Knowledge Orchestration within a Distributed Operations Network

Sajadirad, Solmaz

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

KNOWLEDGE ORCHESTRATION WITHIN A DISTRIBUTED OPERATIONS NETWORK

BY
SOLMAZ SAJADIRAD

DISSERTATION SUBMITTED 2017

AALBORG UNIVERSITY
DENMARK

KNOWLEDGE ORCHESTRATION WITHIN A DISTRIBUTED OPERATIONS NETWORK

by

Solmaz Sajadirad

AALBORG UNIVERSITY
DENMARK

Dissertation submitted 2017

Dissertation submitted:	December 2017
PhD supervisor:	Associate Prof. Astrid Heidemann Lassen Aalborg University
Assistant PhD supervisor:	Prof. Brian Vejrum Wæhrens, Aalborg University
PhD committee:	Associate Professor Cheng Yang (chairman) Aalborg University
	Professor Mats Magnusson KTH Royal Institute of Technology, Stockholm
	Professor Lars Bengtsson University of Gävle
PhD Series:	Faculty of Engineering and Science, Aalborg University
Department:	Department of Materials and Production

ISSN (online): 2446-1636
ISBN (online): 978-87-7210-114-9

Published by:
Aalborg University Press
Skjernvej 4A, 2nd floor
DK – 9220 Aalborg Ø
Phone: +45 99407140
aauf@forlag.aau.dk
forlag.aau.dk

Printed in Denmark by Rosendahls, 2018

ENGLISH SUMMARY

Due to globalization and dramatic change in the competitive environments of companies, innovation has become imperative in many Multinational Companies (MNCs). In line with this trend, tapping into multiple sources of knowledge and integrating such knowledge into unique innovations has become a key capability for MNCs. The critical role of distributed subsidiaries and their diverse knowledge in competitive advantages of MNCs has therefore attracted a lot of attention in international management studies. However, more research is still needed to investigate how MNCs orchestrate knowledge from globally distributed subsidiaries to create innovation.

This PhD thesis investigates how MNCs orchestrate knowledge flow from globally distributed subsidiaries in a distributed operations network. In particular, the four papers constituting this thesis explore how MNCs orchestrate knowledge from globally distributed subsidiaries to create higher degrees of innovation performance, that is, product innovation. For that purpose, the use of inter-firm objects and knowledge orchestration processes are considered as the building blocks of this research.

This research is conducted based on several theories and research streams such as theories of MNCs like network-based and knowledge-based, international management studies, and boundary object perspective. A multiple case study approach was selected for conducting this research, and the empirical data was collected from six pilot case companies and five main case companies from Danish industries.

The findings point to the importance of the dynamic use of inter-firm objects in the facilitation of the collaboration between headquarter and subsidiaries, and thereby two-way knowledge flow between them. In addition, the findings suggest that a combination of the dynamic use of inter-firm objects and a well-established knowledge orchestration process underlies knowledge orchestration for innovation in MNCs, as it advances headquarters' abilities to effectively acquire, evaluate, disseminate, and utilize globally distributed knowledge. In this regard, a taxonomy of knowledge orchestration approaches applied by companies were proposed based on a conceptual framework. The findings also suggest that the particular way of knowledge orchestration offered by this study, i.e., performing the "dynamic use and well-established" approach, is considered as innovation capabilities for companies through which they reach higher degrees of innovation performance.

DANSK RESUME

Grundet globalisering og dramatiske ændringer i virksomhedernes konkurrencemiljø er innovation blevet en bydende nødvendighed i mange multinationale virksomheder. I tråd med denne udvikling er det blevet en nøgleevne at kunne drage nytte af mange forskellige viden-kilder og integrere sådan viden i unikke innovationer. Den vigtige rolle som distribuerede datterselskabers viden spiller for at skabe konkurrencefordele for multinationale selskaber har derfor tiltrukket megen opmærksomhed i internationale ledelsesstudier. Men mere forskning er nødvendig for at studere, hvorledes multinationale virksomheder innoverer ved at orkestrere viden fra spredte datterselskaber rundt om i verden.

Denne Ph.d. afhandling omhandler, hvorledes multinationale virksomheder orkestrerer viden-strømme fra datterselskaber, som indgår i globale operationelle netværk. De fire artikler, som udgør denne Ph.d. afhandling undersøger, hvordan multinationale virksomheder orkestrerer viden fra datterselskaber spredt rundt om i verden for at skabe en højere innovationsevne, dvs. evnen til at skabe nye produkter. Vigtige byggeblokke i denne forskning er begreberne ”viden-orkestrering” og ”interfirm objects”.

Denne forskning gør brug af adskillige teorier og forskningsstrømme, såsom netværks- og vidensperspektivet, internationale ledelsesstudier og ”boundary object” perspektivet. Seks pilot-studier samt fem case studier er blevet udført i danske virksomheder.

Resultaterne peger på vigtigheden af dynamisk anvendelse af ”inter-firm objects” i faciliteringen af samarbejdet mellem hovedkvarter og datterselskaber, og derved vigtigheden af tovejs viden-strømme mellem dem. Derudover peger resultaterne på, at en kombination af dynamisk brug af ”interfirm-objects” og en veletableret viden-orkestreringsproces underbygger viden-orkestrering med innovation for øje i multinationale virksomheder, fordi det øger hovedkvarterets evne til effektivt at skaffe, evaluere, sprede, og bruge globalt distribueret viden. I relation hertil foreslås en taksonomi af viden-orkestreringsfremgangsmåder anvendt i virksomhederne baseret på et konceptuelt rammeværk. Resultaterne peger også på, at det er relevant at overveje ”dynamisk brug og veletableret proces” fremgangsmåden foreslået i denne Ph.d., hvorved viden orkestreres med øje for at øge innovationsevnen.

LIST OF PUBLICATIONS

Enclosed papers:

- Solmaz Sajadirad, Astrid Heidemann Lassen, and Brian Vejrum Wæhrens, "From Static to Dynamic Use of Inter-Firm Objects and Its Impact on Innovation Performance", submitted to (and is currently under review at) *International Journal of Knowledge Management Studies* (This paper is the modified and longer version of the paper presented at *23rd Innovation and Product Development Management Conference (IPDM)*, Glasgow, UK, June 2016. The paper received "Thomas P. Hustad Best Student Paper Runner Up Award".

- Solmaz Sajadirad and Astrid Heidemann Lassen, "Knowledge Transfer Objects and Innovation performance", *Proceedings of the 17th International CINet Conference*, Turin, Italy, September 2016.

- Solmaz Sajadirad, Astrid Heidemann Lassen, and Peder Veng Søberg, "Orchestration of Globally Distributed Knowledge within MNC Network: A Collaborative-oriented View", revised version has been submitted to *Knowledge and Process Management Journal*.

- Solmaz Sajadirad, Astrid Heidemann Lassen, "Orchestration of Knowledge Flow from Globally Distributed Subsidiaries for Innovation: A Multiple Case-Study", submitted to (and is currently under review at) *Journal of International Management*.

Additional papers, not enclosed:

- Solmaz Sajadirad, Brian Vejrum Wæhrens, and Astrid Heidemann Lassen, "The Role of Boundary Objects in the Facilitation of Dynamic Knowledge Transfer", *Proceedings of the 22nd EurOMA Conference on Operations Management for Sustainable Competitiveness*, Neuchâtel, Switzerland, June 2015.

- Solmaz Sajadirad, Astrid Heidemann Lassen, and Brian Vejrum Wæhrens, "From Static to Dynamic Use of Knowledge Transfer Objects and its Effect on Innovation Performance", Paper presented at *23rd Innovation and Product Development Management Conference (IPDM)*, Glasgow, UK, June 2016.

- Solmaz Sajadirad and Astrid Heidemann Lassen, "Orchestration of Globally Distributed Knowledge for Innovation in Multinational Companies",

Proceeding of the XXVIII ISPIM Innovation Conference – Composing the Innovation Symphony, Austria, Vienna, June 2017. The paper was invited for the submission to "*Journal of Technology Transfer and Commercialisation*" special issue with the working title of "Innovation and Technology Transfer—Selected papers from ISPIM 2014-2017.

ACKNOWLEDGEMENTS

I would like to thank a few people who have made my PhD study a wonderful experience. I would like to express my deepest gratitude to my supervisors Associate Professor Astrid Heidemann Lassen and Professor Brian Vejrum Wæhrens for their valuable insights, kind support, and encouragements throughout this project.

I would also like to thank all the interviewees in the case companies for their time, sharing, and support during my PhD study. I would also like to give special thanks to Peder Veng Søberg for being always open to all my questions and for all his advice and suggestions to make my work better.

I am very grateful to Henrik A. Lauridsen for all his priceless support in providing initial contacts with many of the case companies and extra support in organizing the interviews at the beginning of this research.

I would like to thank all nice colleagues at Center for Industrial Production (CIP) both in Aalborg and Copenhagen for their friendly feedbacks and comments on my research and the papers. I would like to specially thank David Schulzmann, Ernst-Jan Prosman, Christian Uhrenholdt Madsen, Alona Mykhaylenko, Jesper Asmussen, and Jesper Kristensen for all their comments and knowledge sharing.

During my time as a Ph.D. student, I have been fortunate to be able to spend time abroad as a visiting scholar. I would like to give special thanks to all nice and friendly people at University of Gothenburg, Institute of Innovation and Entrepreneurship; Professor Maureen McKelvey, Daniel Ljungberg, Snöfrid Börjesson Herou, Ethan Gifford, Erik Gustafsson, Linus Brunnström, and Evangelos Bourelos, who made my visit a lovely and fruitful experience.

Last but not least, my greatest thanks go to my wonderful husband, Ehsan, for always being there for me, listening to me, supporting me, and encouraging me. Without your love, support, and encouragements, I could not have completed this. I am truly thankful for having you in my life!

December 2017, Copenhagen, Denmark
Solmaz Sajadirad

TABLE OF CONTENTS

LIST OF FIGURES IN PART 1

LIST OF TABLES IN PART 1

PART 1. INTRODUCTION

CHAPTER 1. OUTLINE

This chapter outlines this PhD study. The foundations of the research including problem statement, the aim and objective of the study, and research questions are presented in this chapter.

1.1 THE STUDY

Multinational companies (MNCs) are viewed as networks of geographically distributed but mutually linked nodes/units, in which each unit/node possesses unique knowledge resources (Ambos, et al., 2006; Ghoshal & Bartlett, 1990; Ghoshal & Nohria, 1989). As such, MNCs can derive advantages from the broad access to diverse and heterogeneous distributed knowledge across the network (Asmussen, et al., 2011; Bartlett & Ghoshal, 1989).

Orchestration of knowledge flows within MNCs is viewed as a core capability enhancing MNCs competitive advantages (Bartlett & Ghoshal, 1989; Kogut & Zander, 1992; Szulanski, 1996). The explosion of new knowledge sources and technologies in the 1990's put pressure on firms to improve their capabilities by using external knowledge sources. Companies came to rely increasingly on external networks for new knowledge, and MNCs began to benefit increasingly from their international presence to tap an extensive range of knowledge sources (Low & Ho, 2016). This emphasis on external knowledge drew attention to an important organizational issue, that is, companies' capabilities for the acquisition and use of such knowledge (Low & Ho, 2016). The knowledge-based view of firms (Grant, 1996) has been widely used as a theoretical support to unravel how knowledge flows take place in companies and their networks. According to the knowledge-based view of firms, the competitive advantages of MNCs are largely relied on their capabilities to manage diverse knowledge resources within the company (Kogut & Zander, 1992). The knowledge-based view of firms is an extension of the Resource-Based View (RVB) of the firms and is an important approach towards organizational learning (Curado & Bontis, 2006). In line with this trend, extant studies emphasize that the flow of knowledge is no longer one way from headquarter (HQ) to subsidiaries, rather, distributed subsidiaries have become important sources of new knowledge, by developing new capabilities and knowledge and transferring it to the rest of MNC network (Andersson, et al., 2007; Almeida & Phene, 2004; Blomkvist, 2012; Søberg & Wæhrens, 2013; Søberg, 2010).

Due to globalization and dramatic change in the competitive environments of firms, many industrial companies have relocated parts of their operations to globally distributed units all over the world to benefit from e.g., global resources and capabilities (Kuemmerle, 1997). Global development and relocation of operations

activities to distributed units pose issues related to the orchestration of knowledge across such a distributed operations network. The Danish industries are no exceptions to this trend. Some studies suggest that the role of the home-base Danish companies is moving towards network coordination and knowledge-intensive operations activities, while other activities are located in a globally distributed network (Riis, et al., 2007; Slepniov, et al., 2010). Because of the global development of Danish industries, Danish companies need to consider how they can learn most efficiently and effectively from their globally distributed subsidiaries and how they can apply this knowledge to the fullest extent to create innovation.

With a growing interest in subsidiaries knowledge as a key source of MNCs innovation and competitive advantages, tapping into heterogeneous knowledge of subsidiaries and effective use of such knowledge has become a key competence for MNCs (Teece, 2007; Cohen & Levinthal, 1990; Gupta & Govindarajan, 2000; Kogut & Zander, 1993). However, our understanding of how MNCs orchestrate, meaning acquire and effectively use, knowledge from globally distributed subsidiaries to create innovation is still limited (Phene & Almeida, 2008; Piscitello & Rabbiosi, 2004; Lee, et al., 2008).

Orchestration of knowledge within a globally distributed network cannot occur without the assistance of inter-firm objects, that is, all artifacts, people, tools, methods, and mechanisms used by companies to manage the flow of knowledge between two nodes i.e., HQ and subsidiary, in the MNCs network. Different research has identified and discussed a number of inter-firm objects used by MNCs to manage the flow of knowledge (Gupta & Govindarajan, 2000; Pedersen, et al., 2003). Nevertheless, studies on inter-firm objects tend to focus on how companies use them to control the flow of knowledge and coordinate the activities of distributed subsidiaries (Doz & Prahalad, 1991; Nobel & Birkinshaw, 1998). This view of the use of inter-firm objects is in line with the traditional views of MNCs in which HQs attempt to take the central roles, and knowledge is sent from HQ to subsidiaries with an aim of control.

This contrasts with the modern theories of MNCs like network-based (Ghoshal & Bartlett, 1990) and knowledge-based (Kogut & Zander, 1993), suggesting that the creation of innovation and competitive advantages of MNCs is no longer dependent on HQs (Pesalj, 2011). Within a distributed network where companies can learn jointly and develop new capabilities through the collaboration (Inkpen & Tsang, 2005) and the interaction with different collaborators (Tsai, 2009; Søberg, 2014; Søberg & Wæhrens, 2014; Lassen & Laugen, 2017), a control-oriented approach to the use of inter-firm objects limits the connectivity and communicative capabilities of the units (Ambos, et al., 2006). Companies are required to re-consider the use of inter-firm objects and shifts away from a control-oriented view of the use of inter-firm objects, as the outcomes of inter-firm objects are directly related to how they are used (Alavi & Leidner, 2001; Vaccaro, et al., 2010). Understanding the role of inter-firm objects and the way that they are used to facilitate the knowledge orchestration taking

place between HQ and distributed subsidiaries is therefore of great importance to this PhD study. Drawing on Boundary Object (BO) perspective (Star & Griesemer, 1989), a particular view of the use of inter-firm objects, that is, the dynamic use, is identified and applied in this thesis as the basis for the investigation of knowledge orchestration taking place between HQ and subsidiaries in the MNC network.

Boundary objects have been shown to play a key role in the facilitation of knowledge sharing across boundaries by providing a shared understanding through negotiation, interaction, and communication. Recent studies on management and organization have considered the BO perspective (Star & Griesemer, 1989) as an appropriate framework to investigate the collaboration between different group and units possessing diverse knowledge (Carlile, 2004; Levina, 2005). Some studies consider the role of BO in transforming knowledge across different boundaries (Oswick & Robertson, 2009; Carlile, 2002) and across different communities with different knowledge background such as communities of practice (Wenger, 1998). Additionally, there have been several efforts to investigate the impact of BO in the facilitation of learning and innovation in cross-disciplinary settings (Nicolini, et al., 2012; Carlile, 2002). The studies on BO emphasize how they enable actors from different "social worlds" to reconcile different meanings and create a shared understanding, in turn, enabling collaboration and the transformation of knowledge (Bechky, 2003). Due to its specific emphasis on the collaboration (Nicolini, et al., 2012), the BO perspective is considered as the most proper theoretic fit for discussing what is needed in between headquarter and subsidiaries for their co-development in this PhD study.

1.2 AIMS AND OBJECTIVE OF THE STUDY

The overall aim of this research is to investigate knowledge orchestration taking place within a global operations network. Specially, this study focuses on two nodes (i.e., HQ and subsidiary) within a global operations network and seeks to gain a better understanding of how MNCs orchestrate knowledge flows from globally distributed subsidiaries, meaning to acquire and effectively use such knowledge, in order to create higher degrees of innovation performance. As such, the ultimate objective of this research is to explore orchestration of knowledge flows from globally distributed subsidiaries for innovation in a global setting.

Specifically, the objects of this research are as follows:

- To characterize different use of inter-firm objects in the companies
- To identify different approaches to KO applied by companies and the respective impact on innovation performance
- To identify how knowledge is orchestrated differently, depending on KO approaches applied by companies

- To explore how MNCs orchestrate knowledge from globally distributed subsidiaries to create innovation
- To examine what it takes to orchestrate knowledge for innovation

1.3 RESEARCH QUESTION

Despite a lot of attention which has been given to knowledge orchestration within the MNCs network and the importance of reverse knowledge flows from globally distributed subsidiaries in headquarters' competitive advantages, we identified that the following challenges are incompletely explored by extant studies:

First, given that knowledge is globally distributed within MNCs network and orchestration of such knowledge is a key capability fostering MNCs' innovation and competitive advantages (Bartlett & Ghoshal, 1989; Blomkvist, 2012; Zander & Kogut, 1995), our understanding of how knowledge is acquired from globally distributed subsidiaries and utilized effectively by headquarters to create innovation such as new products, is still limited (Phene & Almeida, 2008; Piscitello & Rabbiosi, 2004). Second, while previous research has shown that the outcomes of inter-firm objects are directly related to how they are used (Alavi & Leidner, 2001; Vaccaro, et al., 2010), the ways that they can be used differently and as such contributing more strongly to MNCs' sustained competitive advantages still remain unexplored.

Considering these challenges, the main objective of this PhD study is to address the following research question:

How do MNCs orchestrate knowledge flows from globally distributed subsidiaries for innovation?

In addition to the central research question, four sub-questions are also outlined. The sub-questions help us to narrow the scope of the research by focusing on the use of inter-firm objects, different knowledge orchestration processes, and the relationship between different KO approaches and different degrees of innovation performance which is achieved accordingly.

The first sub-question is:

What are the characteristics of the different use (static vs. dynamic) of inter-firm objects?

This question addresses different ways that inter-firm objects are used by companies to manage the flow of knowledge between HQ and subsidiaries. To answer this question, we need to explore the ways that inter-firm objects are used differently in the companies; either they are used to control the flow of knowledge, i.e., the static

use, or they are used to build a collaborative relationship between HQ and subsidiaries, i.e., the dynamic use. The static use of inter-firm objects is discussed based on the traditional view of MNCs in which the focus of knowledge sharing is based on a sender-receiver relationship and knowledge is sent from HQs and received by subsidiaries. The dynamic use of inter-firm objects is discussed based on the key aspects which are emphasized by the boundary object perspective. This question is addressed in paper 1.

The second sub-question is:

What are significant dimensions of "static" and "dynamic" use of inter-firm objects?

This question addresses the key dimensions of the static use and the dynamic use of inter-firm objects. To answer this question, we take a closer look at the use of inter-firm objects in the companies to extract different dimensions of the static use and the dynamic use of inter-firm objects within KO processes. This question is addressed in paper 2.

The third sub-question is:

How does the specific use of inter-firm objects affect innovation performance?

This question addresses the potential relationship between different use of inter-firm objects (static vs. dynamic) with different degrees of innovation performance achieved by the companies. To answer this question, we need to explore how different inter-firm objects used within different KO processes result in different degrees of innovation performance. A conceptual framework is developed based on two key aspects of KO i.e., the use of inter-firm objects and the KO process. The conceptual framework is applied to the case companies to investigate different approaches to KO and the respective impact on innovation performance. This question is also addressed in paper 2.

The last sub-question is:

How does the use of inter-firm objects within different KO processes affect collaboration between HQ and distributed subsidiaries?

This question seeks to explore different use of inter-firm objects through different KO processes. To answer this question, based on the conceptual framework which is previously developed, a taxonomy of different approaches to KO applied by companies is provided, and will discuss how knowledge sharing and collaboration between HQ and subsidiaries take place in each approach and what level of innovation performance achieved in each approach. This question is addressed in paper 3.

The four sub-questions mentioned above focus on the key aspects of knowledge orchestration i.e., the use of inter-firm objects and KO processes and try to connect different use of inter-firm objects within different KO processes with different degrees of innovation performance which is achieved by HQs. They shape our understanding of how for gaining higher degrees of innovation performance, companies need to orchestrate knowledge flow from globally distributed subsidiaries in a particular way. Further in the central research question, such particular way of knowledge orchestration will be addressed.

1.4 THE STRUCTURE OF THE THESIS

The thesis has six chapters (Figure 1-1). The current chapter outlines the research scope and presents the aim and objective of the research and the research questions. In the second chapter, research methodology including case selection, data collection, data analysis and quality of the research design is presented.

In the third chapter, theoretical framework underlying this PhD study is presented. A discussion of case analysis is provided in chapter four. In chapter five, a summary of empirical studies is presented.

