Knowledge transfer in project-based environments:
The barriers of knowledge transfer

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Acknowledgement

Master thesis is our final course in our program: Business Administration- Strategy and Management in International Organizations. The aim of this course is to develop and extend our ability to handle problems independently in the scope of business administration. We worked in pairs and gained help from our supervisor, Jonas Söderlund, and seminars. It was an exciting and difficult process to do the research by ourselves depending on our knowledge gained from our program.

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Abstract

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Background: Nowadays, projects become the common way of working in many companies. Knowledge management is important for efficient project management. Knowledge transfer in project-based environments became an attractive and important topic for study. Various barriers and challenges will appear during the process of knowledge transfer in projects. Lots of authors thought the barriers of knowledge transfer in project are negative, while others mentioned that some barriers may have positive aspects. We called these two kinds of barriers “positive barriers” and “negative barriers” in this thesis.

Purpose: The purpose of this thesis is to understand knowledge transfer in project-based environments. Specifically, we aim to explain that barriers of knowledge transfer in projects can be both negative and positive.

Method: Due to the special time period and activity limitation, we chose case study to gain the empirical data. When choosing the sample, we used the convenience sampling. The sample chosen is a project team in Ericsson of Linköping. The project manager we interviewed has worked in Ericsson since 2004 and with his present project team for four years. He has already done more than fifteen projects, so he has enough experience in projects for our study. We combined both inductive and deductive approach strategies to analyze our thesis.

Result: This thesis has answered the questions in the part of specified questions and reached the thesis purpose. It has explained the notion of knowledge transfer in projects and its related barriers. It interprets how both negative and positive barriers affect knowledge transfer. Furthermore, this thesis points out some suggestions for improving positive barriers and reducing negative barriers.

Key words: Knowledge Transfer, Project, Positive Barrier, Negative Barrier
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Chapter 1. Introduction

1.1 Introduction:
“We the Great Wall of China is a series of stone and earthen fortifications in, built, rebuilt, and maintained between the 5th century BC and the 16th century to protect the northern borders of the Chinese Empire during the rule of successive dynasties. Several walls, referred to as the Great Wall of China, were built since the 5th century BC. The most famous is the wall built between 220 BC and 200 BC by the first Emperor of China, Qin Shi Huang...” (Great Wall, 2006).

Geraldi, et al. (2008) stated that project has been undertaken for more than 6000 years, and played a significant role for the society development, starting from the Egyptian Pyramids and the Great Wall. During the process of the building Great Wall, the members in the project needed to gain the knowledge about “how to build”. So knowledge transfer is significant for the projects.

Szulanski (1996, p28, cited in Yakhlef, 2007,p45) defined knowledge transfer as “replication of an internal practice that is performed in a superior way in some part of the organization and is deemed superior to internal alternate practices and known alternatives outside the company”. And Argote and Ingram (2000) thought knowledge transfer is to transfer knowledge from one unit to another. “Knowledge transfer in organizations is the process through which one unit (e.g., group, department, or division) is affected by the experience of another” (Argote and Ingram, 2000, p.151). The issues of knowledge transfer are not new to the corporate word (Yakhlef, 2007). Nelson and Winter (1982, cited in Yakhlef, 2007) considered knowledge transfer with the replication of organizational routines.

The history of knowledge transfer is much longer than the history of project, which could date back to roughly 10,000 years ago at the early phase of the Neolithic
Revolution (Lipphardt and Ludwig, 2011), when they transferred their knowledge about how to improve the production in the crop cultivation and livestock farming. Every country, race or region has its own development path about knowledge transfer. For example, according to Basalla (1967), the science transfer in the Western Europe has three phases. The phase one is that the European scientists brought their scientific methods to new environments combining their science with the new knowledge from the new environments to produce the new knowledge (Lipphardt and Ludwig, 2011). The second period is called “colonial science” which is defined as the intellectual subordination went around the European knowledge (Lipphardt and Ludwig, 2011). The last one is the “separate and independent” relationship of these knowledge entities which means that the periphery itself became a center, which exchanged their knowledge with other centers (Lipphardt and Ludwig, 2011).

The above is about the knowledge transfer in the history of Western Europe. How about the knowledge transfer in projects? In recent years, an increasing use of projects in organizations has taken place (Miles et al., 1997 cited in Landaeta, 2008).

“The accountability, control, and design of work made possible through projects have provided organizations with a way to cope with the increasing complexity of their deliverables and operations (Packendorff, 1995; Gann and Sattler, 2000). As a result, several projects are now concurrently and sequentially being managed in what has been recognized as multi-project or project-based organizations (Nobeoka, 1995; Eskerod; 1996; Van Der Merwe, 1997)” (Landaeta, 2008,p30).

As more and more industries and companies have adopted project-based mode of operation, project ventures became important for organization and management science (Bakker et al., 2010).
However, lack of key knowledge in a project means that the project is not fully capable of accomplishing its objectives and the lack of knowledge capability in projects can also generate challenges at the project-based organizational level (Landaeta, 2008). “Knowledge management is of crucial importance to efficient project management” (Huber, 1991 cited in Ajmal and Koskinen, 2008, p9). The growing complexity of projects lets managers to consider an increasing number of technical and social relationships in order to absorb knowledge and experiences from daily work and from earlier projects (Ajmal and Koskinen, 2008). Therefore, knowledge transfer in project-based environments became an attractive and important topic for study.

Various barriers and challenges will appear during the process of knowledge transfer in projects. For example, the employees do not want to share their knowledge with others, which can influence team performance for the project (Sanchez, R., 2000). Most of those barriers seem negative for the performance of project team. But some barriers of knowledge transfer may positively affect projects. We called these two kinds of barriers “positive barriers” and “negative barriers” in this thesis. Lots of authors thought the barriers of knowledge transfer in project are negative, while others mentioned that some barriers may have positive aspects.

1.2 Debate
1.2.1 Positive barriers
The barriers of knowledge transfer can positively influence the project and organization. Referring to Argote and Ingram (2000), barriers of knowledge transfer can support organizations’ competitive advantages by transferring knowledge internally while preventing its external transfer from competitors. “By embedding knowledge in interactions involving people, organizations can both effect knowledge transfer internally and impede knowledge transfer externally”(Argote and Ingram, 2000 ,p150). It is because people are more similar within the organization than between firms. In one organization, people have similar backgrounds and contexts
which can affect their translation and understanding of knowledge. Moreover, interactions among people in one organization are also more willing than between firms (Argote and Ingram, 2000).

Another barrier which has positive effect is tacit knowledge. Although tacit knowledge is difficult to be codified, it can provide the source and core capability of sustainable competitive advantages. Nonaka (1991), Grant (1993) and Spender (1993) as cited in Ambrosini and Bowman (2001) have argued that tacit knowledge occupies a central role in the development of sustainable competitive advantage. The resource-based view of firm argues that core competence, intangible resources and tacit knowledge occupy the central place in development of sustainable competitive advantage. This is because tacit knowledge is argued to be difficult to imitate, to substitute, and to transfer and it is rare (Ambrosini and Bowman, 2001). The customary way of tacit knowledge’s definition is compared with objective knowledge which is communicable and can be written down, encoded, explained or understood. Tacit knowledge is context specific, practical, personal knowledge, and hard to be written down. According to Barney (1991), the firm resources which hold the potential of sustained competitive advantages must be valuable, rare, imperfectly imitable and none substitutable. The nature of tacit knowledge matches the requirement of potential resources for sustainable competitive advantage.

Moreover, “Tacitness also generates ambiguity because the organization may be unaware of the resources and notably the actions it undertakes that are sources of its competitive advantage. In other words, the relation between actions and results is causally ambiguous” (Reed and UeFillippi, 1990 cited in Ambrosini and Bowman, 2001). In short, the barrier caused by tacit knowledge protects the knowledge being imitated by competitors and provides the possibility of sustainable competitive advantages.
1.2.2 Negative barriers

The first negative barrier for knowledge transfer in projects is that the tacit knowledge cannot be put into words (Polanyi 1958; Polanyi 1966, cited in Bjorkegen 1999). It causes that the experiences cannot be transferred among individuals in a large number. Language is the method to make the private knowledge to public but tacit knowledge is difficult to be codified into language (Furberg, 1981, cited in Bjorkegen 1999). Nonaka (1994) said that although ideas are formed by individuals, interactions between individuals actually play the significant roles in developing these ideas. It is said that “communities of interaction” conduces to new knowledge’s expansion and development (Nonaka, 1994). But the limitation of the tacit knowledge will cause the barrier of knowledge transfer and interaction in the large number of people.

Moreover, even though the negative barriers caused by tacit knowledge can be removed if tacit knowledge is converted to explicit, not all tacit knowledge can be transferred to explicit knowledge. Ambrosini and Bowman (2001) argued that at least some tacit knowledge cannot be made explicit.

Another negative barrier of knowledge transfer is that employee turnover can spill out core knowledge. According to Lundin and Soderholm (1998, cited in Bjorkegen, 1999), all knowledge belongs to person and no other carriers. It means only individuals can implement the process of knowledge transfer. Nevertheless, the employee turnover may spill out important knowledge even to competitors and destroy the project’s core competence about the knowledge (Fisher and White, 2000).

In addition, Tjosvold (1995, cited in Hoegl and Gemuenden, 2001) argued competition is a big barrier for the knowledge transfer in the project. Knowledge transfer across projects positively connects with the individual knowledge in these projects and the individual knowledge in projects is positively connected with these projects’ performance (Landaeta, 2008). Lindkvist (2004) said that when the members in the team can use each other’s knowledge as the “external memory”, they could
solve the problem beyond their own limited cognitive capabilities. Nonetheless, the competitions between the projects can generate the conflicts in the organization and become the barrier for learning mutually and resource reuse (Cross and Baird, 2000).

1.3 Purpose:
The Master thesis emphasizes the importance of knowledge transfer and its related barriers in the project-based environments. This thesis describes how knowledge transfers among different projects and internal employees in one project. It is because that knowledge transferring helps to improve the performance and increase the competitiveness of the project. However, a number of elements would come out and have effect on knowledge transfer, causing barriers of knowledge transfer in projects. Part of these barriers would become the problems of knowledge transfer and have negative influence for these projects. However, some barriers would make improvements for these projects. Therefore, this study will be expected to find out what kind of barriers are negative or positive, and then give some recommendations for controlling these barriers in projects so that the negative barriers decline and positive barriers increase. All of these above can be combined as the purpose of this study.

- The purpose of this thesis is to understand knowledge transfer in project-based environments. Specifically, we aim to explain that barriers of knowledge transfer in projects can be both negative and positive.

1.4 Specified questions:
In order to better manage knowledge transfer in projects and control its related barriers, two questions should be mentioned to go deep along the purpose of the Master thesis.

- What are the barriers of knowledge transfer in projects?
The first question is supposed to give an overall concept of knowledge transfer in projects and its related barriers, which appearing in the process of knowledge transfer.

- **How would those barriers affect knowledge transfer in terms of both negative and positive aspects?**

The second question is expected to explain that the barriers of knowledge transfer can be divided to negative and positive barriers. This question also aims to interpret how negative and positive barriers influence knowledge transfer in projects.

1.5 **Target group:**

Our target groups are project managers, employees and the interested students. For the project managers, our case describes the current barriers during the processes of knowledge transfer in the project-based environments, so that the project managers can understand not only the negative barriers but also the positive barriers, which are helpful for the development of the project. Then the project managers can utilize the positive barriers in the knowledge transfer and also can gain some suggestions from our thesis for the negative barriers, so that they can improve the quality of the knowledge transfer in their projects and build better relationship and trust with their members.

For the employees in the projects, they can understand more about knowledge transfer and its barriers and correctly deal with these barriers in the project. If they can minus the negative effect and promote the positive effect, they can better coordinate with each other and complete the task on time.

For the interested student, our thesis provides them the new ideas and notion about the barriers of knowledge transfer in the project-based environments, and some suggestions for dealing with these positive and negative barriers, so that they understand the new role of the barriers. We also hope that this thesis can give some
suggestions and help for their researches, if they would like to do researches in the same area.

1.6 Delimitations:
The purpose of our study is to discuss how knowledge transfers in project-based environments and both the positive and negative barriers for knowledge transfer. And our case study is based on a project team in Ericsson, called CAPA, not the whole company. However, due to the limitation of our resources and time, we cannot do the research about various the industries and companies. The case study will focus on one project team in Linkoping, Sweden. The limitation of geography and time makes us choose one project team in Linkoping, because it is earlier for face-to-face communication. The project team we focused on is a team working in GSM area of Ericsson. Because the project members have tight schedules, we only interviewed and emailed with their project manager. But the other members may have different ideas for some information. We are business students, so our disinclined background and knowledge may influence our interpretation and understanding of the interview with the project manager. The information and record of the interview only gained from one manager, so it is subjective and unique in some way. When we translated and interpreted the information we got, we also did it subjectively. Moreover, our argument and analysis cannot cover all conditions.

