Increasing the utilization of research in product and business development
Key factors for transferring applied research within a high technical organization

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Abstract

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Purpose
The study aims to complement the knowledge management literature within research-based knowledge on how product developing organization can utilize the research results in product development.

Main research question
What are the main enablers for research-based knowledge to transfer in order to be adopted in a product developing organization?

Sub research question
What are the indicators for measuring the utilization of research results? What patterns for generation and spreading of knowledge increases utilization of research results? What factors in a research project are barriers for research to be adopted in product development? How do organizational structures impact the transfer of knowledge from research departments to business units?

Methodology
This master thesis is based on a case study at a global firm within automation, robotics and electrification. Data was collected by interviews within product development departments and industrial research department. The findings are supported by established theory in knowledge management, organizational learning and innovation management.

Findings
The study presents several project conditions that facilitates knowledge transfer in terms of communication, presentation, language, timing and engagement. Organizational structures that enables utilization of research-based knowledge have clear organizational responsibilities, integration of technological strategy in projects and channel for multidisciplinary interactions. In order to determine the success of research projects results the receiving part’s absorptive capacity and ability to gain new knowledge have to me measured.
Popular science summary

Applying research results to product and business development have become increasingly important in cases where organizations wish to shorten the innovation cycle. The innovation cycle is shortened when new technology is applied to products faster than before. In order to deploy new technology to market, applied research projects are conducted to deliver new solutions to the business. These applied research projects aim to deliver results that can be applied into a product development projects and create customer value.

Although, several studies in this area has identified problems with transferring applied research to product development, where the results from applied research projects are not obtained and utilized into products and services. This is a concern for ABB AB as the project results at the Corporate Research Centers are not obtained and developed on the receiving business lines. One identified issue is the lack of experience and ability to utilize on the receiving side, the absorptive capacity of the receivers is crucial to manage the research results. Another issue is how the research results are presented. This study, amongst other, presents that the research is not presented in a format that the receiver can obtain.

Knowledge management principles are considered by previous research in the field to increase the utilization of research in product development. This study presents some of these principles in terms of success factors for ABB to enhance business line’s utilization of research results. It is crucial to understand what factors facilitates research results to be applied into business lines in order to enhance the utilization of research results. Further principles for performance indicators and organizational structure are confirmed to increase the utilization of research results at ABB and shorten the technologies time to market.
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Abbreviations & acronyms

ABB: Asea Brown Boveri
BL: Business Line
CRC: Corporate Research Center
IM: Innovation Management
KM: Knowledge Management
KT: Knowledge Transfer
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1. Introduction

Recent studies have presented difficulties in the innovation process for large industrial firms, with a problem of applying new technologies in product development and in the business development. Issues in the innovation process is considered, amongst other reasons, to be caused in unsuccessful transfer of research-based knowledge. Knowledge Management (KM) can have crucial impact in the innovation process, Darroch (2005) argues that in cases where KM principles that are applied accurately the organization will gain a higher level of innovation and overall performance. Further studies by, amongst others, Nonaka (2007) present the importance of applying knowledge and in particular new knowledge to products; according to Nonaka, this is the main factor to gain a competitive advantage. Moreover, research in the KM field suggests that new knowledge needs to be obtained and transferred in the organization in order for inventions and new products to be developed. In order for the transfer to occur Nobelius (2004) considers the linkage between Research and Development to have a crucial impact in the transferring process of new technologies from applied industrial research into products. Issues have been presented from several studies where the identified factor concerns lack in the organization’s internal absorptive capacity of new theoretical knowledge (Nobelius, 2004; Bergek et al, 2008; Magnusson et al, 2005). The lack of absorbing new theoretical knowledge is further described as being caused by the knowledge format being inconvenient to translate to product development and overall business development. Magnusson et al (2005) describe the issue in exploiting the inventions and new technologies on a manufacturing level, which is argued to be more complex than on a research level. Further the studies present accordingly that there is a difference in absorbing theoretical knowledge and creating a product from that knowledge. KM theories suggest that in the transferring knowledge process the knowledge type and the transferring method have to be adapted for what purpose it is meant to give the receiver. Nonaka (2007) argues that for knowledge to transfer the channel have to be adapted for the knowledge type, in regard to this matter the channel of transferring research-based knowledge has to be customized.

In order to investigate the mechanisms that is stated to hinder and facilitate research-based knowledge to be obtained and adapted into product and business development this thesis is conducted at a large industrial manufacturing company. Firstly, the case study attempts to identify the enablers and obstacles there are in transferring research-based knowledge to
technical complex product development. Further the study aims to consider what organizational structures in the company creates the prerequisites for absorptive capacity, with focus on the theoretical knowledge, and for the knowledge to be converted to development and finally be implemented. One last aspect of the issue that is taken into account is how the utilization of research results can be measured and what the performance indicators are for successful research-based knowledge transfers. The study covers a company delivering different technologies in several markets with a specified research department which performs industrial applied research – namely ABB AB.

ABB AB is a global company within industrial technology with local offices all over the world, the head office is based Switzerland. This study is conducted in a local office based in Sweden, Västerås. Currently ABB Sverige AB is divided into five Business Areas Power Grids, Electrification, Industrial Automation, Robotics & Discrete Automation and Motion. All these areas are divided into Business Line (BL) that have responsibility for research and development of their own respective product or products. In addition to the traditional R&D, ABB also have a centralized research department, corporate research, working interdisciplinary within the areas User Experience, IoT etc. The aim for ABB’s corporate research centers is to increase innovation performance of all four divisions. The Corporate Research Centers purpose is to do applied research for both long term perspective and short-term perspective for the business line development departments, see Figure 1. The CRC staff are scientist within one of the mentioned areas and do industrial research and are therefore expected to be specialized with in a research area or technology rather than working towards one market or product. The projects conducted by CRC distinguish from the BL’s own development projects in terms of higher risk and it requires scientist expertise.
However, the company has identified several issues in that the applied research results from CRC projects in Sweden, Västerås are not transferred into business value at BLs. The research results and knowledge from the CRC projects are not diffused in the organization for development or knowledge sharing. Further the issue results in that the divisions do not utilize the results from the corporate research projects to the expected extent. The arrows in Figure 1 which represents the research result transfer is not utilized in the products to market. ABB do not take advantage of the new knowledge and possible inventions from the scientists at CRC. Although there are indications on that research projects are not transferred to BL in a matter so that the BL can convert it to products development, one of the issues are that CRC organization do not know to what extent research results are used. Knowledge transfer is done between the parties where the knowledge is shared but the knowledge is not obtained and applied by the receiver. Whereby the CRC is questioned to some extent and losing legitimacy due to its research projects and results not being translated into applications. Thus, ABB are following performance indications for the research projects and for BL performance, there are no measurements which indicates the utilization of research results.

1.1 Purpose

The purpose of this study is, more precisely, to investigate how knowledge management principles can enable knowledge transfer between the CRC and BU in order to increase utilization of research results within product development. Research questions will approach the issues of where and how research results are presented to the BL, with the aim of identifying...
The problem will also be approached from an organizational perspective, where the different conditions for transferring and utilizing the knowledge are investigated. This research also attempts to address the factors a transfer of research results can be performed by to measure the utilization of research results in product development. Results are presented in this report through a case study at ABB and previous research on primarily the fields of knowledge management and knowledge transfer of applied research.

1.2 Research question

The research question guiding this study will investigate the process of creating and transferring research results in a product developing organization, with the objective to find factors that enable utilization of research-based knowledge. By investigating previous projects that are considered as successful and unsuccessful the study will present what attributes that enables research results to transfer in the organization as well as attributes that enables utilization of research results.

What are the main enablers for research-based knowledge to transfer in order to be adopted in a product developing organization?

In order to answer the research question, four sub questions will form the study and the empirical findings. Research sub questions investigate enablers in different levels and perspectives, the first question have a general perspective and high level that investigate the factors that indicates for successful project and utilization of research results. Question two and three investigates enablers on a more detailed level, that focus on project specific factors that enables or hinders transfer of knowledge. The fourth and last question have a high-level investigation of factors in the organizational structures and strategies that enables utilization and transfer of research-based knowledge.

1.2.1 Research sub questions

Q1. What are the indicators for measuring the utilization of research results?

The first question will investigate how the product development utilization of research-based knowledge, in format of research project results, can be measured. What factors decides if a research project is regarded to be successful or unsuccessful. Identifying the
factors for successful project will both contribute to understanding the project objective, all project should aim to be successful, and also identifying how the projects can be compared with each other. It will primarily consider indicators that signal whether a result from research project is utilized or not.

**Q2. What patterns for generation and spreading of knowledge increases utilization of research results?**

The second question will investigate the projects that are considered to be successful and the patterns of factors that lead to successful projects. Focusing on how the procedure of transferring the research results’ impacts if the knowledge is utilized at business line and can enhance product development. This includes defining what conditions are essential to transfer research results in the organization and for research results to be obtained. Conditions and factors that identifies when in the process is it beneficial to communicate, how to present the result and where in the process should decisions be taken.

**Q3. What factors in a research project are barriers for research to be adopted in product development?**

The third question will investigate the patterns in projects that are considered to be unsuccessful research projects which lead to unsuccessful utilization of project results. Exploring the factors that impact these patterns, the question seeks to identify and shed light on obstacles or barriers hindering the utilization of research results in product development.

**Q4. How do organizational structures impact the transfer of knowledge from research departments to business line?**

The final research question will investigate what organizational structures enable research knowledge to be applied in product development in business line. The question will be approached from different perspectives including the different departments responsibility in knowledge transfer, what purpose the research project has and the overall internal structures to enable diffusion of research and absorptive capacity of internal theoretical knowledge.
1.2.2 Approaching the research questions

The four sub research questions have firstly been investigated by secondary data and then by first hand data that is later presented in subsections to be analyzed and concluded in each research question.

Q1 is investigated in studies by, amongst others: Bergek et al (2009), Cummings and Teng (2003), Lawson and Potter (2012) and Schroder and Swanson (2002). Results from the first hand data is presented in 4.4 Project success measurements and analyzed in chapter 5.1 Definition of successful research project together with the previously conducted studies.