In the last chapter, we discuss the main findings and conclusions of this thesis, as well as theoretical contributions and managerial implications. The limitations of this study and suggestions for further research are also addressed in the last chapter.

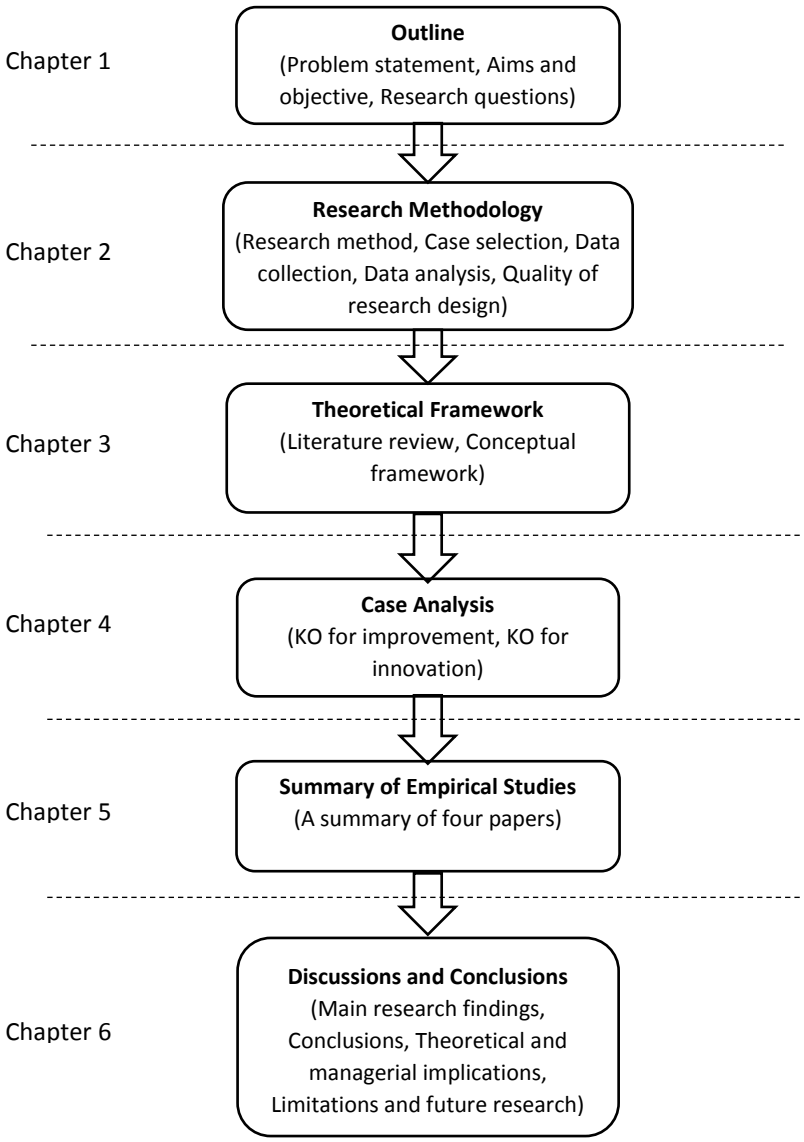


Figure 1-1 Structure of the thesis

CHAPTER 2. RESEARCH METHODOLOGY

The research method applied in this study has been described in the papers included in this thesis (see Part 2). This chapter aims to elaborate further on the research method and design applied in this study to add more details to what already presented in the papers.

Given that this PhD study intends to investigate how MNCs orchestrate knowledge flows from globally distributed subsidiaries for innovation, it was critical that the data and information collected should reflect KO taking place between HQ and subsidiaries. It was also important to make sure that the data considers the key elements constituting the research questions i.e., the use of inter-firm objects, KO process, collaboration, and innovation performance. To properly address the research questions and to make sure that collected data considers the main elements, case-study was found to be the most appropriate research method and conduction of interviews was found to be the most appropriate data collection method for this PhD research.

By focusing on the well-established multinational companies from Danish industries with a favorable attitude towards capturing subsidiaries' knowledge, bringing it back home, and applying it to create innovation, we ensured that the dataset is ideal for studying how MNCs orchestrate knowledge flows from globally distributed subsidiaries for innovation.

In order to address all aspects and elements which were required to answer the research questions, we paid attention to the full process of KO as a multi-stage process (acquisition-evaluation-dissemination- use) and took into account all the aspects of each stage during the interviews. Moreover, we asked interviewees about each stage of KO, not KO in general. In doing so, we paid attention to: the KO process, barriers and challenges, the role of HQ, the role of subsidiary, the role of inter-firm objects, the way that inter-firm objects are used, the interaction taking place between HQ and subsidiaries, HQ-subsidiaries relationship, resources allocated to KO, and the outcomes and benefits achieved by HQ. This helped us to gain a very good understanding of all the elements which are needed to answer the research questions. The interviews were mainly based on open-ended questions that let the interviewees relate their stories of how each stage of KO takes place. We also asked probing questions to establish details.

The following sections discuss the research method, case selection, data collection, data analysis and the quality of research design for this PhD study.

2.1. RESEARCH METHOD

Given limited understanding of how to orchestrate knowledge flow from globally distributed subsidiaries for innovation, we conduct an inductive, multiple- case study (Eisenhardt, 1989). By adopting an inductive approach, we follow the logic of proceeding from empirical research to theoretical findings (Collis & Hussey, 2009). "Inductive approaches tend to let the data lead to the emergence of concepts" (Yin, 2011; p.94). Case study is considered as an appropriate approach for investigation of a contemporary phenomenon in its real-life context (Yin, 2003). Case study is relevant for conducting this study as it requires a deep understanding of a dynamic and highly context-specific phenomenon i.e., knowledge orchestration process in a global setting. In addition, since the forms of research questions in this study are WHAT and HOW, case study approach is the most relevant method to be used for providing answer to them (Yin, 2003).

Multiple case studies are preferable to single case for many reasons; multiple case studies are effective as they enable us to identify idiosyncrasies of each case company, as well as allowing for cross-case comparisons (Miles, 1979), due to collection of comparative data (Eisenhardt, 1991). Additionally, multiple-case design provides us with more cogent evidence and more robustness to the conclusions from the study (Miles, 1979; Yin, 2003). Multiple case studies also increase external validity, i.e., generalizability, compared to single case study (Leonard-Barton, 1990). According to (Eisenhardt, 1989), although there is no ideal number of cases, there is a general agreement that a number between four and ten cases is enough. In this study, KO processes of five main cases are investigated. In addition to these five main cases, we also conducted pilot study in six additional companies from Danish industry.

According to (Yin, 2003), case studies can be divided into holistic or embedded. For the purpose of this study, we chose embedded case studies and draw conclusions about KO taking place between HQ and subsidiaries by investigating and analyzing two levels of analysis, that is, improvement projects and innovation projects, within each case company (Figure 2-1). Some of the evidence which is provided in this study is in relation to specific projects in the companies, whereas some are more general evidence across different projects.

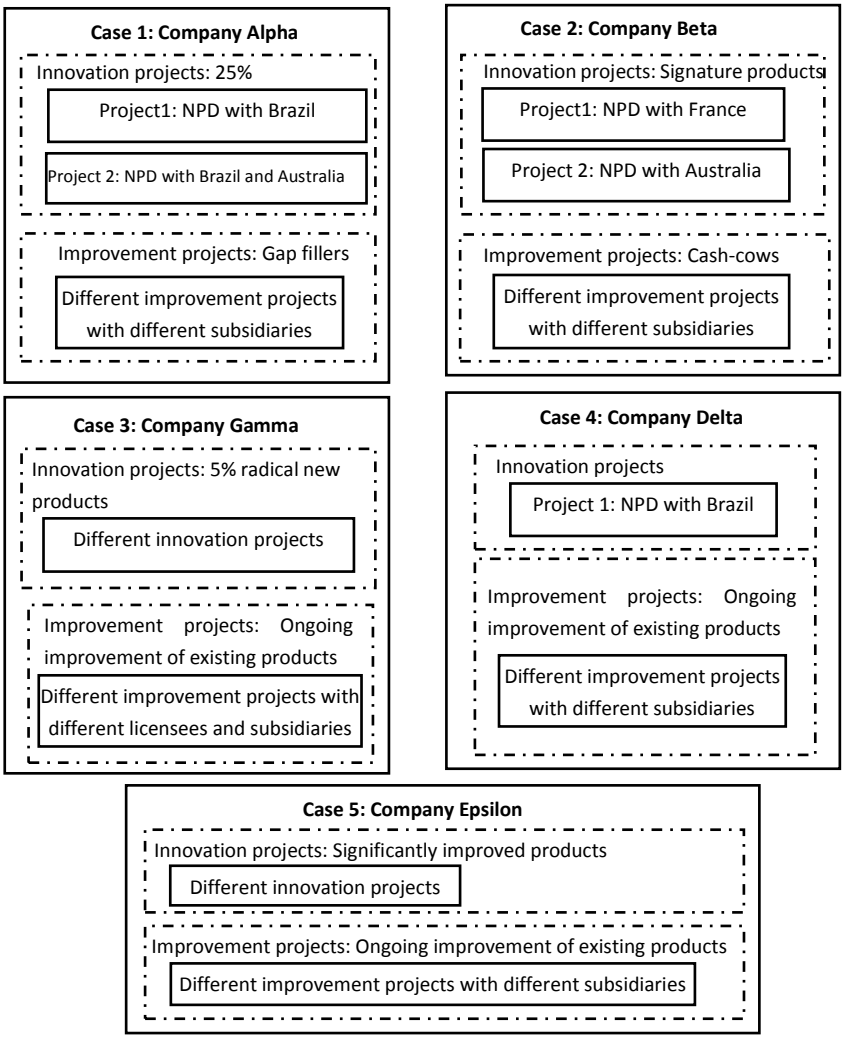


Figure 2-1 Embedded cases

2.2. CASE SELECTION

To select the case companies, a Danish data-base called Navne og numre (Names and numbers) is used. The case companies are selected based on the following criteria;

1) the companies must be multinational companies relocating their activities such as manufacturing and sales partly or totally to distributed subsidiaries,

2) are well-established (since such companies are likely to have enough resources to involve partners and thereby making collaboration likely) (Davis & Eisenhardt, 2011), and

3) are medium-sized and large companies belonging to the medium-to-high tech or high-tech industries (since such companies are likely to have a high level of R&D investment and a higher attitude toward knowledge sharing activities). An overview of the main case companies is provided in Table 2-1.

One exception among the case companies is company Gamma in which our main focus was on knowledge orchestration between the main company and licensees. However, we believe that it does not make any difference in our research because of the following reasons. First, since the company has a very stable long-term relationship with licensees, it makes them almost equivalent to subsidiaries for the purpose that we are looking at them, which is long term relationship. Second, company Gamma needs to understand what is developing in the licensees and use it as an input for the company. This is exactly what other companies aim for in relation to subsidiaries. As such, for the purpose of this study, it is not a major difference between KO within HQ-licensees network or HQ-subsidiaries. The only dimension which needs to be considered in relation to licensees is the ownership, as our finding show that the tendency to share valuable knowledge is affected by ownership structure. Company Gamma, based on the licensee contracts, has the right to share the acquired knowledge from one licensee to the others. Having said that and considering a high level of competition between licensees, the flow of high-value knowledge from licensees to HQ may become limited. However, investigation of the KO process and the use of inter-firm objects by the company is not affected by this.

Table 2-1 An overview of the main case companies

Company	Number of employees (globally)	Year of establishment	Activities	Origin
Alpha	17000	1883	Leading global supplier of products and solutions for heat transfer, separation, and fluid handling through key products – heat exchangers, separators, pumps, and valves	Sweden
Beta	+600	1877	Leading producer of feeding, feed milling and ventilation systems for livestock producers	Denmark
Gamma	15000	1757	The world's leading provider of large-bore diesel engines and turbo-machinery for marine and stationary applications	Germany
Delta	600	1933	A global supplier of green, safe, and reliable control solutions for decentralized power production, marine and offshore, and wind turbines	Denmark
Epsilon	18000	1834	A global leader in advanced technologies and complete lifecycle solutions for the marine and energy markets	Finland

In addition to the main case companies, six companies were considered as pilot case studies in order to become familiar with KO and its issues in MNCs at earlier stage of our study. An overview of the pilot case companies is presented in Table 2-2.

All the pilot and main cases have the main company in Denmark serving as the center of key relations and knowledge distribution, referred to as headquarters in this study.

Table 2-2 An overview of the pilot case companies

Company	Number of employees (globally)	Year of establishment	Activities	Origin
A	+ 1000	1921	Manufacturer of innovative and customized cooling systems to leading OEMs in a wide range of wind and on and off-road industry segments	Denmark
B	+ 200	1959	Manufacturer of large earth moving equipment and global market leader of mine-clearing vehicles	Denmark
C	4700	1973	Manufacturer of the modular system for the construction of electrical panels, customized solutions in lacquered or stainless steel, and flexible copper bus bars for a prompt and professional execution of electrical connections	Denmark
D	4000	1983	A leading global provider of advanced equipment, systems and services to the poultry, fish, meat and further processing industries	Iceland
E	7800	1847	Manufacturer of blades for turbines (Blade global manufacturing)	Germany
F	6200	1955	A global leader in plastic pipe systems and the chemical and petrochemical industries	Netherlands

2.3. DATA COLLECTION

Data was collected through semi-structured interviews, as interviews are one of the most important sources of information in doing case study (Yin, 2009). Semi-structured interviews allow for the flexibility in relation to the questions about issues that emerge during the interviews, while keeping the researcher focused within the research boundary (Bernard, 1995). This study was conducted in two stages. First, we conducted a pilot study in six multinational companies from Danish industries. 10

semi-structured interviews, including one group interview and nine individual interviews, were conducted with managers in the pilot case companies.

The interviewees were chosen based on their availability and their familiarity with knowledge sharing between HQ and subsidiaries. The interviews lasted between 50 to 120 minutes, and was recorded and transcribed. Based on the transcriptions and reports from the pilot cases, the data was tabulated and codified in order to specify the initial patterns. The main focus of the interviews in the pilot companies was on the understanding of knowledge sharing between headquarter and subsidiaries, the issues and challenges in relation to knowledge flow from subsidiaries, the possible outcomes in terms of innovation which are achieved based on the knowledge flow from subsidiaries, and different inter-firm objects which are used by the case companies. During the interviews, we tried not only to ask the general information about the topics mentioned above but also to focus on the specific experiences of the interviewees about any kind of situations in which they faced any challenges regarding interaction and knowledge sharing with subsidiaries. Based on the data collected from the pilot study, we developed the primary research questions on central issues and concerns of the interviewees in relation to KO. The research questions developed in this stage helped us to prepare the key questions for semi-structured interviews in the main case companies.

The data collected from the pilot study also provides the underlying assumption of this study saying that in order for companies to make better use of knowledge flows from globally distributed subsidiaries for innovation, they have to orchestrate such knowledge in a particular way. An overview of the interviews in the pilot companies is presented in Table 2-3.

In the second stage, we carried out 40 semi-structured interviews with managers at headquarters in the main case companies. Interviews consist of in-person interviews and Skype interviews (35 individual and five group interviews) during a two-year period from 2015 to 2017; seven interviews with company Alpha, eight interviews with company Beta, seven interviews with company Gamma, nine interviews with company Delta, and nine interviews with company Epsilon were conducted. The interviews lasted between 45 to 150 minutes and were recorded and transcribed to facilitate a solid analysis (Fisher, 2004). All the missing and complementary information and details were provided by being referred to other persons to be interviewed.

Table 2-3 An overview of the interviews in the pilot case companies

	Interviewee	**Date**	**Pilot case company**	**Duration**
1	Senior business project manager	05-12-2014	Company E	60 min
2	Supply chain Director	23-01-2015	Company F	90 min
3	Senior R&D manager	19-10-2015	Company A	120 min
4	Group interview with: R&D manager and Financial director	20-10-2015	Company B	90 min
5	R&D manager	27-11-2015	Company C	80 min
6	Regional Director of Manufacturing	05-12-2015	Company D	60 min
7	Regional Director of Manufacturing	11-02-2016	Company D	80 min
8	Senior R&D manager	15-02-2016	Company A	60 min
9	R&D manager	26-02-2016	Company C	50 min
10	R&D manager	29-02-2016	Company B	50 min

Transcriptions were usually done at the soonest time possible after the interviews, both to maximize recall and to facilitate follow-up. In addition to interviews, some detailed notes were taken during each interview. Interview notes were read after each interview in order to better understand the key aspects of the interviews and to make use of it to get ready for the next interviews. The interviewees were all knowledgeable about the knowledge sharing between HQ and subsidiaries and they were mainly the ones who were either directly involved in improvement/innovation projects or informant about those projects. During the interviews, we largely focused on open-ended questions in order to encourage the interviewees to talk openly about their experiences and point of views. In many cases, the same questions were asked from different interviewees to increase the validity of the findings. We were also referred to other persons by the interviewees to get more information and details about some specific projects.

In order to have a common understanding about the research questions with the interviewees, we tried to use simple terminologies which is understandable and familiar to the interviewees. All the terminologies were clearly explained to the interviewees to make sure that we are on the same page. Based on the common pattern of words that we heard from different interviewees, and according to the feedbacks received at conferences and from reviewers, some terminologies were refined and adjusted. For example, “knowledge transfer object” were changed to “inter-firm objects”, “knowledge transfer” were changed to “knowledge orchestration”, and

"routine" and "non-routine" processes were changed to "well-established" and "Ad-hoc" processes.

An overview of the interviews in the case companies is presented in Table 2-4.

In addition to the interviews, e-mails, information on companies' website, and products brochures, were used as secondary data sources. E-mails were mainly used to receive some complementary and supportive information, and fill the missing details. Companies' websites were mainly used to gain some information about the companies such as number of employees, main activities, subsidiaries location, as well as some key information about the inter-firm objects used by the companies. Product brochures were used to get some further information regarding some products which were improved or developed based on the collaboration with subsidiaries. In addition to these resources, some documentation such as screen shots of a specific SharePoint page, structure of the knowledge sharing and relocated people, business system concept overview, idea sharing pages, and idea generation status were also provided by the interviewees upon request. Collecting data from multiple sources, so-called triangulation, increases the quality of the study (Yin, 2009) as well as the confidence in the accuracy of the findings (Jick, 1979).

Table 2-4 An overview of the interviews in the case companies

	Interviewee	**Date**	**Case company**	**Duration**
1	Group interview with: Vice president business support, Senior manager global support and service, Team leader of technical documentation, and Global business support	06-03-2015	Delta	120 min
2	Vice president business support	01-10-2015	Delta	60 min
3	Product and technology manager	27-10-2015	Alpha	90 min
4	Director of feed milling division	25-11-2015	Beta	90 min
5	Head of emission technology	11-01-2016	Gamma	80 min
6	Product and technology manager	8-02-2016	Alpha	45 min
7	Director of feed milling division	10-02-2016	Beta	60 min
8	Global sales director	12-02-2016	Epsilon	60 min
9	Vice president business support	24-02-2016	Delta	60 min
10	Group interview with: Head of emission technology, Head of technical department, Head of feedback and fuel equipment, head of production support	25-02-2016	Gamma	60 min
11	Global sales director	08-03-2016	Epsilon	70 min

12	Product and technology manager	28-04-2016	Alpha	55 min
13	Global sales director	29-04-2016	Epsilon	60 min
14	Group interview with: head of emission technology, Head of technical service and engineering support in China, Head of engineering process development	01-06-2016	Gamma	120 min
15	Vice president business support	08-06-2016	Delta	60 min
16	Director of feed milling division	23-06-2016	Beta	60 min
17	Group interview with: global sales director and logistic manager	19-08-2016	Epsilon	150 min
18	Group interview with: Head of emission technology, Head of technical department, Head of feedback and fuel equipment, head of production support	22-08-2016	Gamma	110 min
19	Director of feed milling division	01-09-2016	Beta	60 min
20	Vice president business support	02-09-2016	Delta	60 min
21	Export and application manager	06-09-2016	Beta	50 min
22	Product and technology manager	21-09-2016	Alpha	50 min
23	Vice president business support	19-10-2016	Delta	50 min
24	Platform manager	20-10-2016	Delta	50 min
25	Global sales director	14-11-2016	Epsilon	70 min
26	Head of emission technology	23-11-2016	Gamma	70 min
27	Product and technology manager	25-11-2016	Alpha	45 min
28	Platform manager	28-11-2016	Delta	60 min
29	Project manager	09-12-2016	Epsilon	60 min
30	Product manager	15-12-2016	Alpha	45 min
31	Director of feed milling division	22-12-2016	Beta	50 min
32	Senior project manager	10-01-2017	Gamma	60 min
33	Export and application manager	12-01-2017	Beta	45 min
34	Product manager	17-01-2017	Alpha	45 min
35	Head of emission technology	18-01-2017	Gamma	75 min
36	Project manager	27-01-2017	Epsilon	45 min
37	Global sales director	06-02-2017	Epsilon	50 min
38	Project sales manager	06-02-2017	Beta	45 min

39	Platform manager	20-02-2017	Delta	55 min
40	R&D manager	06-03-2017	Epsilon	60 min

2.4. DATA ANALYSIS

Data was analyzed both within individual cases and across multiple cases. We began data analysis by writing individual case histories. For each case, a case description consisting of tables and quotations was written up, as it is central to the creation of insights (Eisenhardt, 1989; Pettigrew, 1990). Few examples of case analysis tables and quotations are provided in Appendix A and Appendix B. The aim of within-case analysis is comprehensive understanding and description of the phenomenon under study (Paterson, 2012). Through the within-case analysis, the unique attributes and patterns of each case emerge (Paterson, 2012). Within-case analysis allows us to become familiar with each case as a stand-alone entity. It also allows the unique patterns within each case to emerge before we seek to generalize across cases (Eisenhardt, 1989).