1.7 Disposition of the report:
Chapter 1- Introduction describes the basic background on this topic of the report and the debate about the positive and negative opinions of the barriers during the processes of knowledge transfer in the project-based environments. In this part, the specified questions with the aim to reach the purpose of the study are mentioned after the part of the thesis’ purpose. The paper’s target group, delimitations and the disposition conclude this chapter.
Chapter 2- Methodology presents the research methodology of the thesis and the reasons for how the literature and data are collected and analyzed. It also shows the possible sources which can influence the research results.

Chapter 3- Frame of reference elucidates the theoretical backgrounds of the thesis and provides the concepts and theories, which can help the readers’ understanding and comprehension and also guide the analysis part in chapter 5.

Chapter 4- Case study introduces the current situation of Ericsson and the project team, called CAPA, based on the purpose of the thesis. The objective of the chapter is to provide the overview of the project team, and the detail information about the knowledge transfer of the project team.

Chapter 5- Analysis contains the discussion and analysis of knowledge transfer in this case study. This part is the relevance and comparison between the theoretical findings presented in chapter 3 and empirical findings described in chapter 4. The positive and negative barriers of knowledge transfer will be discussed based on both the empirical and theoretical study.

Chapter 6- Conclusion evaluates the thesis if it reaches the purpose and specified questions of the chapter 1. It also shows the study’s contribution to the academic world.
Chapter 2. Methodology

The aim of the research is to identify and understand the positive and negative barriers during the processes of knowledge transfer in the project-based environments. This thesis involves the literature study mentioned by other authors, and the empirical study which contains meeting and discussions with a project manager.

2.1 Qualitative and case study:
Methodology is the plan and procedure for the research and thesis which explains the decisions from broad assumptions to methods of data collection and analysis (Creswell, 2009). According to Creswell (2009), there are three key types of designs for the thesis: qualitative, quantitative, and mixed methods. Qualitative research is the means for exploring and understanding the individuals or groups. This method helps to understand a social or human problem. Quantitative research is the means that checks the relationships of variables in order to test the theories. Quantitative research needs the numbered data to be analyzed to get the useful information for the thesis. Mixed research is the means that combines both the methods of qualitative and quantitative research.

Because we had no internships, and it is difficult to gain the large number of samples for this thesis within limited time, we chose the qualitative research method for this thesis.

There are different types of qualitative research, which include phenomenology, ethnography, grounded theory, narrative analysis, critical research (Merriam, 2009), and case study (Creswell, 2009). Phenomenology is a type of qualitative research, which is interested in people’s “lived experiences” (Van Manen, 1990 cited in Merriam, 2009) and the people’s “everyday life and social actions” (Schram, 2003, cited in Merriam, 2009). Ethnography is the most familiar type of qualitative research to the research (Merriam, 2009), which is the finding written by researchers.
Grounded theory is the meaning gained from data through qualitative research, which includes the multiple stages of data collection and refinement of the information (Charmaz, 2006, cited in Creswell, 2009). Case study is that the researcher explores a case in depth and data are collected bounded by the time and activity (Stake, 1995, cited in Creswell, 2009).

Due to the special time period and activity limitation, we chose case study to gain the data. Case study can focus on our research area and also have no specific requirement for the samples. When choosing the sample, we used the convenience sampling, which means that we selected the sample based on time, location and availability of respondents (Merriam, 2009). The sample chosen is a project team in Ericsson of Linköping. The project manager is called Antony Selvaraj and we only interviewed him about his team. Some may argued that the convenience sampling is not very credible and is likely to produce “information-poor” (Merriam, 2009). However, the project manager has worked in Ericsson since 2004 and with his present project team for four years. The team has two projects per one year. It means that the project manager has already done more than fifteen projects. He is full of experience with projects and knowledge transfer in projects. So we thought he had enough experience and a suitable position for our interview. Also, he is our friend and works in Linkoping, so we can contact him easier and often.

In our thesis, we have literature study, case description, analysis and conclusion. The literature study includes the relevant theories to our thesis and research questions. The case part describes the background of the project team and the data from the project manager. Then the analysis part combines literature theory and case together, in order to analyze the data and gain useful information for our research questions. In the end, our thesis includes the conclusion about our thesis. In the last part, we also points out some research questions for further study.
2.2 Literature study
The literature review is necessary for the study and one of its functions is to provide the foundation for knowledge base of our study (Merriam, 2009). All of these were synthesized and illustrated what the present studies have been done on the topic.

Firstly, the approach we used for study was to analyze literatures of knowledge transfer and project. The initial phase focuses on the comprehension and comparison of knowledge transfer and project team. In order to understand that, we started our literatures from the courses we had before about knowledge management, knowledge conversion and project. After that, we tried to find the literatures which mentioned the relevance of knowledge transfer, knowledge management and project-based environments. Next, our study continues to focus on knowledge transfer in project team and the barriers of knowledge transfer. Some barriers of knowledge transfer have negative effects for performance of projects but some have positive effects. Then, we tried to find out some theories about how to improve positive barriers and reduce negative barriers.

The frame of references aims to present the fundamental understanding of knowledge transfer, project team, positive and negative barriers of knowledge transfer in project and the relevant solutions to these barriers.

2.3 Data acquisition
The collection of the data contains both primary and secondary data. The primary data was collected with the specific intent of the study, and the second data was acquired from the secondary sources.

The primary data was gained through the interview and the emails with the project manager called Antony Selvaraj. The person was selected because he has worked in projects of Ericsson since 2004, and therefore he has plenty of experience about knowledge transfer in projects. He has also been in a stable project team for four years.
until now. DeMarrais (2004, p.55, cited in Merriam, 2009, p.87) defined that an interview is “a process in which a researcher and participant engage in a conversation focused on question related to a research study”. We used the most common form for interview, which is called person-to-person interview. It means that one person gain the information from another (Merriam, 2009). Since we cannot observe the project team’s behavior, the interview is necessary and helpful for our study. The purpose of the interview was to gain better understanding of the project and knowledge transfer in this project team. The interview was structured by our questions, which had their own specific goals and meanings for our thesis, and lasted approximately one hour. We recorded the interview so that we can listen to the record again and make sure we wrote correctly about the project team and project manager.

The data was collected regarding the manager’s understanding about barriers of knowledge transfer, and solutions to these barriers. Our questions were open and less structured, so the individual respondent can answer in his unique ways. It is also called semi-structured interview (Merriam, 2009). The questions in the interview were flexibly and mixed with structured questions in our questionnaire. And the questions in the questionnaire were formed based on our theories study and the purpose of this thesis. Therefore, the respondent can freely answer the questions. He had the possibility to supply and give the supporting answers as well, which were out of our original questionnaire but useful for our thesis. When we had any problem about the data, we emailed the project manager and gained the answers from him.

The secondary data of the case was acquired from the library of Linkoping University and the Google Scholar. This secondary data was collected regarding the information provided by the project manager through emails. Our secondly data is mainly about background of Ericsson, which is the background of the project team. The data about the project team cannot be gained from the secondary source, and the only way to gain is from the interview and emails directly with the project manager.
2.4 Analysis strategy

In this part, we chose the step-by-step of analysis, which includes naming the categories, determining the number of categories, and figuring our systems for placing data into categories (Merriam, 2009). A category could be a theme, a pattern, a finding, or an answer to a research question (Merriam, 2009). Our categories are the themes from our literature part, and some of them are the answers to the research questions. We combined both inductive and deductive approach strategies to analyze our thesis. Inductive approach is the analysis based on empiricism, and deductive approach is the analysis based on theories.

Though the analysis of our thesis is mainly based on deductive strategy, inductive strategy is also used. According to Altheide (1987, p.68, Merriam, 2009, cited in, p.205), “although categories and ‘variables’ initially guide the study, others are allowed and expected to engage throughout the study”. In our thesis, we initially guided our analysis based on the theory part. But the case part did add some important to knowledge transfer in projects for our thesis. Through inductive and deductive approach strategies, our analysis was done in conjunction with the data collected and theories. Furthermore, this chapter would be not simply combination of the theories and empiricism, but also include our opinions on the positive and negative barriers of knowledge transfer in project and suggestions of controlling these barriers.

2.5 Method criticism

In order to increase the reliability of the study, we used the voice recorder during the interview. Reliability means the trustworthy of the thesis and can be approached through careful attentions to the study’s conceptualization and the way how data are collected, analyzed and interpreted, etc. (Merriam, 2009). We can listen to the record after interview to make sure what we collected is correct and useful. We also listed the necessary information about what we can gain through each question before the interview, so that our questions are related to the purpose of the thesis.
The interaction between researcher and respondent can affect the quality of the information collection (Klein and Myers, 1999). We tried to make our questions simpler and easier to understand for the respondent. At the beginning of the interview, we also told him our purpose of the thesis so that he can better understand our questions and supplied the related information to us.

Because no research study is exactly perfect, the thesis also has some limitations. The first one is that the single case, which provides not enough information. Because our case study just focuses on a project team in Ericsson, it has relatively limited information. However, the project team has already taken eight projects and worked with each other for four years, especially the project manager of the team has at most taken seventeen projects. They have enough knowledge to provide useful data for our study. This second limitation is the limited time. We had not enough time to understand the whole project team. The information and knowledge we gained about the project team is only a part. When designing questions for the interview, there is another risk that we may make assumptions regarding to our pre-understanding of this problem area. These assumptions might have affected the answers of the interviewee and also may cause us not gaining the comprehensive data for our study.

Next, we did not have any working experience in the project team. The key information is just gained from the interview with the project manager. It has a risk that the respondent answered the question subjectively, but it is hard for us to judge it. What is more, we did not gain the chance to interview their project members. Their project members may have different answers and opinions about knowledge transfer in projects and the related barriers. However, we gained the answers and data only based on the responses of the project manager.
Chapter 3 Frame of reference

3.1 Knowledge transfer

3.1.1. What is knowledge

Knowledge is a multifaceted and complex phenomenon with a long history in the philosophy field (Björkegren, 1999). Since the classical Greek, the history of philosophy period can be regarded as a never-end search for the meaning of knowledge (Nonaka, 1994). The deep discussion about what is or what is knowledge depends on the scope and topic of the thesis (Björkegren, 1999). Therefore we narrowed down the definition and dimensions of knowledge according to our understanding of knowledge transfer. In this paper we adopt the definition of knowledge as "justified true belief" (Nonaka, 1994, p15).

*It should be noted, however, that while the arguments of traditional epistemology focus on “truthfulness” as the essential attribute of knowledge, for present purposes it is important to consider the importance of the “justification” of knowledge (Nonaka, 1994, p15).*

This definition emphasizes both the essential particularity “truthfulness” and the importance of “justification” of knowledge. The “truthfulness” reflects the view of knowledge in traditional epistemology which regards knowledge as absolute, static, and nonhuman nature of knowledge. While the “justified”, in another hand, views knowledge as a dynamic personal justifying process so that justified personal beliefs are parts of an aspiration for the “truth” (Nonaka, 1994).

It should be emphasized that data, information and knowledge are different even though they can replace each other sometimes. According to Nonaka (1994), information is a flow of massages while knowledge is created and structured by proper flows of information based on the holder’s beliefs. Information can be organized to become knowledge by human’s beliefs. Through this, we can find that information is
more like nonhuman matter but knowledge is firmly related to human actions and beliefs. Knowledge involves a person using his/her awareness, skills and experience to process information. So information can be converted into knowledge in the mind of individual (Kirchner, 1997 cited in Ajmal and Koskinen, 2008). The process begins with data being formed to produce general information. After that, the general information can be structured into contextual information by specific group of users. Individuals then can absorb contextual information and transform it into knowledge depending on the basis of their specific experience, attitudes and the context they be involved in (Ajmal and Koskinen, 2008).

3.1.2 Different knowledge dimensions

*A man has no ears for that to which experience has given him no access.*

*Friddrich Nietzsche cited in Björkegren, 1999*

The extreme explanation of this quotation is that it is impossible to learn thing which you have no previous experience. This quotation can also be interpreted to mean that it is more difficult to gain knowledge from which you have no previous experience than you have. That is because what we learn and gain depends on both immediate sensory data and our experience before which we had no immediate awareness and accessibility (Björkegren, 1999). Building on Ryle’s (1949) concept of knowing how and knowing that, Polany(1966) expounds the concepts of tacit and explicit knowledge (Björkegren, 1999). Tacit and explicit knowledge can be seen as two sides of the coin that neither side can exist without the other. There is some knowledge which we know but we cannot tell. At the same time, some knowledge can also be formulated into explicit knowledge and shared among individuals (Björkegren, 1999).