Results from the interviews are presented for Q2 and Q3 in section 4.2 Success Factors and 4.1 Obstacles where the identified projects attributes are presented. The attributes are later analyzed separately in a separate chapter: 5.2 Presentation Result, 5.3 Communication in projects, 5.4 time and 5.5 Product development engagement with findings from the theoretical framework.

Q4 is approached with the secondary data from Bergek et al (2008), Liyanage (1999), Bergek et al (2009) and Schilling (2013). Results are presented in the entire empirical findings chapter and are later analyzed in 5.2 Presentation Result, 5.3 Communication in projects, 5.4 time, 5.5 Product development engagement and 5.6 Strategic alignment with findings from the theoretical framework.

1.3 Limitations

The study contains limitations that have impact on the results, both in terms of organizational dependencies and research scope. Dependencies of company structure at ABB are that the study is limited to industrial manufacturing firm, which provides complex technical products that are divided into several different industry segments. The study has its limitations on the validity for other companies due to only one case study have been conducted. Flyvbjerg (2006) argues that findings from one case study cannot be generalized. However, with the ambition to generalize the finding from this case study the empirical data was connected to other studies within the same research field. In this matter the findings provide support for previously conducted and defined theories to be applied for this specific setting at ABB.
Nevertheless, here are some limitations in terms of scope, only some selected parts of ABB have been covered in this study. One Corporate Research Center and five different business lines that have received results from this Research Center which limits the results width. The results can be generalized to the extent of industrial manufacturing firms with industrial research departments. However, there are further limitations in depth of scope in terms of accessibility to the participant. The study recommendations should only be to the extent in which the Corporate Research Center Manager have authority to make changes. Whereby organizational structures changes and project management structures is considered with focus on the perspectives that the study participants can obtain recommendations, this has limited the results from the case study findings.

Furthermore, this study will not consider measurements or performance of research department not business lines. Included in this research is limited to performance and transfer of knowledge between research to product development.

2. Theoretical framework

The theoretical framework is built on research areas from different fields in order to fulfil the research purpose. Knowledge Management (KM) is the main theory that is studied from different perspectives, it is studied in general terms of organizational structure by Nonaka (2007), which considered to be the foundation of KM. Further perspectives that are studied within the theory is KM within R&D organization’s by Cummings & Teng (2003). Furthermore, KM has been studied by deep diving into the research field of Knowledge Transfer (KT), a perspective that focuses on the process of transferring knowledge between product development subsidiaries by Lawson & Potter (2012). Knowledge transfer a matter of transferring knowledge from applied research to product development, the understanding of research-based knowledge transfer draws on studies by Nobelius (2004) and Johansson et al (2008). In the process of converting research to knowledge for product development the research presents this process by the organization’s capability of absorbing new theoretical knowledge.

In addition to KM theory, organizational capabilities and mechanisms are studied by Andrawina et al (2008) where it is presented to a matter of the organization’s absorptive capacity. Absorptive capacity and the process of obtain new theoretical knowledge is further
discussed through the theoretical framework in terms of internal technical knowledge transfer by Bergek et al (2008). Other research fields are considered in addition to the KM theory to cover the mentioned theories impact on innovation performance. Measurements and performance indicators are studied within Innovation Management (IM) by Shilling (2013), who’s studies also concerns the impact organizational structure have on absorptive capacity. IM in terms of the role of communication in innovation management by research of Aarts et al (2011), which complements the research area of KT with other perspectives. Further studies have complemented the mentioned researchers to obtain different perspectives on the same research area.

2.1 Knowledge management

Previous research in organizational performance has demonstrated the importance of knowledge management (KM) in an organization. Knowledge is according to Nonaka (2007) the source to obtain a competitive advantage, that is achieved from the organization’s ability to manage new knowledge and apply it to new products. Similar insights can be found in KM research, such as studies by Darroch (2005) which presents that applying KM principles correctly will yield a higher level of innovation and the firm’s overall performance. In later years the increased pace of technological development and a higher degree of competition has become an important driver of innovation and thereby research and development, the increased pace both enhances the importance as well as the challenges in research and development (Park & Kim 2005). According to Lopez et al (2011) the core value in an organization is the knowledge and the intellectual capital, emphasizing the importance that KM is used as a mechanism to increase the level of innovation. Further, in respect to innovation performance studies by Darroch (2005) states that if a company is able to apply KM principles it will achieve higher level of innovation and overall performance. This is in concurrence with Park and Kim (2005) who argue that innovation is essential in order to transform and transfer new technological knowledge and market demands.

2.1.1 Purpose of knowledge management

According to Stonehouse and Pemberton (1999) organizational learning is developed from the individual learning. To develop existing individual knowledge and transfer it to organizational knowledge is the purpose of KM, from a company context (Stonehouse and Pemberton, 1999). As Nonaka (2007) puts it, the purpose of KM is to make the personal knowledge available to
others to obtain and to be utilized for a valuable matter. According to Cummings and Teng (2003), knowledge transfer can be divided into three different research areas. They state that the first area concerns the context of knowledge in terms of people, tools and routines where the knowledge source is launched. Further in order for knowledge to transfer there are two contexts in which knowledge can be obtained; through relationship and by activities. The third area for a successful knowledge transfer is the recipient and the context where the receiver in form of people, tools and how routines are handled (Cummings & Teng, 2003). While the first area of gaining knowledge can be considered as individual learning, the later areas of transfer and receiver are organizational as well and therefore have to be adopted to the way success is measured.

### 2.1.2 KM in organizational learning

To achieve the organizational learning from individual learning by KM there are studies that present how organizations should be structured and managed. Organizational learnings function within KM is to develop knowledge in a structured manner, for storage, transfer and coordination of knowledge levels. Stonehouse and Pemberton (1999) state that organizational learning is developed from internal as well as external relationships, where knowledge is shared and obtained. The researchers further point out some factors in the organizational learning that are crucial in order to make a competitive advantage; the process agility and timing of when knowledge is transferred. From another perspective Shilling (2013) argues that the organizational factors in research and developments are essential to transfer and obtain knowledge. Departments that do research and development should organize the department with no formalization and be decentralization into small ventures. Furthermore, it is argued that traditional development should aim for cross fertilization of ideas and the information should diffuse in the organization (Schilling, 2013). Activities conducted across subsidiary by sharing resources and knowledge in the organization increase the level of innovation (Cummings & Teng, 2003). Accordingly, research from Lundvall and Nielsen (2007) have demonstrated that organizations that focus on job rotation, inter-divisional teams and delegation of responsibility are more capable of adapting new knowledge to the development. However, Stonehouse and Pemberton (1999) put some attention on one obstacle in transferring new knowledge; the knowledge gap between delivering and receiving part in managing knowledge. The holistic organization is claimed to be essential in order to minimize knowledge gap between different parties, and thereby enable knowledge transfer, again the cross
functional interaction is the key for the organization to be holistic (Stonehouse and Pemberton, 1999). Other studies present that to minimize obstacles in knowledge transfer the initial knowledge gap have to be rather limited between the knowledge source and the recipient in order for the outcome of the process to be successful (Hamel, 1991). On occasions that the gap is too great it is necessary to have intermediate learning steps to fill the gap (Cummings & Teng, 2003). Further studies by Lawson and Potter (2012) demonstrates that a high absorptive capacity can identify the knowledge gap and develop a common knowledge base. Absorptive capacity defined by Lawson and Potter (2012, p 1232);

“Absorptive capacity, defined as the ability to value, assimilate, and apply new knowledge”

Organizational capabilities of gaining new knowledge is according to Bergek et al (2008) the learning process of an organization, whereas an organizational technological capability represents the capacity of applying science-based knowledge. Technological capabilities are in essence the organization's ability to introduce new products by obtaining and developing new technology (Bergek et al, 2008), which can be described as an internal technological absorptive capacity.

2.1.3 KM and innovation strategy

Considering innovation as a term, it is used in research for different matters and the scope of the term differs for occasions. While some use it as narrow definition of innovation in regard to inventions and new technology. According to Nelson (1993) innovation is a wider definition described as the process organizations conducts and practices design of new products and processes. Further the author states that innovation is created from different parts of the organization, however the innovations are often made by organizations themselves. There are several factors that are affecting the innovation process, however Nelson (1992) limits features of innovation to allocation of activities, funding and characteristics of firms.

The approach to measurements of innovation performance is conducted in various ways in order to measure business value, research fields of IM and KM do not align on measurement methods neither the connections between innovation and economic performance. Schilling (2013) have summarized the methods in four categories. The first two are measurement done by production of new products: in methods that (1) calculates the return of new products in
relation to total expenses and (2) percentage of revenue produced by new products. Other methods measure the project success in terms of (3) number of reached sales goals and (4) ratio of successful projects in a portfolio. Nelson (1992) states that the measurements should involve economic return, the author argues that innovation performance cannot be separated from economic performance and should therefore always be measured accordingly. Although, recent studies present that innovation performance is according to Schroder and Swanson (2002) not connected to economic performance. Further studies made by Bergek et al (2009) confirm this by stating that patenting activities are hard to relate to economic performance.