We then start cross-case analysis, systematic searching for similarities and differences in the cases. Cross-case comparisons increase the possibility of capturing the novel findings from the data (Eisenhardt, 1989). During cross-case analysis, data obtained from the case companies were categorized and sought for potential similarities and differences.

At this stage of analysis, we cross-compared the improvement projects and innovation projects to explore the pattern of KO for both. At earlier stages of our research, the focus put mainly on the cross-comparisons of the use of inter-firm objects and KO process and the potential outcomes achieved in term of innovation performance. As we proceeded, based on the patterns emerged from the cross-case comparisons, the level of analysis was clearly defined. The level of analysis is product-based projects, divided into improvement projects and innovation projects. This enabled us to search for similarities between KO taking place within improvement projects across cases as well as for KO taking place within innovation projects across cases. We then searched for key differences between KO for improvement and KO for innovation projects to find out different approaches to KO in companies.

In order to become familiar with the data, we listened to all the interviews and transcribed them. The transcripts were precisely read several times and examined. We then codify them and compare across them, wrote notes about our learning and understanding, and the potential themes and patterns that existed in the data (See Appendix C and Appendix D). This was an iterative process. We were repeatedly looking for supporting and opposing evidence within and across cases.

Data analysis for the final stage of research was inspired by the thematically organized method (Gama, et al., 2017), which identified themes from evidence (Fereday & Muri-Cochrane, 2006). An example of identified themes is provided in Appendix E. This helped us to arrange different pieces of evidence together to construct meaningful codes and themes. In doing so, we first codified the evidence from the case companies. The evidence used for this purpose includes anecdotal evidence and stories from companies' experiences in doing KO for improvement projects, companies' experiences with KO for innovation projects, and conceptual contribution; It was difficult to find the data-set and evidence desired for the investigation of KO for innovation in the case companies, whereas we had a very reasonable set of data and evidence for the investigation of KO for improvement. As such, we also relied on the storytelling and specific experiences of the interviewees with improvement projects to gain useful insights in relation to the aspects and dimensions that need to be involved in order to improve KO for innovative purposes. Moreover, the data analysis applied to investigate KO for innovation in the last stage of the research is based on the entire data-set, not based on a subset of data. The codification of the evidence was conducted manually for each case. The key quotes were highlighted, and if a dimension was emphasized by the majority of the interviewees, it was corroborated and became part of the initial codes. The codification of data enables us to organize our data into meaningful groups (Tuckett, 2005). We then conducted cross-case to compare the initial codes and to find the most common patterns emerged. By moving back and forth across cases and replication of the cases against one another, the codes were sorted into the themes. At the last stage, we start analyzing the codes and initial themes to consider how different initial themes can be combined to form the overarching themes (referred to as core themes in our analysis). The core themes were labeled based on "the essence of what each theme is about" (Braun & Clarke, 2006).

2.4.1. UNIT OF ANALYSIS

The unit of analysis is knowledge orchestration process from a dyadic point of view, between HQ and distributed subsidiaries. More specifically, we focus on a set of activities through which HQs acquire and effectively use knowledge from distributed subsidiaries. To make the questions in relation to KO more understandable for interviewees, we operationalized KO processes in terms of four stages: knowledge acquisition, knowledge evaluation, knowledge dissemination at HQs, and knowledge utilization by HQs. This operationalization is inspired by the key dimensions of absorptive capacity which are introduced by (Zahra & George, 2002), that is, acquisition, assimilation, transformation, exploitation.

It is also worth clarifying some terminologies which are frequently used in this thesis. In this study, we consider knowledge as know-how, expertise, ideas, technical skills, and competencies including market and customers, engineering, design, and manufacturing pertaining to production. Administrative information such as financial data, billing data, and personnel data are not considered as knowledge in this research.

High-value knowledge refers to knowledge which is serving companies in achieving higher degrees of innovation performance i.e., new product development.

2.4.2. LEVEL OF ANALYSIS

As discussed earlier, this study is an embedded multiple case study. Moreover, we conduct this study at product-based projects level within the case companies. In the beginning of our research, we only focused on the outcomes in terms of innovation in which subsidiaries knowledge were also involved. However, in conducting the main case studies, we narrowed our focus and divided the level of analysis into product-based projects and we then categorized activities identified in the cases under two groups, that is, improvement projects and innovation projects, which are operationalized as follows. Improvement projects refer to those projects that focus on improvement of existing products in the case companies. Improvement of existing products (Zhang, et al., 2009) cannot necessarily differentiate a company from the competitors and may be easily replicated by the competitors in the market of existing activities.

Innovation projects refer to those projects that focus on the development of new products. New products can be either totally new products or significantly improved products which can differentiate a company from the competitors and requires intense knowledge utilization (Tsai, 2001; Zhang, et al., 2009).

The division of the projects in the case companies into improvement and innovation projects is made by considering how incremental/radical the project under study is (Lassen & Laugen, 2017; Duguet, 2006). Incremental and radical innovations are representatives of different degrees of newness created through the projects. Incremental innovation focuses on improving/expanding existing products and services (Bessant, 2003). Radical innovation, on the other hand, is concerned with the creation/development of new product and services. Incremental and radical innovation are substantially different in terms of nature, process, and outcomes (Leifer, et al., 2000; Lassen, et al., 2006). Since radical innovations face a more uncertain development process and more complicated customer adoption processes, companies need a different skill set for the implementation of radical innovation in comparison with the implementation of incremental innovation (Lassen, et al., 2006).

The common measures used in the studies on innovation performance are the number of patents (Ernst, 2001), the frequency of new product introduction (Katila & Ahuja, 2002), and percentage of sales of new products (Laursen & Salter, 2014). Such measures do not differentiate incremental innovation from radical innovation (Lassen & Laugen, 2017). We chose broader categories of improvement and innovation as measures of innovation performance over the traditional innovation measures such as R&D investment, number of patents, frequency of new products, sales generated based on new products in the specific number of years, and so forth, for conducting

this research. This is because by looking at traditional measures, we might be able to measure the success and the outcomes achieved by knowledge orchestration, but we would not be able to see the dynamism of the KO taking place between HQ and subsidiaries including, HQ-subsidiaries relationship, the involved actors, the way inter-firm objects are used, the interactions between HQ and subsidiaries, and many more.

Whereas, improvement and innovation projects provide the good settings for exploration of the quality of KO taking place between HQ and subsidiaries and the circumstances under which KO is conducted.

2.5. QUALITY OF THE RESEARCH DESIGN

Quality considerations in empirical research are addressed by "validity" and "reliability" (Yin, 2009). Validity is used to determine whether the study is well-designed and examines what it was intended to examine. Three types of validity can be used to ensure a solid case study research: construct validity, internal validity, and external validity (Yin, 2009). In what follows, each type of validity in relation to our research is briefly discussed.

2.5.1. CONSTRUCT VALIDITY

Construct validity is concerned with the extent to which the researcher operationalizes the concepts being studied correctly. Construct validity is mainly concerned with reducing subjectivity. One tactic which increases the construct validity of a research is the use of multiple sources of evidence, which is relevant during data collection (Yin, 2009). In this research, we used different sources of evidence, as the interviews were conducted by different managers in each case company. Using different sources of evidence is considered as a major strength of data collection in case study research. Additionally, relying on different sources of evidence make the findings and conclusions of case study research more convincing and trustworthy (Yin, 2009).

Another tactic which is used to increase the construct validity is establishing a chain of evidence. By precise transcription of the interviews Appendix C), tabulation of the data and reducing it into categories (Appendix B), and codification of it into themes (Appendix E), we tried to maintain the chain of evidence in this study.

2.5.2. INTERNAL VALIDITY

Internal validity is concerned with the ability of the research to deliver credible evidence to address the research problem (Yin, 2003). One way to increase internal validity is the use of methodological and data source triangulation (including cross-case comparisons) (Baškarada, 2014). In this study, data triangulation was achieved by interviewing with multiple respondents in each case company. Also, following a

replication logic in which the findings from cases complement one another, increases internal validity in our study, as it provides us with more credible evidence to address the research questions.

2.5.3. EXTERNAL VALIDITY/GENERALIZABILITY

External validity is the extent to which the findings of a study can be generalized to the other situations (Yin, 2009). In multiple case study approach, replication is recommended to enhance external validity of research.

Eight out of 11 case companies, including the pilot and main cases, originate from Scandinavian countries; Five from Denmark, one from Iceland, one from Finland, and one from Sweden. As such, it is reasonable to propose that the findings of this study are particularly relevant for MNCs with Scandinavian origin. More specifically, as all the case companies have their HQs in Denmark, the findings and propositions of this study can be generalized to the MNCs which have their HQ, that is, the center of key relations and knowledge sharing, in Denmark. Additionally, since all the cases are from medium to high-tech and high-tech industries, the findings can be relevant for the companies operating in the similar industries.

Nevertheless, we do not intend to generalize the results of this study to the whole population of Scandinavian MNCs. According to (Yin, 2009), case studies rely on analytic generalization in which the researchers try to generalize the empirical findings to some existing theories.

Despite its focus on KO between HQ and subsidiaries in a global operation network, the findings of this study can also be applicable to similar contexts concerning orchestration of distributed knowledge between different parties. For example, KO in global supply chain networks, KO in joint ventures, KO in product development teams, and so forth.

2.5.4. RELIABILITY

To attain rigor in qualitative research, in addition to validity, maintaining reliability is also needed (Morse, et al., 2002). Reliability is concerned with showing that the same findings can be obtained by repeating the data collection procedure (Bellamy, 2011). One strategy for ensuring reliability in case study research is the creation of case study database. In this study, data collected from the case companies including all the interview records and transcriptions, tabular materials, narratives, notes, and e-mails are well organized and documented as a database for case studies.

Triangulation is another strategy which is used to ensure reliability. Triangulation refers to the use of multiple methods or different data sources to develop a comprehensive understanding of phenomena (Carter, et al., 2014). In this research,

the interviews were conducted with different managers in the case companies in order to enable data triangulation. Additionally, the interviews were combined with secondary data sources such as e-mails, taking notes during the interviews, documents (e.g. product documents), screen-shots (e.g. SharePoint page, idea sharing pages), information on companies' website (e.g. companies' facts) to increases the quality of the study (Yin, 2009) and the confidence in the accuracy of the findings (Jick, 1979).

CHAPTER 3. THEORETICAL FRAMEWORK

3.1. KNOWLEDGE MANAGEMENT IN MNCS

Multinational companies (MNCs) are increasingly considered as networks of complementary units such as headquarters (HQs), manufacturing or sales subsidiaries, and R&D units (Kirsimarja & Aino, 2015). Compare to domestic companies, the relevance of knowledge management in MNCs is higher (Gupta & Govindarajan, 2000; Rabbiosi & Santangelo, 2013), as they have to compete more intensely and they face a higher number of changes in diverse countries they are operating in (Jiménez-Jiménez,, et al., 2014). MNCs also have more opportunities to leverage their knowledge resources as they have the potential to have access to new knowledge through their network of distributed subsidiaries (Bartlett & Ghoshal, 1989; Gupta & Govindarajan, 2000; Jiménez-Jiménez,, et al., 2014).

By considering the evolution of sources of advantages in global competition, the perception of the significance of knowledge flow in MNCs is strengthened (Doz & Prahalad, 1991) and knowledge management within MNCs has been increasingly gaining attention (Rabbiosi & Santangelo, 2013; Magnusson, 2004). The global distribution of operations requires capabilities to support continuous improvements and to enhance the role of each unit in the network as well as the overall operations network (Ferdows, 1997). This needs companies to move beyond home-base knowledge exploitation and to give their attention to home-base knowledge augmentation capabilities (Kuemmerle, 1997).

The focus of knowledge transfer in MNCs was primarily on the unidirectional knowledge transfer, from HQ to subsidiaries (Szulanski, 1996). In fact, these kinds of transfer were encouraged by some specific factors such as transaction costs and ownership (Yahiaoui & Chebbi, 2008). In this approach, the global strategy and results expected from subsidiaries are specified and formulated by HQs (Yahiaoui & Chebbi, 2008). This practice is used exclusively by MNCs which formulate and implement a global strategy (Bartlett & Ghoshal, 1989) based on the assumption that customers' needs are homogeneous and similar all over the world, resulting in products standardization (Yahiaoui & Chebbi, 2008). The agency theory (Jensen & Meckling, 1976), reduction of transaction costs, and dependence on HQ's resources (Pfeffer & Salancik, 1978) are the theoretical approaches asserting the predominance of this model (Yahiaoui & Chebbi, 2008).

The leading role of HQs within the MNCs network is also emphasized by the home-based model of MNCs. The home-base model of MNCs (Sölvell, et al., 1991)

highlights the importance of the home-base of MNC in the process of upgrading competitive advantage (Chini, 2004). In this view, the home base/headquarter plays critical role in experimentation and learning activities and builds the basis for upgrading of competitive advantage, whereas the global subsidiaries become important for global efficiency and exploitation (Sölvell & Zander, 1995). When it comes to learning and innovation, which is the foundation of continuous improvement of competitive advantages, the home-base model of MNC puts the focus on home-based company, saying that the home-based company plays the most prominent role within the MNC network. Core activities and decision makings are performed in home base, whereas distributed subsidiaries carry out peripheral operations such as sales and services (Sölvell & Zander, 1995).

According to the traditional views of firm's multinational growth (Vernon, 1966), firms which relocate abroad must take advantage of their ownership to control the foreign subsidiaries. In this case, knowledge transfer and learning are one way, from HQ to subsidiaries (Pesalj, 2011). It is assumed that it is mainly the subsidiaries which learn from HQ and there is no important knowledge flow from subsidiaries to HQ (Dobrai, et al., 2012).

Contrary to traditional views of MNCs, in contemporary MNCs like knowledge-based (Kogut & Zander, 1993) and network-based (Ghoshal & Bartlett, 1990), it is expected that the distributed subsidiaries not only develop necessary skills and competences but also collaborate intensely with other units in the network and share their competencies and knowledge with them (Pihl & Paulsson, 2014). For a significant number of MNCs, knowledge transfer is not merely unidirectional (from HQ to subsidiaries). Rather, knowledge transfer takes place bi-directional, or even multi-directional (Cantwell, 1994; Gooderham, 2007). According to the knowledge-based view of firms, knowledge is the most important resource, and superior competitive advantages of MNCs can be attained by their capabilities to orchestrate different knowledge resources (Kogut & Zander, 1992). Kogut & Zander (1993) put the focus on the strategic and organizational significance of knowledge and knowledge creation in MNCs (Fransson, et al., 2011).

Considering that a company does not possibly possess all the necessary knowledge and resources to compete and survive, it relies on both internal and external relationships of ties for resources (Li, 2004). Therefore, companies can be seen as networks of resources and other flows which are connected to each other (Gulati, et al., 2000). This shifts the attention to the network-based view of firms (Ghoshal & Bartlett, 1990). In this view, MNCs are conceptualized as companies whose advantages are originated from their access to diverse and heterogenous knowledge which is distributed across MNCs network (Bartlett & Ghoshal, 1989) and their capability to transfer and utilize such knowledge (Gupta & Govindarajan, 2000; Kogut & Zander, 1993; Mudambi, 2002). One key asset of networked MNCs is their opportunity to learn from their diverse environments (Doz & Prahalad, 1991).

For the purpose of this PhD study, the knowledge-based view of firms provides a useful theoretical basis as it gives the emphasis to knowledge as the most important resource for companies and highlights that the existence of the firms can be explained by its knowledge management capabilities (Kogut & Zander, 1993). Thereby, the ability of companies to acquire knowledge and utilize it as well as learning from such knowledge determines the companies' capability to gain competitive advantages.

For the purpose of this PhD study, the network-based view of firms enables us to view knowledge orchestration as a cross-boundary activity which is taking place in collaboration with distributed units e.g., subsidiaries, across the network, and not as an activity which is limited to the boundaries of a firm. Moreover, the network-based view of firms highlights the importance of cross-boundary collaboration in knowledge creation and application, and thereby leads us to consider "collaborative-relationship" as a key concept in the study of KO taking place between HQ and distributed subsidiaries.

3.2. THE ROLE OF SUBSIDIARIES IN HEADQUARTER'S COMPETITIVE ADVANTAGES

Historically, subsidiaries are used by MNCs for two purposes: "the adaptation of products developed in their home countries to local tastes or customer needs, and the adaptation of processes to local resource availabilities and production conditions" (Mudambi & Pedersen, 2007). In such situation, subsidiaries were dependent on their headquarters' competencies and their role was considered as "home-base exploiting" (Kuemmerle, 1999). Later, by emergence of the networked MNCs and by closer integration of subsidiaries into international MNC network, some subsidiaries have gained more creative roles, e.g., to create new technologies (Mudambi & Pedersen, 2007; Zander, 1999).

Bartlett and Ghoshal (1989) provide an extensive typology of MNCs in which companies are categorized by different types of strategies (global, transnational, international, multi-domestic) which are followed by HQ (Harzing, 2000). This categorization (See Figure 3-1) is conducted based on two pressures: local responsiveness and global integration (Bartlett & Ghoshal, 1989). The HQ-subsidiaries relationship, the role of subsidiaries, and the flow of knowledge between HQ and subsidiaries are considered being different in different types of the MNCs proposed by Bartlett and Ghoshal (1989). Transnational companies operate as the integrated and interdependent networks in which HQ does not play a dominant role, the mutual development and dissemination of knowledge is emphasized, and subsidiaries act as centers of excellence (Bartlett & Ghoshal, 1989; Harzing, 2000). The flows of knowledge and products are quite large in transnational companies.

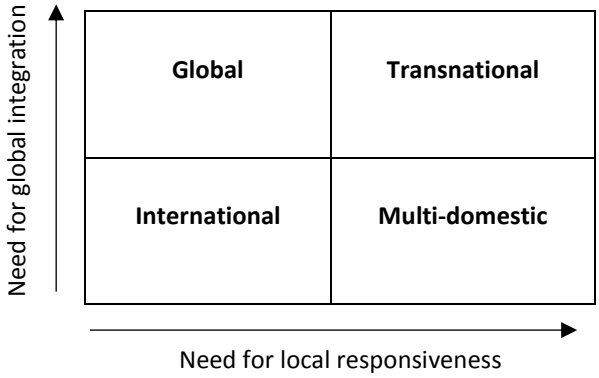


Figure 3-1 Bartlett & Ghoshal model of international strategy

Global companies are characterized by a centralized structure in which the main role of subsidiaries is to "act as pipelines of products and strategies" (Harzing, 2000). The global companies are organized based on the hub-and-spoke model (Bartlett & Ghoshal, 1989) in which most of the strategic operations such as manufacturing are centralized at HQs, and the flows of knowledge and products are mainly from HQ to subsidiaries (Harzing, 2000). Multi-domestic companies are characterized by a decentralized and loosely connected structure. As subsidiaries need to be very responsive, they are relatively independent from HQ and other subsidiaries in the MNC network. The knowledge which is developed in subsidiaries of multi-domestic companies is not shared with the rest of the MNC network. International companies' operations and activities are mainly based on the expertise and knowledge which are developed at HQ. Knowledge is mainly developed at HQ and sent to distributed subsidiaries. This strategy is not defined as clearly as the other types (Harzing, 2000).

Over the past decades, the role of subsidiaries has been changed from "being the subservient executors of headquarters commands" (Mudambi & Pedersen, 2007) to the "competence-creating" entities (Cantwell & Mudambi, 2005). The network thinking which has been applied to MNCs research is also being increasingly applied to subsidiary-level studies (Birkinshaw & Pedersen, 2008; Gupta & Govindarajan, 2000; Andersson, et al., 2002). The advantage of the network perspective is that subsidiaries are not subordinate entities anymore, rather they are seen as nodes in the network with internal and external linkages, greater authorities, and so on (Birkinshaw & Pedersen, 2008). The modern MNCs are associated with highly distributed subsidiaries, and knowledge in the MNC networks is largely distributed across subsidiaries (Asmussen, et al., 2013). According to (Björkman et al, 2004; p.443), "globally distributed networks of subsidiaries constitute a potentially important source of competitive advantage for multinational corporations (MNCs)". The increasing strategic importance of subsidiaries as sources of innovation and new knowledge is

widely recognized by extant studies (Blomkvist, 2012; Zander, 1999; Cantwell & Mudambi, 2005).

Subsidiaries possess heterogenous knowledge as they are embedded in local environment including customers, suppliers, competitors, etc. (Håkanson & Nobel, 2001). Each subsidiary keeps unique and distinctive patterns of networks connections and linkages and therefore have access to new knowledge and opportunities (Andersson, et al., 2002). Through the transfer of such knowledge and capabilities from subsidiaries to the rest of the MNC network, MNC's competence will be improved (Phene & Almeida, 2008; Andersson, et al., 2002). Consequently, subsidiaries can be expected to capture and effectively utilize diverse knowledge from other parts of the MNC network in order to enhance their innovativeness (Phene & Almeida, 2008). Studies on international management highlights the importance of subsidiaries' capabilities to create knowledge and integrate it through both their internal and external network (Andersson, et al., 2002; Phene & Almeida, 2008; Rabbiosi, 2011).

By tapping into the knowledge residing in globally distributed subsidiaries, MNCs can both exploit the existing knowledge and explore new knowledge and competencies (Björkman, et al., 2004; Frost, 2001). The flow of knowledge from foreign subsidiaries to HQ (i.e., reverse knowledge transfer) has received lots of attention (Eden, 2009; Gupta & Govindarajan, 2000; Håkanson & Nobel, 2001; Yang, et al., 2008). The positive impact of reverse knowledge flow from subsidiaries on MNCs' competitive advantages (Ambos, et al., 2006; Rabbiosi & Santangelo, 2013) and innovation (Piscitello & Rabbiosi, 2004) is also largely studied.