Nowadays, knowledge management, integration and creation have been discussed in many literatures (Hansen, Nohria, and Tierney, 1999; Nonaka and Konno, 1998; Lindkvist, 2005). Most of those theories are based on the categories of two different kinds of knowledge: tacit and explicit knowledge.
The concept of tacit knowledge originally is described by Polanyi (1958, 1967, 1969 cited in, Jasimuddin, Klein and Connell, 2005). Tacit knowledge is the knowledge embedded in human’s brain which is hard to formalize and communicate. In Nonaka’s words, “the tacit knowledge is deeply rooted in action, communicate, and involvement in a specific context” (Nonaka, 1994, P.16).

Explicit knowledge refers to the knowledge which can be transmittable in formal and systematic language. Explicit knowledge, which can be codified into tangible form, data or number, is just a small part of knowledge (Nonaka, 1994). Nonaka and Kanno (1998) also argued that tacit knowledge and explicit knowledge can mutually transform. They call the conversion “spiral evolution of knowledge conversion and self-transcending process”, (Figure 1)

![Figure 1: Spiral Evolution of Knowledge Conversion and Self-transcending Process, Nonaka and Konno, 1988, The Concept of “Ba”, p43](image)

The main advantage of tacit knowledge is that it is the most secure and significant kind of knowledge because it is difficult to be imitated or understood by other organizations (Spender, 1994). “The skills and resources that underlie a firm’s core competencies must be relatively widely transferable within the firm, but very difficult for other firms to copy or develop. Tacit knowledge fits these criteria” (Lubit, 2011,
p165). Tacit knowledge is the key for developing sustainable competitive advantages (Lubit, 2011).

Nonetheless, there are some problems about tacit knowledge. Firstly, since tacit knowledge is difficult to formalize, time-specific and space-specific, tacit knowledge can be gained only through sharing experience, such as spending time together or living in the same environments (Nonaka, Toyama and Konno, 2000). Tacit knowledge is embedded in individuals’ heads, so the only way to move knowledge within the organization is to move people (Sanchez, 2000). Moving people is often costly and time-consuming and may be resisted by individuals (Sanchez, 2000). Even when knowledgeable individuals are willing to be moved, an individual can only be in one place at a time and can only work for limited hours. Thereby it limits the scope and the speed of transferring individual knowledge in an organization (Sanchez, 2000). The second disadvantage is that individuals in an organization may claim to have some tacit knowledge which they do not actually have or may claim to be more knowledgeable than they really be (Stein and Ridderstråle, 2001, cited in Sanchez, 2000). As a result, tacit knowledge increases difficulty for choosing new members. What is more, keeping knowledge tacit in the individuals creates a risk that the organization may lose that knowledge if any of those individuals leaves the organization. Or even worse, people leaving original company will be hired by competitors (Sanchez, 2000).

The main advantage of explicit knowledge is that it is possible to be accessed and reused at anywhere and anytime (Sanchez, 2000). Then explicit knowledge can be shared at low cost among individuals (Nonaka, 1994).

Another advantage of explicit knowledge is that it is often being more carefully codified and more effectively leveraged than tacit knowledge (Sanchez, 2000). It is because explicit knowledge can be used through information systems by lots of people and groups in the organization (Sanchez, 2000). Moreover, by disseminating
explicit knowledge to other individuals who are experts in the same knowledge
domain, the explicit knowledge can be discussed, debated, tested further, and
improved (Sanchez, 2000). The companies can also analysis and make full use of the
existing explicit knowledge, so that they can produce new knowledge (Nonaka and
Krogh, 2009).

The next advantage of explicit knowledge is that, once an organization converts the
individual’s tacit knowledge to explicit knowledge, it could minimize the risk that the
company may lose key knowledge if individuals become unavailable or leave the
organization (Sanchez, 2000).

What is more, the company can choose the most simple way to acquire the resources
and capabilities through buying explicit knowledge for their competitive advantage
(Grant, 2010), because explicit knowledge can be transferred much more easily than
tacit knowledge.

However, there are some disadvantages about explicit knowledge. Some argued that
at least some tacit knowledge cannot be made explicit (e.g. Ambrosini and Bowman,
2001). Moreover, people may not be willing to make tacit knowledge explicit,
because individuals’ job and positions in the organization depend on their tacit
knowledge which is needed by the organization (Sanchez, 2000). Thirdly, the
company’s explicit knowledge even including core competences would be much
easily spilled out. The turnover of the employee can also cause the loss of companies’
knowledge (Jasimuddin, Klein and Connell, 2005).

3.1.3 Knowledge transfer
There are two different views of knowledge transfer being discussed by Björkegren
(1999). According to Björkegren (1999), these views are inspired by Reddy’s (1986)
conduit and toolmaker metaphor on communication.
**Knowledge transfer as knowledge copying**

From this view, knowledge transfer can be described as knowledge copying. It means that all of knowledge is explicit and can be copied in order to transfer. “Knowledge transfer can be described as a mechanical process where a stock or a body of knowledge is transferred from sender to receiver as with bits of data over a telephone line” (Björkegren, 1999, p25) (Figure 2). So from this view, all of knowledge can be codified and expressed in words. Transfer process is the process which knowledge is copied from sender’s mind to receiver. This view implies that everyone could receive the same knowledge since the receiver does not take any active part in this transfer (Björkegren, 1999).

![Knowledge transfer diagram]

*Figure 2: Knowledge transfer as knowledge copying. Björkegren, 1999, p26*

However, not all knowledge can be told and codified (Polanyi, 1996), and we cannot receive anyone else’s thoughts directly into our mind when using language (Björkegren, 1999). As a result, knowledge cannot be simply copied and transferred among individuals.

**Knowledge transfer as a process of translation, reconstruction, and utilization**

*“There are a thousand hamlets in a thousand people's eyes”*  
*Shakespeare*

“Rather than being viewed as knowledge copying, knowledge transfer is here to be understood as an interactive process of knowledge translation and reconstruction
which is dependent upon the actors’ previous experience” (Björkegren, 1999, p27) (Figure 3).

Figure 3: Knowledge transfer as a process of translation and reconstruction, Björkegren, 1999, p27

When people try to communicate with each other, they are isolated in different environments or previous experiences (Björkegren, 1999). The only thing they can exchange, according to Reddy (1986, p. 292 cited in Björkegren, 1999, p 27), are “odd looking blueprints scratched on special sheets of paper that appear from a slot in the hub and can be deposited in another slot and nothing more”. Hence, the knowledge transfer is a process of translation and reconstruction. The received knowledge of receivers is based on their specific interpretations which can be related to their previous experiences. Thus, learning from own experience and learning knowledge from other people cannot be the same.

Even if all knowledge is explicit and codified, according to the definition of knowledge above, the knowledge being perceived is based on receivers’ interpretation which depends on individuals’ specific experiences, attitudes and skills. It implies that people cannot receive totally same knowledge, but people with similar previous experiences can interpret knowledge in the similar way (Björkegren, 1999).
3.1.4 Knowledge Conversion

Nonaka and Konno (1998) recommended that organizational knowledge is created through the continuous social interaction of tacit and explicit knowledge. Nonaka and Konno (1998) formulated a knowledge conversion process which called SECI involving four sequential modes of knowledge conversion: socialization, externalization, combination and internalization. “This SECI model describes a dynamic process in which explicit and tacit knowledge are exchanged and transformed. The four modes of knowledge creation allow us to conceptualize the actualization of knowledge within social institutions through a series of self-transcendental processes” (Nonaka and Konno, 1988, p45) (see Figure 1). The process is spiral and depicted by matrix, described as the “engine” of the entire knowledge creation and conversion process (Jasimuddin, Klein and Connell, 2005, cited in Nonaka and Konno, 1988).

Socialization is a process of tacit-to-tacit knowledge and individuals share tacit knowledge in this section. Externalization is a process of tacit-to-explicit knowledge involving the expression of tacit knowledge and its translation into comprehensible forms which can be understood by others. Combination involves the conversion of explicit knowledge into more complex forms of explicit knowledge. Internalization is a process that explicit knowledge is converted to tacit knowledge so that newly created knowledge becomes organizational tacit knowledge (Nonaka and Konno, 1988).

3.1.5 Learning Process

Knowledge learning is an important topic related to knowledge transfer and project-based learning. In this part, we chose to illustrate two different views of learning processes.

Zollo and Winter (2001, cited in Prencipe and Tell, 2001) distinguishes three kinds of learning processes: experience accumulation, knowledge articulation and knowledge codification. In order to understand experience, we need to illustrate routine first.
Levitt and March (1988, cited in, Prencipe and Tell, 2001) argued that organizational learning is based on historical experiences and stored routines. Routine is a product of trial-and-error and the reflection of accumulating experiential wisdom. Therefore, experience learning process is always local and related to existing routines. In another way, this type of learning is reached through “learning by doing” and “learning by using”.

The second process is knowledge articulation. Zollo and Winter (2001) presented that articulation of knowledge has two roles. Firstly, it provides a context for justification. Secondly, it is a cognitive process which implies consideration and provides the possibility for groups and individuals that they can grip causality and feasibility when performing different tasks (Prencipe and Tell, 2001). This process improves the understanding of action-performance relationships and creation based on representations. Knowledge articulation is reached through learning by reflecting, learning by thinking, learning by discussing and learning by confronting (Prencipe and Tell, 2001).

The extension of knowledge articulation is knowledge codification. Knowledge codification allows the creation of externalized knowledge through linguistic and symbolic representation. Although this process will take more cost and effort, it can bring economics of information. It is because that codified knowledge can be re-used and diffused easily. This type of learning can also be reached through learning by wring or re-writing, learning by implementing, replicating and adapting (Prencipe and Tell, 2001).
Table 1: Learning processes and Learning typologies, Prencipe and Tell, 2001, p1378

In the book of Grant (2010), knowledge process is distinguished into two categories: knowledge generation (exploration) and knowledge application (exploitation). These two processes are relevant with the development of organizational capabilities. Exploration activities belong to knowledge generation process which is associated mostly with dynamic capabilities. Exploration activities include both internal knowledge creation and knowledge acquisition. Knowledge acquisition means identification and absorption of existing knowledge from outside of the organization. As a comparison with exploration, exploitation involves both the use of existing knowledge and its development. These development processes are critical to the improvement of existing operational and functional capacities. Some of them can improve utilization of existing knowledge and knowledge generated during the ongoing operations. The most basic aspects of knowledge exploitation include knowledge integration, knowledge sharing, knowledge replication, knowledge storage, knowledge measurement, and knowledge identification (Figure 4).
3.2 Project

3.2.1. The concept of project

Project has been undertaken for more than 6000 years, and played an outstanding role for the development of the society, starting from the Egyptian Pyramids and the Great Wall (Geraldi, et al., 2008). And it is also argued by many project researchers, projects have become a common way to finish a task in today’s organizations (Engwall 1998; Lundin 1998, cited in Bjorkegen, 1999). Then how to define a project? What is a project? What is the scope of the project? Plenty of articles have mentioned the definition of project management, and the tools and processes of project management, but few articles mentioned the pure definition of a project. According to Tonnquist (2008), the definition of project methodology is not about size nor the length of it, but whether it is specific and limited in time.

According to Tonnquist (2008), a project is a work method or methodology, with a strong focus on the goal. The project needs to be time limited and has appropriate resources. The four elements about the definition of a project are (Tonnquist, 2008):

- Knowledge Creation
- Knowledge Acquisition
- Knowledge Integration
- Knowledge Sharing
- Knowledge Replication
- Knowledge Storage and Organization
- Knowledge Measurement
- Knowledge Identification
- Knowledge Application ("Exploitation")
• Specific goal-a unique assignment
• Specific time period-timed
• Specific resources-own budget
• Unique work arrangements-temporary organization

An assignment, which fits all these criteria, is considered to be a project. All criteria are not necessarily needed at the beginning of the project, and also could be met during the process of the project (Tonnquist, 2008).

3.2.2 Project Process:
Project scheduling has been a research topic for many decades and has a variety of optimization processes (Vanhoucke, 2010). A basic project process can be described simply as the process with just a start and an end. More details about the process of project means more exercises needed to be considered when executing the project. According to Tonnquist (2008), the definition of a process is as follows:
• A process is a list of continuous activities.
• A process lets the goods and services to meet needs which are established at the beginning.
• A process has at least one input and one output for the project.

The purpose of process about the project is to make sure that the predefined goal can be reached every time. And most of companies’ projects are being executed through the process of project management (Uppal, K.B., 2008). The project work’s processes contain several small sub-processes which all have their own purposes and goals. The processes can be divided to core process and supporting process. The core process is which can lead the result of project and the supporting process is needed when executing core process (Tonnquist, 2008). The process of project has different models in current articles. No matter what model it is, the model usually has the core processes and phases. Each phase has its own objectives, which should be reached so that the project can move to the next phase (Uppal, 2008).
3.2.3 Project tasks:
The project task could be homogeneity, which is that the task in the new project is similar with the pre-project, or heterogeneity, which is that the task in the new project is different (Enberg, Lindkvist and Tell, 2006). If the task is homogeneity, it means that individuals can use the previous experience to finish their new jobs.

