knowledge management is not something that could be purchased from a store or a subcontractor. The persons responsible for knowledge management, the CKOs, have to internalize a lot of knowledge and then try to apply it on the very organization they work for.

## 5.3 Reliability of the Research Results

The research solved quite well the research questions, considering that the concept of knowledge management – not to mention the concept of knowledge sharing – is still being developed. If there were some restrictions concerning the reliability of the study, they would be related to the fact that the case study concerned only one organization and they cannot be generalized without further considerations. On the other hand, the results of this study were very similar to the earlier research done on knowledge management and that is why they can probably be generalized.

The researcher was a part of the work community for six (6) months, which could be a burden for an objective research if the reality would be pushed aside. In this case, the researcher was fully aware of her task and its limited endurance and as the research period was only half a year long, it was possible for her to observe the organization quite objectively. Of course, there must have been things that the researcher did not recognize or for some other reason notice; if there had been another researcher doing the actual research, the results would probably have been more reliable as the observations and discoveries could have been compared and discussed. Yet, as the results do not

significantly differ from the line of the earlier research, the lack of another observatory probably did not affect the research result reliability.

One thing that could have facilitated the interviews to go deeper into the subject would have been completion of the theoretical part of the research before even planning the interviews. That way the researcher would probably have been able to more profoundly discuss the subject with the interviewees and possibly also been more capable of digging up the opinions the interviewees had – now there possibly was some problems of understanding each other as the interviewer and the interviewee used the same words and yet meant slightly different things. These mix-ups with the concepts were possible to find out from the interviews while transcribing them and the possible misunderstandings were paid regard to when registering the research results but it would have been best if there were no confusions in the use of the concepts.

## 5.4 Utilizing the Results

The results of both the case and literature study have been presented, suggestions for the improvement of CIS's knowledge sharing offered and comparisons with earlier research and analysis of the research reliability has been done. This section presents the study results again but this time in such light they potentially facilitate knowledge sharing and the building of knowledge strategy also in other organizations (besides Sonera's CIS unit).

It should be kept in mind that the whole knowledge management should, in order to be efficient, be unique (e.g. Davenport et al. 1998). Therefore here cannot be written any straightforward instructions on how every organization should organize their knowledge sharing process but every organization should consider what kind of knowledge it needs and when does it need it to be able to run its business and to reach its goals.

Transformation of existing knowledge and thus also creation of new knowledge is a continuous process likewise should a knowledge sharing process be. To best illustrate