The attention given to the critical role of reverse knowledge flow from subsidiaries to HQs has stimulated studies on tools and mechanisms, and processes through which knowledge is orchestrated within the MNCs network (Rabbiosi & Milano, 2005; Nobel & Birkinshaw, 1998; Gupta & Govindarajan, 1991). Additionally, extant studies explore the circumstances under which knowledge flow from subsidiaries to HQs is facilitated (Håkanson & Nobel, 2001; Yamin & Otto, 2004).

While MNCs' capability to orchestrate knowledge from globally distributed subsidiaries and integrate such knowledge to improve their knowledge base and performance has been of great interest to scholars and practitioners, research on this topic is very scant (Rabbiosi & Santangelo, 2013). As such, this thesis aims to expand studies on knowledge orchestration taking place between HQ and distributed subsidiaries for innovation within the MNCs network.

3.3. KNOWLEDGE AND INNOVATION

Innovation has played a key role in theories of multinational companies (Frenz, et al., 2005). The perspectives on the relationship between multi-nationality and the

development and distribution of innovation has been gone through several changes (Frenz, et al., 2005); The earlier perspectives, deriving from the International Product Life Cycle (IPLC) model (Hirsch, 1965; Vernon, 1979), focused on a hierarchical view in which the home country has the lead in the development of innovation and subsidiaries would follow HQ's lead and imitate (Frenz, et al., 2005). Decentralization of innovation activities, interaction between HQ and subsidiaries and between subsidiaries and their local network were largely overlooked in this model (Frenz, et al., 2005).

In response to a number of changes such as emergence of the new information and technologies facilitating the transfer of knowledge, the increased internationalization of activities, and the growth in inter-firm collaboration, the theories in which the innovation accumulation is used to enhance competitive advantages of companies emerged (Cantwell, 1989). Here, the interaction with the external environment is also emphasized. The focus has been further changed to the more decentralized and network-centered view of the development and distribution of innovation and integration of the different units of MNCs came to prevail over hierarchy (Frenz, et al., 2005).

Bartlett and Ghoshal (1989) thereafter emphasize the relevance of linkages among the distributed units of companies for innovation processes. Gupta and Govindarajan's (2000) view of firm as a "bundle of knowledge" gives also emphasis to the relevance of internal networks for knowledge transfer.

Innovation is becoming increasingly dependent on the availability of knowledge and therefore rich knowledge needs to be captured and managed to ensure successful innovation (Du Plessis, 2007). In more recent views of MNCs and innovation development, MNCs are no longer developing new products at HQ and transferring these innovations to distributed subsidiaries, rather they are increasingly acquiring diverse knowledge of subsidiaries to improve their innovation capabilities (Gooderham, 2007; Davis & Meyer, 2004). Also, the evolution of subsidiaries suggests that they play more prominent roles in MNCs network (Zander & Sölvell, 2000) and they are becoming active contributors to MNC's global innovation (Nobel & Birkinshaw, 1998). Increasingly, the traditional assumption of HQs super-ordination (Nobel & Birkinshaw, 1998) has been changed and they started becoming also the knowledge receivers from distributed subsidiaries (Abdulsomad, 2014; Ambos, et al., 2006). Knowledge sharing has been considered as a key activity by which new knowledge is increased and innovation capability is fostered (Usman & Mat, 2016). Companies which foster their knowledge management approaches will be successful in creation of innovation (Jiménez-Jiménez,, et al., 2014). The role of knowledge and knowledge orchestration, that is, acquiring knowledge and effectively utilizing it, in improving companies' innovation capabilities and performance has become more stressed in different studies (Spender, 1996; Grant, 1996; Jiménez-Jiménez,, et al., 2014). In many MNCs, orchestration of the knowledge resources

residing in the network of distributed subsidiaries is conceived as the main means of developing and disseminating innovations (Johnston & Paladino, 2007).

One of the main drivers for knowledge orchestration ‘s role in innovation is to create and sustain competitive advantages through the utilization of knowledge and collaboration (Du Plessis, 2007). Another driver of the role of KO in innovation is that knowledge resources are used to decrease the complexity of innovation process, and as such orchestrating knowledge as a resource is of significant importance (Du Plessis, 2007).

Despite the acknowledged importance of knowledge orchestration for innovation, more research is still needed, particularly in the context of MNCs (Jiménez-Jiménez,, et al., 2014).

3.4. INTER-FIRM OBJECT AND ITS USE

As companies are increasingly seeking knowledge from globally distributed subsidiaries to achieve global competitiveness, their capability to effectively use different inter-firm objects to exploit such knowledge is becoming crucial (Lagerström & Andersson, 2003). Moreover, a critical step is for MNCs to organize inter-firm objects that facilitates bringing subsidiaries’ knowledge back home (Eden, 2009).

A major stream of research within the MNCs studies and international management is concerned with different types of inter-firm objects and their role in the facilitation of knowledge flow within globally distributed network of MNCs; Extant studies investigate how to select different inter-firm objects that improve knowledge flows within the MNCs network (Foss & Pedersen, 2004; Cheng, et al., 2010). Few efforts have been made to study the impact of inter-firm objects on knowledge sharing within the MNCs network (Gupta & Govindarajan, 2000; Wæhrens, et al., 2012). The impact of different inter-firm objects on the knowledge flow from subsidiaries to HQ is also investigated in extant studies (Björkman, et al., 2004; Rabbiosi, 2011).

However, existing studies focus on the use of inter-firm objects as the governance, and control means by which MNCs keep the control over subsidiaries (e.g. Birkinshaw & Hood, 1998).

Theoretical discussions and justification for the use of control means applied by HQs are well-founded in the resource-dependency perspective and agency theory (Björkman, et al., 2004; Li, 2004). In the resource-dependency perspective (Pfeffer & Salancik, 1978), the HQ is dependent on its subsidiaries for certain crucial resources. As the HQ’s dependence on subsidiaries resources grows and the resource flows between the HQ and subsidiaries increases, the HQ is willing to apply more control over subsidiaries (Ghoshal & Nohria, 1989). This perspective put the focus on the

control and coordination in knowledge sharing between HQ and subsidiaries and in the HQ-subsidiaries relationship within MNCs (Ghoshal & Bartlett, 1988; Birkinshaw, et al., 2000).

The agency theory (Jensen & Meckling, 1976) is also widely applied to study HQ's control mechanisms in knowledge transfer within the MNCs network (Chang & Taylor, 1999). In the agency theory, the HQ (principal) allocate tasks and works to subsidiaries (agents), and the agents carry out the tasks on the principal's behalf (Jensen & Meckling, 1976). In the context of HQ-subsidiary relations, more serious agency problems are controlled by increased HQ's control (Chang & Taylor, 1999; Mudambi & Pedersen, 2007).

The use of control and administration means by MNCs is in line with the traditional view of MNCs in which the hierarchical relationship between HQ and subsidiaries is emphasized and knowledge is mainly transferred unidirectional, from HQ to subsidiaries. In traditional views of MNCs, due to global competition, MNCs adopt a control-oriented approach to the use of inter-firm objects in which subsidiaries implemented what is decided by HQ as "centralized hub" (Bartlett, 1986; Martinez & Jarillo, 1989). A control-oriented view of the use of inter-firm objects might be efficient as it reduces the transaction cost resulting from coordination (Sawhney & Prandelli, 2000). However, it does not allow companies to take advantages of the creativity and diversity of distributed subsidiaries.

Control has been largely discussed by scholars in the MNCs studies (Prahalad & Doz, 1981; Martinez & Jarillo, 1989; Baliga & Jaeger, 1984). However, previous research shows that too much control and centralization negatively affect knowledge sharing from subsidiaries (Tsai, 2002). Poppo (1995) discuss that centralization may lead to inefficiency because knowledge flow from subsidiaries to headquarter is prone to errors. According to (Grant, 1996), "once organizations are viewed as institutions for integrating knowledge, a major part of which is tacit and can be exercised by those who possess it, then hierarchical coordination fails" (Tsai, 2002).

Nevertheless, the traditional model in which inter-firm objects are used as control means is still evident in many industries, "because there are enduring benefits to operating a hierarchical, centrally-led organization with regards to information processing, coordination, and control" ((Birkinshaw, et al., 2017; Egelhoff, 2010).

When it comes to the network-based view of MNCs and taking the complexity and heterogeneity of network relationship (Li, et al., 2007) into consideration, collaboration and building a collaborative relationship is the key to facilitate knowledge sharing and creation within networks (Inkpen, 1996). Collaboration between companies has been considered as a powerful tool to increase competitiveness, especially within complex and fast-changing environments (Hoffmann & Schlosse, 2001). Acquiring knowledge and competencies through

collaboration is considered being an effective and efficient way of successful innovation (Lassen & Laugen, 2017; Du Plessis, 2007). Also, the positive impact of collaboration on organizational learning is largely argued (Hamel, 1991; Dodgson, 1993).

Recent studies on organization and management studies have argued the role of inter-firm objects in cross-boundary collaboration through the lens of boundary object perspective (Star & Griesemer, 1989). In the following, we review the literature on boundary object and boundary object perspective, and on how applying boundary object perspective contributes to collaboration between different entities in companies.

3.5. BOUNDARY OBJECTS

The concept of BO was first introduced by (Star & Griesemer, 1989). BOs refer to the artifacts residing between different communities which "are plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star and Griesemer, 1989: 393). Different studies consider the role of BO in transforming knowledge across different boundaries (Oswick & Robertson, 2009; Carlile, 2002) and across different communities with different knowledge background such as communities of practice (Wenger, 1998). BOs can be both abstract and concrete concepts (Star & Griesemer, 1989), but they have some "interpretative flexibility" that appoint them a common interface for communication across different kinds of knowledge. Hence, they have a great potential of helping to understand innovation processes in different fields (Swan, et al., 2007). Previous literature shows the application of different BOs to different fields and context. For instance, drawings and problem report in the manufacturing context (Carlile, 2002; Betz, 2010), documentation in maintenance context (Betz, 2010), prototype, computer simulation and drawing in design (Carlile, 2002; Bergman, et al., 2007).

Carlile (2002) identifies three characteristics of an effective BO as follows:

- constitutes a shared language for actors to state their knowledge,
- provides a concrete means for actors to identify their differences and dependencies across the boundaries and learn about them, and
- facilitates a process of knowledge transformation which is the process of changing the current knowledge, creating, and validating the new knowledge within and across functions.

Barrett and Oborn (2010) notice the interacting aspects of BOs, emphasizing the collaboration and interactional capabilities of BOs and their application by different actors (Thomas et al., 2008). This conceptualization of BOs identifies their collaborative role, since their use is continuously being negotiated and argued

between involved actors through their interactions over the time. Barrett and Oborn (2010) in their study, take both BO and actors into account in an interactional manner.

Lee (2007) introduces the "boundary negotiating artefacts" based on the BO concept. She emphasizes the importance of the significance and complexity of negotiations in the interface of different communities in order to unbind the routine of BOs.

More studies are drawing upon the insights on boundary object perspective to investigate knowledge management and collaboration across boundaries and cross-disciplinary settings (Carlile, 2004; Levina, 2005; Levina & Vaast, 2005). These studies discuss how the certain aspects emphasized by the BO perspective allow diverse group possessing heterogenous knowledge to collaborate and share their knowledge (Carlile, 2004; Levina, 2005; Nicolini, et al., 2012). Additionally, some contributions have been made focusing on the collaborative aspect of the BO perspective facilitating learning and innovation in multidisciplinary settings (Carlile, 2002; Nicolini, et al., 2012).

The BO perspective highlights the circumstances under which an object can become boundary object. Some of the key circumstances are as follows:

- supporting collaboration,
- being a basis for interaction and negotiation,
- providing a shared understanding, and
- facilitating the transformation of knowledge among the involved actors (Carlile, 2004; Star & Griesemer, 1989; Wenger, 1998).

Dimensions emphasized by boundary object perspective inspired us to think about the certain circumstances which is needed in between HQ and subsidiaries for their co-development. By integrating different insights from extant literature on the application of the BO perspective in facilitation of collaboration, learning, and innovation across different teams and boundaries (Levina, 2005; Carlile, 2002; Swan, et al., 2007) and drawing on Levinas' study arguing that an effective collaboration among the involved actors cannot be created by objects per se, rather through the use of objects (Levina, 2005), we discuss how using inter-firm objects in a collaborative way creates the opportunities for two-way knowledge sharing and learning between HQ and subsidiaries.

3.6. CONCEPTUAL FRAMEWORK

Based on the literature review and empirical evidence from the companies, we clearly know how important is the role of inter-firm objects in the facilitation of knowledge flow in a global setting like MNCs. As discussed earlier, the outcomes of inter-firm objects are directly related to how they are used (Alavi & Leidner, 2001; Levina, 2005; Vaccaro, et al., 2010). As such, the use of inter-firm objects is a key aspect which is

considered in the investigation of KO taking place within a distributed operations network in this PhD study. To further understand the different use of inter-firm objects, we distinguish between the static use and the dynamic use of inter-firm objects.

A static approach is limited to the use of inter-firm objects as control means regardless of the interactions and communication going on between the involved actors. A static approach to the use of inter-firm objects is in line with the traditional view of MNCs (discussed in the theoretical background) in which the hierarchical relationship between HQ and subsidiaries is emphasized and knowledge is mainly transferred unidirectional, from HQ to subsidiaries. One limitation of the static use is that either the involved actors do not have the opportunity to negotiate and interact through inter-firm objects or they have limited opportunities for specific areas.

On the contrary, the dynamic use of inter-firm objects refers to a collaborative-oriented view of the use of inter-firm objects in which the flow of knowledge is facilitated by building a collaborative relationship between HQ and subsidiaries. Here, the role of inter-firm objects is considered to be collaborative and learning-centric which can support the two-way knowledge flow between HQ and subsidiaries. As mentioned earlier, the BO perspective is applied to investigate the dynamic use of inter-firm objects in this study.

KO is not only about using an inter-firm object in between HQ and subsidiaries in a global setting facilitating their knowledge sharing. It is also about developing a process around inter-firm objects by which we recognize how people interact with inter-firm objects, how good they are at using inter-firm objects, who are responsible for KO activities, how familiar they are with the process of KO, and how knowledge is used. The importance of KO processes is also largely highlighted by extant studies; Failure to bring about the specific processes necessary to acquire, adopt, and disseminate dispersed knowledge is the primary obstacle to the success of learning within the distributed companies (Inkpen, 1996). Therefore, the capability and practices of how MNCs orchestrate the flow of knowledge has become one of the key issues in international management studies (Björkman, et al., 2004). To better understand the characteristics of KO processes, we distinguish between ad-hoc and well-established processes. Inspired by the key dimensions of absorptive capacity which are introduced by (Zahra & George, 2002), we consider a well-established KO process as a set of activities (knowledge acquisition, evaluation, dissemination, utilization) by which companies not only acquire knowledge from subsidiaries but also effectively utilize it, otherwise it is an ad-hoc process.

Considering both the use of inter-firm objects and KO process allows us to think about KO as a more broader process than just the communication happening between two units. Taking KO process into account in our study helps us investigate how well integrated the use of inter-firm objects is in the operating procedures of the company,

how well-performed is the use of inter-firm objects, and how companies get full benefits of the use.

Based on the above characterization of the use of inter-firm objects and KO processes, a conceptual framework (Figure 3-2) is developed as the foundations to investigate KO taking place between HQ and globally distributed subsidiaries within MNCs.

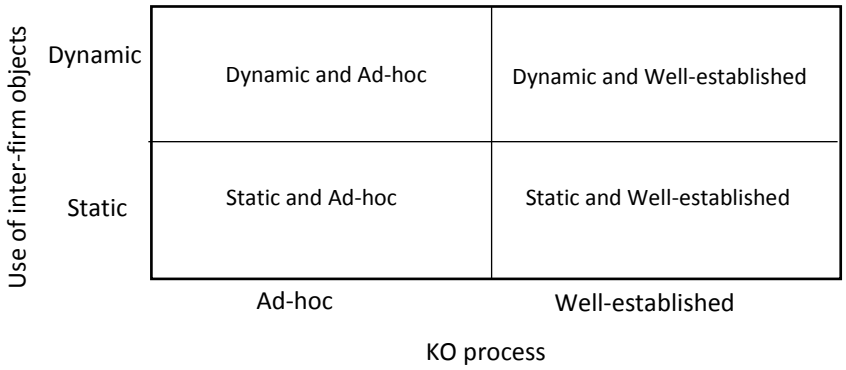


Figure 3-2 The conceptual framework

Our idea underlying the framework is that the use of inter-firm objects and the characteristics of the KO processes should be considered together as the constructs of KO taking place between HQ and subsidiaries. The conceptual framework will be further applied to the case companies in order to investigate different approaches to KO applied by them.

CHAPTER 4. CASE ANALYSIS

In this chapter, a description of the five main case companies is provided and a case analysis of knowledge orchestration for improvement and knowledge orchestration for innovation is conducted.

4.1. CASE ONE: COMPANY ALPHA

Company Alpha is a Swedish company which is a leading global supplier of products and solutions for heat transfer, separation, and fluid handling. The company's main products consist of heat exchangers, separators, pumps, and valves. Boilers' headquarter is based in Denmark. The products are used in the manufacturing of food, chemicals, pharmaceuticals, starch, sugar, and ethanol. They are also used in nuclear power, onboard vessels; and in the engineering sector, mining industry and refinery sector as well as treating wastewater and creating a comfortable indoor climate. Company Alpha was founded in 1883 and has over 17000 employees all around the world. The HQ in Denmark has relocated manufacturing and sales activities partly or totally to distributed subsidiaries all over the world. Subsidiaries are based in different countries such as Brazil, China, Australia, Finland, and so forth. The strategic reasons behind the relocation of activities to subsidiaries are different. For example, the strategic reason behind the relocation to China is cost reduction and decreasing the delivery time, whereas the strategic reason behind the relocation to Brazil is having access to local markets and skilled people. The product center in Denmark is fully responsible for a set of products (i.e., boilers, burners, automation, and heat exchanger) from idea to developments, production, and sales.

Company Alpha uses different inter-firm objects e.g., documentation and drawings, e-mails, Skype-meetings, visiting, workshops, change request system, and idea ambassadors to orchestrate knowledge within the global network of HQ and subsidiaries. With the implementation of major changes or new products, the company holds training sessions either by skype or face-to-face meetings.

Company Alpha has some products which are always under modification and improvement. The company also has a target called newness covering the projects that have the maximum age of 5 years old, and a minimum of 25% of sales. Company Alpha was considered being an interesting case for this study, allowing us to explore how KO is taking place between HQ and subsidiaries within improvement projects as well as within innovation projects.

The initial contact with company Alpha was made by one of my colleagues, Henrik, at Center for Industrial Production, Aalborg University. Henrik arranged the first interview with the product and technology manager and participated in the meeting for the introduction. The rest of interviews were held between me and the product and

technology manager. Further, I was referred to the product manager who was directly involved in knowledge sharing between HQ and subsidiaries within some projects.

In the beginning, it was very tricky to talk about the improvement and innovation separately, as the interviewee believed that many of the projects that they are doing in collaboration with subsidiaries are innovation projects. As we continued, I made a clear distinction between improvement and innovation based on the level of newness. This made the further interviews much easier. However, I still found some disagreement between the interviewees in relation to improvement and innovation. For example, the product manager thought that many of the projects which are referred by the company as innovation are the improvement and gap-filling projects, not significantly or totally new products. Whereas, the product and technology manager considered many of the projects implemented by the company as being innovation projects. To arrive at an agreement, I focused on those innovation projects which they both considered as product innovations. Focusing on the specific improvement and innovation projects during the interviews was difficult, as the interviewees were not able to remember all the details of a specific project. As such, I tried to listen to all the stories about improvement and innovation projects and to look for the details of each stage of knowledge orchestration happening within the projects as much as they remembered, and they wanted to talk about. In this way, I was able to compare the stories told by the interviewees to gain a better understanding of KO within different projects.

The identification of patterns for KO taking place for innovation was difficult as the company had experienced few innovation projects in which knowledge from subsidiaries was involved. As such we did not focus only on the innovation projects to investigate KO for innovation but also on the experiences of the interviewees with different improvement projects and the factors emphasized by them as barriers to or enabler of successful KO taking place between HQ and subsidiaries.

In what follows, the analyses of knowledge orchestration for improvement and knowledge orchestration for innovation based on the evidence from company Alpha are presented.

4.1.1. KNOWLEDGE ORCHESTRATION FOR IMPROVEMENT

Improvement of the existing products and modification of them are the on-going activities in company Alpha. Even though knowledge coming from subsidiaries is seen as the key source which can contribute to improvement projects in company Alpha, the flow of knowledge from subsidiaries is considered being low. According to product and technology manager in company Alpha, "*subsidiaries know a lot about boilers and other productions that can be beneficial for HQ. We (at HQ) started being more aware of what subsidiaries are doing and what experiences they have…. Specifically, we would like to be aware of their technology and knowledge*."

The company uses different inter-firm objects such as training, visit, meetings, people, change request, and so on, to get the knowledge back from subsidiaries. The inter-firm objects are mainly used by company Alpha either to transfer HQ's knowledge to subsidiaries or to control the subsidiaries' operations and activities. All the products, documentation, and key ideas originate from HQs. As such knowledge sharing is considered being mainly one-way from HQ to subsidiaries. According to product and technology manager in company Alpha, "*products, documents, and materials specifications, which are more appropriate to be used in different countries, are developed at HQ in Denmark and are sent to subsidiaries*". She also states that "*in a long-term, objects are used to control because the overall goal is to have things done in a best way, in a most efficient way, less time-consuming….*"

The knowledge which is shared by subsidiaries is mainly in relation to either what is pre-determined by the HQ or what the HQ needs to be informed of. The starting point of knowledge flow between HQ and subsidiaries is mainly the HQ which is acting as a central hub. Interactions taking place between HQ and subsidiaries are mainly with the purpose of controlling subsidiaries' activities, the quality of products, and making sure that knowledge from HQ is received by the subsidiaries.