There is also another more detailed distinction about the project task. According to Packendorff (1993, cited in Bjorkegen, 1999), on the basis of project task there is a distinction between unique and repetitive projects (Figure 5). In unique projects, both project task and project procedure are unique so that no any previous experience in the organization can be utilized for the new projects. Repetitive projects means that project task is unique but project procedure is repetitive. Thus, previous experience of pre-projects can be utilized for the repetitive projects. If both task and procedure are standardized and repetitive, it is called the large-scale production (Packendorff, 1993, cited in Bjorkegen, 1999). In the large-scale production, every previous experience and knowledge can be used for the current project.

![Project task diagram](attachment:image)

Figure 5: Unique and repetitive projects, Packendorff, 1993, cited in Bjorkegen, 1999. p.30.
### 3.2.4 Project group:

Although models about project group have tiny differences, a project in common has these three roles: line manager, project manager and project workers (Figure 6). For example, according to Tonnquist (2008), the roles in the project have line managers, project manager and employees. While according to Bredin and Soderlund (2011), the roles in the project have human resource specialists, line managers, project managers and project workers.

![Figure 6: General roles in the project](image)

Line managers’ responsibility turns towards competence management which focuses on human resource issues, such as project staffing, competence development and career counseling (Clark and Whellwright, 1992). Project managers’ responsibility is to give direct feedback to employees and also contact line managers to provide resources for evaluation and reviewing processes (Bredin and Soderlund, 2011). Project workers’ responsibility is to stay employable, to drive their own careers and competence development, to take responsibility for various project processes and activities (Bredin and Soderlund, 2011). In short, project workers’ responsibilities refer to keeping relations with various roles, such as co-working with others, and having the responsibility for maintaining and developing the relations (Hallsten, 2000, cited in, Bredin and Soderlund, 2011).
3.3 Knowledge transfer in projects:
Knowledge transfer in project-based environments has special characters. Project teams could consist of members from different departments and from various physical and cultural backgrounds (Pretorius and Steyn, 2005). Moreover, “Trust is needed for the efficient transfer of knowledge among people” (Pretorius and Steyn, 2005, p43). Because the duration of projects is limited, members in one project have not enough time to develop their trust (Pretorius and Steyn, 2005). In addition, projects are characterized by tight schedules and high-intensive work environments, so people may have not enough time for knowledge-sharing activities (Pretorius and Steyn, 2005).

3.3.1 Different views of knowledge transfer
According to Bjorkogren (1999), knowledge transfer in projects has two views. One is the traditional view, which is the normative view of knowledge transfer in internal project. Another view shows the importance of knowledge transfer across projects.

The traditional view of knowledge transfer in projects:
In this view of knowledge transfer, planning and forecasting are both possible and desirable (Lundin& Soderhol, 1995). In this view, project plan is the basic for the success of knowledge transfer in projects. There are three most important dimensions for this kind of knowledge transfer, which are time, cost and quality (Lock 1996, cited in Bjorkegen, 1999).

The focus of traditional view on knowledge transfer in projects is internal knowledge transfer focusing on its own project, such as individuals’ knowledge transfer, and knowledge transfer between project manager and project members, and etc. (Figure 7).
Partington (1996) said that knowledge transfer in internal project has generic principles, where a project is “a given, plannable, and unique task, limited in time, complex in its implementation, and subject to evaluation” (Packendorff, 1995, p. 320).

In the book of Nonaka and Takeuchi (1995, cited in Gourlay, 2006), they said that the first prototype bread-making machine failed to produce ‘tasty bread’ and the master chef could not tell the research and development what they could know. Thus one of the members, Tanaka, who was a younger engineer in the research and development, learned the necessary skills with the master baker at a nearby luxury hotel. One day she noticed that the baker was not only stretching but also twisting the dough, which was the secret for making tasty bread. When she came back to the company, she explained to her project team. After her important illustration and explanation to the product development group about how the master baker kneaded the dough, the group found their machine’s problem (Nonaka and Krogh, 2009). Then the research and development group had got the machine with the movement of “twisting stretch” and kneaded the bread correctly.
It is an example about knowledge transfer in the project, which is that the member described her experience and knowledge to the whole group and the project group cannot gain any experience and knowledge from other previous projects.

**Knowledge transfer across projects:**

In this view, knowledge transfer is not the traditional one, but as knowledge creation, which focuses on gaining new knowledge and experience through these organizational activities. Jankowicz (1999, cited in Yakhlef, 2007) describes that the process of knowledge transfer is a process of “mutual knowledge creation”, catching the new understanding through interactions. Lenoard-Barton (1992, cited in Bjorkogren, 1999), said that knowledge integration in the organizations is an excellent way for creating new knowledge. During the process of participants in the project, their learning processes, new experiences and knowledge can be helpful for other parts in the organization. It means that projects are not separate entities within the organization and knowledge created within one project can also be used for later projects (Figure 8).

![Knowledge transfer between projects](image)

*Figure 8: Knowledge transfer between projects, Bjorkegren, C.,1999,p.22.*

Ekstedt et al. (1998, cited in Bjorkegen, 1999) said that learning between projects is complicated and the same mistakes are often repeated in every new project. When the
problems are solved in a project team, other project teams can reuse the solutions. It could be said that the organization’s learning and gaining for knowledge is through the transfer of knowledge in the project as well as related projects. The reuse of experience from previous projects is an example (Bjorkogren, 1999).

Sanchez (2000) said that, in the 1990s, Motorola designed every new generation per 12-15 months. Each new generation was designed to offer more advanced features and options for customization, using existing explicit knowledge and new knowledge developed in each project. At the beginning of their project, each new team of designers would receive a manual of design methods and techniques from the team who had developed the previous generation. This example shows that the core knowledge of the company can be improved continuously through knowledge transfer.

3.3.2 Negative Barriers of knowledge transfer:
According to Hoegl and Gemuenden (2001), there are six elements affecting the success of projects, which are communication, coordination, balance of member contributions, mutual support, effort and cohesion. The success of projects is measured by team performance and personal success. “Team performance can be defined as the extent to which a team is able to meet established quality and cost and time objectives…Team performance is described in terms of the variables effectiveness and efficiency (Hoegl and Gemuenden, 2001, p439).” Due to the six elements’ importance for the success of project, we would like to represent negative barriers of knowledge transfer from these six aspects.

Communication:
Communication is the way to provide methods for exchanging of knowledge among projects (Pinto and Pinto, 1990). Because project teams usually consist members from different departments and from different disciplines with various physical and cultural contexts (Pretorius and Steyn, 2005), it can cause lots of communication barriers.
Knowledge needs communication so that receivers can understand what knowledge senders want to transfer (Figure 9). During the process of communication for knowledge, the message about knowledge is expressed and articulated by using the sender’s way, which can be called coding (Tonnquist, 2008) for the knowledge. Then when receivers gain the message of knowledge from report, meeting or other ways, receivers will use their own ways to understand the message of knowledge based on their own previous experiences, which can be called decoding (Tonnquist, 2008). Then receivers can give the feedback to the sender through receivers’ understandings about the knowledge of sender. During the process, lots of information can influence the feedback and understandings of receivers for the knowledge, such as language, and structure of the communication.

According to Bjorkegen (1999) and Hoegl and Gemuenden (2001), language, frequency, formalization and structure can affect process and effectiveness of knowledge transfer.

- Barriers of language:

The barriers of knowledge transfer about language can happen in the two dimension of knowledge: tacit and explicit. The tacit dimension of knowledge cannot be put into words so that the experiences cannot be transferred between individuals in a large
number (Polanyi 1958; Polanyi 1966, cited in Bjorkegen 1999). It is the limitation of language, but language is an important method to make the private knowledge to public (Furberg, 1981, cited in Bjorkegen 1999). Even these kinds of knowledge and experience still can be transferred from tacit to tacit, it still has some limitations. It is often costly and time-consuming and may be resisted by individuals when transfer tacit knowledge (Sanchez, 2000), because this kind of knowledge transfer needs to move person from one place to another.

Even explicit knowledge transfer can make knowledge accessed at any time, any place, by saving money and time comparing with tacit knowledge transfer. But not all tacit knowledge can be transferred to explicit knowledge to save time and money. At least some tacit knowledge cannot be made explicit (Ambrosini and Bowman, 2001). There are also other challenges for transferring explicit knowledge. In order to understand the content which is written in the document, individuals have to refer the content to their previous experiences (Polanyi, 1966, cited in Bjorkegen 1999). Hammeren (1999, cited in Bjorkegen 1999), said that when people learn from an example, they have to depend on their previous experiences to understand the example. The members who have taken part in the similar projects can be much easier to understand and gain knowledge from written reports of projects than the members who have no any experience in similar projects. Then explicit knowledge is not so helpful for new members or the members who have no related experience about the project. Thus explicit knowledge transfer is incomplete (Dutta, 1997).

Tacit knowledge is hard to be understood by others, while explicit knowledge can be easily understood and spread because the documents can be understood by everyone who read it. If all tacit knowledge of the company has been converted to explicit knowledge, the company’s explicit knowledge would be much easier to be spilt out.

- Barrier of frequency:
The frequency of knowledge transfer refers to how often team members communicate for knowledge. Tacit knowledge needs necessary face-to-face communication for knowledge (Hansen, Nohria, and Tierney, 1999). Then the understanding of tacit knowledge is connected with the frequency of meeting through face-to-face. The members of a team in different locations have the low level of frequency to meet each member. The low frequency of knowledge transfer can be a barrier for transferring tacit knowledge, causing not enough knowledge-sharing and trust between the members of project. While explicit knowledge meet less problems of this barrier when knowledge transferring because they are easily accessed.

- Barrier of formalization

“The formalization refers to how spontaneously team members are able to converse with each other” (Hoegl and Gemuenden, 2001, p.437). If the knowledge transfer needs the “formalization” way which needs the preparation, planning, such as, scheduled meetings, and written reports, members of the project will not be possibility to spontaneously communicate and transfer knowledge (Hoegl and Gemuenden, 2001).

Coordination and Balance of Member contributions:

One project usually only has one task but contains many activities which can be divided to individuals (Hoegl and Gemuenden, 2001). The coordination for projects and knowledge is important, showing in harmonization and synchronization of individual works (Tannenbaum et al. 1992, Larson and Schaumann 1993, Brannick et al. 1995, cited in Hoegl and Gemuenden, 2001). Knowledge collective is a kind method for knowledge coordination. During the process of knowledge collective, members should have the ability of seeking the necessary knowledge and using other members’ knowledge to solve the problems of their own limited capabilities (Lindkvist, 2004). Then project members need to coordinate with each other and use others’ knowledge, or the project team cannot effectively use resources.
It is also important that all members of the project can contribute the task-relevant knowledge and experience to the project (Hackman 1987, Seers et al. 1995, cited in Hoegl and Gemuenden, 2001). When choosing a new member for a project, the group must make sure that the skills of members are necessary needed and valuable for the group. Otherwise, the group can only put them on the bench (Huemann, Keegan and Turner, 2007) or spend huge amount of time and money to train them. Another problem is that tacit knowledge is not visible, so it is possible that individuals in an organization may claim to have some tacit knowledge which they do not actually have or may claim to be more knowledgeable than they really be (Stein and Ridderstråle, 2001, cited in Sanchez, 2000). It is harmful for a knowledge transfer if the member does not have necessary knowledge needed in the project, because they cannot do equal knowledge contributions to the task.

Mutual support:
Tjosvold (1995 cited in Hoegl and Gemuenden, 2001) said that mutual support is more productive than the forces of competition. According to Hoegl and Gemuenden (2001), the collaboration of individuals in the projects depends on a cooperative rather than a competitive frame. But for different projects in the organization, no matter the exploration and the exploitation of knowledge, these projects often compete for the scarce resources of the organization (March, 1991). These competitions can lead to conflicts in the organization and become the barrier for knowledge transfer crossing projects (Cross and Baird, 2000).

Knowledge transfer in the project will also meet resistances from individuals, because individuals’ positions in the organization depend on their knowledge which is needed by the organization (Sanchez, 2000), especially tacit knowledge which is personal, context-specific and gained from experience (D’Eredita and Barreto, 2006). According to Lundin and Soderholm (1998, cited in Bjorkegen, 1999), all knowledge belongs to person and no other carriers for organizational knowledge. The company may meet some resistances when they transfer knowledge from specialists. The
company wants to transfer specialists’ core knowledge which are different from others’ skills to make them special and valuable (Lazarus, 2002). But the core competences of specialists are based on their knowledge. If the specialist’s tacit knowledge has been transferred to explicit knowledge which is stored in the document of the company, then the specialist is not necessary for the company and also the company does not need to pay higher salary and position for him/her. As a result, this kind of conversion may face resistances from individuals (Sanchez, 2000). This kind of resistance is negative barrier for knowledge transfer in projects.

**Effort:**

To achieve high quality about knowledge transfer and avoid conflicts among members in projects, members should accept and finish the work of the project with sufficient effort (Hoegl and Gemuenden, 2001). Then the incentive (Hansen, Nohria, and Tierney, 1999) for members in the project play a key role in the knowledge-sharing process. The barriers will come out when members in the project do not want to devote enough effort in their work.