this the research results are combined with the four modes of knowledge creation process presented by Nonaka and Takeuchi in 1995 (see Figure 9). Sharing of different kinds of knowledge requires different capabilities and they can be assisted with different kinds of tools. These capabilities and tools are discussed after the figure.
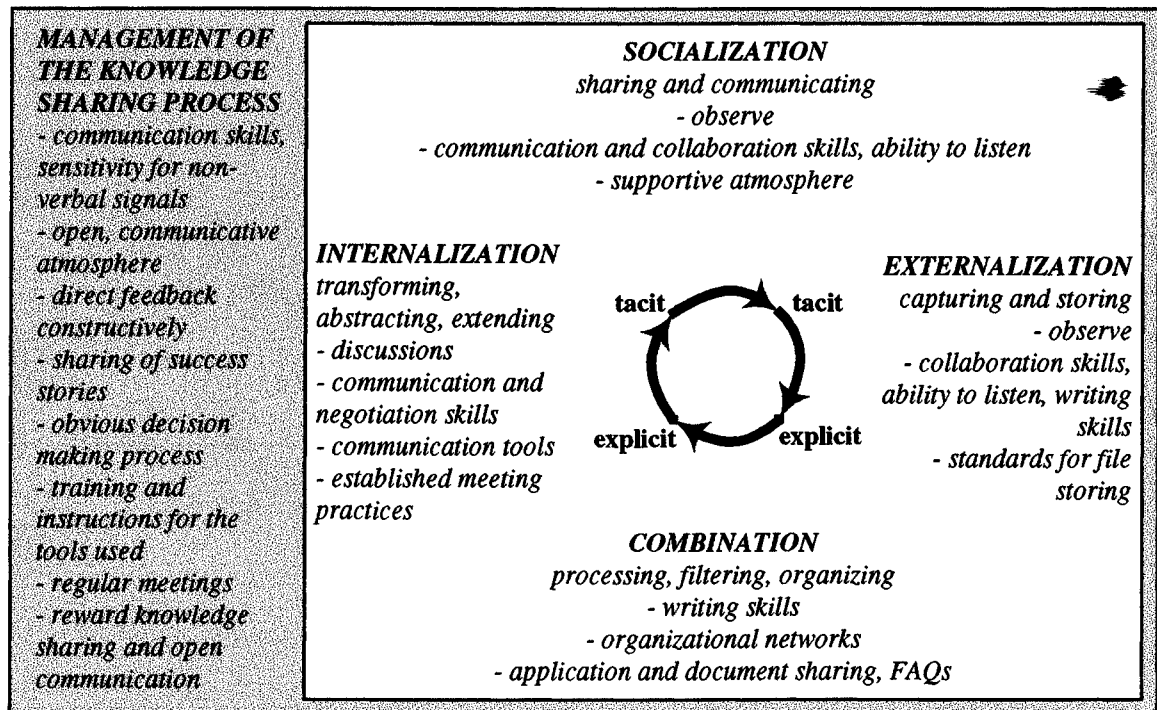


**MANAGEMENT OF THE KNOWLEDGE SHARING PROCESS**
- communication skills, sensitivity for non-verbal signals
- open, communicative atmosphere
- direct feedback constructively
- sharing of success stories
- obvious decision making process
- training and instructions for the tools used
- regular meetings
- reward knowledge sharing and open communication

**SOCIALIZATION**
sharing and communicating
- observe
- communication and collaboration skills, ability to listen
- supportive atmosphere

**INTERNALIZATION**
transforming, abstracting, extending
- discussions
- communication and negotiation skills
- communication tools
- established meeting practices

**EXTERNALIZATION**
capturing and storing
- observe
- collaboration skills, ability to listen, writing skills
- standards for file storing

**COMBINATION**
processing, filtering, organizing
- writing skills
- organizational networks
- application and document sharing, FAQs

**Figure 9.** Facilitating Knowledge Sharing.

Knowledge can be transmitted among individuals as tacit or explicit partly depending on the methods used. Using the terminology of the knowledge process (Radding 1998; data to knowledge; see Figure 2 on page 15), *socialization* could be described as sharing and communicating knowledge. Transforming tacit knowledge into tacit knowledge is observing and learning-by-doing and it can be facilitated by communication. It is potentially impossible to precisely verbally describe the tacit knowledge but this kind of knowledge can be transferred by observing and aping the person who has the knowledge. Socialization requires communication and collaboration skills, ability to observe and willingness to learn. Also an atmosphere that allows learning-by-doing and making of mistakes potentially facilitates this kind of knowledge sharing. Instead, there are not that many technological tools that would support the socialization process. Of course, tools facilitating face-to-face communication such as videoconferencing could be considered as such but the most efficient way to share tacit knowledge to be someone

else's tacit knowledge is to share it physically face-to-face and allow observations of behavior.

*Externalization* (tacit knowledge to explicit) is capturing and storing the knowledge obtained by observing and interviewing, for example. This process requires collaboration and writing skills and ability to listen and to sense non-verbal signals. In addition, standards for file storing potentially support this process. Here videoconferencing tools and even telephones are potentially useful, as well as organizational networks, document management software for storing the captured knowledge.

*Combination* (explicit knowledge to explicit) could easily be described as mode of processing, filtering and organizing existing knowledge. This is the most traditional part of knowledge management in all organizations and in most cases this is read as document management process. Here efficient and flexible document and information management software would be a very powerful tool. Writing skills would be needed only to facilitate writing of meta-data of the re-organized knowledge and to facilitate very useful in facilitating combination as they facilitate application and document sharing. Also storing of frequently asked questions (FAQ) or equal knowledge potentially facilitates another person to create new explicit knowledge.