One of the main challenges in company Alpha has been the development of a structured knowledge orchestration process between HQ and subsidiaries in order to improve two-way knowledge flow between them. According to product and technology manager in company Alpha, "*we are right now in the process of figuring out what we do and how we as a company at least from (HQ) in Denmark can secure that we get some good ideas and some valid ideas that we secure our earnings not only in two or 3 years but also in 10-20 years. Right now, we are not quite sure how to do it; we have a number of ways to follow but have not taken any decision on how we will do it."* However, due to a long history of working with subsidiaries, the company has established a KO process.

The findings show that knowledge acquisition from subsidiaries for improvement projects depends mainly on the running projects. Product and technology manager explains that companies acquire knowledge from subsidiaries when it is relevant for the running improvement projects. Moreover, depending on the running projects different inter-firm object or KO processes may be applied in order to get the knowledge back from subsidiaries. Product and technology manager states that "*depending on which kind of knowledge and which kind of project and where in the world it is, [we use different objects]. Best [way which] works is always to have people face-to-face. But that is very often is not easy, and it is too expensive. Then it would be either by mails or by Lync meeting*."

Different factors were given by the interviewees influencing two-way knowledge sharing between HQ and subsidiaries: cultural differences, control over subsidiaries, lack of a cooperative structure for knowledge sharing, lack of subsidiaries'

involvement due to the irrelevancy of the project. Additionally, the company's direction towards either the improvement or the innovation is mainly determined by the market trends and industry. The strategy is given by top level and there is no clear template for knowledge orchestration. The following quotes from the interviewees illustrate the above-mentioned factors:

> **Culture,** *"Sometimes, it can be difficult to have knowledge sharing because they (subsidiaries) want to keep it and do not want to share, and they are afraid that the job would be taken from them. In that case, it is very difficult to open them up [to] share their experience."* (Product and technology manager)

> **Control,** *"They (subsidiaries) should be coordinated with us and tell how is the progress and report it to HQ…it is because we want to make sure that we are not doing the same thing twice or doing the same thing in different ways."* (Product and technology manager)

> **Structure and lack of involvement,** "*If possible, it would be good to always have knowledge transfer updated and structured. So far, I have not found a way that works in real life. We have tried different situations to establish a structured knowledge sharing in general, but it dies because only part of it would be interesting for people being involved, and then they found that their time could be spent in better projects and different tasks instead.* (Product and technology manager)

> **Market trend,** "*Now the trend is going more towards having non-fossil fuels for example, gas for combustion instead of oil, so that is a trend. Then, the strategy from the manager and the company is that we should go to that direction and prepare ourselves and products, and develop the products that can support gas combustion. So that is strategic way based on trends and environmental requirements."* (Product and technology manager)

> **Industry,** *"People in marine market are very conservative. Some ship owners they don't want the product if it has not been tested for several years. Someone needs to be the first one. That affects also the salespeople's [knowledge sharing]. They are saying that we know that our customers are conservative."* (Product manager)

The evidence shows that only for standard and codified knowledge in relation to standard products, knowledge sharing is happening in a systematic way. This is mainly due to the certain level of familiarity with the process which is created because of the standardization. According to product and technology manager in company Alpha, "*knowledge sharing for standard products is also sort of on-going project, because we have change request, and the ideas are evaluated once per month. So, that is also quite regular and structured.*"

According to the discussion above, the KO for improvement projects in company Alpha is characterized by: a high level of control over subsidiaries, hierarchical knowledge sharing (from HQ to subsidiaries), inadequate knowledge flow from subsidiaries, a well-established KO process due to the long history of working with subsidiaries, and lack of a well-defined strategy for KO.

4.1.2. KNOWLEDGE ORCHESTRATION FOR INNOVATION

Company Alpha has recognized that they need to create more innovative outcomes, otherwise they would fall behind their competitors. According to product manager in company Alpha, "*we need to bring ourselves in the position where we are better to push out new technologies. So far, we have not been very good at this, because traditional customers have just asked the same thing as they have always gotten. So, it has been not that big incentive to do things and when you are a company with a market share above 50% worldwide, then you don't really do too much about it. Right now, we all kind of realized that even though we have a huge market share globally, we need also to bring new technologies to push this out. If we don't do it, someone will overtake us very quickly. That is what we know at the moment, and try to figure out how do we handle that*." He also explains that "*we have a small project group working with product management, R&D, and the business unit management where we try to figure out how as an entity we want to solve this [moving towards being more innovative]. How do we get in a position where we are better to think in the future and come up with some really ground-break new technology. It is initiated. So far, we have identified that we are not good at it, and we need to figure out how we do it to get better*."

Groundbreaking ideas and knowledge from subsidiaries are keys to the innovation projects, stated by product manager in company Alpha. He explained, "*most of the ideas are gap fillers […] mostly for small improvement. We lack new radical ideas, and we don't really have a process on how we should gather these kinds of ideas. But we want to do this, and we are looking at different possibilities of how we can put ourselves in a position where we get also radical development, not only incremental stuff as we do today*." The knowledge and ideas contributing to product development are mainly shared by the sales subsidiaries. According to product manager, "*we don't get that much (knowledge) from operational guys. Reverse knowledge is mainly from sales subsidiaries because they see the need for new products faster than operation people…The ideas coming from operations is mostly on how to optimize the certain process, and how to weld faster or produce something cheaper*."

Two examples of innovation projects (new product developments) in company Alpha are as follows: the development of the electrically operated fan unit and the development of the dual fuel burner for marine boilers. Company Alpha in collaboration with Brazilian and Danish subsidiaries has developed a product for a fan unit previously bought from sub-suppliers. The new product changed the system from

previously being pneumatically operated to being electrically operated and thereby giving a highly reliable system securing uptime for boilers, meaning much better performance, and lowest maintenance costs. The product already exists, but it is new to both the company and the market. In addition, the company has an on-going new product development project which is a new dual fuel burner for marine boilers in the range of approximately 1 MW to 45 MW. The project is based on the technology from Brazil (and to some extent from Australia). This new product is expected to be tested as a middle size prototype in 2017. The KO taking place between the company Alpha and the involved subsidiaries for the above-mentioned products is as follows. There is a group of people from each department in the company appointed as idea ambassadors to continuously acquire knowledge from subsidiaries. When they collect the ideas, they will be asked to write one page about the ideas, and if possible, they meet face to face. They know who is the right person to share the ideas with. A product manager is always in charge of holding those meetings and is the link between the customers, which means the sale and service organization, shipyards and ship owners, and technician and product development center at HQ. This is a structured process in this part, as stated by product and technology manager. Idea ambassadors gather all together twice a year to come up with the ideas that have come in. They will make a very first evaluation of the business case briefly. Afterwards, there is another small group consisting of salespeople and few technical people to investigate the feasibility of the ideas. The meetings are held to discuss the ideas and people can interact with each other to reflect on the ideas from subsidiaries.

In summary, KO from the acquisition of knowledge to utilization is organized as follows: one dedicated person from each department who is supposed to act as idea ambassador is responsible for idea acquisition. Then, the acquired ideas are evaluated by PCB (product center for boilers) idea generation board meetings, held twice a year, which is steered by PCB product manager. The prioritized ideas are discussed in product council meetings twice a year where all the relevant stakeholders for certain products areas gathered (10-15 people). One of the topics that they discuss through the meetings is the new ideas and what kind of new ideas have been prioritized. In product council meetings, the new ideas are shared with rest of the group. As explained above, the main inter-firm objects used by company Alpha to orchestrate knowledge for innovation are idea ambassadors, meetings, and excel sheets.

Based on the discussion above, the pattern of KO for innovation in company Alpha through the use of idea ambassadors is as follows: all the KO activities (acquisition, evaluation, dissemination, utilization) are in place, roles for knowledge-related activities are clearly allocated, there is a high level of interaction and communication between HQ and subsidiaries, subsidiaries with relevant knowledge are involved in KO process, and there is a collaborative relationship between HQ and subsidiaries.

Figure 4-1 shows the disposition of company Alpha in our conceptual framework. The filled quarters show how company Alpha can be roughly positioned in the conceptual framework.

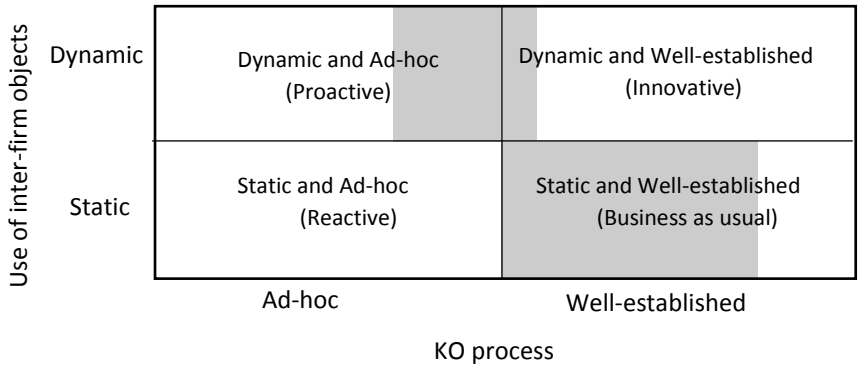


Figure 4-1 Disposition of company Alpha in the conceptual framework

As it can be seen from Figure 4-1, the disposition of company Alpha is not limited to one zone in the conceptual framework. Company Alpha is mainly placed in "static/well-established" zone (we refer to the companies adopting the static/well-established approach as *business as usual*) as the company mainly uses the inter-firm objects to either acquire knowledge and ideas in relation to the running projects or formulate subsidiaries' tasks or activities. Also, as discussed earlier, the company has developed a well-established KO process due to a long history of working with subsidiaries and standardization of operations. Our evidence shows that company Alpha has moved to some extent towards adopting the "dynamic/ad-hoc" approach to KO (we refer to the companies adopting the dynamic/ad-hoc approach to *proactive* companies), since the company has recognized the value of subsidiaries' knowledge as a key asset contributing to HQs' innovation projects. Moreover, for the new projects, the company puts great emphasis on the collaborative-oriented use of inter-firm object, that is dynamic use, to acquire knowledge from subsidiaries. However, the company does not have a well-established KO process to support the dynamic use of inter-firm objects, as the project is new.

In some situations which explained in the KO for innovation section, the company's approach to KO portrays the "dynamic/well-established" approach in our conceptual framework (we refer to the companies adopting the dynamic/well-established approach to *innovative* companies). In doing so, the company has experimented different approaches and started building a collaborative relationship with subsidiaries through the idea ambassadors and establishing a structured process for KO. More roles are allocated to KO activities, subsidiaries are more involved in the innovation projects, and HQ and subsidiaries are interacting more often.

4.2. CASE TWO: COMPANY BETA

Company Beta is a Danish company among the leading producers in Europe of feeding, feed milling and ventilation systems for livestock producers. They develop, produce, and offer advanced machinery and projects for feed production, pig farming, and grain and seed cleaning and grading. The HQ is located in Denmark. The company was founded in 1877 and has over 600 employees all around the world. The company has sales and manufacturing subsidiaries in different countries such as China, France, Poland, Russia, Spain, Belarus, Ukraine, and Australia. The strategic reasons behind the relocation of activities to subsidiaries are different. For example, the strategic reason behind the relocation to Poland is cost reduction, whereas the strategic reason behind the relocation to France is having access to knowledge and skilled people.

Company Beta uses different inter-firm objects e.g., documentation and drawings, face-to-face and Skype meetings, physical movement of people between HQ and subsidiaries, ERP system, and Idea bank to orchestrate knowledge within the network of HQ and subsidiaries.

Company Beta focuses on the modification and improvement of the standard products as well as the development of new products. Moreover, the company has two group of products; the first group is more like cash-cow products where the company makes a good profit on them. They are not unique and can be purchased from other sources. The second group is innovative products (know-how products) which are unique to the market and are not replicable. Due to their focus on both improvement and innovation projects, company Beta was considered being an interesting case for studying how KO is taking place between HQ and subsidiaries within improvement projects as well as within innovation projects.

The initial contact with company Beta was made by my colleague, Henrik, at Center for Industrial Production, Aalborg University. Then, I sent an introduction email to the director of feed milling division with more details about my PhD project and how the company can contribute to my study. The interviews were held between me and the director of feed milling division. I was afterward referred to the export and application manager, as he was involved in some projects with subsidiaries and was able to provide me with some details about the specific projects. Additionally, one interview was conducted with project sales manager in Australia. He gave me some insights into KO from the subsidiary point of view.

Similar to what I did for company Alpha, I tried to listen to all the stories about improvement and innovation projects and look for the details of each stage of knowledge orchestration taking place between HQ and subsidiaries within the projects as much as the interviewees remembered, and they wanted to talk about.

As the company had experienced few innovation projects in which knowledge from subsidiaries was involved, the identification of patterns for KO taking place for innovation was difficult. Therefore, we did not focus only on the innovation projects to investigate KO for innovation but also on the experiences of the interviewees with different improvement projects and the factors emphasized by them as barriers to or enabler of successful KO taking place between HQ and subsidiaries.

In what follows, the analyses of knowledge orchestration for improvement and knowledge orchestration for innovation based on the evidence from company Beta are presented.

4.2.1. KNOWLEDGE ORCHESTRATION FOR IMPROVEMENT

Knowledge acquisition in relation to improvement projects in company Beta is mainly based on the running projects and the possibilities for making some differences in the existing products. According to export and application manager, "*idea acquisition is conducted 70-80 % in connection with the projects that we already have a problem with them. We get the feedback to improve the running projects.*" The HQ is doing a lot of control and pushing in order to get the knowledge back from subsidiaries. Director of feed milling division states that "*we do a lot of pushing to get the knowledge out. If our representative in the subsidiaries doesn't do optimal work, chances of getting an order to make a new project would be low. We try to make the people understand that we are all in the same direction. When it comes to engineering, it is the hardest part. When we get plan engineering, it takes 4-5 years in order them[subsidiaries] to be independent and can perform more independent.*"

According to director of feed milling, the company is trying to make subsidiaries understand that they are "*in the same boat"*. However, knowledge sharing considers being dependent on the people's mentality and cultural background in subsidiaries. Director of feed milling states that "*depending on people [in subsidiaries], it can be also the voluntary share of knowledge. Some people are naturally curious and want to do more self-study and so on*." Although the company uses different inter-firm objects such as visits and meetings in relation to subsidiaries in a routine-based, this is mainly with an aim of control.

Knowledge evaluation is a formalized process in company Beta. People with practical knowledge and experience get together in a forum to make the best evaluation of the ideas. That is the forum for knowledge sharing as well as selecting the best ideas. Depending on the type of products, people from subsidiaries are also involved in the evaluation process. However, the level of subsidiaries' involvement, as well as the interaction among HQ and subsidiaries were considered being low. Besides, the interactions and communication through the meetings and forum is mostly aim at the evaluation process per se rather than at creating a two-way knowledge sharing and communication between HQ and subsidiaries.

The company does not have a well-defined strategy for KO but there is a lot of awareness about KO within the network, stated by the director of feed milling division. Cultural differences between HQ and subsidiaries is found as a barrier to the flow of knowledge from some subsidiaries since some subsidiaries see the knowledge as the power and are not willing to share that. The company has started to overcome this barrier by getting more aware of subsidiaries' culture and needs. According to director of feed milling division, "*it is important to us to understand the subsidiaries' requirements. Beta is moving to the place to take the knowledge back to Denmark. It is an ongoing process in company Beta. It is not easy to adapt to the [subsidiaries'] culture and traditions*."

Based on the evidence, the company has established a KO process due to the long history of working with subsidiaries and building the relationship with them. Based on the discussion above, we can conclude that the KO for improvement projects in company Beta is characterized by hierarchical knowledge sharing (from HQ to subsidiaries), a low level of knowledge flow from subsidiaries, a well-established process for KO due to the long relationship with subsidiaries, and lack of a well-defined strategy for KO.

4.2.2. KNOWLEDGE ORCHESTRATION FOR INNOVATION

The main goal of company Beta is to "*gather ideas [from subsidiaries] to develop new products which might not exist in the market and also [to gather] ideas for certain needs…. It is more to get good ideas*", stated by director of feed milling in company Beta.

The company is moving towards a company structure where the same manager for a function is responsible for different locations (subsidiaries). This facilitates the knowledge sharing as the interviewees mention that people with the same technical background interact easier. The company also started allocating more knowledge-based roles to managers in which knowledge sharing is their main responsibility and they spend the time to listen to the people and their ideas. This helps the HQ to create synergies between subsidiaries as well as between subsidiaries and HQ, according to director of feed milling division. The company puts lots of effort into the creation of an open environment where people can bring things to the table and feel that they are listened. This is possible by building the relationship and trust with subsidiaries by means of meetings and social activities.

Two examples of the innovation projects (new product developments) in company Beta are as follows: a special kind of conveying system for feed with an exceptional lifetime and a system for adding food additive for use in animal feed. The conveying system for feed was developed in collaboration with French subsidiary. The product has an exceptional lifetime compared to the ones produced by the competitors in the market. In addition, the company developed a system for adding food additive for use in animal feed in collaboration with Australian subsidiary. The previous system

worked well, but it was very expensive. Based on an idea from Australian subsidiary, a new system is developed which is cheaper, simpler, and smarter. The product is the best in Denmark, and it opened a new market.

The KO taking place between the company Beta and the involved subsidiaries for new product developments is as follows.

Knowledge acquisition for innovation projects is taking place by involving people who are expert and aware of the relevant knowledge and relevant people. Application and export manager states that "*I think the role of people is very clear and people know to whom contact. There is no one sitting and having this question where can I get this knowledge. People know where to go*." People who are assigned as knowledge seekers are continuously looking for new ideas and knowledge by interacting with people who are aware of new technologies and knowledge in relation to a new product. Knowledge acquisition process is to some extent a structured process through the people who visit the subsidiaries in order to gather their ideas and knowledge. Knowledge sharing and acquisition is not about sitting in the office and collecting the ideas systematically. Rather, it is based on building relationships. However, the company has a big challenge in relation to dissemination of knowledge at HQ.

According to application and export manager, lack of a systematic dissemination of the acquired and utilized knowledge at HQs impedes the formalized learning. In-house knowledge dissemination at HQ is found to be a big challenge for the company. It is largely based on person-to-person relationships. Application and export manager stated that "*constantly, we have new things made and new requirements from clients. So, I would say almost every project contains something new. I like to say that a god project contains 90% known stuff where we would not make too many mistakes and 10% new. 10% new is where we have to spend a lot of time and get that right when we have a new equipment, find new suppliers, it can be many different things. And then the challenge is once you have done this, and hopefully have been successful, how do we share that knowledge [with] the other people which have never done this before? That is the true challenge. Not just among group company, but even within our own organization sitting in the same location.*" He also states that "*when we have made something new, it is very hard for us to distribute that to everybody so that they know what is made of new things. If we make something, we need a system that people who want to know about that can go there and get it. For instance, if we make a liquid pump system and make it a standard product, if we change something in that product, then it is difficult to get everybody to know about that change and this is the way to do because it is smarter*." Sharing the new knowledge among other people is a big challenge in relation to KO for innovation projects. This makes new product development slow, as many things need to be repeated. In company Beta, learning usually takes place through person-to-person interactions and depends on the people who are sitting there being able to remember what they have done before to share with the rest of the network.

The knowledge and ideas contributing to product development are mainly shared by the sales subsidiaries. According to director of feed milling division, "*most innovative ideas [coming] from sales subsidiaries because they see the potential of improvements in particular markets*." He also explains that "*manufacturing [subsidiaries] are looking more at how to optimize and maybe combine different locations, purchase, and manufacturing agreements. While sales [subsidiaries] are more tending to be innovative*."

Having the ability to build on the knowledge and to identify the high-value knowledge at early stages of KO process is seen as the key to KO for innovation in company Beta.

What we found as the pattern of KO for innovation in company Beta is: the allocation of clear knowledge-related roles to certain people, a balanced authority between HQ and subsidiaries, a structured knowledge acquisition process, a structured evaluation process, lack of a structured in-house dissemination process, and frequent interaction between HQ and subsidiaries possessing relevant knowledge.

Figure 4-2 shows the disposition of company Beta in our conceptual framework. The filled quarters show how company Beta can be roughly positioned in the conceptual framework.

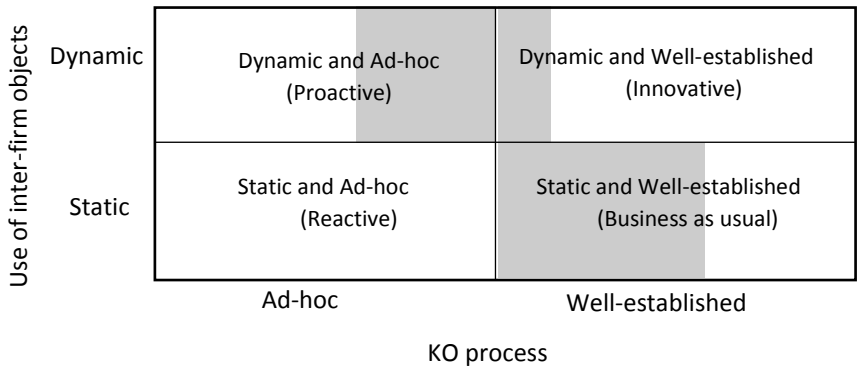


Figure 4-2 Disposition of company Beta in the conceptual framework

The disposition of company Beta in the conceptual framework is very similar to the disposition of company Alpha. Company Beta is considered being more proactive compared to company Alpha; meaning that they have recognized that they need to acquire knowledge from subsidiaries and utilize that to create new knowledge, and they have examined a number of practices in some parts of the company and with some subsidiaries. The company has been more interactive and open to subsidiaries. The HQ tends to involve subsidiaries in the projects and listen to them in order to

construct a trust relationship as well as encourage them to share their knowledge. Additionally, the HQ has become increasingly aware of subsidiaries' requirements.