**Cohesion:**

Team cohesion refers to how these projects can connect with previous projects, and the previous experiences of members in these projects. According to Sahlin-Andersson (1989; 1998, cited in Bjorkegen, 1999), the comprehending by members in the project can affect the performance of the project. If the project is unique, no previous experience can be used to guide project members about how to perform in this project. But if the project is repetitive, the previous knowledge can influence the performance of the project. Szulanski (1995, 1996, 2003, cited in Love, Fong and Irani, 2005) also said that the prepared and prior knowledge for the recipient of knowledge transfer are important.

The barriers will come out when knowledge transfers across projects. Knowledge transfer crossing projects is not easily performed and the outcome is not measureable
(Love, Fong and Irani, 2005), due to the complex connecting with different projects. Then the group has to cope with the problems of both external adaptation and internal integration (Schein, 1985, cited in Love, Fong and Irani, 2005).

Packendorff (1993, cited in Bjorkegen, 1999) said that individuals can also learn knowledge from different projects. But if there is low cohesion about the relationships of individuals and group, the employee turnover will increase. The turnover may destroy the organization’s core competences by spilling important knowledge out and even to the competitors (Fisher and White, 2000).

<table>
<thead>
<tr>
<th>Effect elements</th>
<th>Related Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Communication</td>
<td>Barriers of Language: tacit and explicit limitations</td>
</tr>
<tr>
<td></td>
<td>Barriers of low frequency: trust, not enough knowledge-sharing</td>
</tr>
<tr>
<td></td>
<td>Barriers of formalization: lots of time for preparing</td>
</tr>
<tr>
<td>2 Coordination and Balance of Member contributions</td>
<td>Others’ knowledge and Tacit knowledge’s invisible</td>
</tr>
<tr>
<td>3 Mutual support</td>
<td>Competition, resistance from individuals</td>
</tr>
<tr>
<td>4 Effort</td>
<td>No sufficient effort</td>
</tr>
<tr>
<td>5 Cohesion</td>
<td>No previous experience, employee turnover</td>
</tr>
</tbody>
</table>

*Table 2: Impactive elements and their related barriers for knowledge transfer in projects*

**3.3.3 Positive barriers of knowledge transfer**

As we mentioned before, barriers of knowledge transfer have positive effect for projects. We would like to present positive barriers from different aspects.
**Definition of knowledge transfer**

We started with the definition of knowledge transfer. Here we accept the definition of knowledge transfer as an interactive process of knowledge translation and reconstruction which is dependent upon actors’ previous experiences (Björkegren, 1999) (Figure 3). Knowledge transfer process is a process of translation and reconstruction. The knowledge received by receivers is based on their specific interpretations which can be related to their previous experiences (Björkegren, 1999). Therefore, learning from own experience and learning from other people cannot be the same. People outside or inside the organization and environment may have different interpretations related to their context.

![Knowledge transfer diagram](image)

**Figure 3: Knowledge transfer as a process of translation and reconstruction, Björkegren, 1999, p27**

People outside the context or with different previous experiences will have trouble to gain the knowledge correctly. This knowledge transfer barrier makes knowledge transferring is effective and easier inside the organization or unit. But outside the organization or unit, knowledge cannot be translated and reconstructed so entirely and correctly.
Three characteristics of knowledge transfer

Szulanski (2000) analyzed that the recipient, the context, and the knowledge affected knowledge transfer in projects. These three characteristics can also create positive barriers of knowledge transfer.

- Recipient

Szulanski (2000) stated that characteristics of members can affect knowledge transfer such as motivation and ability. “Lack of motivation may result in procrastination, passivity … in the implementation and use of new knowledge (Szulanski, 2000, p12)”. Also, recipients’ abilities to absorb knowledge affect the execution of knowledge transfer (Argote and Ingram, 2000). Therefore, only when members have similar motivations and abilities, they can transfer knowledge more effectively and correctly. In this way, project members must be qualified and with highly agreement on their goal.

On one hand, it is difficult to transfer knowledge among people with different level of abilities and agreements. On the other hand, this barrier provides a standard of recruitment for project members.

- Context

Institutional, contextual factors play a vital role in the success or failure of knowledge transfer (Yakhlef, 2007). Context, according to Inkpen and Dinur (1998, cited in Yakhlef, 2007), is a part of the background, but not that of the knowledge content.

The context where knowledge transfer is embedded may affect the eventfulness of transferring (Szulanski, 2000). Cognition is dependent on particular features of the context, so knowledge transfer from other contexts is regarded to play little role in learning process (Argote and Ingram, 2000). Knowledge transfers more freely across organizations that are entrenched in a network or super-ordinate relationship, such as franchise, chain, or alliance, than across independent organizations (Argote and
Ingram, 2000). To conclude, knowledge transfer is easier in one project or in one organization than across organizations. Without appropriate context, competitors have difficulty to totally catch the original meaning.

Argote and Ingram (2000) thought if the knowledge be translated inappropriately or cannot adapt to the new context, negative effects will occur. “The greater the differences are between the institutional profiles of the home country of the practice and the recipient country, the greater the likelihood that the transfer will run into difficulties or fail altogether” (Yakhlef, 2007, p46). For example, routines imported from other markets were not suitable for the local market where competitors were different (Argote and Ingram, 2000). Likewise, knowledge is difficult to be moved by moving the networks in which it is embedded. “In order to transfer knowledge successfully, reservoirs or sub-networks that are moved must fit or be compatible with the new context (Argote and Ingram, 2000, p159)”. As a result, competitors coming from other markets take risk to enter into the local market, because adaptation to new context is vital and has risks for knowledge transfer. Thus, the context of a project protects itself being imitated from other competitors and it also hinders new entrances from other markets.

- **Knowledge**

When the knowledge is not codified, frequent and close relationships allows for repeated interactions promoting knowledge acquisition and shortening project completion time (Argote and Ingram, 2000). So the nature of knowledge can also generate the barrier for knowledge transfer.

People in one project need more communication and interactions in order to understand each other’s experience and knowledge. If project members lack interaction, they may meet troubles or delay the project due to low quality of knowledge transfer. It seems the non-codified knowledge is the barrier of knowledge transfer. But this is also a promotion for frequent interaction. If the knowledge is hard
to understand and seems tacit, members will need to discuss more and communicate more in order to get the right knowledge and complete the project on time. Fluent interactions among members do contribute to building the trust, enhancing team spirit, and learning from others.

In addition, characteristics of task also affect knowledge transfer. “The more similar the number of elements across the tasks, the greater the likelihood of transfer” (Thorndike, 1906 cited in Argote and Ingram, 2000, p162). In this way, project members can reuse their experience and knowledge gained from previous similar projects. Thus new members without experience seem harder to be involved in or to communicate with members of abundant experiences. The requirement of special experience can be a barrier for knowledge transfer. But if knowledge cannot be brought from one project to another and experiences are useless, it must cause a trouble to select people for one project. So this barrier provides a clue about how to select project members and design the career path for them.

**Tacit knowledge and competitive advantage**

Tacit knowledge is always being regarded as barrier of knowledge transfer but it has positive function and influence for projects.

Tacit knowledge is difficult to be imitated, rare and hard to find substitutes so it is the source of sustainable competitive advantage (Ambrosini and Bowman, 2001). “Nonaka (1991), Grant (1993) and Spender (1993) have argued that tacit knowledge occupies a central role in the development of sustainable competitive advantage” (Ambrosini and Bowman, 2001, p811). Also tacit knowledge is the most secure and significant kind of knowledge, because it is difficult to be imitated or understood by other organizations (Spender, 1994). “The skills and resources that underlie a firm’s core competencies must be relatively widely transferable within the firm, but very difficult for other firms to copy or develop. Tacit knowledge fits these criteria” (Lubit,
Barney (1991) stated that not all the resources can hold the potential of sustained competitive advantages. To have this potential, resources must have four attributes (Figure 10): “(a) it must be valuable, in the sense that it exploits opportunities and/or neutralizes threats in a firm’s environment, (b) it must be rare among a firm’s current and potential competition, (c) it must be imperfectly imitable, and (d) there cannot be strategically equivalent substitutes for this resource, which are valuable but neither rare or imperfectly imitable” (Barney, 1991, P105). Tacit knowledge has these four attributes. Additionally, “firm resources can be imperfectly imitable for one or a combination of three reasons (Figure 11): (a) the ability of a firm to obtain a resource is dependent upon unique historical conditions, (b) the link between resources possessed by a firm and a firm’s sustained competitive advantage is causally ambiguous, or (c) the resource generating a firm’s advantage is socially complex” (Diericks and Cool, 1989, cited in, Barney, 1991, P107). Tacit knowledge is usually gained by experience and has its special historical context and causal ambiguity. Thus, tacit knowledge is imperfectly imitable.

Figure 10. The relationship between resource heterogeneity and immobility, value, rareness, imperfect imitability, and substitutability, and sustained competitive advantage. Jay Barney, 1991, p112
As mentioned above, tacit knowledge matches most or all elements of potential resources for sustained competitive advantages. From this aspect, barriers of transfer can avoid the reveal of knowledge and the imitation. In this way, barriers protect the core competence and sustainable capabilities of an organization.

In the other hand, organizations can obtain competitive advantage by transferring knowledge internally while preventing its external transfer from competitors. This barrier protects the core competence and also ensures the transferring of knowledge internally. “Because people are more similar within than between organizations, interactions involving people transfer more readily within than between firms. By embedding knowledge in interactions involving people, organizations can both effect knowledge transfer internally and impede knowledge transfer externally (Argote and Ingram, 2000, p150)”. Even if the knowledge is explicit, receivers’ own translation and context can affect the understanding and transferring, too.

### 3.3.4 Suggestions for the barriers

There are no directly references mentioned the suggestions for these barriers. But we found out some related recommendations about controlling both positive and negative barriers.
**Automation**

“Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services” (Wikipedia, 2012). The company can build a common method of automation, called electronic document system. It is a method to codify, store, disseminate and allow reuse of knowledge (Hansen, Nohria, and Tierney, 1999). Explicit knowledge transfer reduces cost and time of transferring. The electronic document can be accessed at any time, any place by any member in the project. The company can also develop the networks, another way of automation, for linking peoples so that tacit knowledge can be shared (Hansen, Nohria, and Tierney, 1999). The networks which link people can make necessary tacit knowledge transfer much easily. The networks are also helpful for some part of tacit knowledge, which cannot be transferred to explicit knowledge.

The network can build a “transactive memory” (Wegner, Erber and Raymond, 1991), “where people were responsible for remembering different pieces of knowledge and where people knew about locations rather than details” (Tsoukas, 1996, cited in Lindkvist, 2004, p.15). It can also be called distributed knowledge (Tsoukas, 1996, cited in Lindkvist, 2004). This kind of project groups can operate on a collective knowledge, which cannot be gathered from just a single mind. It is because collective ideas are distinct from individual idea through the interrelated activities among many people (Weick and Roberts, 1993). And also when the interrelating and mindful experiences increase in a project, the errors of the project would decrease (Weick and Roberts, 1993).

Tetra Pack Converting Technologies Inc. (CT), which was established in 1989 as an R&D organization, formed the competence networks about memory. In the networks, it was used for sharing experiences (Lindkvist, 2004). It created the “transactive memory” so that members were responsible for remembering different pieces of knowledge and knew where they can gain the necessary knowledge from the group (Wegner, Erber and Raymond, 1991). Also individual knowledge was made as a part
of the group knowledge to form a network memory, connecting well individual knowledge. It is beneficial because those members can use others’ knowledge to solve the problem beyond their limited cognitive capabilities (Lindkvist, 2003, cited in, Lindkvist, 2004).

**Reward:**
In order to gain better knowledge transfer, people need some incentives to share the knowledge and communicate with each other but not hide what they know. So companies need to formulate some incentive strategies, and employees who help others or share knowledge with others should be rewarded. Zack (1999) said that effective knowledge creation and sharing requires the organizational climate and reward system which values and encourages cooperation, trust, learning, and innovation. The company, called Ernst & Young, rewards the employees who write down what they know and get these documents to the company’s whole electronic repository (Hansen, Nohria and Tierney, 1999). In order to keep and motivate specialists, firms can meet the needs of employees according Maslow’s hierarchy of needs (Figure 12).

![Figure 12: Maslow's hierarchy of needs](image)

**Figure 12: Maslow's hierarchy of needs**
The first is physiological need, which is defined as the most basic need (Sadri and Bowen, 2011). It includes the monetary compensation, which can be salary increases, or stock options and etc. (Sadri and Bowen, 2011). It is the basic need for employees so that employees feel satisfy when they give their own knowledge to the project and make the knowledge transferred in the project.