Bergek et al (2009) state that technology strategy should align with the technology activities conducted in an organization in order to maintain competitive advantages. Technological capabilities are both gained by management strategies and operational activities (Bergek et al 2009). To measure innovation performance is essential to be able to develop an innovation strategy and further to see the impact of innovation integrated in knowledge management. Nonaka (2007) states that the western companies have not yet adopted the organizational strategies to see knowledge as an essential factor for success. Researchers presents the importance of closely connected strategies for the different areas in KM and the stage of organizational learning. Research, innovation, business strategies should all be integrated in a knowledge creating organization, in respect to the organizations operational level, research and development have to be closely related to technical management framework (Liyanage 1999). Technological capabilities are argued by Bergek et al (2008) to be established by both strategy as well as operations. Technology activities are the operations of researching new technology in order to gain knowledge to both exploration and exploitation of technology (Bergek et al, 2008). Further insights of organizational structures and how management should utilize knowledge not only as a resource but also in their own decision making. Stonehouse and Pemberton (1999) states that information driven by technology is crucial to increase the use of knowledge in decision making. Finally, Stonehouse and Pemberton (1999) suggests that the aim for management should be, by encourage a climate of questioning current practice, making experimentation the norm. Further recommendations from research is found by Bergek et al (2008) that studied factors which contributes to capability and it presents that an organization with smaller technology scope and a clear technology leadership strategy where the most successful.
2.2 Knowledge transfer

Knowledge transfer is described by Cummings and Teng (2003) to be created in relationships between two parties and the conducted activities. In order to transfer accurate information from the personal knowledge to organizational knowledge where is should be maintained and then use research results, the channel for information should accommodate the knowledge type (Nonaka 2007). Knowledge type for applied research is previously stated to be theoretical technical knowledge. Aartss et al (2011) argue that the role of communication must be rethought in order for innovation to be adapted in organizations. Further they state that a part of the re-thinking of communication in the innovation processes is to facilitate “everyday talk” between stakeholders, a considered more important factor then professional communications. Baraldi et al (2011) are addressing the different cultures between industry and research creates a language difference due to the usage of different terminology. The authors are suggesting that issues and questions should be formulated by industry representatives in order to decrease the barriers of interaction between the two parties. Studies by Nonaka (2007) describes the knowledge transfer and how the content passes different phases. When the knowledge has form of a tacit knowledge, this needs to break down to explicit knowledge in order to be transferable knowledge to a second part which can comprehend the explicit knowledge and develop this to tacit knowledge (Nonaka 2007).

2.2.1 Knowledge transfer methods

Knowledge management theory targets both how knowledge is presented, codified or written, and in what way it is transferred. Thus, there are different approaches on how the knowledge should be transferred. According to Darroch (2005) enable transfer of knowledge or sharing the research needs to be codified for someone else to obtain the knowledge. However, Cumming and Teng (2003) addresses the simplicity of transferring codified knowledge but argues for the lacking legitimacy of codifying knowledge. Stated that the recipient’s commitment and ownership of the knowledge defines success, the transfer requires a higher degree of articulation (Cummings & Teng, 2003). There are further studies supporting the importance of articulation rather than codification. Nonaka (2007) describes knowledge management in the knowledge creating company as the spiral of knowledge, two central concepts in the theory is articulation and internalization. Articulation is the process of obtaining explicit knowledge from tacit knowledge and internalization is the personal processes of expanding the tacit knowledge by explicit knowledge (Nonaka, 2007). Personal commitment
is mentioned to be the key to succeed in the knowledge transfer process due to it is required in order for the two central concepts to succeed. Involvement in the transferring knowledge in the articulation process is of great importance to the relationship between parties and the recipient’s ownership and commitment of the knowledge (Cummings & Teng, 2003). Further the authors state the importance to also have the same knowledge and view on the projects and knowledge transfer process. Cummings & Teng (2003) present aspects of transfer success in the common view on knowledge transfer projects, in order to have the common view managers should coordinate a constant knowledge transfer between the two parties.

2.2.2 Measure knowledge transfer

Four different approaches are presented in previous research to measure transfer success, the first one is to measure number of knowledge transfers and the second approach measures if the knowledge is on time, on budget and have a satisfied recipient (Cummings & Teng, 2003). Thus, the approaches can be argued to be too simplified measurements and does not take all organizational aspects into account. Knowledge management literature have another approach which focuses on the recipient's ability to use and develop the knowledge gained, Nelson (1993) defines knowledge transfer success to the extent is it re-created. Andrawina (2008) states that successful knowledge is dependent on the employee’s ability to organize new knowledge that they received. Accordingly, to Andrawina (2008), Lawson and Potter (2012) argues that inter firm knowledge transfer increases for organizations with a high absorptive capacity. However, the approach has received some criticism due to its complexity as it both requires replication action of recipient and knowledge have to be compressed so it can be deconstructed without affecting evidence and validity. Fourth approach to measure the success of a knowledge transfer can be found in institutional theory which targets the recipient’s appliance in three aspects, (Meyer & Rowan, 1977). It defines the success to the extent the recipient takes ownership, commitment and satisfaction of the knowledge presented. Cummings & Teng (2003) states that the recipient can only understand and apply the knowledge adequately if the recipient herself internalizes the knowledge.

2.3 Transfer knowledge from research to development

Linkage between Research and Development have been identified to be a crucial issue when managing new technologies into products and more specifically transferring applied industrial research to commercial products (Nobelius, 2004). Characteristics of product development and
the applied research in terms of technology development differ, this challenges development of new product from new technology (Johansson et al, 2008). The issues can be as a result of problems with utilizing the research resources adequately (Roussel et. al, 1991). Other reasons for this issue are argued by Roussel et al (1991) to be lack in communication, strategy or the operations. Transferring applied research into product development can be divided in three parts according to Nobelius (2004), the whole process is called internal technology transfer process. The first part is synchronization of technological strategy and product development, followed by the issue of content to be transferred to product development. Finally, the third part of Nobelius (2004) process is managing directions on how the transfer is proposed to be managed. Nobelius (2004) argues for the applied research to be transferred continuously in order to be successful. Timing is one factor to why applied research results are not utilized in product management. Nobelius research presents that when research results are delayed it misses a transfer opportunity to product development. According to Nobelius (2004) there is a “Window of opportunity” where the research results can be transferred to product development, a window which is based on timing for product development projects. Although in opposition to Nobelius statements, Johansson et al (2008) suggest that there should be a standardized time frame for internal technology transfer.

Magnusson et al (2005) argue that the absorptive capacity of an organization is however dependent on department and purpose of the development, it is argued that exploiting new technology on a R&D level is considerably different then doing so at a manufacturing level. Although a new technology or an invention for that matter is suitable in practice and there is a difference in absorbing the theoretical knowledge and developing a product from the gained knowledge. Absorptive capacity is therefore argued to have substantial meaning for technology knowledge and learning if it has impact on the production of new technology.
3. Method

This research has been conducted as a qualitative case study in order to answer to the purpose of this study. A qualitative approach is according to Bryman & Bell (2011 p. 383):

“Qualitative research is a research strategy that usually emphasizes words rather than quantification in the collection and analysis of data.”

A qualitative approach was chosen due to the study aims to understand an issue by exploring how the people within the organization interprets as barriers and successes. Further definition of qualitative research is according to Bryman & Bell (2011 p. 383):

“... an epistemological position described as interpretivist, meaning that, in contrast to the adoption of a natural scientific model in quantitative research, the stress is on the understanding of the social world through an examination of the interpretation of that world by its participants...”

An inductive research method has been used in a matter so that primary data from the study interacts with secondary data. The primary data in this study consists of empirical findings from qualitative research based on interviews and the secondary data contains the theoretical findings from previous studies on the subject. The inductive research approach is often an iterative process of going back to the literature to find theoretical support for a finding (Bryman & Bell 2011). This iterative process has enabled the primary data to interact with the secondary data.

The research was conducted as a qualitative case study at ABB, which finally will conclude in a strategy to apply in product development and research-based KM. Since the understanding of social interactions and relations in transferring research results are in focus, a case study suits this research method due to the interaction between a specific context and a phenomenon (Jacobsen, 2002). The case study was conducted with semi structured interviews, which is a structured format with a number of questions regarding a certain topic where there is flexibility for the interviewees answers and how the questions are asked (Bryman & Bell 2011). The findings of the empirical data from case study will be analyzed with the theoretical framework to create a strategy for transferring research-based knowledge and increase level of innovation.
at ABB. Conclusions of the study will contribute with some stated success factors and suggestions of actions to improve the current process. Further conclusions would be recommendations of management and measurements to increase innovation at ABB.

3.1 Interviews

The semi structured interviews were where the empirical data is gathered, where the questions of how the process of transferring results are done and measured today, together with obstacles and success factors. The interviews present patterns in projects for a successful result transfer and identifies common obstacles in the process.

The strategy of sampling is the most common method in qualitative research (Bryman & Bell 2011). First tool that is used is the theoretical sampling (Bryman & Bell 2011) which is done by interviews and then transcribing, followed by a codification of the results into concepts and categorizations.

Interviews was booked for 30 minutes, this time limitations were crucial in order to get as many participants as possible. This was prioritized instead of finding fewer participants with longer interviews, therefore the validity of the research increased by the number however the lack of time might affect the quality of the answers and the understanding of the participant. Most interviews were done face to face, however a small amount of people was interviewed from other locations which made face to face impossible. Then phone interview was made instead. All interviews were recorded with the participants approval which facilitated the transcribing of the interviews. Interviews was not transcribed word by word; however, the recordings were played several times and the direct answers was transcribed word by word. This made the answers more focused and increased the reliability of the later coding of the interviews.

Equal questions were asked to all participants however the order of questions was changed to maintain a good flow in the current discussion. Same questions were asked to all participants; however, some did not want to or had the knowledge to answer. Therefore, some interviews did not receive answer for all asked questions due to lack of experience or other personal matters. The researcher was presented before the interview as well as the purpose of the study together with the areas the interview concerns.
3.1.1 Pilot interview

A pilot interview was conducted on an engineer with a product development background in order to test if the questions generated answers relevant for the case study purpose. The pilot interview should not be tested on a person which is involved in the study (Bryman & Bell 2011), therefore a person outside the organization but with similar role was chosen. Experiences was gained from the pilot interview and some questions that were misconceived was modified before initiating the study.

3.1.2 Participants

Corporate Research Center (CRC) Manager is the first roles that was interviewed at CRC in Västerås, the role is manager for a research department at CRC. Their perspective to contribute to the study is the overview of the research department and what role the research has at another department. Corporate Research Scientists work in the research projects, both to generate applied research and to present the research results to the receiver. The role has detailed insight in projects which makes them contribute on a detailed task level, rather than an overview perspective. Business line Managers are the receivers of research-based projects from CRC, the role is managing or working with product development. The receiver's perspective in this study is considered to be necessary considering getting both delivering and receiver perspective in terms of study results to be valid.