*Internalization* (explicit knowledge to tacit) is transforming, abstracting and extending the given knowledge with one's own knowledge, experiences and beliefs. This process requires communication and negotiation skills and ability to make questions as the process is about internalizing existing explicit knowledge and as a consequence creating new knowledge. Explicit knowledge can be internalized while studying written knowledge but also in discussions when explicit knowledge is combined with personal tacit knowledge – however, tacit knowledge cannot be formed without own thinking, internalization of the knowledge. Internalization can be supported for example with business intelligence software that combines information and knowledge from different sources in an unusual way and thus facilitates new kind of thinking. The internalization process can also be supported with established meeting practices ensuring that certain information and knowledge is being shared every time. In addition, communication

tools such as e-mail, telephones and videoconferencing potentially facilitate internalization of explicit knowledge.

The *management* of this whole never-ending process requires especially communication skills and sensitivity to non-verbal signals. Management's job is to create appropriate foundation to build the knowledge sharing and the whole knowledge management on. This requires adequate infrastructure (both technological and organizational; Davenport, De Long, Beers 1998) and open culture having the management as an example. To facilitate knowledge sharing between contemporary projects, the management should aim at creating open and communicative culture to the organization. This can be eased with the management's example; for example, obvious decision making process and rewarding active knowledge sharing and open communication most likely encourages the employees to share their knowledge with others. The old truth "you get what you measure" is valid also here: if the management rewards only based on figures that is what they will get – employees concentrate only on their own project and try to be as fast and efficient as possible. But if the management rewards knowledge sharing, the employees will share their knowledge with others as a part of their job.

To ease their job, the management could use technological tools for monitoring projects, such as resource management software and network calendars. Also project timetables could be located in network calendars or other software that would be available for everybody in the organization. This way it would be easier for the other projects to know in which phase the other projects are as they many times are dependent on each other's progress.

Whatever technological tools the organization shall have to support its knowledge sharing, training and instructions for the use of them will be needed. Standards for information and knowledge storing are also needed to enable comparing the projects with each other.

To effectively utilize these means, organizations should first analyze their need for knowledge: what kind of knowledge their organization – preferably a part of it, such as R&D department, invoicing department etc. – needs to be able to reach the strategic and functional goals the organization has (Davenport et al. 1998). If the organization has to

innovate continuously to meet its goals, it needs different kind of knowledge but also different organizational structure and culture than such organization whose mission is to produce the exact same quality every time (for example a certain product or pay the monthly payments). Wang and his colleagues (1999, 95-98) suggested that information should be treated and managed as product with life cycle. They suggested that information should be considered through its purpose and thus also with its development needs, meaning how the information needs to be developed so that it would benefit the organization the most. This idea supports the researcher's thought that knowledge management is a unique process in each organization. The content of knowledge management depends significantly on the market area and situation as well as on the goals and vision of the organization.

In addition, the organizations should realize that as Kreps (1990, 30-31) and Uusitalo (1995,12) among others have stated, personal observations and experiences are very powerful sources of information and knowledge because people tend to trust their own experiences rather than researched information. This is why the importance of tacit knowledge is so enormous and important organizational explicit knowledge should be transformed into tacit knowledge before it really can benefit the organization. And as people trust their experiences and their tacit knowledge, it is important to share success stories of the organization to motivate the employees and to make them more committed to the organization. But as important as commitment of the management is for the success of knowledge sharing as well as the whole knowledge management inside an organization, the most important and influencing factor is, assuming that the observations made in this study are valid, the culture of the organization. The case study unit had several tools that potentially supported knowledge sharing but still its knowledge was poorly shared. This supports the researcher's earlier statements that technological tools by themselves do not guarantee efficient knowledge sharing but also support and facilitation for the use of them is needed.