Company Beta is mainly placed in "static/well-established" zone (*business as usual*) as the company uses the inter-firm objects to either acquire knowledge and ideas in relation to the running projects or control subsidiaries' tasks or activities. Also, as discussed earlier, the company has developed a well-established KO process due to a long history of working with subsidiaries and standardization of operations. Our evidence shows that company Beta has recognized the value of subsidiaries' knowledge as a key asset contributing to HQs' innovation projects and as such has moved towards adopting the "dynamic/ad-hoc" approach to KO (*proactive companies*). Moreover, for the new projects, the company puts great emphasis on the collaborative-oriented use of inter-firm object, that is dynamic use, to acquire knowledge from subsidiaries. However, the company does not have a well-established KO process to support the dynamic use of inter-firm objects.

In some situations which explained in the KO for innovation section, the company's approach to KO portrays the "dynamic/well-established" approach in our conceptual framework (*innovative companies*). In doing so, the company has allocated clear knowledge-related roles, created a balanced authority between HQ and subsidiaries, made KO more structured, and interacts more frequently with the subsidiaries possessing relevant knowledge.

4.3. CASE THREE: COMPANY GAMMA

Company Gamma is a German company and the world's leading provider of large-bore diesel engines and turbo-machinery for marine and stationary applications. The company designs two-stroke and four-stroke engines that are manufactured both by the company and by its licensees. The company was founded in 1758 and has over 15000 employees all over the world. Company Gamma located in Denmark is in charge of two-stroke engines and they have much more than 85 percent of market share. Two-stroke engines are manufactured by licensees, primarily in Asia such as Korea, Japan, and China. Company Gamma in Korea is very well-based. They have very experienced engineers who have been there for many years together with local people. The experienced engineers have a good network connection back to the R&D department and design department in Denmark. In China, company Gamma is relying mainly on the local people. Japanese are very self-running; they are trying to develop extra products on their own to be differentiated from Korean and Chinese. The HQ makes little support to Japan. The development stage in Korea and China is different. All the new products are usually built in Korea. The ones built in China are more mature but they have more production-related and quality-related issues. In Korea, they have more design-related issues. So, the need for support from the HQ is different. The company also has a group of sales subsidiaries all around the world.

Company Gamma uses documentation, phone calls, e-mails, meetings, LOD (List of difference), training, DUN (Design Update Note) as the inter-firm objects to orchestrate knowledge taking place between HQ and licensees.

The modification and improvement of the existing products and innovation of new products are both the focus of company Gamma. The company is aggressively attacking the strategy of R&D development and wants to make sure that none of the competitors would have the chance to put a foot in the door.

The initial contact with company Gamma was made by my co-supervisor. Based on an earlier conversation between my co-supervisor and the head of emission technology of company Gamma, it was found out that company Gamma is dealing with challenges in relation to reverse knowledge flow from the licensees. The head of emission technology showed great interest in my PhD project, and he had a supportive and contributory role in my PhD project. Even though company Gamma was a very interesting company with real-life challenges in relation to global knowledge sharing, their main focus was on reverse knowledge flow from licensees than on reverse knowledge flow from subsidiaries. However, due to the reasons that we discussed in section 2-2, the company was a very interesting case to study global knowledge orchestration. In addition to the individual interviews with the head of emission technology, three group interviews were also conducted with people who were knowledgeable about the KO taking place between HQ and licensees, and between HQ and sales subsidiaries. All the people who participated in the group interviews were invited by the head of emission technology. I also interviewed with the senior project manager who was highly involved in innovative projects in relation to NOx deduction. Interviewing with people from different departments in company Gamma helped me gain a very good understanding of global KO taking place within the company's network.

However, the identification of patterns for KO taking place for innovation was difficult as the company had experienced few innovation projects in which knowledge from licensees was involved. As such we did not focus only on the innovation projects to investigate KO for innovation but also on the experiences of the interviewees with different improvement projects and the factors emphasized by them as barriers to or enabler of successful KO taking place between HQ and licensees.

In what follows, the analyses of knowledge orchestration for improvement and knowledge orchestration for innovation based on the evidence from company Gamma are presented

4.3.1. KNOWLEDGE ORCHESTRATION FOR IMPROVEMENT

Knowledge acquisition for improvement projects in company Gamma is taking place based on the close contact and relationship between HQ and licensees (also between

HQ and sales subsidiaries), stated by the interviewees. The head of emission technology states that "*it [knowledge acquisition] is a rather random process. Almost all departments here [at the HQ] are at some level continuously in connection with our Licensees. Everybody from the entire company will travel to licensees, and licensees very often visit us in Copenhagen from different parts of technologies. But as far as I know, we don't have anybody, central person or central department or anything collecting this [knowledge]*." The knowledge from licensees and sales subsidiaries is mainly acquired through personal networking and visits. According to the head of emission technology, "*I think for salespeople it [knowledge sharing] is very relational. If they hear something for example, in my area of technology, they will contact me. If we have met, he will call me, and I go to R&D department and say if we can do something about this. I don't know any formalized way*."

During the last years, the company has been so busy with repetitive works and less attention has been given to knowledge sharing activities. "*The normal business will keep us away from developing collaboration with external partners to develop new products*", stated by the head of emission technology. One reason is lack of a clear strategy by which knowledge orchestration activities and roles are well defined such that it will be integrated into company's business process. People are mainly relying on the individual initiatives than the strategy to initiate a KO process. According to the head of emission technology, "*we need a strategy, we need to know where we are heading and why, but most managers here are extremely busy has been most of the time solving technical problems*." Also, the local people in subsidiaries are very busy with doing repetitive tasks such as design and guarantee- related issues and as such they do not have time for knowledge sharing with and giving feedbacks to the HQ. Additionally, since they are doing repetitive tasks which they are familiar with them very good, they do not ask questions contributing to new knowledge and learning. In general, knowledge sharing between HQ and licensees is a random process and very focused on the interpersonal relationship.

The close relationships between HQ and sales subsidiaries, which is formed due to the long history of working together, were considered playing the key role in the facilitation of knowledge flow between HQ and licensees in some part of the company. Sales and promotion department has their own subsidiaries called "international group of companies", and locally based sales persons assigned as local sales managers have extremely close relations with both shipyards and licensees. This facilitates the interaction and knowledge sharing between sales department and licensees as they know with whom to share knowledge. The knowledge which is shared by them mainly contributes to the design changes.

While company Gamma is putting a lot of effort to tap into licensees' high-value knowledge in a systematic way, they have not been successful in this regard. One of the key barriers is the lack of a formalized inter-firm object and a formalized process by which knowledge is acquired and used effectively. The head of emission technology states that "*internal knowledge sharing is very important and very high in*

strategic agenda, but I have not heard anybody talk about finding a tool or new process for external knowledge." One more barrier is the competition between licensees. If a licensee has a high-value idea, they are not always willing to share it with the HQ because the idea can be shared with other licensees due to the license agreement between HQ and licensees. According to the head of emission technology, "*we tried to get Japanese and Koreans to discuss how to develop a new product, but it is a very difficult situation. They contribute very little because they feel competitors.*"

LOD (List of Difference) is one of the main inter-firm objects used by the company in a structured way. However, the purpose of the use of LOD is not to get the licensees knowledge back, rather its focus is on by-product. It means if licensees would like to make any changes in product's design, they will send their request by means of LOD. Training is also one of the key inter-firm objects which is used to transfer knowledge between HQ and licensees. However, it is mainly used to inform licensees of the products and share product-related knowledge with them. It is very difficult to get some useful feedback contributing to improvement projects during training programs, and knowledge flow is mainly one way from HQ to licensees. Most of the feedbacks received by the HQ are general questions about already existing subjects.

Knowledge evaluation in company gamma is a formalized process in the way that roles are clear, and people know the involved persons in the evaluation process. There is a weekly technical meeting in which representative from all departments as well as sales and promotion department are involved in the evaluation of ideas. Knowledge dissemination is considered being very ad-hoc, depending on the persons who possess the acquired knowledge. If the people have time to share knowledge with the rest, they will do so; otherwise, knowledge is lost.

Based on the discussion above, the pattern of KO for improvement in company Gamma is as follows: inter-firm objects are mainly used by the HQ to transfer knowledge to licensees, insufficient flow of knowledge from licensees, lack of a clear strategy for KO, and the use of inter-firm objects with the purpose of acquiring pre-defined knowledge from licensees.

4.3.2. KNOWLEDGE ORCHESTRATION FOR INNOVATION

Knowledge sharing for innovation is very important to company Gamma because they cannot maintain the knowledge about the products if they do not get the knowledge from licensees, stated by the interviewees. If the HQ cannot follow knowledge in licensees and give the feedbacks to the designers at the HQ, then they cannot develop new engines. According to senior project manager, "*we have been doing this license business for more than 100 years in Japan and today, I think we have 20 licensees around the world. We have Japan, China, and so on. So, it is actually where we work well, and it is also working very well because of the feedbacks that we get from the licensees specially in R&D projects, of course also in engineering, but specially in*

R&D, some of them are very good at this and we can do lots of exchange of ideas and knowledge and so on and kind of having a synergy in development… They [licensees] also acknowledge that they get the knowledge from our people and together and with their knowledge and our knowledge we actually reach a better product."

Due to market trends and environmental changes, company Gamma has started a journey on developing the products that are not closely related to their core products and include some add-on technologies which are in line with new emission deduction rules. As such, the operations department has started working on reverse knowledge transfer from licensees. There are lots of knowledge exchange and feedbacks between R&D people and the HQ for NOx deduction projects, but it is mainly due to the long history of working with licensees and the relationship which is created over time.

The head of emission technology in company Gamma has initiated implementing a new strategy within his team in the operations department. The purpose is to develop a two-way knowledge sharing process with licensees. He states that having a KO strategy in place is more urgent than before as they are moving towards the development of new products with the focus on new clean technologies and as such the systematic flow of knowledge from licensees is critical.

Additionally, the company is trying to put an inter-firm in place by which they can encourage knowledge flow from subsidiaries. According to the head of emission technology, "*if we want to use the knowledge which is developed in licensees, I think that this once in a while meeting is not sufficient (in R&D context)…. I think in order to use the ideas for the development of new products, our present system [inter-firm object] is not sufficient*." They are going to expand the current extranet through which they can have access to high-level knowledge. Also, the operations department is focusing more on the people in their department who have a good relationship with the rest in order to have access to more knowledge resources.

Based on the evidence from the company Gamma, a well-established relationship between HQ and licensees can provide the basis for knowledge flow from the licensees. Also, a clear strategy by which the importance of knowledge sharing and the involvement of people in that is can help the company to incorporate knowledge sharing for product innovation into the business model.

Figure 4-3 shows the disposition of company Gamma in our conceptual framework. The filled quarters show how company Gamma can be roughly positioned in the conceptual framework.

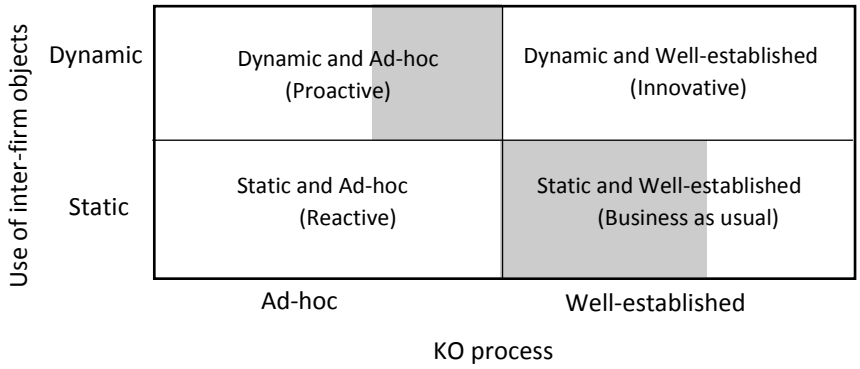


Figure 4-3 Disposition of company Gamma in the conceptual framework

As Figure 4-3 illustrates, KO in company Gamma can fit into static/well-established and dynamic/ad-hoc approaches in the conceptual framework. Company Gamma is largely relying on the static/well-established approach to orchestrate knowledge globally. The main focus of the company is the operational capabilities and repetitive tasks and activities. As discussed earlier, the HQ uses different inter-firm objects to specify the tasks and activities and share them with licensees and inform them of new changes. While some inter-firm objects are also used to get the knowledge back from licensees, the knowledge received is mainly in relation to cost deduction concerns. However, due to the emergence of new emission reduction technologies, the company is concerned with developing new products addressing final users' requirements. Therefore, the company has become more proactive. However, the HQ is mainly relying on the long history of working with licensees and inter-personal relationships to orchestrate knowledge between the HQ and licensees than on a well-established KO process. As discussed above, the operations department, initiated the implementation of a strategy for KO by which they aim at two-way knowledge sharing between HQ and licensees. According to the head of emission technology, they have a long way to go.

4.4. CASE FOUR: COMPANY DELTA

Company Delta is a Danish global supplier of green, safe, and reliable control solutions for decentralized power production, marine and offshore, and wind turbines. The company was founded in 1933 and has over 600 employees around the world. The HQ is located in Denmark and has sales and service subsidiaries all around the world e.g., China, India, USA, Africa, and more.

Company Delta uses different inter-firm objects such as documentation, meetings, training, visiting, Intranet, and IT-based platforms e.g., Lync, Yammer, AHA, JIRA, and Sage to orchestrate knowledge within its global network.

Company Delta engages largely in an ongoing improvement of the products, which is mainly global customization of the existing products. Yet, innovative projects are also going on. Most of the products are "customized to order" which means different parts of a product are produced and then when the order is placed, they will be assembled and delivered as one order. Usually, there is a high flexibility in the products both in the hardware and the software.

My attention was drawn to company Delta by my husband. He was working in the R&D section as a software designer, and he told me that the company fits into my case selection criteria. I was referred to the vice president business support who was involved in knowledge sharing with subsidiaries. He was very open and very supportive of my PhD project, not only the by interviews but also by informal conversation, e-mails, and sharing of documents. The first interview with company Alpha was a group interview arranged by the vice president business support. My main supervisor accompanied me to my first interview. I also interviewed with the platform manager who was directly involved in the implementation of a new inter-firm object in between HQ and subsidiaries.

One of the key challenges in the investigation of KO in company Delta was the diversity of the inter-firm objects used by the HQ, specially, IT-based systems. To have a good understanding of the way that inter-firm objects are used by company Delta, we narrowed down our focus to the exploration of some specific inter-firm objects which were mainly used in between the HQ and subsidiaries.

As the company had experienced few innovation projects in which knowledge from subsidiaries was involved, the identification of patterns for KO taking place for innovation was difficult. Therefore, we did not focus only on the innovation projects to investigate KO for innovation but also on the experiences of the interviewees with different improvement projects and the factors emphasized by them as barriers to or enabler of successful KO taking place between HQ and subsidiaries.

In what follows, the analyses of knowledge orchestration for improvement and knowledge orchestration for innovation based on the evidence from company Delta are presented.

4.4.1. KNOWLEDGE ORCHESTRATION FOR IMPROVEMENT

Company Delta has given a lot of attention to experimentation of different kinds of inter-firm objects, specifically different IT-based systems. However, the main effort of the company has been on the improvement of the knowledge flow from HQ to

subsidiaries than on the improvement of the reverse knowledge flow from subsidiaries to HQ. Lack of a clear process for KO, lack of subsidiaries' involvement in knowledge sharing, control over subsidiaries' activities, and cultural differences were found as barriers to knowledge flow from subsidiaries to the HQ. The followings are the illustrative quotes given by the interviewees:

> **Lack of clear process,** "*I don't think we have good procedures that we have to follow to ensure the quality of the feedbacks we get and the knowledge sharing that we have between HQ and subsidiaries. We don't have these procedures right.*" (Platform manager)

> **Control,** *"We are not going directly [to subsidiaries]to say you should do just what we say you should do. We say you should do as you should do local, but you have to do in a structured way that we want to control*." (Vice president key account and business support)

> **Cultural difference**s, "*The other problem can be the lack of knowledge sharing culture in some countries. For instance, knowledge is power in China and it is very difficult to share their knowledge with someone else. It is very hard to involve them in knowledge sharing where the information is open for the other parts and everyone can see and have access to their knowledge*." (Vice president key account and business support)

> **Lack of subsidiaries' involvemen**t, "*There is no knowledge flow from subsidiaries to the HQ. Company Delta really would like to have input from subsidiaries, but the problem is that [the HQ] does not involve the subsidiaries that much in knowledge sharing*." (Vice president key account and business support)

Knowledge acquisition process is mainly based on the meetings and visits from the subsidiaries and takes place randomly. The rest of the inter-firm objects are mainly used for making the subsidiaries informed of the products developed by the HQ, installation, quality issues, and training. The company has some ongoing feedback sent by Chinese subsidiaries through the repair system which is used for further improvement. However, this is limited to knowledge sharing between the HQ and China and is not taking place through a well-defined process.

Knowledge flow between HQ and subsidiaries and dissemination of knowledge at HQ is very one-to-one and it usually ends up being an email sent to a specific product manager at HQ. He can keep it for his own list of ideas for his products, but the problem is that then it becomes very personal and dependent on a specific person to decide if this is shared with other product managers or other users. According to the platform manager, "*with the set -up we have today, [we] might have a lot of ideas collected in different emails for a product manager, and then if either he is disappeared, or he has left the company, I don't know if somebody is allowed to open*

this mailbox. I don't know the policies here but there is a high risk that we will lose a lot of knowledge for sure…. I think no matter what system or tool we introduce in the company; if you don't make a right process around the tool, you have nothing." So, knowledge sharing and dissemination happen in company Delta, and ideas are taken in from subsidiaries, but it is very unstructured. A big issue here is that the knowledge acquired and created can be easily lost.

The evaluation process is also very ad-hoc, depending on the product manager who receives the idea from subsidiaries. According to the platform manager, "*he (product manager) has his own favorite stakeholders if he has planned a release of a product, he would select a number of the ideas that has been given and then he will ask maybe 5-10 colleagues that could be also a few people from our subsidiaries, some supporter, salespersons or what it is. They will in a quite small forum discuss the features and prioritize them and decide how this should be solved and he will just go ahead. So, I think some information will be shared also with subsidiaries but again it is very dependent on who your contact is at HQ and whom he will get back to."*

Based on the discussion above, the pattern of KO for improvement in company Delta is as follows: knowledge flow is mainly from HQ to subsidiaries, inter-firm objects are mainly used as control means, and KO activities are taking place based on the interpersonal relationship between HQ and subsidiaries.

4.4.2. KNOWLEDGE ORCHESTRATION FOR INNOVATION

As a global company, company Delta aims at developing a communicative and two-way knowledge flow between HQ and subsidiaries in order to create better outcomes for the global customers. In line with this, the company started the global implementation and experimentation of an inter-firm object called AHA. This is a communicative inter-firm object in which the subsidiaries can come up with new ideas and discuss the ideas with each other and with the HQ. This allows them to interact, to negotiate, and to get informed of the evaluated ideas. By voting to the ideas, the subsidiaries can be involved in the evaluation of the ideas and adaptation of it by the HQ. Nevertheless, there is not a very structured process for idea evaluation by the HQ and there is still lots of discussions going on in relation to the relevant people, the process, and distribution of the ideas. A few product managers are allocated to manage the flow of knowledge and discussions on the AHA. This is with an aim of facilitating the knowledge flow rather than controlling the flow of knowledge. However, there still is a lot of experimentation going on in order to establish a process for the use of AHA. According to the platform manager, "*we have the tool (AHA) to be used interactive but we lack the process.*"

The availability, visibility, and accessibility of the knowledge from both parts (HQ and subsidiaries) have been improved through the use of AHA. According to the platform manager, knowledge sharing between HQ and subsidiaries has shifted away

from being person-to-person (subsidiaries and product managers) towards being a collaborative knowledge sharing through AHA.

The company is also moving towards adopting a more global culture in which there is an awareness about different cultures. An understanding of cultural differences helps the company to have more interaction and dialogue with subsidiaries. According to the vice president key account and business support, "*we try to say that company Delta does not have one culture and we have many cultures and we need to be aware of that. Having this in the mind, make us open to do dialogue*." In addition, the HQ has the opportunity to share the new product releases globally. The findings show that trust relationship between HQ and subsidiaries and a shared understanding among them provide the company with better knowledge sharing and communication.

Company Delta also puts the focus on the development of a KO strategy with the focus on two-way communication. The strategy also aims to pay attention to the way that inter-firm objects are used rather than to the diversity of them. According to the vice president key account and business support, "*in our next strategy, we will focus more on communication. By having this, we also need to be more precise about how we want to collect the inputs, where can we seek the information. That is why we need to narrow down the official tools.*"

One of the key aspects of KO for company Delta emphasized by the vice president key account and business support is to make KO a global and structured process. He believes that in doing so, they need a global strategy in which some people are allocated to make KO global in the whole network, and all the frames for tasks, roles, tools, are clearly identified. Understanding of the different cultures and setting a global mindset for the whole network based on the differences are the key steps to be considered in making two-way knowledge flow in company Delta.