Interviews was conducted with 17 participants from different departments in order to get different perspectives of the issue of transferring research results. The participants are five managers at corporate research, six managers from product development departments, six engineers conducting research. 17 participants were a chosen number of interviews, more interviews were to be preferred, however time limitations hinder more interviews. Although importance of conducting interviews with a sufficient spread between the roles was prioritized rather than maximizing and getting an uneven number of participants from the different roles, see distribution of the participants in Figure 3.1.2. This can be argued to have a reliability purpose due to the different roles gets equal opportunity of sharing experiences. Process of gathering participants was done through snowball methods, where the new participants was found through the contact of an earlier participant (Bryman & Bell 2011).
3.2 Analysis

For the analysis method the study has coded the data, which is done by interpreting the data to organize the data. Interpretation of data is done by reviewing the transcriptions and applying labels to data that are of interest of the study (Bryman & Bell 2011). Data can be sorted on different levels two of the levels are named **Open Coding** and **Axial Coding** (Bryman & Bell 2011). This study was conducted through a process that first consisted of open coding, followed by axial coding. Axial coding sorts the data into concepts after reviewing the transcriptions and comparing the different answers (Bryman & Bell 2011). Observations and themes were identified in the transcription of the interviews, where the answers of each question were summarized for each participant group. In this matter the interviews were analyzed firstly within all the participant groups and sorted into four concepts; obstacles, success factors, practical improvement and project success measurements. The concepts are presented as the results of the empirical data. A second level of analysis was done after the concepts where created, Axial Coding of the data in order to make connections between the categories. Secondly the four categories were analyzed between the different groups to identify the commonalities and differences of the different groups. Bryman and Bell (2011) state that the inductive research often is an iterative process of going back to gather new data with the analyzed data. This was done in the analysis process to find relevant evidence for the findings. Further the concepts and categories were compared to results of previous research on the subject identified in the theoretical framework for both confirming and opposing findings between the secondary and primary data in order to generalize the findings. Different research fields and simplification of the findings is argued to be an issue by Cummings and Teng (2003), there is a balance with over simplicity on one hand and the preoccupation on the other.
However, to avoid oversimplification all findings are anchored in evidence from the theory whereby the conclusions are drawn. Finally, the findings in the four categories were lastly analyzed to answer the four sub research questions.

3.3 Validity

Research validity can be divided into four categories according to Bryman & Bell (2011); Measurement, Internal, External and Ecological. The first and forth categories, Measurement and Ecological are not considered for this study. Internal validity assigns to how valid the research process is, from collecting the data to analysis, and specifically how the method deflect confusion and avoid several independent variables (Bryman & Bell 2011). In order to improve the internal validity factors such as bias in the study and the study being influenced by wanted characteristics, have been acknowledged during the research. Furthermore, the validity of the empirical data was considered by involving participant from different departments that have different experiences. This method is called assessment selection and is argued to increase the validity of the gathered data (Lekvall et al. 2001). Moreover, during the interviews the participants were asked if the answer were interpreted correctly, a method argued by Michrina and Richards (1996) to increase the validity of the data. External validity concerns to what extent the study can be generalized from the initial set up and conditions (Bryman & Bell 2011). In this study external validity would be to apply the results on other organizations, this is discussed in previous chapter 1.3 Limitations.

3.4 Reliability

Reliability of the research is the possibility of replicating the study and the results (Bryman & Bell 2011), therefore methodology and research questions are presented in this report. Although there are limitations for this study’s reliability with respect to firms’ organizational structure, where the applied research project should be somewhat separated to the product development operations. However, for large industrial companies’ further research presents that similar structures are applied in terms of industrial research departments. Even though the research findings are concluded from only one case study, which can limit the reliability of the research, the findings are carefully connected with theories from previously conducted research. The result from this study then provides support for the theories and the applicability of the theories in the setting of ABB.
3.5 Bias

Participants of the study is acknowledged to have a subjective view on the research subject due to previous experiences, in a matter which can be considered as bias in this research. Hence, the biases of the participants have been reduced by interviewing several participant groups with different perspective of the research topic. Further issues of bias in the research is the roles and values of the researcher. Research cannot be conducted without the researcher’s values to be transferred into the study (Bryman & Bell 2011). Therefore, self-reflection was obtained during several stages of the research in respect to how the personal opinions were handled during both interviews and analysis. Another stakeholder in this research is the firm the case study is conducted on. Bryman and Bell (2011, p. 415) describes that a researcher financial dependency on the should be managed with self-awareness:

*Action researchers must, therefore, possess a high degree of self-awareness in order to combine the roles of researcher and consultant and be prepared to defend their research in these terms.*

Moreover, Bryman and Bell (2011) argue that the participants in the case study can also have bias. This concern is managed by conducting the interview in several departments, see further description in chapter 3.1 *Interviews*.

3.6 Ethical considerations

All participants in this study was aware of the purpose and objectives of this study as well as the method to accomplish the purpose. Further, all individuals have right to anonymity and have been asked for consent in recording interviews. In cases where the participant did not want to answer this was accepted and interview continued with next question without forcing the participant to answer.
4. Empirical findings

The empirical findings are divided into following themes; Obstacles, Success factors, Practical improvements and Project success measurements. Obstacles are identified from characteristics from projects where the research knowledge is not utilized in product development. Empirical data from the different participant groups defines certain project characteristics that hinders the project success. Success factors are indicated project attributes of projects where the projects results are according to expectations. Attributes that makes project results considered as successful projects. Thirdly empirical data is divided into suggested improvements that is considered to have impact on the project's success. The practical improvements are factors that the participants have described for improving their working conditions in the projects. The final theme contains measurements of project results, which aspects the participants considers a successful project are measured by. The findings from each participant groups are presented in the identified themes from all interview data.

4.1 Process of research projects

The empirical data presents that the purpose of projects at CRC departments are to deliver technological research results to BL departments that the BL do not have the competence to do themselves. The research projects that are conducted at CRC are considered to have higher risk then the projects at BL, as the research areas are new and not researched before at ABB therefore the output is often unknown. Projects can be initialized by any of the two parties; CRC gives a project suggestion for a BL or that BL presents an issue for CRC that they don’t have competences to solve. All research projects at CRC are supposed to follow a project template for technology development projects. Before the technology development project starts, project requirements and project goals should be declared. After the technology development a handover to BL is done as last step of technology development project, after that the BL takes the results from the technology development project to start a product development project.

Two different types of project are presented in the study: long term projects and short-term project. The long-term projects aim to develop new technology that can be applied to product development in a few years. Short-term projects aim to develop technology that can be directly applied into a product development project.
4.2 Obstacles

The study presents the identified obstacles in both successful but also for unsuccessful projects. Patterns of projects shows that some project attributes are found to be reasons for projects and transfer of project results to be unsuccessful. Results indicates that there are obstacles on both delivering and receiving side of the project transfer. Table 4.1 presents an overview of the identified project obstacles.

<table>
<thead>
<tr>
<th>Obstacles</th>
<th>CRC Managers</th>
<th>CRC Scientists</th>
<th>BL Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of resources</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>BL communication</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>CRC communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge gap</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Project business perspective</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Unable to do internal trips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of BL commitment</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Lack of requirements / goals</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Timing</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning and management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure with different methods</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 4.2. Results for obstacles in projects*

4.2.1 Corporate Research Center managers

Data from CRC manager have identified obstacles in several different areas in the research project as well as the transfer of the project. Regarding to the research transfer process an obstacle has been identified in presentations made by CRC of the research results. Issues with the presentations are that it is not adapted to the audience, the terminology that researchers use are different than the receiving business lines and the content of presentation are not adapted to be of interest to the audience. One manager at CRC describes the factors as a problem in the presentation phase:

“Today we do not present the research results differently depending on the audience”
In cases where presentations are held for a big audience of people that are not deployed on the subject and the content is on a very detailed level, this issue reduces interest and understanding on BL side. Further the interviews demonstrate that the content is not visualized whereby the receiver do not understand technology functions nor how to apply the technology in a product. The lack of visualization creates a knowledge gap between CRC and BL due to the research results are not being understood and therefore not utilized in products. Another obstacle related to presentation concerns the long-term research projects, for these research projects it is hard to present the research result due to the technology being very novel and the utility might be longer in the future, therefore for the time being the success cannot be measured. In respect to technology timing in research presentations at BL, obstacles were mentioned in delivery of the result being presented to BL. Reason for the lack of timing in project result delivery is that BL are not mature for the technology nor knowledge. The result that are delivered requires knowledge that BL do not yet have or do not have other enabling technologies and knowledge about.

“Sometimes the timing can be wrong, when the BU is not mature for research, and are then not able to obtain the knowledge.”

Factors that influence the inadequate timing is lack of planning and decision making in projects. Unclear project goals are mentioned as one reason for that project goals are not met, which is seemed to be related to unclearness of responsibility, whose responsibility it is for research results to be presented and used in BL. Additional reasons for not reaching the project requirement are described as the lack of CRC ability to measure business value. Staff in the projects do not have the business nor product understanding enough to cooperate to the extent it is seemed necessary. Further factors that are identified at CRC are the time and budget restrictions which are limiting project success, an obstacle that is considered from a management perspective. Communication with BL is not working due to there is lack or no receiver at BL side to present the research result or questions to. This is described in the interviews by a manager:

“The projects are having a hard time finding the correct people to communicate with and hand over the project result to.”

A reason for insufficient communication is described to be the lack of commitment from BL.
4.2.2 Corporate Research Center scientist

Obstacles in the presentation phase of the projects were mentioned to be concerning the presentation scope and the participants, both in regard to how the results are presented to an audience and concerning what roles in the organization the presentation attracts. Timing in the projects presentation and handover are described as crucial, in cases where research results are presented too early or too late the research results are not utilized at BL due to, they do not have the knowledge to obtain the research. Further obstacles that projects members mentioned is the technical knowledge at BL is an obstacle for the result and goals met, further reasons are described as the unclear requirement specification leads to that the results are not met. Lack of communication with BL which have several consequences both during the project and feedback after the project where the CRC do not have the knowledge if the research results have been utilized. During the project lack of communication between CRC and BL leads to inadequate research. Another aspect with concerns communication is the unawareness of other research projects, the CRC project members have identified that instead of cooperating there are several BLs working on the same issues without knowing it. One CRC scientist express the issue as an obstacle in research projects:

“Lack of information of what everyone is doing. Instead we need to enable the cooperation in innovation by knowing who to talk to. We do not know what other departments and teams are doing in the same area. CRC are often creating bubble a research bubble where they are using the research language and do not communicate.”