The second need is the safety need, which is that the company supplies the safe place to live for employees from both physical and mental aspects (Sadri and Bowen, 2011). In order to build employees’ trust and loyalty, the company has to supply the necessary safe place for the employees after they giving their core competence knowledge to the company, but not fire these employees without suitable reasons.

The third one is belonging, which means that the employees is to be loved and in the environment of family and friends (Hablemitoglu, Ozkan, and Purutcuoglu, 2010). Then the employees is usually willing to distribute their knowledge to the project, because they see themselves as a family member in the project and want to make their family better performance.

The fourth is esteem need, which includes the needs for reputation, prestige, and respect from others (Sadri and Bowen, 2011). The company should provide the employees’ respect and reputation in the company after employees’ knowledge contributions, and may give the employees higher positions.

The fifth one, called self-actualization need, is that the employees want to help others, and the company can give the employees chances to study after they transferring their knowledge to the company (Sadri and Bowen, 2011). Even the members lose their core competence knowledge, but they can learn the new knowledge for personal and professional growth and development.
Chapter 4 case study

4.1 Background

This case study is based on an individual interview with the information of a project team. The man we interviewed is a project manager in Ericsson. Ericsson is a global company and a world-leading provider of telecommunications equipment and services to mobile and fixed network operators (Ericsson, 2012). And it has over 1,000 networks in more than 180 countries (Ericsson, 2012) with approximately 52,000 employees (Ericsson, 2003, cited in Hustad and Munkvold, 2005). Ericsson implements the global competence management system, which will replace the local developed solutions, supporting global competence sharing and reaching the ‘communities of knowing’ in the company (Hustad and Munkvold, 2005). The competence management (CM) involves the planning, implementation, and evaluation of the performance in order to make sure that the company can reach the objectives (Nordhaug, 1993, cited in Hustad and Munkvold, 2005). And also knowledge management (KM) is an importance element in the competence management, which includes the methods, tools for the generation, acquisition, exchange, protection, distribution, and utilization of knowledge(Montana,2000, cited in Hustad and Munkvold, 2005).

4.2 Project team background

The manager, called Antony Selvaraj, is working with GSM telecom switch and responsible for a software testing team. There are ten members in his team and five of them are consultants from Poland. The other five members are from Ericsson and most of them are Swedish who work as testers. The composition of this team is stable and will not change totally when they have new projects. Sometimes, one or two people in the team will change for some reasons and new members will come into the team. He separates this ten people to five groups and the two people in each group do the same task. In this way, people can communicate with each other often and get ideas to solve the problems. He said he has worked with this team for four years now.
“Four years ago, we did change people often but then we talked with our boss that the team members’ changing every project is useless. The next project we will get the new person so there is no knowledge transfer. So we told the manager and then the manager decided to have stable teams. So the same team works together until they get tired of the team...I have worked with one team for four years, but the new member joined also. And some people in my team will only come for six months from Poland and then go back. I will change a new team from next summer.”

In his team, three people work as programmer and most of them are testers. One project lasts six months, so approximately there are two projects per year. One project must be finished in six months. He has worked for projects since 2004 so that he at most has experienced seventeen projects. As he said, the tasks of each project are different but the basic area is the same, so he can reuse his experience and knowledge from previous projects for new projects.

“Every project has different task. We will change the task every six months. For example, now we are working with phone card. But many years ago, we only had video card. Sometimes other customers or department came to me and gave me new task. But even though the tasks are different but they have the same features, so I can reuse the knowledge gained from other projects also.”

At present, the project manager has a project about developing software. He designed and wrote how to develop the software, and then the teammates will use his ideas and test them.

“For example, we want to develop some software, so I will write some documents about how to develop them and tell the programmer to use these
ideas. For every project, I will do the analyzing and programming and my team will do the programming and testing.”

The general process of a project is analyze, programming and testing. And soon there will be a new way of working which called Agile. This method means they need to separate a project to different parts by time. And after them finishing one part, they need to communicate with the customers in order to make sure they are doing the right thing what the customers want. In this way, if the project team misunderstood the customers’ thought, they can change it at the earliest time.

“Usually, the customers will tell us what they want at the beginning and at the last month, the customer comes to us again. Sometimes they will think the project is not what they want. So we do like this, every month we will list what we did and give it to customers. If they feel something wrong we can change it at the beginning. Later, the whole Ericsson in Linkoping is going to change.”

4.3 New members
About four or five years ago, team members would change for every project at Ericsson. At that time, project managers told the higher manager that if team members changed every project, there was no use for the performance and development of the projects. Because new project would get new person, there was no knowledge transfer in the project. Then the higher manager agreed with one stable team. The same team will work until members are getting tired and bored with this team. This project manager has been with this same team for four years. The majority of members in the project are the same, but the new people will join when someone moves out. Then the project manager will get new people. Some of the people will only stay in the team for six months and then will go back to their previous working environments. The project manager will move to a totally new team after this summer.
Ericsson has agreements with other companies, such as the companies from Poland. Usually these companies will choose some people and send their information to the project manager. Then the project manager will check the knowledge background of the person. If the person does not have the suitable background he needs, the project manager will reject to accept the person. If the person is qualified and has suitable knowledge background, the project manager will give an interview with him/her. When they had big and complicated projects, the project manager never took any new member. It is because that the new members need time and training before they can work. Otherwise, the project manager may hire new members. For example, last project this project team had was an easy project and they hired two new persons.

The project manager has the right to choose the people his team needs. The human resource department only does some assistance. What is more, the project manager will focus on the academic backgrounds of candidates. The interview with the new person will contain about problems like “how you will do about programming”. For example, the project manager will give them a task, and ask them to tell him their ways of solution. The project manager will also give the interview by telephone in a short time, around six minutes.

Sometimes, the project team took the people, but the new person did not work very well. The project manager has an agreement with cooperated companies that in the first one month the project manager will check the performance of the new person. After one month, the project manager can measure the performance and decide whether he wants the person or not. Moreover, the project manager does not have to hire the person from these companies, which have contracts with Ericsson. Sometimes new members can work in his project team for a long period, and sometimes new members can just work in his project for six months.

In a six-month project, usually the first month is used for training new members. The new ones do not need to do any programming or testing job at the beginning. In this
one month, the new person needs to read the documents from database and lab. And they should understand some basic matters about working such as backgrounds, terms, and processes. Then in the second month, the new person will work with the project team together with experience members. The experience person will always help the new one. And the project will never tell the new person what they must to do.

It is hard for the new member to learn all knowledge in the one month. The project manager always plans one task for the new member in first month and gives the exactly same task at the second month. In the first project, new members will gain the help from other people. But from the second project, they will try to do tasks by themselves. It means new members will have six months to learn.

Every employee in Ericsson had a separate room before. It was very hard for communication, because people need to go to another room even if they wanted to ask very small things. Later, Ericsson set everyone sitting very closely to each other in an open place. So the new members and experienced ones can interact often and get help from each other.

4.4 Knowledge transfer in daily life
The knowledge sharing and transferring has different forms. Daily knowledge transferring and sharing is important. All the team members and the project manager sit at one area where they can talk with each other easily.

“Before, everyone had one room. So my team members had ten rooms. If I want to go to other rooms to talk with them, it is hard. But one year ago, Ericsson put us at one area. Not in rooms, but an open place. So we sit closely and new people can easily talk with other people.”

In the past time, each person had their own office so that it was hard for person to go to another room just for asking small things. Nowadays, there are no individual rooms,
and members of one project sit together. It means that if anyone has any questions, people can ask others easily. Despite the communication on work, they also get together discuss out of work level. This project team made its own logo, T-shirt and cup with the logo in order to build team spirit. On their free time, these project members also organize some activities such as bowling. They interacted with each other quite often and treated each other as friends. And they have worked together for a long time now and they trust each other.

“Sometimes the same problem will come to next projects, so we will use the first month of the new project to solve the problems.”

If they did not solve the problem of previous project, they will use the first month of the new project to solve the problem. That’s because they reuse their experiences and knowledge in next project also and they may meet the same problem in the new project.

4.4.1 Meeting

The manager has two kinds of meeting. One is to meet with the higher manager once a week, and another type is to have meeting twice a week with his team members. In the meeting with the higher manager, the project manager needs to understand what the higher manager wants. In the meeting with the project members, he tells his members what are their tasks and some specific requirements, such as time. In the meeting, the members discuss problems they meet in the work, too. This meeting normally lasts thirty minutes and the purpose of this meeting is to assign tasks and solve problems.

However, the project team will change their way of meeting soon because of the new policy. The new policy requires each team should have a short meeting everyday which lasts five to ten minutes. In this meeting, each person has one or two minutes to present what they did yesterday and what they will do today. If they have some
problems or trouble, others can provide assist. But the project manager didn’t think five to ten minutes are enough for a meeting.

4.4.2 Database (CDM)

There is a database system which called CDM (Configuration Data Management). All members in Ericsson over the world can access to this system and get the information they need. This database was in Swedish before 2003, and then it changed to English. So the whole Ericsson all over the world uses one system now.

“We will do the presentation when we have new members, but mostly at the first month, the new people work with the computer and database. They need to read the documents in order to understand the terminologies.”

This system is safe because everyone has a secret code. And if they access to this system outside the company, they will receive a massage by phone. Antony writes a project report at the end of each project and then submits it to the database.

“At the end of the project we will write a report. And in this report, we will write what’s the problem we reached and what is the solution. So that document will be used in the next project.”

When the project manager submits the report, he can select the group, location and people who can see the document. So other people also can learn from the experiences of the project team. Sometimes, the project manager also did some presentations about his project, and records of the presentations will be put in the database, too.

4.5 Risk of knowledge transfer in the project

The project manager usually takes knowledge as a serious problem. When the member, whose knowledge is never transferred to others, is sick, the project team
cannot finish this project on time. It is because that no other members can substitute for the sick person.

Another huge risk is the turnover of employee, because the person leaving Ericsson knows what Ericsson is doing now and what the future is. The competitors also have the habit to hire people from Ericsson.

“If anyone is fired by Ericsson, Huawei will hire the person. And also if anyone is fired by Huawei, Ericsson will hire the person. Most of the person in Ericsson moved to Nokia. People will bring all the knowledge from Ericsson to other companies.”

And these people are easier to join the new team in new companies, because they know basic knowledge about how to work. So it is easier for them to enter to competitor companies. But if any person wants to leave Ericsson, he/she has to inform the project manager three months earlier, so that the project manager can use the three months to make other person learn all necessary knowledge in the three months. It is the Ericsson rule that if leaving the job, three month inform before leaving.

Moreover, some people may not be willing to share knowledge. The project manager said he did not meet this kind problem so much in Sweden. But because project members came from different culture backgrounds, some people may against transferring knowledge. The project manager met a member as a consultant in the project who did not share his/her knowledge with anyone else in the team. The project manager said that it was bad, because if the consultant is sick, no one can take his/her job. However, the consultant thought if his/her knowledge is transferred, he/she would lose the job.

There is another problem here that there are too many emails sent to wrong people or groups. Through their intra-net, members can choose the group or people who can
receive the email. But some people may send the message wrong, not directly to somebody but to the entire department. Sometimes, hundreds of emails will be received and it wastes time to check all of them.

4.6 Solutions for these barriers

“Why people move to another company? There are two things. One of the reasons is that the competitor company supplies the person higher salary to attract the person move to their companies. Another reason is that if the person is not satisfied with the team, and the team work is boring, he may leave. But if they tell these to their boss, and then the boss can give the member a chance to enter another team. Then the member, who is not satisfied with the team, will not go to the competitor companies”.

Ericsson supplies good salary, good benefit, good job and good team. And employees can choose where they want to work. For example, the project manager worked in one department before, which was closed in Stockholm and moved to Italy. Because he did not want to move to Italy, Ericsson let him work in Linkoping.

If the members do some good matters, even small, the project manager will put the information on the notice board to tell the whole department, which has about two hundred people. Then the new person will be happy.

The team member should trust other people. Sitting closely can create more communication and build trust among people. The trust can also be gained through lots of activity. This project team has the team logo, team flag, team name (CAPA), and team t-shirt. And they also play football together, bowling and etc. Even on weekend, they may get together for some activities. The project manage started his team with the team members from different countries with different backgrounds. It cost the project manager nearly six months to one year to tell the team members that
they are a team. After people understanding that they are a team, it is much easier to share knowledge.

The team members do well on knowledge sharing, and they help each other. Usually if the member wants to move to another team in order to learn some new knowledge, the higher manager will move the member to a new team. Then this member can get the knowledge, through the first month’s training and the rest months’ practices and experiences.

For the person who did not want to share knowledge with the team, the project manager explained to the person that it was not a team work, and knowledge transfer in a team was very important. If one member is sick, the other members need to have ability to do his or her job. And the project manager told the member that Ericsson needs the experience people, so Ericsson will not fire them. The members in the team are friends not competitors. Then the people who against knowledge transfer at beginning will also transfer knowledge to others. This project team is working as friends and a family, not only working as team members. In this project team, if they have problems about life, such as their parents or money problems, the other members will help. Every person is very helping each other in the project and lives like a big family.