Figure 4-4 shows the disposition of company Delta in our conceptual framework. The filled quarters show how company Delta can be roughly positioned in the conceptual framework.

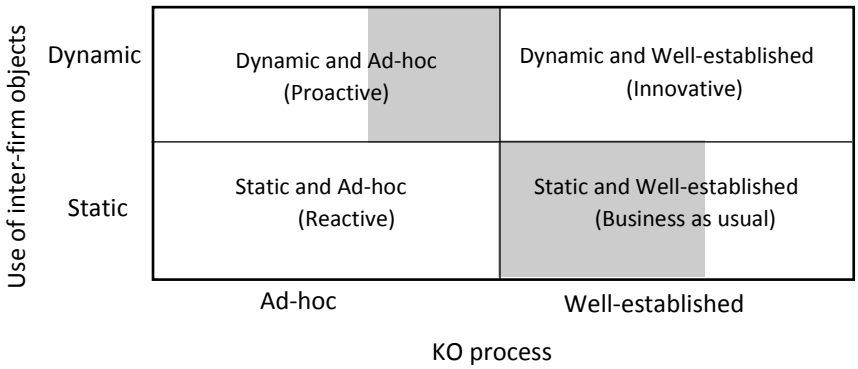


Figure 4-4 Disposition of company Delta in the conceptual framework

The disposition of company Delta in the conceptual framework is very similar to the disposition of company Gamma. As Figure 4-4 illustrates, KO in company Delta can fit into static/well-established and dynamic/Ad-hoc approaches in the conceptual framework. Company Delta is largely relying on the static/well-established approach to orchestrate knowledge globally. The main focus of the company is on standardizing the knowledge they are working with and creating efficient KO processes. The evidence shows that the company uses inter-firm objects to specify the tasks and activities and share them with subsidiaries, to inform them of new changes, to distribute the reports, and to assure that subsidiaries' activities are in line with the HQ's expectations. Due to a long history of working with subsidiaries and long-term relationship with them, the KO process is well-established.

As discussed earlier in KO for innovation, company Delta aims at developing a communicative and two-way knowledge flow between HQ and subsidiaries in order to create better outcomes for the global customers. As such, the company has become more proactive and started the global implementation and experimentation of an inter-firm object called AHA. However, the HQ lacks a structured KO process to support the use of AHA.

4.5. CASE FIVE: COMPANY EPSILON

Company Epsilon is a Finnish company, a global leader in advanced technologies and complete lifecycle solutions for the marine and energy markets. The company was founded in 1834 and has over 18000 employees around the world. Subsidiaries are located all over the world, mainly in Asian and European countries. The focus of the company is on marine and power plant industries. Internally, they are called marine solutions and energy solutions. The capabilities of the company are located in a number of factories around the world, and they have also their global sales and service network. The company has two parts of the organization: the factories where there are

product experts, and the sales network where a lot of account managers are responsible for around 20 customers. Company Epsilon uses documentation and drawings, excel sheets, e-mail, training, CRM, ERP, to orchestrate the knowledge within HQ and subsidiaries.

Company Epsilon focuses mainly on an ongoing improvement, modification, and global customization of the existing products, and partly on new product development. According to global sales director, "*It is not definitely the radical innovation in our company, but some kinds of development*." The base of the products is very standard, but the company adds a lot of features to the product, and also some of these features have to be developed. If there is a product development project, the company has to make it from A to Z. The company does not have any target of having many innovative products. The most innovative developments are conducted in relation to electrical systems than in relation to the pump itself.

The initial contact with company Epsilon was made by my co-supervisor. He connected me with the global sales director, who was highly involved in knowledge sharing with globally distributed sales subsidiaries. His focus is on the marine business and the products that are suitable for special vessel types.

As the global sales director had initiated the implementation of a knowledge transfer portal, he was exploring the issues, barriers, and challenges in relation to knowledge sharing between HQ and globally distributed subsidiaries. Therefore, he was very well informed of knowledge sharing taking place between HQ and subsidiaries and was very open and supportive. He shared his training experiences in the subsidiaries, the information which was collected in relation to the pilot implementation of knowledge transfer portal, and videos about the new products. By implementation of a new portal, he would like to have an open system where the sales network put the ideas into that. The main purpose of the implementation of a new knowledge transfer portal was to encourage two-way knowledge sharing between HQ and subsidiaries.

I was further referred to a project manager who was involved in a product development project in collaboration with the subsidiary in China. He provided me with some good information about knowledge orchestration taking place between the HQ and the subsidiary in China and respective challenges.

In what follows, the analyses of knowledge orchestration for improvement and knowledge orchestration for innovation based on the evidence from company Epsilon are presented.

4.5.1. KNOWLEDGE ORCHESTRATION FOR IMPROVEMENT

Company Epsilon uses training as the key inter-firm object within sales network. It is very structured in the way it is planned and held. All the documentation, videos are

prepared and shared with subsidiaries during the program. The global sales director is traveling to different subsidiaries and training them in a very structured way. However, knowledge is shared quite one-way from the HQ to subsidiaries. The training program is mainly used to inform subsidiaries of the instruction manual, product guide, installation, and contact persons. According to global sales director, "*we spend a lot of time communicating because we do not do it in a structured way. We communicate a lot to avoid mistakes, to collect information or sharing information. If we did it in a structured way, we could be more effective and reduce the time used."* He also states that "*the knowledge sharing we do today is 90% one-way, from HQ to subsidiaries. In the future, we would like to have a knowledge sharing culture where everyone is contributing to a shared community. The shared community should be a place where every employee feels that they can contribute and benefit even more (1 + 1 becomes 3)."*

Knowledge acquisition from subsidiaries is based on the salespeople traveling around the world and getting feedback from the customers. The improvements are to some extent based on the customer's experiences and complaints. we have no process to collect the information from the market to R&D. Global sales director states that "*I asked our R&D manager some time ago what do we base our products when we develop a new product? He laughed and said that the sales director's last customer visit*." It is not like that they gather knowledge from different places and put it into an inter-firm object and then extract three most important ones and develop according to that. It is a random process. According to global sales director, "*a lot of my job is to go and do training at the network offices. I go there and train them for one or two days with all local sales guys. I am giving them a lot of information, but also getting them to think about ideas and feedbacks [from customers] and bringing it back to the offices. But, not really in a systematic or structured way*."

One of the key barriers to knowledge flow from subsidiaries is lack of subsidiaries technical knowledge in relation to the products, stated by global sales director in company Epsilon. The global sales director believes that if they can increase subsidiaries' knowledge about their products and technical issues, subsidiaries can better ask questions from customers and receive feedbacks on products and share them with the HQ. Keeping up the relations with subsidiaries, especially the ones with relevant knowledge and markets, is a key factor in knowledge acquisition from sales subsidiaries.

Knowledge evaluation is an unstructured process. When people receive feedback and knowledge from subsidiaries, they will report them, but it will be evaluated quite randomly. Global sales director states that "*when I got a feedback, I go to this tool and type in it and then the product responsible in R&D department would monitor this all the time. But he would not be continuously upgrading the product, but maybe every 6 months we will evaluate the list and then do some upgrade. It is a random process and not systematic*"

Knowledge dissemination is considered being very personal, meaning that it depends very much on the persons who receive the idea from the subsidiaries. Knowledge can be lost because of either the lack or poor dissemination. However, due to a long history of working with each other, people who disseminate knowledge know the right persons in the company to share the acquired knowledge with.

The company lacks a clear strategy for KO. They have a very ad-hoc setup; depending on the ongoing project, they will decide on roles, resources, and so on. Knowledge sharing and communication are very much dependent on the project that the company is engaged with.

KO for improvement in company Epsilon can be framed as follows: one-way knowledge flow from HQ to subsidiaries, a certain level of control over subsidiaries, lack of a clear strategy for KO, and problematic knowledge sharing and learning due to subsidiaries' relevant technical knowledge.

4.5.2. KNOWLEDGE ORCHESTRATION FOR INNOVATION

While company Epsilon uses different inter-firm object to acquire radical ideas and knowledge from subsidiaries, knowledge from subsidiaries is acquired quite randomly. On the sales network part, they are working on the training program as a strong inter-firm object in order to use that not only to train the sales subsidiaries and inform them of the products but also to receive feedbacks from them. One of the important aspects of using training program to initiate two-way knowledge flow with subsidiaries is the opportunities to build a trust relationship with subsidiaries through the training program.

Allocation of knowledge-related roles like training people who are only responsible for training and communicating with subsidiaries is also a key step in developing the KO process, stated by global sales director. The investigation of the KO taking place in innovation projects showed that involving the subsidiaries possessing the relevant knowledge, and building a shared understanding enable both HQ and subsidiaries to share their knowledge, to negotiate it, and to avoid misinterpretation of it.

Here again, like KO for improvement, knowledge dissemination is very personal and there is no clear process for how to do so. It depends very much on the persons to remember to put it into the excel sheets.

The HQ tries to support the subsidiaries and not to be controlling and be focused on a sender-receiver relationship in relation to subsidiaries. In doing so, cultural understanding is a key, stated by the global sales director. According to global sales director, "*I would like to support the subsidiaries in the countries they are located and adjusting to their needs in their countries. That is also why culture is very important to us because we need to know how things are working in a specific country in order*

to support them." Cultural understanding also plays a key role in building the relationship with subsidiaries. According to project manager, "*when you are dealing with China, it is very important that you spend a lot of time with Chinese people because relations between people in China are very important. In Europe, you can have more emails but in China, you need to be face- to- face. This is part of the culture*."

Knowledge evaluation is systematic for the knowledge which is used for product development; every product family has its own excel sheet, the ideas are put into there, and then the product committee evaluate the ideas. If the idea is approved, this will be entering into the stage- gate model.

KO for innovation in company Epsilon can be characterized by a climate of trust, clear knowledge-related roles, the cultural understanding between HQ and subsidiaries, a shared understanding, and involving subsidiaries with relevant knowledge.

Figure 4-5 shows the disposition of company Epsilon in our conceptual framework. The filled quarters indicate how company Epsilon can be roughly positioned in the conceptual framework.

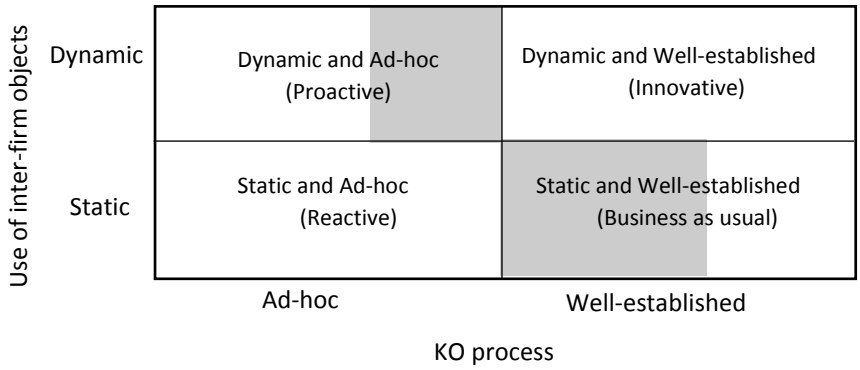


Figure 4-5 Disposition of company Epsilon in the conceptual framework

As Figure 4-5 depicts, KO in company Epsilon can fit into static/well-established and dynamic/ad-hoc approaches in the conceptual framework. Company Epsilon is largely relying on the static/well-established approach to orchestrate knowledge globally. The main focus of the company is on standardizing the knowledge they are working with and creating efficient KO processes. The evidence shows that the company uses inter-firm objects to train subsidiaries and inform them of new changes. Due to a long history of working with subsidiaries and long-term relationship with them, the KO process is well-established.

As discussed earlier in KO for innovation section, by creating a climate of trust, clear knowledge-related roles, the cultural understanding between HQ and subsidiaries, a shared understanding, and involving subsidiaries with relevant knowledge in KO activities, company Epsilon is moving towards being proactive.

CHAPTER 5. SUMMARY OF THE EMPIRICAL STUDIES

This chapter summarizes the findings from the four papers enclosed in this thesis. Paper 1 focuses on how inter-firm objects are used by companies in order to transfer knowledge between HQ and subsidiaries. This paper proposes that companies use inter-firm objects either as control means to control the flow of knowledge and subsidiaries' activities or as means to build a collaborative relationship between HQ and subsidiaries through which knowledge is shared bilateral. The former is referred to as the static use and the latter is referred to as the dynamic use of inter-firm objects. The results of this paper also propose that there is an association between the different use of inter-firm objects and the respective innovation performance created by HQs; The static use of inter-firm objects is related to the lower degrees of innovation performances whereas the dynamic use is related to higher degrees of innovation performance. The results of paper 1 are particularly useful in providing support to the main assumption underlying this PhD study saying that in order for companies to make better use of knowledge from subsidiaries for innovation, they have to orchestrate knowledge from globally distributed subsidiaries in a particular way.

The results of paper 2 add to the findings of paper 1 by proposing the significant dimensions of the static use and the dynamic use of inter-firm objects. In this paper, rather than only examining the different use of inter-firm objects in the case companies, we have made a step forward in the investigation of KO taking place between HQ and subsidiaries by adding the KO process dimension to the use of inter-firm objects. Based on that, a conceptual framework is developed in this paper. By applying the framework to the case companies, four approaches to KO are introduced: static use/ad-hoc process, static use/well-established process, dynamic use/ad-hoc process, and dynamic use/well-established process. This paper provides initial insights into the relationship between different approaches to KO and different degrees of innovation performance achieved by companies.

Paper 1 and paper 2 provide a strong support for the relevance of the dynamic use as a key to facilitate collaboration and two-way knowledge sharing between HQ and subsidiaries. As such, paper 3 puts the focus on the collaborative-oriented view of the use of inter-firm objects and investigates how the use of inter-firm objects within different KO processes affect collaboration between HQ and distributed subsidiaries. The findings of this paper add to the findings of paper 2 by investigating and comparing the characteristics of the companies adopting different approaches to KO. The findings of this paper expand our understandings of KO taking place between HQ and subsidiaries within each approach introduced earlier. Consistent with paper 2, the results of this paper support the relationship between different approaches to KO and different degrees of innovation performance.

The findings of paper 2 and 3 propose that we are expecting to see higher degrees of innovation performance in the fourth quadrant of the conceptual framework (dynamic/well-established). Paper 4 expands the findings of the prior papers by exploring how companies organize KO around the dynamic/well-established approach. Paper 4 builds upon the conceptual framework developed earlier in paper 2 and extends our earlier works by focusing on the dynamic use/well-established process approach which underlies KO for innovation. The findings of this paper contribute to the understanding of how MNCs orchestrate knowledge flow from globally distributed subsidiaries for innovation, which is the final objective of this PhD study.

The rest of this chapter will briefly summarize the findings of the four papers. The full papers are found in part 2 of this thesis.

Paper 1

From Static to Dynamic Use of Inter-Firm Objects and Its Impact on Innovation Performance

Given that subsidiaries role has become increasingly important for MNCs' competitive advantages, effective use of different inter-firm objects to exploit knowledge from globally distributed subsidiaries is becoming a key capability for MNCs (Lagerström & Andersson, 2003). However, existing studies tend to consider inter-firm objects as control means to control the flow of knowledge and subsidiaries' activities (Doz & Prahalad, 1991; Nobel & Birkinshaw, 1998). Due to changing nature of global competitions and a shift from the traditional views of MNCs to a network-based view of them, companies need to reconsider the use of inter-firm objects. Therefore, in this paper we put our focus on the ways that inter-firm objects are used by the companies and the respective impact on innovation performance. The question addressed in this paper is therefore: ***What are the characteristics of the different use (static vs. dynamic) of inter-firm objects?***

To address this question, we distinguished between two key approaches to the use of inter-firm objects; a control-oriented approach and a collaborative approach. A control-oriented approach to the use of inter-firm objects is mainly related to the traditional views of MNCs where headquarter is a "centralized hub" (Bartlett, 1986), and the flow of knowledge is controlled by HQs. We referred to a control-oriented view of the use of inter-firm objects as *the static use*. On the other hand, drawing on boundary object perspective (Star & Griesemer, 1989; Carlile, 2002), a collaborative-oriented approach was proposed, in which the collaboration and interaction among involved actors in knowledge sharing as well as the negotiation of knowledge are largely emphasized. Through a collaborative-oriented approach, inter-firm objects are used to provide a basis for collaboration and two-way knowledge flow between HQ and subsidiaries. We referred to it as the dynamic use.

The key purpose of this paper was to explore different use of inter-firm objects by the case companies. This paper has created an argument about the relevance of how companies use inter-firm objects in relation to subsidiaries and how boundary object perspective, because of its emphasis on the collaboration, teaches us to create circumstances for the collaboration and two-way knowledge flow between HQs and subsidiaries.

The finding of this paper demonstrated that inter-firm objects are mainly used by companies as control means by which knowledge is largely developed and codified by HQs and transferred to subsidiaries. This way of the use of inter-firm objects does not necessarily provide companies with diverse and valuable knowledge of subsidiaries. Rather, it provides them with some information and data from subsidiaries which is mainly used to control subsidiaries' activities and performance. Here, there is no dialogue between HQ and subsidiaries, and the interactions and negotiations between HQ and subsidiaries take place randomly.

Our findings also showed that in some situations, some evidence of the dynamic use is also revealed. Moreover, in some situations in the case companies, inter-firm objects are used such that being consistent with some key aspects emphasized by boundary object perspective; i.e., being interactive, supporting a collaborative relationship and a shared understanding between HQ and subsidiaries. In addition, we explored that different use of inter-firm objects is associated with different degrees of innovation performance. Based on this, two propositions were proposed in this paper as follows:

Proposition 1: The static use of inter-firm objects is associated with lower degrees of innovation performance i.e., improvement and modification of the existing products.

Proposition2: The dynamic use of inter-firm objects is associated with higher degrees of innovation performance i.e., new product development.

This paper highlights the need for MNCs to use inter-firm objects in a certain way, that is, the dynamic way, to build a collaborative relationship between HQ and subsidiaries.

These propositions provided a basis for further research on the investigation of the relationship between the use of inter-firm objects and different degrees of innovation performance.

Paper 2

Knowledge Transfer Objects and Innovation Performance

The main aim of this paper is to ***explore significant dimensions of the static and the dynamic use of inter-firm objects and the respective impact on innovation***

performance. Moreover, building up the findings in paper 1, this paper put the focus mainly on how taking the dynamic view of the use of inter-firm objects enables MNCs to achieve the higher degrees of innovation performance.

A growing demand for cross-boundary collaboration among different units operating in a globally distributed network to achieve successful innovation is largely recognized by different studies (Arias & Fischer, 2000; Huang & Huang, 2013). According to (Inkpen & Tsang, 2005), through the collaboration, companies can learn jointly and develop new knowledge and capabilities within a globally distributed network.

In this study, we have proposed that through the dynamic use of inter-firm objects companies can build collaboration between HQ and subsidiaries and as such encourage two-way knowledge flow among them. We also discussed that adoption of subsidiaries to the use of inter-firm objects is the main dimension of the dynamic use by which subsidiaries can easily navigate inter-firm objects and access the relevant knowledge and people.

Using inter-firm objects in a dynamic way provides the involved actors with the opportunities to interact with each other and negotiate, and communicate their knowledge such that a shared understanding and joint learning are provided.

Applying the conceptual framework (Figure 3-2) to the case companies, a taxonomy of different approaches to KO was discussed in this paper. Four different approaches to KO are: static and ad-hoc, static and well-established, dynamic and ad-hoc, and dynamic and well-established. The evidence from the case companies showed that the dominant approach adopted by them is the static and well-established approach. In the static and well-established approach, the flow of knowledge is mainly from HQ to subsidiaries, and it is controlled by HQs. The main focus of these companies is the improvement of the existing knowledge rather than the creation of new knowledge. However, due to a long history of working with subsidiaries, these companies have been able to create a well-established KO process.

Few patterns of the dynamic and ad-hoc approach also emerged from some case companies. These companies have recognized that they need to access knowledge from globally distributed subsidiaries in order to innovate, but they lack a well-established process for that purpose. Nevertheless, they have started examining a number of practices.

The anecdotal evidence from the case companies suggested that orchestration of knowledge across distributed units and transformation of this into innovation performance can be achieved through the dynamic use of inter-firm objects which is supported by a well-established KO process.

This paper suggested that by dynamic use (as opposed to the static use) of inter-firm objects companies would be able to create the circumstances to systematically acquire

knowledge from subsidiaries and raise its potential for innovation through the global operation network.

This study provides initial insights into the relationship between different approaches to KO and different degrees of innovation performance achieved by companies.

Paper 3

Orchestration of Globally Distributed Knowledge within MNC Network: A Collaborative-oriented View

Drawing on our earlier studies, this paper aims to investigate **how the use of inter-firm objects within different KO processes affect collaboration between HQ and distributed subsidiaries.** For that purpose, we expanded on the characteristics of different KO approaches proposed by paper 2. Moreover, we aimed at examining the ways that companies orchestrate knowledge in different approaches and the outcomes achieved based on innovation performance.

Tapping into the diverse and heterogeneous knowledge of globally distributed subsidiaries and effective use of that is a key to innovation performance and development of new products and processes (Cohen & Levinthal, 1990; Gupta & Govindarajan, 2000; Teece, 2007). However, the orchestration of knowledge flow across distributed units and transformation of this into innovation capabilities has become a key competence for companies (Sawhney & Prandelli, 2000).

The main purpose of this study was to identify how different use of inter-firm objects within different KO processes affects collaboration among HQ and subsidiaries. The findings of this paper showed that companies cannot achieve higher degrees of innovation performance i.e., new products, unless they orchestrate knowledge in a particular way, that is, the adaption of the dynamic use/well-established KO process approach.