The empirical data presents that lack of resources on BL side is one of the most mentioned factors for unsuccessful projects, considering that the research is not prioritized and therefore receiving resources are not allocated to receive the knowledge. In respect to receiving the knowledge and lack of resources for hand over process this consequently cause a knowledge gap between BL and CRC due to there not being enough time for a proper hand over process. A consequence of these factors are the missing commitment and ownership from BL side of the projects.

4.2.3 Business line

The study presents from BL perspective that obstacles in projects are firstly that research results are presented in theoretical terms instead of applicable possibilities. The results are not presented adapted to the audience which do not involve the staff. Further presentational
obstacles are that the research result is not modified to be applicable for a product, and this makes the handover more difficult due to knowledge gap between the two parties. Further obstacles in handover phase concern the research results’ lack of timing, the results are presented too early when the required knowledge is not applied at BL and there is a knowledge gap, or after a technology is already implemented. The BL presents that another identified obstacle in transferring research results are regarding presentations are only done after project is finalized.

“Presentation of research results are only done with the final result.”

The communication is not continuous enough and results are not partly handed over, which also leads to unclear project scope. Besides the obstacles regarding presentation, the study presents factors on both BL and CRC side that have negative impact on project success. One factor mentioned in the study is concerning that BL is not involved in decision making nor in handover and that the objectives are therefore not clear. Factors which are described to be caused by lack of time, resources and commitment from BL. Obstacles presented for CRC are the understanding business value, factors in matters of product knowledge and the ability to see how to apply research results to product development, creates results which are not adopted to BL.

4.3 Success factors

Empirical findings for the theme that concerns project success factors show that some project characteristics have been identified to have a crucial role in the studied successful projects. Table 4.3 summarize the findings from each participant group. These project characteristics are described to be factors for project success by the different participant groups.
<table>
<thead>
<tr>
<th>Success factors</th>
<th>CRC Managers</th>
<th>CRC Scientists</th>
<th>BL Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic alignment</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Clear objectives</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Iterative communication</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Customer knowledge</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Product understanding</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Customer need</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>BL responsible for objectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation format decided by BL</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 4.3. Results for success factors in projects*

4.3.1 Corporate Research Center manager

Success factors from CRC managers perspective are identified in three areas, firstly the BL engagement and specifically that BL manager is engaged from the beginning. BL engagements in results is often facilitated when BL are funding the projects due to BL having ownership. The commitment and ownership force the engagement that is required and also generally involves the receiver in decision making. Further factors that have been identified in projects are that BL decides the presentation format and presentation participants of the research results. This factor of delegating the responsibility have positive impact on the presentations thanks to the receiver has a better understanding of stakeholders and their interests. Secondly the CRC’s understanding of BL business and to have good knowledge about the products is seen as crucial in successful projects. In projects where CRC have the responsibility to understand BL, know what results are expected and can show technology applicability, the successful results are delivered. Lastly CRC managers have seen a pattern in the successful projects that it contains constant communication and partial/iterative communication between the parties.

“To have several workshops with result handover during the project.”

One part of the communication is described to be iterative handover of project results creates successful output of research projects. Another part of communication between the parties are that the strategic technical direction is decided in collaboration between CRC and BL, where the output is a strategic road map.
“CRC is invited to the BL R&D days and are involved in the strategic road map.”

In these projects where the initiative is generated in cooperation the expectations of project results are met and timing is accordingly.

4.3.2 Corporate Research Center scientist

Empirical data from project members presents that identifying business value is crucial for CRC. The understanding of product and customer knowledge can be obtained in the CRC projects conceding that BL can facilitate this knowledge to CRC in terms of sharing experiences and delivering clear requirements. In order for this to occur one factor is presented to have great importance in successful projects; the ability of CRC to create an interface in terms of communicating with the BL in order to understand what results that are desired.

“Trying to understand what the BL needs and then find a suitable approach for solving issues rather than working with tech and see where this can be applied at ABB.”

In projects where the delivering part can understand the receiver’s requirement the parties are using the same terminology. One further factor concerning communication is to have close communication and iterative communication. An additional reason for this success factors that it enables changes in project and changes of project goal during the project. Concerning the decisive impact of projects scope, the researchers do not give a definitive answer to.

“The project scope is not a key success factor.”

“The project scope does not matter.”

However, the majority claims that project scope in terms of project size is not a success factor. Although project scope in terms of how well the content of project scope is defined the majority of the respondents argue to have major impact in project success. Therefore, common goal is one important factor in order to deliver results that are expected of the project. Lastly the study presents that commitment from BL, and more specifically that there is a receiver at BL, is one requirement for the success. It is described that BL have to be dependent on the research result for the transfer to be successful.

4.3.3 Business line

Patterns for projects with successful results have been identified from business line’s perspective as well. One factor for successful projects are described to be partial presentations which enables CRC to modify the results to the receiver’s requirements. The partial
presentations facilities a forum where the project can receive feedback from BL. This iterative follow up makes research results presented aligned with expectations. In addition to partial communication another factor has crucial effect, a decision making of the parties for committing to a level of presentation. Involvement of receiver have a good impact the audience and the resources allocated to project presentation. Further factors that facilitates successful project result transfer are the conditions of the environment the result is presented in. There must be an identified need at BL side, a pull from business side, this creates engagement in product development and commitment from BL.

“Successful projects occur when there is a need from customer and Business”

In order for this to occur other factors are mentioned as crucial in terms of project should be customer focused and product understanding. It is BL is responsibility for giving CRC the opportunity to understand the products and the business value. Furthermore, CRC participants are responsible for creating the project requirement and responsible for delivering the desired business value and project results.

4.4 Practical improvements

The interviews present specific subjects and areas that is assumed by the participants to be necessary to enable better conditions for projects to succeed. Practical improvements are not given to the participants. Thus, the participants have during the interview stated specific areas that they believe needs improvement. The suggested improvements are considered to enhance the knowledge transfer from the research projects to the receiver. Improvement areas differ between the participant groups, in below table presents a general view results from the different participant groups, Table 4.4.
<table>
<thead>
<tr>
<th>Improvements</th>
<th>CRC Managers</th>
<th>CRC Scientists</th>
<th>BL Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication plan</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Small deliverables</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Set objectives together</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage timing</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More BL engagement</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Clear responsibilities</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Additional innovation forum</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Visualization in presentation</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prioritize the future</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More customer engagement</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

*Table 4.4. Results for suggestions on improvements in projects*

4.4.1 Corporate Research Center manager

Some practical improvements have been identified in the study from the CRC managers that concerns project management as well as deliverables. The suggested improvements are to always have a communication plan in the projects between receiver at BL and project members at CRC.

"Planning the communication, have to have a large communication plan."

Communication plan would manage the cooperation, demand constant communication and enable feedback in the process. Further suggestions are to do the project deliverables in small packages rather than big scope deliverables.

4.4.2 Corporate Research Center scientist

Project members have several suggestions on how to improve the projects and the transferring of the projects. Firstly, in cooperation between the parties where objectives of projects should be developed together. Objectives of project concerns the research goals and requirement specification of research scope, one scientist suggests a more critical approach from BL from the beginning of project planning:
As a scientist I would welcome more criticism from the BL during projects, help in narrowing down options, throwing out bad design ideas and sharpening the ones that are left.

Further cooperation in terms of planning the communication is described as area for improvement, where is it suggested for all projects to manage iterative communication. More communication and feedback from BL during projects are encouraged, positive feedback as well as critique. In line with communication plan it is suggested for project to create a common language were the goals, deliverables and issues are discussed. Secondly timing should be managed in early stages of project where development project at BL department should start before the handover is finished due to it is time consuming to understand research results. This is suggested to minimize risk of knowledge gap due to opportunity to ask questions and have additional sessions if required. Another recommended improvement area is responsibility for BL to have ownership to a greater extent. All mentioned the topic of the engagement of BL should be bigger. CRC is responsible for the transferring the correct results to BL, however there were differences about this issue. Although the majority argue for the BL should have responsibility for understanding business need, delivering results and ensure that research is used. It is also a common view from project members that the future should be more prioritized, and more people should have interests in projects. Further it is suggested to have some forum where the project results are presented to create awareness, for instance an Innovation Day. The suggestion aims to coordinate the projects and enable communication and knowledge sharing between the projects. Lastly it is recommended improvement to always present a movie in order to visualize the solution.

4.4.3 Business line

Business lines suggested improvements which encounter both BL and CRC part of the project. Firstly, it is suggested to conduct pre studies before larger projects are initiated in order to show adoption possibilities early in the process. The suggestions for this are stated to realize the possibilities and gain knowledge of the research area before committing to a full technical development project. Furthermore, customer involvement is encouraged in respect to understanding of the BL domain. A need to understand the end customer is suggested to have positive impact on understanding the product for CRC and application of technology. For the matter of presentations, it is suggested to visualize something concrete in each project. This suggestion also points to enable for BL to understand the application possibilities of the
In addition to these suggested improvements the empirical data shows that project should also be managed to a greater extent from BL side, this facilitates BL to provide input clearly and show the artifacts clearly. Lastly there are practical improvements regarding knowledge sharing between projects and the need for a forum of where other projects results can be presented.

4.5 Project success measurements

Project success is measured in different ways, the empirical data shows that both economic value as well as strategic importance and utilization determinates the project success. The study presents that the project distributor is measuring the success on other perspectives than project receivers. Measurements such as strategic value and NPV are used by CRC to measure success, while BL considers other aspects as customer value and gained knowledge. Below Table 4.5 presents the general distribution of measurements of project success.