There are other methods for transferring knowledge across projects and knowledge learning. Ericsson has a workshop, where all members can take part in. There, the project team can help other teams and also learn from the other teams at the same time. Sometimes, the team cannot take part in the workshop, and then there is less knowledge transfer for the project team across projects. The team can gain some courses outside for improving their management, such as Linkoping University.
Chapter 5 Analysis

5.1 Definition of knowledge transfer

The knowledge learning process in the case proves that knowledge transfer is a process of translation, reconstruction, and utilization not only copying. “Rather than being viewed as knowledge copying, knowledge transfer is here to be understood as an interactive process of knowledge translation and reconstruction which is dependent upon the actors’ previous experience” (Björkegren, 1999, p26)(Figure 3). Cognition is dependent on particular features of the context, so knowledge transfer from other contexts is regarded to play little role in learning (Argote and Ingram, 2000).

The manager had worked with his team for four years now and his team members are stable. Even though they have two projects per year and there was no same project, they had the similar previous experiences. Although they had worked together in the same projects before, each person still has his or her unique experience. But because they were working under the same situation and context, their experiences must be similar. The manager said that they keep stable team is aim to reuse the previous experience. Even though new members can learn knowledge trough the database and
documents, the knowledge gained from experience are also valuable and helpful. If they have a new member, it takes half a year to train him/her. That is because after one month of reading documents, the new one must learn things during the procedures of project under the same context as experienced members.

“The motivation and ability of individual members affect the transfer of knowledge from training to transfer contexts” (Argote and Ingram, 2000, p162). The recipient’s background and knowledge can affect the translation and reconstruction of knowledge learning.

The manager told us, when he interviews candidates, he needs to test their knowledge backgrounds and capabilities. Only the people having the similar and needed capabilities can be accepted. In our case, all the members has a similar background, previous experience and context, so knowledge translation and reconstruction will not go too far away from the original knowledge.

“Trust is needed for the efficient transfer of knowledge among people”(Pretorius and Steyn, 2005, p43). As they work together for such a long time, the members build trust in daily life. And the team members sit at one open area, so they can interact and communicate with each other frequently. In this way, their frequent and easy communication diminishes the misunderstanding and builds up the trust.

“The more similar the number of elements across the tasks, the greater the likelihood of transfer” (Thorndike, 1906 cited in Argote and Ingram, 2000, p162). In our case, the previous experiences are highly similar and people involved are similar also. They change project every six months, but the basic knowledge needed for different projects are the same. So the contexts of each project are similar. Now we draw another knowledge transfer figure according to our case (Figure 13). Actor A and B are similar with similar backgrounds, and B translates and reconstructs knowledge under the similar context as A.

Firstly, these project members learn the knowledge from daily work by doing the programming, and this is the experience learning process. Then they discuss problems and experience in the meeting and daily life. When they communicate with others, they need to do representation and then others will give feedback.

Knowledge articulation is learning by reflecting, learning by thinking, learning by discussing and learning by confronting (Prencipe and Tell, 2001). This knowledge articulation improves the understanding of action-performance relationships and creation based on representations.

At the end of a project, the project manager needs to write a report about this project including the problems and solutions. All the documents and records will be submitted to their database so that others can access to them also. This step is
knowledge codification. Knowledge codification allows for the creation of externalized knowledge, brought forward in linguistic and symbolic representation (Pencipe and Tell, 2001).

Moreover, we can find that the learning process is a cycle. In this cycle, when the process comes to the end, the process in the cycle starts again from the beginning (Figure 14).

![Learning process in this project team](image)

*Figure 14: The learning process in this project team*

### 5.3 Project, project process and project task

A project usually has its own special goal, specific time period, specific resources and unique working arrangement (Tonnquist, 2008). This project team called CAPA changes its task and project every six months. Every project has its own goal based on GSM technology, but the main members of the project team do not change. And in the six months, the project team must finish everything in order to reach the goal of the single project.

But the project team is not a temporary organization. Before about 2007, the project team in Ericsson was temporary because they changed members in every project. However, lots of employees complained to higher manager that there was no knowledge transfer in team if every project always had totally new members. Therefore, the higher manager agreed with their suggestion of forming stable teams for projects. Now the team is mainly steady, even though still may have several new
members come to the project team and stay for six months or longer. So in every six months, the team members are stable.

In our opinion, because main of the project team members are stable even when the project changes, it will cause that these members have the similar background and their knowledge transfer in projects is much easier.

Figure 15: The general process of the project team

The general process of the project is analyzing, programming and testing (Figure 15). And the processes fit the theory from Chapter 3, which said that these activities are continuous and each process has an output for the project (Tonnquist, 2008). The group also has milestones which show the tasks they need to finish during different special periods (Figure 16). For example, the first month, it is the time for the new members’ training or the group’ solving some problems. A new management method, which will be used by Ericsson, is called Agile. In this method, the project is separated to different parts by time. And after them finishing one part, the members need to communicate with the customers in order to make sure that they are doing the right thing wanted by the customers. In this way, if the project team misunderstood the customers’ thought, they can change it at the earliest time. Agile can keep the project team on the right track. We thought both the general process and the agile process are stable and beneficial.

Figure 16: The process for Agile
According to Packendorff (1993, cited in Bjorkegen, 1999), the project task can be distinguished between unique and repetitive projects, which is mentioned in chapter 3. For example, unique project means that both project task and project procedure are unique, and repetitive project means that project task is unique but the project procedure is repetitive. From Chapter 4, this project team’s procedure is unique because the general process is always analyzing, programming and testing (Figure 15). Then the previous experience in the pre-project can be used for the new projects. The project manager said that even though the task of the project will change every six months, those projects are still based on GSM technology. The project team can use the previous experience about GSM technology and they also have to use the unique technology for the special goal of a single project.

5.4 Knowledge transfer in project
According to Bjorkogren (1999), knowledge transfer in project has two views. The traditional view is that knowledge only transfers in internal project where individuals in the project can transfer their knowledge to each other. Another view is that knowledge can transfer across projects so that other projects’ experience and knowledge can be helpful for them. For this project team, they focus on both the knowledge transfer of internal project and across projects.

Firstly, the new members in Ericsson gain the knowledge from the Lab, which records the others’ knowledge and experiences, and understand what the work is going and why it works like that. And then after the first one month, the member still can gain the necessary knowledge and help from his/her teammates and experienced members. The project manager said that the meeting with the project members can also help knowledge transfer in the project team, which contains knowledge transfer between the project manager and members. The project members can attach to CDM, which contains the previous projects’ working reports and what people have done and learned in the previous projects. At the end of this project, the project team writes a
report, which includes the problem they met and the related solutions. That document will be collected to CDM and used for next projects. There is a workshop for the project team in Ericsson as well, where the project team can gain the knowledge from other projects when offering their knowledge at the same time. According to information above, we build a model about the internal project and across projects’ knowledge transfer for this project team in Ericsson (Figure 17).

![CAPA diagram](image)

*Figure 17: Knowledge transfer of internal project and across projects for this project team*

### 5.4.1 Negative barriers

In the literature, the thesis mentioned that language of knowledge transfer, which included the tacit and explicit, can cause the barriers during the process of the knowledge transfer. It is because that tacit knowledge can be hardly transferred between individuals in a large number (Polanyi 1958, Polanyi 1966, cited in Bjorkegen 1999). Even though tacit knowledge can be transferred to explicit, some tacit knowledge cannot be transferred to explicit (Groulay, 2006). This kind of barriers actually happens in the case, but Ericsson has already found the solution. The project manager said that in the first month of the project, new members can learn from the explicit knowledge in the lab. After the first month, new members started to join the work with experienced members. If any problem or misunderstanding happens, the experienced member can help the new members and transfer tacit knowledge. From our view, this is a good method for transferring both tacit and explicit knowledge in the project team. In this project team, the tacit and explicit knowledge work together and complementarily for knowledge transfer in projects.
The low frequency and formalization of communication can also lead the barriers of knowledge transfer, which is mentioned in Chapter 3. The project manager said that each member of the team had a separate room before, and it generated the problems for communication. Nonetheless, the members of a project team sit in an open place and closely to each other now. If the members have any problems, they can discuss with others easily and conveniently. Afterwards, there are less low frequency and formalization barriers of communication. In our mind, sitting closely with each other actually improves the chances of communication. If the members are willing to transfer their knowledge, the open place is much convenient for transferring knowledge in projects.

The project team has ten people and two people form a sub-team. Each sub-team does the different activities in order to coordinate and finish the work harmoniously and synchronously. It reduces the negative barrier of coordination mentioned in chapter 3 (Frame of reference). When choosing a new member, the project manager will check their information and backgrounds, and interview them. The project manager interviews the new member by asking their solutions for some problems. After that, project manager can understand whether the member has the necessary knowledge for the project or not. We believe that through this kind of interview, the members chosen have the necessary and related knowledge for the project team. Then it is beneficial for knowledge transfer in the project team. Another favorable method is two-people group as a sub-team. It makes better coordination and supervision with each other. Because each sub-team sits closely with other sub-teams, they can gain the information and knowledge about other sub-teams, keeping themselves on the correct track of the whole project team.

According to the theory of Tjosvold (1995, cited in Hoegl and Gemuenden, 2001), mutual support from the project member is more productive than the forces of competition for knowledge transfer in the project. Nonetheless, the knowledge can
connect with the member’s value to the project. Therefore, members may resist their knowledge being transferred to others, which could reduce their importance to their projects. The project manager said that their members are from various backgrounds. A member has met the situation that person taught another the knowledge but lost his/her own core competence and importance for the project. After coming to this project team, the member worked still with the resistance of transferring knowledge to other members. From our opinion, it is not beneficial for the project team. If the member is sick, no member can do his/her job. Finally, the project team may not finish the work on time.

Not enough effort from employees is another negative barrier for knowledge transfer in projects, which can contains the carelessness. The project manager said that the members have the intral-net, and they can choose just one group to send the email. Some people may send the message wrong, not directly to somebody but to the entire department. This problem sometime happens so that hundreds of email will be received in a short time by the people who do not need the information. These members have to check every mail and then delete them. It will be also inconvenient for the members and cause the resistance for others’ messages. We believe that it also can generate the negative barriers for knowledge transfer in project, due to the incorrect sending and necessary message sent to another project group. However, one way for the solution is just carefulness.

In the literature part of the thesis, team cohesion is mentioned. If there is a low cohesion between the relationship of individuals and group, the employees will not try their best for the work and more employee turnovers appear which destroy the project’s core competence of knowledge (Fisher and White, 2000). The turnovers of members can spill out the knowledge of the project and the company, even to the competitors of the company. In the case, the members may move from Ericsson to another competitor companies. It is a risk because the person knows what Ericsson is doing and what the future is. And these people are easier to join the new team due to
their previous experiences and the needed knowledge backgrounds. We consider that this kind of situation can happen in any project and company, especially when the competitors supply much higher salary for the employees.

5.4.2 Positive barriers

In this case there are some positive barriers for communication and knowledge transfer. When people are under the different contexts and have different motivations and abilities, there will be troubles in knowledge transfer. The context where the transfer is embedded may affect the eventfulness of knowledge transfer (Szulanski, 2000). Argote and Ingram (2000) thought if the knowledge be translated inappropriately or cannot adapt to the new context, negative effects will occur. In our case, the members of this team always have the same context, because they have a stable team and all the projects need a similar basic knowledge. So they can transfer knowledge effectively and correctly. We believe the barrier of context enable the high quality knowledge transfer among people under similar contexts and hinder the competitors to catch the knowledge correctly.

The database system is also a positive barrier for knowledge transfer. Even though everyone in the whole Ericsson all over the world can access to the database, there are still some limitations. When people submit or store documents in the database, they can choose the group who can read them. Others cannot check those documents if they are not chosen. In this way, knowledge transfers to the exactly group but not everyone. This is the barrier the company wants for the safety of information and knowledge. Moreover, the people who do not need the knowledge will not access to it. So it prevents the overflow of useless knowledge and information, and employees can put more attentions and efforts to learn the knowledge they need to know.

Thirdly, as we mentioned above, the characteristics of the recipient affect the knowledge transfer also. “The motivation and ability of individual members affect the transfer of knowledge from training to transfer contexts” (Argote and Ingram, 2000,
So only when members have a similar motivation and ability, they can transfer knowledge more effectively and correctly. Cognition is dependent on particular features of the context, so knowledge transfer from other contexts is regarded to play little role in learning (Argote and Ingram, 2000). This barrier is the standard for selecting members.

The manager told us, when he interviewed the candidates before, he focused on their capabilities and knowledge backgrounds. If the background and capability do not match with the project, he cannot hire the people. So this barrier actually helps to set a standard for recruitment. When the team members have the similar background, they can communicate more effectively and correctly.