## 5.5 Areas of Further Research

This study has brought up several issues that could be studied later. For example, the research could be continued further with the very subject; this study confronted the problems of inter-project knowledge sharing on a rather general level. Further research could focus for example in knowledge sharing strategies or in comparing different technological tools that assist certain parts of knowledge sharing. It would also be possible to study whether the utilization rate of the technological tools has an affect on the quality or level of knowledge sharing inside an organization. This kind of research would provide information of how important role the technology has in knowledge sharing.

This study could also be continued by taking more psychological point of view and studying the human factors affecting and especially those hindering knowledge sharing inside an organization. What are the reasons for not wanting to share knowledge and how can those barriers be removed? Additionally, further research could study this area having an approach based more on communication theories and hence focusing on the possible ways of communicating.

A further research could also study the knowledge sharing framework created in this study and explore whether it really is as useful as the researcher assumed. For example, the usability of the framework could be studied in the process of acquiring or refining of knowledge.

Moreover, it would be interesting to know, if it was easier for smaller organizations to adapt to the world of knowledge management. After all, it does require an enormous change in attitudes, especially with older organizations, and one would assume that change is easier for smaller, and often more flexible, organizations.

Another interesting research composition would be one focusing in knowledge sharing between consultants and their client organizations. The organizations that hire consultants expect, naturally, to get something to the organization – some knowledge that stays after the consultant is gone. Especially large organizations, usually with

numerous divisions and units, hire consultants, as they do not know who in the organization itself would be able to solve the problems. This, on its part, brings up another interesting research area: it could be rewarding to study, how large organizations could manage their knowledge more efficiently; how could they know what they really know – or can they? From a consultants point of view further study could focus on how to manage knowledge that is for sale and what kind of responsibilities and moral obligations are involved.

In addition, further research could focus in studying the meaning and importance of trust between different parties that are expected to share knowledge between each other. Furthermore, also the importance of information quality in knowledge sharing is an important issue to study more. Both trust and information quality affect the success of knowledge sharing.

# 6 SUMMARY

During the 1990's it has become more and more obvious that organizations' success is based on the knowledge of their employees. Changes in the environments have forced the organizations to find new ways to succeed in the ever-intensifying competition (e.g. Davenport et al. 1998; Nonaka & Takeuchi 1995; Malhotra 1998). Knowledge management is the buzzword that is on every business manager's lips – it is that something that is assumed to make them all winners. Basically, it includes gathering, organizing, refining and sharing of knowledge and managing the mentioned processes.

The difficulty of managing organizational knowledge lies mainly in the fact that knowledge is not something that can actually be owned by the organization nor is it something that can be seen or touched. Tacit knowledge, which is the key to real success, is embedded in people (Nonaka & Takeuchi 1995; Malhotra 1998; Davenport et al. 1998) but if taken seriously it can be shared to benefit the organization. Knowledge management has to be considered as an actual process that needs efforts and it should be designed to support the organization's business and to help to reach its goals. As organizations have their own values, visions and goals, and they work in different areas of business, there is no one-size-fits-all KM but some guidelines can be specified to facilitate the creation of an organization's knowledge management.

First of all, organizations should study their environment, business and the functions inside them. The organizations need to analyze what kind of knowledge is vital for their business and in what kind of situations they need it (Davenport et al. 1998). This way, the organizations can estimate how their knowledge should be moved around the organizations and they are able to create their own knowledge management process and they can evaluate the different tools and means that could support different parts of their knowledge management process.

Hansen, Nohria and Tierney (1999) divide knowledge management strategies in two categories: codification and personalization strategies. Codification strategy focuses on

systematizing the knowledge — it could be described as persons-to-documents strategy. Personalization strategy emphasizes personal contacts and sharing of tacit knowledge. Probably neither of the mentioned strategies suits the organizations as such, but they form a good basis to build an organization's knowledge management strategies on.