<table>
<thead>
<tr>
<th>Measurements</th>
<th>CRC Managers</th>
<th>CRC Scientists</th>
<th>BL Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPV</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Applied in Product</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Generation of sales</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saving future Investments</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aligns with BL road map</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Receiver satisfaction</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Project delivery</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invention height</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Publications</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Patent</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visibility</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Goals are met</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Additional customer value</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Utilization of knowledge</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Table 4.5. Results for measuring project success per participant group
4.5.1 Corporate Research Center managers

Measurements of how successful a research project become in the organization is done in economic terms with amongst others NPV method, the method calculates the possible present value the research result have. One manager points put a performance indicator for CRC in terms of minimum value of NPV together with deployment date:

“NPV greater than 6 million dollar and be adapted by the BL with date.”

Calculations are done by generation of sales with the research and if project results are saving future investments for other projects. Another perspective of measuring project result is by the strategic value; if project is aligned with overall strategic goals. Strategic goals are set before hand with a holistic organizational perspective and if the research results align with the strategy the project is considered to be successful. Further strategic measurements that is generally used is the intellectual property a project generates. Research publications and media visibility are other important research measurements that are used at CRC. Further the study presents that projects are measured accordingly to satisfaction of the receiver, when research is obtained at BU the project is considered successful.

4.5.2 Corporate Research Center scientist

Project members results of measurements of projects have several measurements methods; intellectual property is one method that is used to encouraged for strategic purposes. NPV is a method that calculates the business value of the research and is used for economic purposes. Receiver satisfaction and to the extent the research is utilized, are according to the study feedback that is of more importance for project members.

“The definition of a successful project is if the business is satisfied with the results.”

However, obstacles of feedback process are stated that it is rarely done, whereby the project members cannot measure it. Invention of new technology is considered to be crucial for the department success and further the different kinds of visibility is also measured.

4.5.3 Business line

Projects are measured at BL with focus on product development, if the results are applicable in an existing or new product is considered successful or if BL can utilize the knowledge in other ways. Other parameters that product development departments measure is if the project goals are met. Although, in projects where results are delivered as expected but is not applicable
in a product or development of a product, the result is not considered successful. Customer value is an important aspect when results are measured, if the research have contributed to a product development that creates additional customer value. However, a successful project should also commit some invention height in order to be successful. Even though a project met the goals and can be applied in product development there are expectations for research projects to bring a development which could not have been conducted at BL.
5. Analysis

From empirical findings of the different participant groups the themes will firstly be analyzed by comparing and generalizing the different group’s answers. Secondly, the findings are compared to results of previous research on the subject identified in the theoretical framework. Concludingly the theoretical contribution will be described how to use the findings to a general purpose where the general purpose is to transfer research-based knowledge in product development organizations.

5.1 Definition of successful research projects at ABB

In favor of investigating the knowledge transfer of research results from research department CRC to product development department at BL, the attributes of successful and unsuccessful projects have been reviewed. Thus, the results of this study also indicate what impacts the different measurement methods within the organization have on projects, the study presents that projects at ABB are not measured by the same parameters.

Cummings & Teng (2003) describes that in previous research four approaches for measuring knowledge transfer success is defined. The first approach is a quantitative measurement, that counts the number of knowledge transfers, this measurement is not found in this study. However, the second method where project success is measured by time, budget and satisfaction of recipient (Cummings & Teng, 2003), is conducted to some extent at ABB. Although, the method is both considered by previous research and by this study to be a notably too simplified method to measure the success of a project. The method is used however at ABB in a objective manner to indicate the progress of projects, but there is an identified need for using other methods simultaneously to define a research project success.

The final goal of the projects and the main purpose of CRC is to deliver research results that will be applied into existing or new products at Business line. Therefore, the common view of project success is for research results to be adopted and utilized by product development to the extent that a product is manufactured. Nevertheless, the study presents that there are other parameters to take into account when measuring success of projects that converts applied research to product development. The third approach of measuring knowledge transfer is from KM literature which defines success according to what the study presents to be the main
purpose of CRC. The method defines knowledge transfer success by the recipient’s ability to utilize and further develop the knowledge (Nelson 1993). Other researchers Andrawina (2008), Lawson and Potter (2012) addresses this as an organization’s absorptive capabilities in inter firm knowledge transfer. Magnusson et al (2005) argue accordingly, that absorptive capacity of new technologies is essential. Moreover, the researchers state that there is an additional step to create a product from that knowledge. Which implies that in order for CRC to succeed with delivering research results to BL it is dependent on the receiving organization’s absorptive capacity. Furthermore, to measure the absorptive capacity the recipient’s and their ability to utilize the research from the provided project results, CRC must gain information about how results are developed and used.

Receiver satisfaction is one method used at ABB to measure the project outcome, however the method is described to be another subjective measurement. Although the method is addressed in previous research (Meyer & Rowan, 1977) and is argued to be the fourth approach of knowledge transfer measurements (Cummings & Teng, 2003). Whereby the success is defined by the recipient’s ownership, commitment and satisfaction of the knowledge. Thus, there are no quantitative manners to do it, and is therefore measured in a subjective matter by obtaining feedback from the recipient. The study presents however that the measurement is identified to have additional issues, the CRC do rarely get the feedback from receiver. Considering that the method is dependent on feedback, the projects are not measured nor can be successful with this approach.

Innovation height is described by all participant groups to have importance in project success, however the methods for measuring the innovation progress are rather subjective. This study present that there is an issue of using subjective parameters rather than numbers and other objective methods is. There are however objective methods for measuring the success at CRC is by intellectual property and publications. In financial terms CRC managers and CRC scientist calculates the success by calculating generation of income with NPV method, while BL do not state measurements of sales or other savings. Schilling (2013) presents accordingly to this study that innovation can be measured by number of new products and the economic return of new product. However, results from this study presents that the measurements should be conducted by same parameters for the whole organization so that the projects can be compared.
In respect to the relevance of measuring innovation performance and the connection it has to economic performance, the researchers do not align on the subject. Nelson (1992) argues that innovation performance and economic performance should be measured according to the dependencies between new products, patent and economic return. While, Schroder & Swanson (2002) argue that there is no connection between innovation and economic performance, Bergek et al (2009) argue that patenting activities are not to be related to economic performance. Thus, the issue of patenting’s connection to finance seems to be somewhat dependent on the market and industry segment and can therefore neither exclude nor include intellectual property to business value. However, if feedback is gained from recipient with information if patents are used this patent and project should be considered very successful. Moreover, the study presents that the unused patents and research that contributes to success of CRC but do not have connection to BL should be measured by other parameters and for research purpose rather than business value. Thus, the study cannot determine if patent and other intellectual property relate to economic earnings, both perspectives should be measured.

5.2 Presentation of research results at ABB CRC

Obstacles concerning the presentation phase of the projects are found from CRC managers and the BL managers, while the study presents that CRC scientist do not recognize this obstacle to the same extent. However, there are some differences in how BL and CRC managers approaches the issue. BL identifies the issue of how the knowledge is presented are creating the knowledge gap between the parties. CRC scientists present the research results in theoretical terms; thus, the BL are interested in understanding the applicable possibilities. CRC mangers are approaching the same issue of knowledge gap with identifying an obstacle of not visualizing the results. Another obstacle in presentation presented by studies from CRC managers is the issue of presenting the long-term research projects to BL, where the research results are very abstract. Success factors that this study presents are from CRC manager and BL mangers, it is identified by both groups that projects when presentation format and audience is decided before hand are successful. CRC managers identifies the success of when BL decides both presentation format as well as the audience, while BL express that both parties have to commit to a level of presentation in advance together.

Results of this study presents obstacles in how the research results are presented to product development staff. One issue is to involve the correct people to the presentations and the hand
over session. Stonehouse and Pemberton (1999) argue that individual learning is the origin for organizational learning, therefore the lack of individual learning and people not participating in presentations interfere with development of organizational learning. Accordingly, other studies show that successful knowledge transfer is dependent on the receiving people and the context (Cummings & Teng, 2003). The study presents that success factors related to presentations are for BL to have responsibility to decide presentation participants for the matter of reducing obstacles and to increase the possibility for successful knowledge transfer to receiver. Nonaka (2007) recognizes the issue in matter of success measurement as well and argues that the process of gaining knowledge on an individual level should be considered when success is measured in such manners. One obstacle is the responsibilities in the projects, it is unclear of whom is responsible for results to be presented and used at BL. The issue is identified in previous research by Lundvall & Nielsen (2007) that presents organizations that focuses on delegation of responsibility have higher absorptive capacity, thereby superior at utilizing new knowledge in development.

Second issue is regarding the content that is presented and the obstacles that occur when different terminology is used by the parties. Previous research has presented similar difficulties in the interaction between academic language and industrial terminology. Baraldi et al (2011) describe the cultural differences a reason for misunderstandings in communications and suggests that research results issues and questions are developed by industry representatives. Suggestions from previous research align with the findings in the empirical data which presents that a success factor is for the BL, knowledge receiver, to decide presentation format and for both parties to commit to a level of presentation scope. CRC’s ability to communicate and present research in same language as BL, increases project success rapidly. The subject of formulating or codifying knowledge in presentations and handovers in order for it to be obtained are discussed further in previous research. Darroch (2005) argues that the knowledge needs to be codified for recipients to be able to obtain the knowledge, although Cumming and Teng (2003) confirm the simplicity of codification they claim that it lacks validity. Instead their research presents the importance of higher degree of articulation of knowledge. Nevertheless, by measuring project success from utilization of the results the content and terminology of the transferred knowledge are of great importance.

The third issue in presentation of project results are that the results are not visualized; the technology is presented thus if the application and functions are missing then BL lacks
understanding which creates a knowledge gap. Nonaka (2007) argues for the importance of channel in which knowledge is presented, through which it should accommodate knowledge type. In the knowledge transfer process of research results the channel of presentation should be adopted to the receiver and the knowledge type. The final success factor of projects is to present a movie to visualize the research results is a way to show applicable possibilities of the research results and for the previous obstacle of creating both a common language.

5.3 Communication in research projects

Concerning how the communication is done in the projects is a factor of the research success, whereby the obstacles are presented by CRC scientists and BL managers. From the CRC perspective the obstacle is stated to be a general lack of communication, while the BL managers interviews presents a more specific factor for unsuccessful projects. The obstacle is presented to be that the presentation of results is only done once in the end of the project, which makes it harder to do follow up questions later and considerable amount of knowledge to obtain at once. Nevertheless, success factors in terms of communications are found from all participant groups where the success factor for project are the continuous and iterative communication between the parties. BL mangers are further addressing the success factor of project gaining feedback from BL by constant communication and a channel that facilitates this. While, the general view from CRC scientists are the success factor of the project managers ability to accommodate channel and language that suits the BL.