The features of recipient can be barrier of knowledge transfer. As the manager said, he did not employ the people who are useless for his project. So the people he hired must have the similar knowledge background as him. We thought if members be selected by this barrier, they may transfer knowledge much easily because of a similar capability, motivation, and knowledge background.

Additionally, tacit knowledge is the most secure and significant kind of knowledge, because it is difficult to be imitated or understood by other organizations (Spender, 1994). And tacit knowledge is the key to develop sustainable competitive advantages (Lubit, 2011).

Tacit knowledge is the knowledge the group has in their minds and hard to explain it by words. The manager has been with his team for four years now and they also have private activities except work. Through working times and private activities, they can transfer knowledge with each other. He said the team needs to write a report at the end of each project.
So can all their knowledge be found in the documents? In our opinion, it is impossible to write down everything of these projects all in the documents. Even we asked the manager whether they have any knowledge which cannot be written down. He cannot find some concrete facts to say there is tacit knowledge. But the nature of tacit knowledge is that the knowledge you know cannot be told. What he can tell others is the knowledge written by words and stored in the database. So in this way, tacit knowledge be kept only by those people in one team and the knowledge can affect the consequent or outcome.

5.4.3 How to control barriers
The project team actually has already chosen some solutions for the general barriers during the process of knowledge transfer in the project, which was mentioned in the part of negative barriers in the Chapter 5, so that they have not met those related negative barriers in their knowledge transfer processes. But they still met some negative risks and problems, and the project team also has their own way to reduce and control these problems.

According to the literature, automation is a useful way for the company to build an electronic document system, which codifies, stores, disseminates and allows reuse of knowledge (Hansen, Nohria, and Tierney, 1999). In the case, the project manager said that Ericsson had already used this way for knowledge transfer. The new members have to read lots of documents in the lab in order to understand basic terms and situation about the work. At the end of a project, the project team has to write documents about what they did and upload the documents to CDM, which is the database of Ericsson. So the other teams can use these information and knowledge. Also the team can reuse the knowledge for other projects. We believe that automation is useful for knowledge transfer in projects.

The other better way for reducing negative barrier of knowledge transfer, referred in Chapter 3, is to reward project members according Maslow’s hierarchy of needs. The
first one is physiological need, which includes the monetary compensation. The project manager said that Ericsson supplies the good salary and good benefits to their members. The second one is the safety need and Ericsson also supplies the safe place for the members, even after transferring their knowledge to others. For the people who do not want to share knowledge with the team, the project manager told them that Ericsson needs the experience people, so Ericsson will not fire them. Even if the team member is not satisfied with the team, he/she can tell the higher manager and the higher manager will change the team for him/her.

The third one is the belonging need, which is the employees to be loved and in the environment of family and friends (Hablemitoglu, Ozkan and Purutcuoglu, 2010). The project team did this job very well. This project team has its own team logo, team flag, team name (CAPA), and team t-shirt. They play football, bowling and etc. together as well. In this project team, if the member has any private problem, such as the family problem or the money problem, the other members will also help. Every person is very assisting with each other in the project and lives like a big family.

The fourth one is the esteem need, which means the reputation, prestige and respect from others (Sadri and Bowen, 2011). In this team, after the members doing some good matters, even small, the project manager will put the information on the notice board and the whole department can see it. Then the others know that the member does something good and helpful for the team, and give more respect to the member.

The last one is self-actualization need and Ericsson can supply the chance for the member. The project manager said if any member wants to move to another team in order to learn some new knowledge, the higher manager will move the member to a new team. The team can gain courses from outside too, such as, Linkoping University. In our opinion, the project team has totally catch Maslow’s hierarchy of needs to attract the project members.
Ericsson has some rules so that negative barrier for knowledge transfer reduces. For example, Ericsson has a rule that once a person wants to leave Ericsson, he/she has to inform the manager three months earlier, and then the manager can transfer the person’s knowledge to others in these three months.

The above has discussed a number of solutions about how the project team deals with negative barriers of knowledge transfer in projects. Though there are no related suggestions from literature and case parts for positive barriers of knowledge transfer in projects, the project team actually builds some positive barriers for better knowledge transfer. Through understanding these positive barriers, the project team can keep them consciously.

Firstly, the rule of Ericsson is to inform three months earlier before leaving Ericsson. This barrier makes the knowledge of the leaving person enough transferred to another and keeps the work moving. Next, the project manager also sets up the barrier for choosing new member so that the members chosen can easily join the project team and transfer knowledge. The last one is that the new member has to leave if he/she is not be satisfied by the project manager in the first month. The first one month is just training the new member, using the explicit knowledge and documents from the CDM. When the member leaves in one month, he/she cannot get the deep and core knowledge in the project, especially the tacit knowledge and experience.
Chapter 6 Conclusion

This thesis has explained the notion of knowledge transfer in projects and its related barriers. We also stated the various elements, which can cause the barriers positively or negatively. We divided those barriers into “positive barrier” and “negative barrier” in accordance with their influence for project performance (Figure 18). Furthermore, we explained some suggestions for improving positive barriers and reducing negative barriers.

Figure 18: Main line of the thesis

As argued before, knowledge transfer is a process of translation and reconstruction. This definition has been approved more appropriately by both theory discussion and empirical study. Knowledge transfer in projects contains transfer both in internal project and across projects in the thesis.

From the case study, we found a new form of project team. If the team has stable and single function, keeping a stable team may be a good choice for transferring knowledge and improving project performance. Firstly, because the function of the team is programming and testing, project members need similar knowledge backgrounds which can facilitate knowledge transfer. Secondly, although the team needs to move from project to project, the basic knowledge of different projects is the same. Previous experience is useful and valuable for new projects. So keeping those experienced members stable can ensure the quality and efficiency of their work.
Moreover, members are easier to build trust in a stable team. Through all above, knowledge transfer will meet less negative barriers.

We suggest that this team type can be used when a project team meets the three conditions below at the same time: (a) functions of team members are similar or same, and (b) the basic knowledge of different projects is similar or same, and (c) the function of the project team is single.

The thesis has already answered the questions in the part of specified questions and realizing the thesis purpose in chapter 1. There are some negative barriers mentioned above. We concluded them as six points:

1. Low communication can cause not enough knowledge-sharing, which results in negative barrier of knowledge transfer in projects.
2. Low level of coordination makes individuals never or less using other person’s knowledge, which is negative for knowledge transfer in projects.
3. Next, the invisible tacit knowledge is a barrier for choosing a new member in projects, which generates the barrier for balance of member contribution.
4. Competition in the project team is also a barrier of mutual support, which is negative to knowledge transfer in project.
5. Not sufficient effort from employees is another negative barrier for knowledge transfer.
6. In addition, no previous related experience for the project and the employee turnover are problems of cohesion, causing negative barrier for knowledge transfer.

Nonetheless, the barriers of knowledge transfer in projects can also have positive influence for project performance. Regarding to both of literature study and empirical study, we concluded five positive barriers of knowledge transfer which positively affect the performance of projects.
1. Context as a barrier of knowledge transfer makes knowledge transfer effective and easier inside the project. Without appropriate context, competitors have difficulty to totally catch the original meaning. Cognition is dependent on particular features of the context. This positive barrier does contribution to the safety of knowledge and prevents imitation from competitors.

Also, it creates high risk for competitors from other markets entering into the company’s market. The knowledge transfer must fit the new context. Otherwise, the negative effects of projects will occur. Thus, the context of a project protects itself being imitated from other competitors and it also hinders the new entrances from other markets.

2. Previous experience which influences the translation and reconstruction of knowledge is another good barrier. Project members can reuse their experiences and knowledge gained from previous similar projects. Even when the basic knowledge of dissimilar projects is the same, previous experience is also valuable and useful. Although the requirement of previous experience blocks knowledge transfer among people with totally unlike experience, it ensures that people with the similar experience can transfer knowledge much effectively and correctly. What is more, members in one project may need to have similar experiences in order to improve performance of projects.

3. The features of recipients can provide a standard for recruitment. The ability of absorbing knowledge, motivation, and knowledge background will all influence knowledge transfer. Only when recipients are qualified with enough knowledge, ability and motivation, they may be able to learn from others. Therefore, project members must be qualified and with highly agreements on their goal. On one hand, it is difficult to transfer knowledge among people with different level of ability and agreements. On the other hand, this barrier
provides a standard of selecting project members. The quality of members is directly connected with performance of projects.

4. Tacit knowledge is also a good barrier of knowledge transfer which may create sustainable competitive advantages. Tacit knowledge is always gained from experience and hard to be codified into documents. Tacit knowledge has some or all of these features: valuable, rareness, imperfect limitability, and substitutability. The resource matching those features has potential to contribute to sustainable competitive advantages (Figure 10). So tacit knowledge is the most secure and significant kind of knowledge and it is the key to develop sustainable competitive advantages.

Figure 10: The relationship between resource heterogeneity and immobility, value, rareness, imperfect limitability, and substitutability, and sustained competitive advantage. Jay Barney, 1991, Firm resources and sustained competitive advantage, p112

Organizations can obtain competitive advantage by transferring knowledge internally while preventing its external transfer from competitors. This barrier protects the core competence and also ensures the internally transferring of knowledge.

Moreover, when the knowledge is not codified, frequent interactions and close
relationships are needed for knowledge acquisition and shortening project completion time (Argote and Ingram, 2000). Hence, tacit knowledge as a good barrier promotes frequent communications and interactions among members.

5. Technology tool creates positive barrier as well. The database allows people choose who can access to which documents and not all the people can read all the information in database. This barrier ensures the safety of information and knowledge. Furthermore, it prevents the overflow of useless knowledge and information, and employees can put more attention and efforts to learn the knowledge they need to know.

This thesis found some methods to improve positive barriers and reduce negative barriers. Firstly, in the literature part, we summarized that automation and Maslow’s hierarchy of needs can help to reduce negative barriers. Automation, through the electronic document system and the network of communication, can make knowledge transfer much easier and convenient in project. Maslow’s hierarchy of needs is for project manager to attract project employees and build better knowledge transfer in projects.

These two methods are proved, by the empirical study in chapter 4, to be useful for controlling negative barriers of knowledge transfer in projects. There are other recommendations for reducing negative barriers from the case study, too. Some methods from the project team can also decline the negative barriers of knowledge transfer in projects. The rule of resigning, tacit and explicit knowledge working together, and siting closely in an open place can contribute to the knowledge transfer in the project as well.

Although there are not so many methods mentioned in the case to improve positive barrier, the readers still can recognize positive barriers through this thesis. After they
know the benefits of positive barriers and what kind of barriers is positive, they can keep and enhance these barriers for their projects.

In this thesis, we mentioned these suggestions for containing positive barriers: (a) using the combination of tacit and explicit knowledge and enabling them working together for knowledge transfer in project, (b) setting a standard for choosing new members, (c) applying probation period for new members.

This thesis points out the new opinion for the barriers of knowledge transfer, which is never shown obviously in other literatures. However, due to the limited time and resources, we did not discuss whether the negative barriers can be converted to positive or not. We thought it can be an interesting research question for further study. If this is possible, what kind of methods can be used for this conversion?
Reference

Article:


Webpage:


Appendix:

Questions for the interview:

1. What’s the composition in your project team? (For example, the team members include project members, managers, HR specialist, etc.) And the number of each role?
2. What is the general project process of your project? (From the beginning of the project and the ending. Please select general steps.)
3. How many projects have you been involved until now? Did the tasks of projects always change? Did you do same or similar projects more than once?
4. Did you gain knowledge from other projects which are also helpful for your current project? (We want to know how you used your knowledge gained from other projects for your current ones.)
5. Did you also get knowledge from other projects which you were not involved in? And how?
6. How to select new members for new project? What kind of elements will be considered?
7. How to train new members?
8. How to share knowledge in daily life? (What methods do you use for sharing knowledge in daily life?)(meeting, internet, or other forms)
9. How often did your team have meetings? What kind of meeting did you have before? Did all members attend to the meeting? How long did it last in general? What’s the purpose and function of the meeting?
10. Do you think meeting is helpful for your project or not? Did you experience any other communication methods which are significant for your job?
11. What kinds of technical tools are used for knowledge transfer? (For example: database system)
12. Is the internal internet and database open to all the members?
13. How to store and codified knowledge?
14. How to keep the safety of the data and knowledge? And at the same time how to transfer knowledge effectively?
15. The turnovers of project members will be related to the problem of knowledge safety and reveal. How to control the risk?
16. Were members willing or not to share knowledge in the project?
17. Were there any problems in the process of sharing knowledge?
18. How to solve these problems? (Such as rewards)
19. Is there any conflict or problem in the group about the knowledge transfer which can positively affect the process of project?
20. Does your project team also gain ideas from outside? It means whether your group gains the ideas from the customers, suppliers, and colleagues in the organization. (If yes, please continue question 21)
21. How can your team evaluate these ideas and select from them?
22. What kind of suggestions do you have for better knowledge transfer?
23. Which kind of barriers of knowledge transfer is necessary and needed to be kept, in your mind?