Sharing of knowledge is the only way to benefit the organization with the knowledge they have acquired (Andrews & Herschel 1996). The special value knowledge has is that when it is being shared its value does not decrease nor does the knowledge itself diminish. The same knowledge can be used in divergent places at the same time and it has the same, whole value for all of its users (Ikävalko 1998) although interpretations of that knowledge may vary.

In this study, means for knowledge sharing were observed through a framework developed especially for this study. In the framework knowledge sharing means were divided into three categories: those supporting communication, collaboration and coordination. These categories were, again, divided into organizational and technological factors to provide the study with more versatile and reliable approach. The research frame was used in the case study that was done in a small unit inside a large telecommunications company. The empirical part was carried out with interviews and observations, which were designed to provide the researcher with adequate information on each cell of the research frame table. After the interviews and observations, the research frame was used to analyze the results.

The case study results proved that the technological solutions do not provide organizations with added value if the organizational factors such as communication culture and general atmosphere do not support knowledge sharing. Efficient knowledge sharing is not guaranteed by new and efficient technological solutions nor does the organization structure by itself ensure success in sharing knowledge. Yet, technological tools can be of great help, even irreplaceable, when sharing knowledge inside an organization.

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# Appendix 1: CIS Organization since September 1999
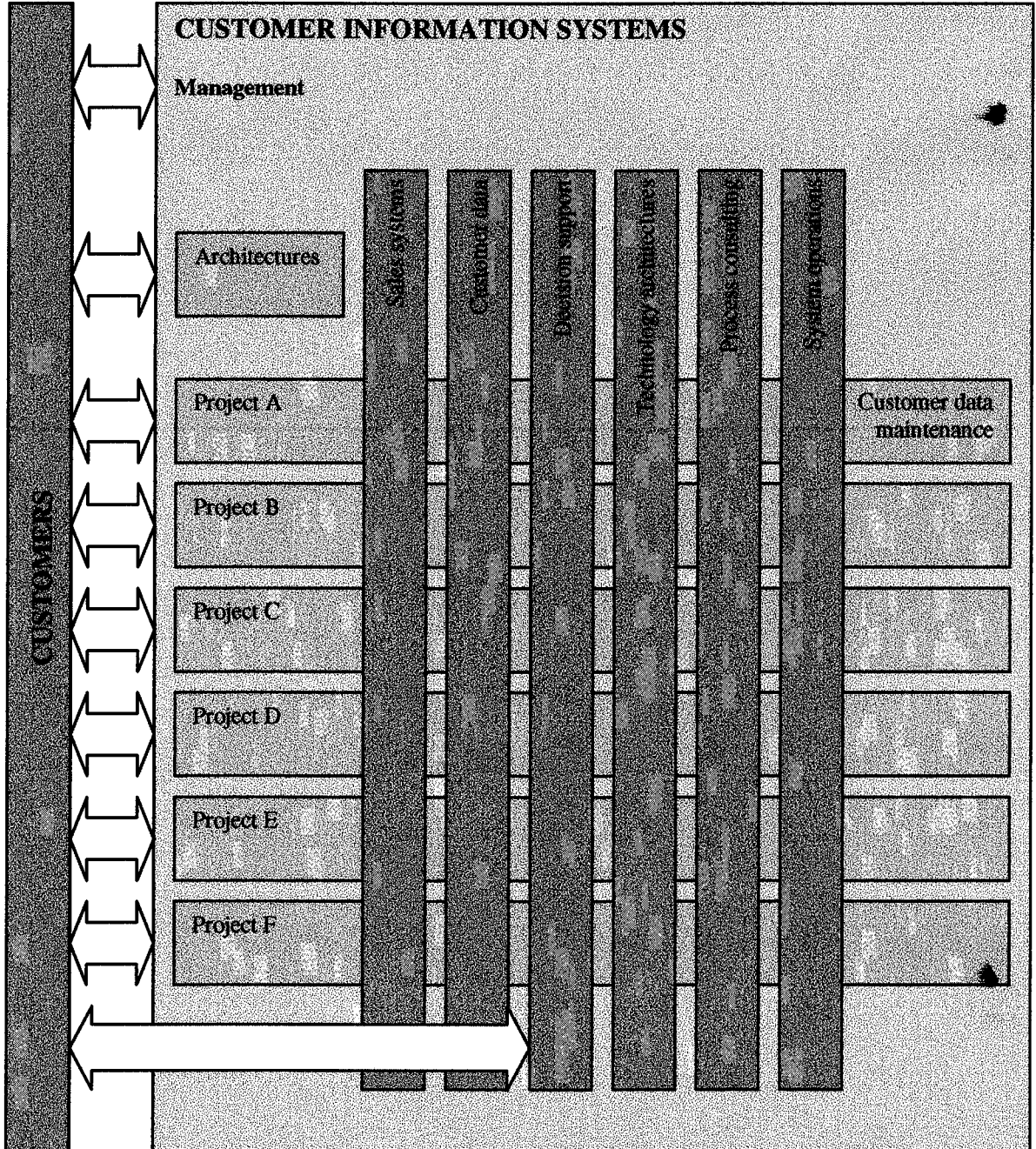
## Appendix 2: Interview Topics