Lack of communication between the parties in a project are one obstacle in projects, the research results are only presented once after project is finalized. The receiver is therefore gaining all knowledge at once and do not have the possibilities to understand the solution. Studies by Nobelius (2004) presents the importance of continuous knowledge transfer for applied research to be adapted at product development departments. Further Cummings & Teng (2003) argues for the role of common view in successful knowledge transfer, which is facilitated by a managed constant knowledge transfer. Accordingly, Stonehouse and Pemberton (1999) addresses the process agility crucial for organizations to make competitive advantages. Partial presentations of research results and iterative communication between BL and CRC is a success factor in the projects for results to align with expectations.

Previous studies by Aartss et al (2011) further argue for the “everyday talk” between stakeholder to be more significant for an organization to adapt innovations, rather than
professional communication. The communication outside the borders of processional communication facilitates the multidisciplinary interactions that is crucial for an organization to have a holistic perspective (Stonehouse and Pemberton, 1999).

5.4 Time and timing in projects

Patterns in unsuccessful projects have often lack in timing, this is an obstacle which occurs when BL is not mature enough for the research knowledge or if the results are presented too late. Both CRC managers and BL managers states the factor of time and timing to be an obstacle in projects. CRC however have an additional obstacle in terms of that the project time restrictions are limiting the project success. Although, time restrictions do not have any identified success factors from CRC other than the importance of time management in the projects.

Results from the study show that timing is crucial for research results to be utilized at BL. In terms of a company’s ability to create competitive advantage process timing is decisive (Stonehouse and Pemberton, 1999). Nobelius (2004) addresses the timing to be one factor to why applied research are not adapted into the product development processes and utilized in products. Regarding how the timing should be managed there are different theories, while Nobelius argues for a “Window of opportunity” that have to be timed to be able to transfer knowledge, Johansson et al (2008) argue for a standardized time frame. Hence, this study present that a success factor for project is when timing is managed by BL and CRC together and that starting handover in early stages have importance in project timing.

5.5 Engagement from the business

The results present that all participant groups have identified an obstacle to be lack of BL, the receiver, engagement in research projects. BL managers and CRC managers also express the CRC understanding of business line and the products it accommodates. The obstacles are described from both delivery and receiver’s commitment to be factors that are barriers for project success. However, BL have not presented the lack of understanding the business value not the products, although one success factor from the participant group is identified on the subject. CRC scientist have identified a factor of BL facilitating the projects with product and business knowledge, to be crucial for project success. Accordingly, BL managers state the same success factor of their responsibility for giving project opportunity to understand business
value. While the CRC managers have identified the responsibility for CRC to understand the business value to be a success factor. These success factors conflict in terms of where the responsibility there is to understand business and products. Concerning the receiver, in these cases product development departments, engagement and commitment in the project are mentioned by all participant groups to be a success factor. In order for the commitment to occur the groups do however present different approaches. CRC managers expresses the importance of BL to be a financial stakeholder and to fund the projects themselves. CRC scientist claims a factor on a more individual basis where the dedication of the receiver is a success factor, whereas BL expresses the need for a market pull and an identified customer value to create engagement from product development.

Obstacles in product development are identified to be lack of CRC ability to understand the research results business value in regard to how to apply research to product development. The lack of understanding is described to be connected to the earlier mentioned lack of iterative communication and cultural barriers. Where the studies form Aarts et al (2011) present the importance of everyday talk and Baraldi et al (2011) suggest that conversation is led from receiving side of knowledge transfer. Further factors are that BL do not have resources to involve in project and product development are not involved in decision making. In terms of recipient involvement Cummings & Teng (2003) describes the commitment of knowledge as a measurement for project success, the essence of a project success is therefore how committed receiving parts resources are. Internalization of knowledge is the only way for the recipient to understand the knowledge to the extent that one can apply it adequately. Successful projects have been identified to have early engagement from BL manager in projects, where the parties have a common language between the applied research and products development and that adaptation possibilities are presented early in the process by conducting pre studies. A success factor for projects to engage receiver is to identify a need at BL to create the commitment. Results for this study presents a division of responsibility for the successful project, where CRC have responsibility to understand the BL and the research project goals and project requirements are clear. BL have the responsibility to share experiences and clear requirements in order to create an understanding of the business value and products, responsibility for the utilization of research results.
5.6 Strategic alignment

In terms of strategic alignment obstacles are identified from CRC scientist that expresses the unawareness of other research projects. Both in terms of channel of information, knowledge of who to contact and forum for discussions and inspiration. While the other groups do not have a general view of the obstacles on subject, thus BL have suggestions on inducing a forum for new technologies and inventions. Although CRC managers do mention it to be success factor to have a strategic technological direction, which is elaborated between research and product development.

General findings of the study present that obstacles in projects are identified in concerns of unawareness of what other projects are running at CRC and therefore several BL are working on the same issues and research. Do not have the management of strategically aligning the product knowledge with research results. The issue of missing strategic alignment in applied research project are studied in previous research by Bergek et al (2009) imply that technology activities should be based on technology strategy. Accordingly, Liyanage (1999) argues for aligning the strategies for research, innovation and business in order to integrate the organization on an operational level, a technical management framework have to be linked to research and development. The cross fertilization of information should be an objective for development in order for information to diffuse is argued by several previous research (Schilling, 2013). The patterns in successful project are when objectives for product development are developed by both research scientist and product developer when there is a prioritization on future. Bergek et al (2008) has identified success factors in organizations that have high innovativeness, they claim that organizations with small technology scope and a clear leadership in technology strategy. There is an identified need at ABB to have an additional forum for the strategic technological development to be presented and aligned.
6. Conclusions of empirical findings

The analyzed concepts and themes from the case study and the theoretical framework is concluded with the purpose to investigate what the main enablers are for research-based knowledge to transfer and be adapted in a product developing organization. Results from the analysis of the report are presented by answering to the three sub research questions.

1. What are the indicators for measuring utilization of research results?

Measurements of research results should be done from different perspectives to get all indicators for a successful project and utilization of research results. Approaching measurements from CRC indicators such as time, budget and receiver satisfaction are recommended but do not cover all areas. Other perspectives that should be measured are the absorptive capacity of the BL, where the indicators are the recipients’ ability to gain, develop and utilize knowledge. Measurements from BL have to be communicated to CRC for the indicators to be summarized and get feedback if the knowledge is used in product development. Furthermore, indicators for measuring the utilization of research results are the generated income the research results gain. Finally, this study presents that an indicator are the utilization of patents in products.

2. What patterns for generation and spreading of knowledge increases utilization of research results?

Several success factors are found by patterns in research projects and in the transferring of the research knowledge that enables utilization of research results in the organization. Findings concerns factors in delivering process but also factors from receivers and other external circumstances.

Project objectives are developed by both delivering and receiving parties

First success factor that increases utilization of research results is the definition of the receiver’s project objectives. Technological objectives for the BL are developed by CRC and BL together, for later execution of projects to deliver research result for into these objectives. Whereby the results can be measured in terms of how well the results align with future technical directions.
**Identified future market pull**

Secondly this study presents a success factor from a stakeholder perspective; the commitment from the knowledge receiver. Early engagement and involvement from BL both facilitate generation of product applicable research-based knowledge as well as empowering the transfer of the research results. Commitment from receiver is gained, according to the case study, when there is an identified market need for the research subject.

**Presentation is managed with receiving stakeholders**

The third success factor enhances the process of spreading the research knowledge to relevant receivers. Close cooperation between the delivering and receiving part should decide the participants of result handover and then commit to a presentation format that is adapted to the participant and their skills.

**Continuous knowledge transfer**

For the fourth factor is also concerning the transferring process but focuses on the prerequisites for the receivers to obtain and utilize the research results. To have continuous knowledge transfer between research and product development, which in practice would imply to conduct partial handover during research projects.

3. **What factors in a research project are hinders for research to be adapted in product development?**

Factors that hinders research results to be adapted and utilized in the organization are identified in how projects are conducted by the delivering part, how the research results are acquired by the receiving part and finally, how the research results are transferred.

**Delivering project lack understanding of receiving parts business value**

The first obstacle in research projects are related to how the projects are conducted. Where the delivering part lack understanding of receiver, in terms of the business value and applications of research into product development.

**Receiving organization are not engage in the projects**

Secondly the receiving process is mentioned to have factors that hinders the research to be utilized by the receiver. The study presents that lack of receiving resources which engage
in the project are a crucial factor to why research results are not adapted by the receiving origination.

**Insufficient timing**
A further factor is how the timing in research project hinders the result from being adapted in the organization. Both in cases when research is delivered after knowledge is already gained and when the research result is transferred before the receiving organization is mature for the knowledge.

**Lack of communication**
The fourth research project factor that hinders research results diffusion in receiving originations are found in the communication between delivering and receiving parties. The lack of communication leads to that the delivering organization not getting feedback and the receivers not following the decision making in the projects.

**Language**
Last factor that is considered to be an obstacle in projects and more specifically the transfer of research results to the product development. Research results are presented in theoretical terms rather than adapting the research-based knowledge to the receiver’s knowledge, capabilities and interest.

4. **How do organizational structures impact the firm’s ability to transfer of knowledge from research departments to business lines?**

The organizational structure contains of divided departments of research and product development is considered to have obstacles, however this study present that the organizational structure of delegation of responsibilities facilitates a higher internal absorptive capacity. Although the structure has positive impact on the firm’s capacity of utilizing new knowledge a few opportunities are identified to increase the organizational learning.

Nevertheless, there are some unclear organizational responsibilities that this study reveals which influence project success as well as absorptive capacity. Thus, the study presents responsibilities in the transferring process should be managed as follows. Research department have the responsibility to understand the business need. Product development have the
responsibility to deliver clear requirements and business value. Further, the receiving department should have responsibility for the utilization of project results. The presented delegation of responsibilities in the current organizational structure facilitates a higher internal absorptive capacity for research-based projects.

Integration of strategy for current technology and strategy for future technologies for all parts of the organization is increasingly important for this organizational structure. Due to the structure with separation of research department and product development the alignment of technology strategy and technology activities are considered to have a crucial impact on the research-based knowledge transfer. Therefore, the technology activities should be integrated and align with technology strategy to a greater extent on all levels and parts of the organization.

Additional organizational factors that increases the alignment between the departments are to encourage multidisciplinary interactions in a channel or forum outside professional meetings where everyday talk can occur. The interactions between staff generates diffusion of knowledge in the organization which impacts the ability to absorb and transfer knowledge.
7. Discussion

Study results are generalized to assumptions that both supports and contributes further to the exists research field. The study is however dependent on the organization and all the circumstances concerning this part of the firm, therefore is has been crucial to find other evidences for the empirical findings.

7.1 Theoretical contribution

Theoretical framework for this study reviews the previous studies that are the evidence for the theories. In order to investigate knowledge transfer in R&D departments with the purpose of applying research to new and existing business to create additional value, the theoretical framework firstly builds a foundation for the research. Secondly this study offers several contributes to the KM of a perspective of researching and developing functions and contributes to KM and IM by integrating the two research areas in a research department matter.

Most of all the study support established theory and aligns with evidence from previous studies and later have proven that some of the theories are applicable for this study’s organization. The research setting for this study is an organization where two or more cooperating departments requires different types of knowledge, in which the knowledge should be transferred. One delivering research department that have research-based knowledge in a one discipline and a receiving development department that have knowledge in multidiscipline areas but all in a applicable setting of a product or product group.

No previous research found on how factors such as presentation format for applied research impact the utilization of research results. This study presents that presentation format has impact on the utilization of results. Success factors are found that points out that the business side in the cooperation should be responsible for the formulation of the requirements, which confirms studies from Baraldi et al (2011) in this context as well. Knowledge management theory does in serval matters touch the innovation management field and how the innovation can increase with KM. Organizational structures in innovation management field is presented however is not proven to be applicable in this setting. This study presents that some mentioned organizational factors facilitates the cooperation between research department and the business line.
7.2 Research credibility

During the study the researcher had a focus on credibility, and it was considered during all parts of the study, from literature review to interviews and analyzing the data. The interviews were done both face to face as well as on telephone which is considered to have impact on the dialogs and interpretation of the answers, where the communication on phone might lead to more misconceptions than face to face. However, all interview was processed in same way with transcribing from a recoded file that would decrease the impact of interviews different settings. Other factors that were considered during the interviews are the languages the interviews were performed in; the participants are from different background and therefore the Swedish speaking participants was interview in Swedish and all others in English. Although in order to minimize the credibility the data was translated after the coding.

Even though there is always a risk of bias in qualitative studies and the risk of wanting the answers to fit into a predefined goal of the study, biasness can originate from different stakeholder of the study; researchers as well as the company the study was conducted. Pressure can also come from research institutes that want the research to follow up on other studies conducted on the same university. This have been under consideration during the whole study.

The research credibility can be questioned due to there is only one case study is conducted. The lack of credibility for this matter is managed so that all findings from case study are proved with theories from the secondary data. Thereby the case study can support theories and indicate whether the theories are applicable for this study’s setting.

7.3 Ethical considerations

Considering the ethical impact this study could have is mentioned in section 3.6 Ethical considerations, where the ethical aspects of conducting the interviews could have on the participants. Although, there are other aspects to consider that this type of research can impact the concerned of this research. While, this research field objective is to enhance the development of new technology and to increase the utilization of research. There are several controversies in commercialize new technology. Untested technology can result in unexpected consequences whereby caution of these should be considered, this is not covered in this study. Furthermore, ethical considerations of new technology or research can be applied for other
purposes by other actors for illegal purposes. All organizations that develop new technology must take responsibility on how the developed technology can be utilized in the society.

The attempt to standardize the innovation process is done in respect to enhance innovativeness, inventions and new technology. However, the standardization of innovation process can harm the process itself by measuring and prioritizing the economically profitable projects. Thus, this study only concerns to measure transfer of research-based knowledge. The measurements of research departments are not included in this study.

7.4 Future research

Further research is recommended to do at the same organization to confirm the stated findings and to get a deeper understanding of each and every finding in order to decrease the risk of simplifying the issue. Moreover, one should not to ignore that the case study is only conducted once and is recommended to replicate the study to test the findings. Although the future research should be conducted at ABB it is also recommended to conduct research to another firm that has also been in the studies from the theoretical framework (Bergek et al, 2008) (Magnusson et al, 2005).
8. Recommendations for organizations to increase the utilization of research results

This study has presented main enablers for research-based knowledge to transfer from CRC to product developing organization and also enables for the knowledge to be utilized in the organization. Results are presented for project attributes that are enablers in transferring applied research knowledge to R&D departments in complex product development organizations. This study recommends ABB to obtain the strategy presented in Figure 8.1 to increase the utilization of research results in BL.

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>Increase utilization of research results from corporate research in business unit’s product development</th>
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<tbody>
<tr>
<td>OBJECTIVES</td>
<td>Measurement</td>
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</table>
| INITIATIVES | Measure delivering part | • Patent utilization  
• Time  
• Budget  
• Receiver satisfaction | • Project objectives set by parties  
• Identified a future market pull  
• Delivering of knowledge decided by BU  
• Continuous knowledge transfer | • Increase understanding business value  
• Engagement from BU  
• Focus on timing in delivery  
• Communication planning  
• Using same terminology  
• Minimize knowledge gap | • Delegation of responsibilities  
• Integrate technology activities with technology strategy  
• Channel for sharing results  
• Encouragement multidisciplinary interactions |

*Figure 8.1. Strategy for ABB and ABB CRC*

Regarding to the transferring of research results the study presents both factors that facilitates transfer as well as obstacles in the process. Focus is recommended to be on the CRC where presentation format and how well CRC understands the BL is crucial for knowledge to transfer. Regarding to the utilization of research results the focus is presented to be on BL for both hinder the obstacles and create prerequisites for the enablers. In order to facilitate sufficient conditions for results to be obtained in the organization and to increase absorptive capacity at
BL, it is recommended to focus on resources and commitment from BL. In Figure 8.2 a model of the cooperation between CRC and BL with five main subjects of common interest.

![Figure 8.2. Knowledge transfer arrow needs to be developed into an iterative cooperation](image)

Further recommendations for ABB are in the areas of measurements, responsibilities and technological strategy. Measurements on the utilization of project results are crucial to be measured with generic parameters in the different parts of the organization. However, the parameters should be adapted accordingly to what part of the knowledge transfer it is. Objective parameters as well as subjective parameters are recommended to use on CRC and BL side of the projects. Recommendations in organizational structures of ABB have impact on the knowledge transfer and the absorptive capacity of the company. Responsibilities in the organization have crucial impact on how well the organization can transfer knowledge, it is recommended for ABB to organize the responsibilities accordingly to this study. Furthermore, the technological strategy for both CRC and BL is recommended to be integrated to a higher extent than it is today. Where the overall technology goals align with the project and the project objectives.

All the above recommendations for knowledge transfer, measurements, responsibilities and technological strategy are defined by a number of action points for both BL in Table 8.1 and for CRC in Table 8.2.
Finally, it is recommended to conduct further research on the results of this study to aim attention to all success factors, obstacles, measurements and organizational structure. This study’s purpose was to investigate all the above areas which provides a holistic view of the issue. Thus, oversimplification is a risk while generalizing and should be investigated further.

Table 8.1. Suggested action points for BL

<table>
<thead>
<tr>
<th>Action Point</th>
<th>Responsibility</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of utilization of research results</td>
<td>Management</td>
<td>2020</td>
</tr>
<tr>
<td>Acquire a strategic road map of product development</td>
<td>Management</td>
<td>2020</td>
</tr>
<tr>
<td>BU must have resources to participate in the projects</td>
<td>Management</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Commitment and ownership in projects</td>
<td>Project</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Getting responsibility for presentation requirements in project</td>
<td>Project</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Forum for sharing ideas and get knowledge about other research projects</td>
<td>Management</td>
<td>Q1 2020</td>
</tr>
</tbody>
</table>

Table 8.2. Suggested action points for CRC.

<table>
<thead>
<tr>
<th>Action Point</th>
<th>Responsibility</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have a clear yearly technological strategy</td>
<td>Management</td>
<td>2020</td>
</tr>
<tr>
<td>Overall quarterly technology goals that can align with the projects</td>
<td>Management</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Objective performance parameters that are measured towards the goals</td>
<td>Management</td>
<td>2020</td>
</tr>
<tr>
<td>Software platform to share the projects to a larger audience</td>
<td>Management</td>
<td>2020</td>
</tr>
<tr>
<td>Presentation format should be set before project start</td>
<td>Project</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Results should be delivered in partial handover session during the project</td>
<td>Project</td>
<td>2020</td>
</tr>
<tr>
<td>All projects should contain a communication plan</td>
<td>Project</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Projects should have constant communication</td>
<td>Project</td>
<td>Q4 2019</td>
</tr>
<tr>
<td>Increase the understanding of the market and products</td>
<td>Project</td>
<td>2020</td>
</tr>
</tbody>
</table>
9. References


Appendix 1

Interview questions

How do research results transfer to business line today?

1. What is corporate research main purpose?
2. How are projects at corporate research initiated?
3. How are the research projects funded?
4. Who are the stakeholders of the projects?
5. Where in the process are decisions taken?
6. How are project results from corporate research communicated?
7. Problems with how research results are presented.

What patterns enables utilization of research results on business line?

1. What result details are business line expecting?
2. What are the main obstacles in the projects from your point of view?
3. Room for improvement on all areas.

What defines the success of research results?

1. What defines a successful project at corporate research?
2. How are the projects measured?
3. Result is planned to be developed at BL or take a next step.
4. Do you think innovation is encourage by research projects?
5. Who do you think is responsible for the research results to be transferred?
6. Do you think the organization enables innovation at ABB?