| Topic | Short description of the discussion area |
|---|---|
| Background | interviewee's earlier work experience and educatioℓal background, current position in Sonera, motivation for work |
| Project work | given versus used methods, processes, systems and instructions; possible problems |
| Organizational means | organization and communication structures and standards; coordination and control; possible problems and things that are organized well |
| Technological solutions | current and needed IT solutions for document management, communication, and knowledge and information sharing; the use and usability of the solutions; possible problems |
| Experiences | how important is giving and receiving knowledge; how well is the function currently organized; are computers needed for knowledge sharing |
| Development ideas | how should the knowledge sharing be intensified in the CIS unit; what kind of improvements are needed |

## Appendix 3: Background Questionnaire

How long have you worked for Sonera? _____ years / months

And for CIS? _____ years / months

What is your current job description?

☐ Development Manager

☐ Project Manager

☐ System Manager

☐ System Expert

☐ something else, what?

_____

In which project are you currently working? What is your role in it?

☐ Project A

☐ Project B

connect with line

☐

☐ Project C

☐ ■ Project Manager

☐ Project D

■ System Expert

☐ Project E

■ something else, what?

☐ Project F

☐ Project G

☐ Project H

How long have you worked for that (those) project(s)?

_____ years / months  _____ years / months

☐ alusta alkaen  ☐ alusta alkaen

☐ tulin kesken projektin  ☐ tulin kesken projektin

**Have you received project training?**

☐ I've been to project management training.

☐ I've been to project work training.

☐ I have not received any project training.

**What is your educational background like (technical/commercial/something else, major)?**

```



```

**Where have you worked before you came to CIS?**

```



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## Appendix 4: Support Form for the Interviewer

**Short description of the interviewee and the situation:**

```
┌──────────────────────────────────────────────────────────┐
│                                                          │
│                                                          │
│                                                          │
│                                                          │
│                                                          │
└──────────────────────────────────────────────────────────┘
```

**Does the interviewee seem to be hiding information?**

☐ No.

☐ Slightly.

☐ Somewhat.

☐ A lot, almost all the time.

**Does the interviewee have any problems in putting his/her ideas into words?**

☐ None.

☐ Slight problems, not significantly.

☐ Somewhat.

☐ A lot; it is hard to control the interview.

**Is the interviewee prepared for the interview and is (s)he focused on it during the actual interview?**

☐ Neither. The interview is interrupted many times.

☐ Slightly, not enough.

☐ Prepared: yes, focused: no. The interview is interrupted many times.

☐ Maybe not prepared but really focused. The interview is really a conversation.

☐ Both prepared and focused. The interview is very productive.

**Quality of answers?**

☐ Unclear.

☐ Quite unclear.

☐ Clear and sharp.

☐ Clear and extensive answers.