In this paper, the outcomes achieved by HQs through the utilization of the acquired knowledge from subsidiaries are investigated by focusing on innovation performance. Particularly, we put the focus on new product as an indicator of innovation performance (Tsai, 2001; Zhang, et al., 2009). We asked the companies whether they use knowledge from subsidiaries to improve, significantly improve, or innovate a new product. This helped us better understand and distinguish the outcomes achieved by different approaches to KO.

A collaborative relationship between HQs and subsidiaries, two-way knowledge flow, a high level of interaction and negotiation, a balanced authority between HQs and subsidiaries, and a complete and familiar KO process were found to be the key characteristics of the companies adopting the dynamic and well-established approach.

Additionally, our findings implied that selection of different KO approaches by companies can be influenced by headquarter-subsidiaries relationship, type of products, knowledge relevance between headquarter and subsidiaries, and level of headquarters' control over knowledge flow and subsidiaries' operation. This study also suggested that different approaches to KO applied by companies can result in different degrees of innovation performance. On the basis of that, four propositions have been suggested which need to be empirically tested in future studies.

Paper 4

Orchestration of Knowledge Flow from Globally Distributed Subsidiaries for Innovation: A multiple Case-study

In many MNCs, innovative capabilities have come to prevail over operational efficiencies (Doz, 2016). In line with this trend, recent research proposes that subsidiaries play an increasingly important role as contributors to MNCs' innovation (Phene & Almeida, 2008). Given that subsidiaries' knowledge plays a key role in the innovation and competitiveness of MNCs (Rabbiosi, 2011), an increasing number of studies have examined how companies can benefit from such knowledge (Ambos, et al., 2006; Gupta & Govindarajan, 2000). However, our understanding of how knowledge is orchestrated, that is, acquired from globally distributed subsidiaries and is utilized effectively by headquarters, to create innovation is still unclear (Phene & Almeida, 2008; Piscitello & Rabbiosi, 2004; Lee, et al., 2008).

Therefore, the question addressed in this paper is: **how do MNCs orchestrate knowledge flow from globally distributed subsidiaries for innovation?** To answer this, we built upon the conceptual framework developed earlier and extended our earlier work by focusing on the dynamic use and well-established process approach, which underlies KO for innovation.

Our findings identified three key attributes for a well-established process — completeness, familiarity, and a clear strategy— and the key attribute for the dynamic use of inter-firm object i.e., the dynamism. In addition, we identified the key components of each attribute by digging into the empirical and anecdotal evidence from the case companies.

The findings suggested that in the KO for innovation, the KO process is a complete and familiar process, that is, knowledge acquisition, evaluation, dissemination, and utilization are in place, knowledge-related roles are allocated, people with relevant knowledge are involved, a cultural understanding is provided, and a clear strategy supporting continuous development and global KO with the focus on learning is established. In addition, through each step of the KO process, inter-firm objects need to be used in a dynamic way, meaning in a way that a collaborative relationship, including a balanced authority, a high level of trust, and frequent interactions between

HQ and subsidiaries, are built and two-way knowledge flow between HQ and subsidiaries are encouraged. Our results also showed that adopting the dynamic use and well-established process approach provides companies with the circumstances through which HQ and subsidiaries can collaborate, co-create knowledge, and jointly learn and thereby efficiently and effectively orchestrate knowledge to reach higher degrees of innovation performance i.e., new products. In this study, we connected companies' ability to orchestrate knowledge in a global setting with their capability to create higher degrees of innovation performance.

CHAPTER 6. DISCUSSIONS AND CONCLUSIONS

This chapter discusses the main findings and contributions of this PhD study. In addition, key theoretical contributions and managerial implications are presented. The chapter ends with limitations of this study and suggestions for further research.

6.1. MAIN RESEARCH FINDINGS

The key findings of this study can be highlighted as follows:

1) The static use of inter-firm objects does not necessarily provide companies with the diversified knowledge of subsidiaries. To tap into diversified knowledge of subsidiaries, inter-firm objects should be used in the dynamic way.

2) The different ways of using inter-firm objects are associated with different outcomes in terms of innovation performance.

3) To make better use (more efficient and innovative) of globally distributed knowledge resources in a globally distributed network, companies need to orchestrate knowledge in a particular type of way.

4) The characteristics of the use of inter-firm objects do not say anything about how often and how well they are used. As such, the use of inter-firm objects should be supported by a process.

5) Different companies adopt different approaches to KO: *static use/ad-hoc process, static use/well-established process, dynamic use/ad-hoc process, and dynamic use/well-established process.*

6) Different approaches to KO applied by companies can result in different degrees of innovation performance.

7) To achieve higher degrees of innovation performance i.e., product innovation, companies need to rely on the combination of the dynamic use of inter-firm objects and a well-established knowledge orchestration process.

8) What takes companies to be dynamic and well-established is to establish a complete, familiar KO process, a clear strategy for product excellence and KO, and the dynamism through the use of inter-firm objects.

In what follows, we discuss the key findings highlighted above.

It is widely recognized that subsidiaries' knowledge is a key source of innovation and competitive advantages for MNCs. Thus, tapping into the heterogeneous knowledge of subsidiaries and effective use of such knowledge has become a key competence for MNCs (Teece, 2007; Cohen & Levinthal, 1990; Gupta & Govindarajan, 2000; Kogut & Zander, 1993). As it is evident from the overview of the literature informing this PhD study (Chapter 1 and Chapter 3), more research is still needed to investigate how MNCs orchestrate, meaning acquire and effectively use, knowledge from globally distributed subsidiaries to create innovation (Phene & Almeida, 2008; Piscitello & Rabbiosi, 2004; Lee, et al., 2008). Therefore, this PhD study aims to contribute to the understanding of how MNCs orchestrate knowledge flow from globally distributed subsidiaries for innovation.

When comparing the knowledge orchestration activities of the case companies and the outcomes achieved by them, we found that the main concern of the case companies was the access to globally distributed knowledge resources, continuous learning, and fully utilization of such knowledge. This fundamental concern led us to consider how companies acquire knowledge from subsidiaries, learn from such knowledge, and apply this to the fullest extent. Accordingly, this highly encouraged us to think about what is needed in between HQ and subsidiaries to create an on-going knowledge flow and learning.

We addressed this issue by drawing on boundary objects perspective (Star & Griesemer, 1989; Carlile, 2002). In collaborative learning and design science studies with focus on collaborative development, several contributions have been made focusing on the impact of BO in the facilitation of learning and innovation in cross-disciplinary settings (Nicolini, et al., 2012; Carlile, 2002). By integrating different insights from extant literature on the application of the BO perspective in facilitation of learning and innovation across different teams and boundaries (Levina, 2005; Carlile, 2002; Swan, et al., 2007), and drawing on Levinas' study arguing that an effective collaboration among the actors in a distributed setting cannot be created by objects per se, rather through the use of objects (Levina, 2005), we investigated how using inter-firm objects in a collaborative way facilitates learning between HQ and subsidiaries.

Our findings showed that although the case companies attempt to access globally knowledge which is distributed in subsidiaries, they are mainly unsuccessful in this regard. Moreover, knowledge flow from subsidiaries is lacked or insufficient. The evidence showed that a key barrier to either the lack or inappropriate knowledge flow from subsidiaries is a control-oriented approach to the use of inter-firm objects adopted by the companies. Most of the companies investigated here use inter-firm objects as control means and coordination tools by which they control the flow of knowledge from subsidiaries and their activities. This view of the use of inter-firm

objects is in line with the traditional views of MNCs in which the flow of knowledge is one way, from HQ to subsidiaries, and knowledge is mainly kept centralized at HQs (Doz & Prahalad, 1991; Nobel & Birkinshaw, 1998). Using inter-firm objects in such way provides the companies with some predefined information and data using for control purposes. For example, in many case companies, visits and meetings are used to control the quality of the products or following up if subsidiaries activities are according to HQs' expectations. Also, many IT-based platforms are used by the case companies to get feedbacks on specific products. The following quotes from the interviewees exemplify the control-oriented view of the use of inter-firm objects:

> "*We have weekly quality meetings where we get feedback from China […]. They are quality related meetings, but quality is also the result of how they have done their working instructions and control plans and so forth*." (Senior R&D manager, Company A)

> "*We train people to use our documentation and understand our product*." (Head of emission technology, Company Gamma)

We suggested that a key step to bring the knowledge back from subsidiaries and is to shift the focus of the use of inter-firm objects from the control-oriented approach to a collaborative -oriented approach. As such, companies need to reconsider the way that they use inter-firm objects. We suggested that through the lens of boundary object perspective, companies can move from a control-oriented approach towards a collaborative-oriented approach to the use of inter-firm objects, which enables them to use inter-firm objects in a dynamic way.

In the situations where the companies use inter-firm objects to build a collaborative relationship with subsidiaries, the flow of high-value knowledge from subsidiaries was considered being higher. Additionally, subsidiaries' involvement in knowledge sharing and HQs activities were considered being high.

Based on the comparisons of the static use and the dynamic use of inter-firm objects in the case companies we came up with the key dimensions of them. These dimensions and a brief description of them are presented in Table 6-1 and Table 6-2.

Table 6-1 Key dimensions of the static use of inter-firm objects

Dimensions	Description
One-way knowledge flow	Inter-firm objects are used to mainly transfer knowledge from HQ to subsidiaries, the intended knowledge flow from subsidiaries to HQ is either missing or insufficient
Instructional	Inter-firm objects are mainly used by HQs to specify the tasks and formulate the related knowledge about product specifications
Non-adaptive	HQs develop/adapt and introduce different inter-firm objects to subsidiaries regardless of the potential difficulties that subsidiaries may encounter regarding the adaptation to the use

Table 6-2 Key dimensions of the dynamic use of inter-firm objects

Dimensions	Description
Two-way knowledge flow	Inter-firm objects are used not only to facilitate the flow of knowledge from HQ to subsidiaries but also to encourage the flow of knowledge from subsidiaries to HQ.
Collaborative	Inter-firm objects are used to build a collaborative relationship between HQ and subsidiaries
Communicative	Inter-firm objects are used by HQ and subsidiaries to negotiate and communicate their knowledge and insights in an open dialogue so that a shared meaning is provided, and misinterpretation is avoided
Adaptive	Inter-firm objects are adapted by subsidiaries

Further discussion of the dimensions is provided in paper 2 and paper 3.

As the main concern of the companies was to access knowledge from globally distributed subsidiaries, to learn from it, and to effectively use such knowledge, we put the focus not only on the inter-firm objects and their roles in the acquisition of knowledge but also on the outcomes achieved through different ways of using inter-firm objects. Our findings showed that in the situations where the companies use inter-firm objects in a static way, they achieve some trivial improvement in relation to the existing products. On the other hand, in the situations where the companies use inter-firm objects in a dynamic way, they experienced some significant improvement of existing product or innovation of new products. Moreover, a relationship between the different use of inter-firm objects and the different degrees of innovation performance was initially found. This led us to the key assumption of our research saying that to make better use (more efficient and innovative) of knowledge from globally

distributed subsidiaries, companies need to orchestrate knowledge in a particular type of way. As such, the rest of our investigation and research has been focused on exploration of such a particular way.

As the focus of this study is knowledge orchestration which is perceived as the acquisition of knowledge from globally distributed subsidiaries, reflecting on it and developing it, and effective utilization of it, KO process as a key aspect of KO was also considered for investigation of KO in the companies. Moreover, we did not aim to look at KO as a communication and knowledge sharing process taking place among two persons at HQ and subsidiary through the effective use of inter-firm objects. Rather, we were interested in a broader process to explore how the knowledge acquired from subsidiaries is also learnt and used.

On the basis of the use of inter-firm objects and KO processes, a conceptual framework (see Figure 3-2) was developed and applied to the case companies as a basis for investigating different KO approaches applied by companies, i.e., static use and ad-hoc process, static use and well-established process, dynamic use and ad-hoc process, and dynamic use and well-established process. Based on the evidence, we expected to see differences in the innovation performance depending on which quadrant in the model we are looking at. We also expected to see the higher degrees of innovation performance in the 4th quadrant (the dynamic use and well-established process). Afterwards, we tried to explore if this assumption is true and is so, how the companies organize KO around this approach.

A comparison of different approaches to KO is provided in Table 6-3. A more detailed discussion of the approaches can be found in paper 3 and paper 4.

Table 6-3 A comparison of different approaches to KO

Approach	**characteristics**
Static/ad-hoc	• unilateral knowledge flow from HQs to subsidiaries with a high level of control from HQs over knowledge flow and subsidiaries' activities • the focus is on the existing knowledge and their operating capabilities where HQs consider subsidiaries as production facilities • the roles of the involved people are the controlling role • due to the lack of a formalized KO process through which knowledge is disseminated and negotiated, any random knowledge from subsidiaries is easily lost • companies are reactive; If they see a problem either at HQ or in subsidiaries, they take it to the table and discuss it

Static/well-established	• a sender-receiver relationship between HQs and subsidiaries • the case companies largely rely on their efforts to get the knowledge back from subsidiaries rather than on a systematic knowledge sharing between HQ and subsidiaries • inter-firm objects are used to specify the tasks and activities and share them with subsidiaries • the focus is not only on the codification of knowledge, rather on knowledge exchange with subsidiaries as well • companies are business as usual; standardizing the knowledge they are working with and creating efficient KO processes
Dynamic/ad-hoc	• the use of inter-firm objects is mainly focused on building a collaborative relationship with subsidiaries • the lower level of control from HQs over the knowledge flow • KO is being practiced to some level in some parts of the company and with some subsidiaries • companies are proactive; they have recognized that they need to acquire the information from subsidiaries and utilize that to create new knowledge
Dynamic/well-established	• a collaborative relationship between HQs and subsidiaries • a high level of interaction and negotiation • a balanced authority between HQs and subsidiaries • joint learning • companies are innovative; innovation capabilities prevail operational capabilities

In the investigation of different approaches to KO applied by the case companies, as we expected from the initial evidence, we found a relationship between different approaches to KO and different degrees of innovation performance in terms of production improvement/innovation. These relationships were summarized in the followings four propositions:

Proposition 1: Companies adopting a static and ad-hoc approach to KO achieve only limited improvements.

Proposition 2: Companies adopting a static and well-established approach to KO achieve a low degree of innovation performance i.e. improvement and modification of the existing products.

Proposition 3: Companies adopting a dynamic and ad-hoc approach to KO achieve some certain degree of innovation performance i.e. significant improvement of the existing products and some infrequent product development.

Proposition 4: Companies adopting a dynamic and well-established approach to KO will achieve the highest degree of innovation performance i.e., new product innovation (Figure 6-1).

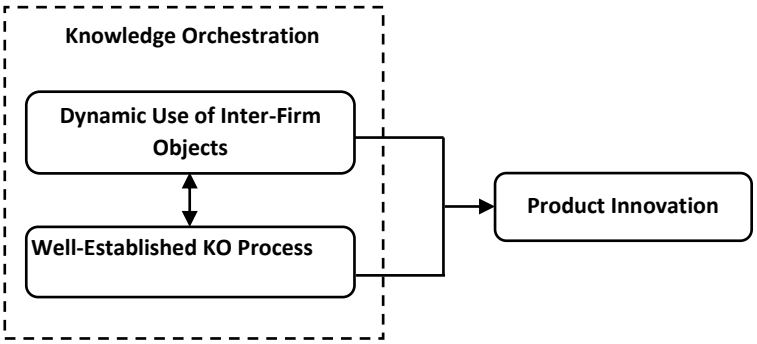


Figure 6-1 A model of knowledge orchestration for innovation

These propositions confirmed our initial assumption, saying that to make better use (more efficient and innovative) of globally distributed knowledge from subsidiaries, companies have to orchestrate knowledge in a particular type of way.

Based on the patterns emerged from the case companies in terms of the outcomes achieved by them, we then narrowed down the outcomes achieved by the case companies to two main groups, that is, the improvement projects and the innovation projects in relation to products. This allowed us to listen to the interviewees' stories about KO taking place in different projects. In this stage of the project, we focused on how the case companies orchestrate knowledge for improvement projects as well as for innovation projects. Further, building on a conceptual framework, we expanded how companies in order to achieve higher degrees of innovation performance, need to develop a knowledge orchestration process which relies on a combination of the dynamic use of inter-firm objects and a well-established process. For that purpose, inspired by thematic analysis, we created a number of themes and key attributes underlying KO for innovation (see Table 6-4).

As stated at the beginning of this thesis, the ultimate objective of this research is to explore orchestration of knowledge flows from globally distributed subsidiaries for innovation in MNCs. Our findings (see Table 6-4) showed that knowledge orchestration for innovation involves a complete and familiar process, in which a clear strategy both for knowledge orchestration and product excellence is established. It also involves dynamism which is achieved through a collaborative relationship and two-way knowledge flow between HQ and subsidiaries.

Table 6-4 An overall structure of findings

Evidence	**Codification**	**Themes (components)**	**Core themes (Key attributes)**	**Dimension**
• When the ideas from subsidiaries are considered as being useful, there is a well-described process to proceed • Knowledge cannot be used very effectively unless it is discussed and put into practice. • For new products, knowledge acquisition and sharing are on-going processes • KO is a structured process through idea ambassadors from idea collection to utilization: ideas are collected, shared with internal department, ranked, evaluated, and discussed in product council meetings, and utilized for NPD projects • There is a need for reflection on the ideas which are coming to HQ	Knowledge needs to be acquired, adopted, and utilized in order to create value for companies	Having all KO activities in place (knowledge acquisition-knowledge evaluation-knowledge dissemination-knowledge utilization) for an effective KO	Completeness	Well-established KO process
• Some people are assigned to get knowledge back from subsidiaries and bring it to HQ • Idea ambassadors know to whom share the knowledge with in-house, it is a structured process • Before the implementation of a new product, it is good to have the right persons to look at the ideas • Certain people who see the synergies between subsidiaries and perceive knowledge sharing as the main responsibility are required to facilitate knowledge sharing and communication between HQ and subsidiaries • More people are needed to communicate with	Companies allocate knowledge-related roles to facilitate KO process	Role allocation	Familiarity	

subsidiaries, find out their problems, and clarify the misunderstandings on knowledge part • Some people are appointed to collect the ideas and represent them in the meetings				
• People from the same area with the same technical knowledge interact easier • Frequency of the interactions and involving subsidiaries in the projects depend on subsidiaries relevant knowledge • Some subsidiaries are regarded as innovation partners for HQ, depending on their relevant knowledge and skills • When knowledge is shared with people with relevant competencies, the best solutions are created	People who have the same background and knowledge interact more often and create better solutions	Knowledge relevance between HQ and subsidiaries		
• By understanding where subsidiaries are, which culture they have, and how they think, HQ can make a trust relationship with subsidiaries • Reverse knowledge sharing from subsidiaries depends very much on the culture. There is a need to adapt to subsidiaries' culture and to do what is needed • Accepting that HQ and subsidiaries have different cultures that HQ needs to be aware of, makes HQ open to communicate with subsidiaries • HQ should be aware that HQ and subsidiaries have different cultures and not to try to change everything into Danish culture	Understanding subsidiaries' culture help HQs communicate and interact with subsidiaries and encourage them to share knowledge with HQ	Cultural understanding		
• There is the lack of a well-defined strategy on how	KO needs a clear strategy with the focus on external	Formalized KO strategy	A clear strategy	

to share knowledge globally • Knowledge needs to be acquired based on a clear strategy rather than based on the experiences which are built up over the years • External knowledge sharing is very important and should be on the top of the strategic agenda	knowledge acquisition			
• Moving towards being innovative is a big challenge at the moment and that is what HQ tries to address and figure out how to manage. Knowledge sharing would definitely be the core stone of the plan • There is a need for bringing the company in a position where it is better at extending new technologies • To come up with break through new technologies is the position that the company would like to be and is working on it • Innovation is very important for company's strategy	There is a need for a product portfolio strategy with the focus on continuous development and innovation	Product excellence strategy		
• The annual meetings with subsidiaries would be very important to make a trust relationship • Knowledge sharing is not only about technical sharing, it is also about knowing each other for further collaboration • Workshops and meetings are used to build a trust relationship with subsidiaries • People at HQ are asked to make relationships through the tools and not only focusing on the business stuff • More relationship maker tools are used to have the possibility to discuss the ideas	Inter-firm objects are used to build a collaborative relationship between HQ and subsidiaries including a balanced authority, trust, and frequent interaction	Collaborative Relationship	Dynamism	Dynamic use of inter-firm objects

• Not controlling subsidiaries and having open dialogue with them help HQ to create a better relationship with subsidiaries and motivate them to share more radical ideas				
• The meetings are not like that people from HQ talk and share, and subsidiaries listen. Rather, high level of subsidiaries involvement in knowledge sharing is also part of the meetings • The new developed IT-based system is used as the basis in which subsidiaries can share and discuss their ideas and receive feedbacks on it • Idea ambassadors share HQs' knowledge with subsidiaries and bring back subsidiaries' ideas and feedbacks to HQs	Inter-firm objects are not only used to share the knowledge from HQs but also used to gather knowledge from subsidiaries	Two-way knowledge flow		

In what follows, we discuss the key attributes of the dynamic use and well-established process which underlies the KO for innovation.

A well-established KO process

A complete and familiar process

Our findings suggested that KO for innovation involves a *complete process* in which knowledge acquisition, knowledge evaluation, knowledge dissemination, and knowledge utilization are all in place. The evidence showed that many of the case companies have some of the KO stages in place, instead of having them all in place, and this leads to either failed or poor-performing KO process. The following selected quotes from the interviewees illustrate how the lack of knowledge acquisition and knowledge dissemination results in the lack of access to high-value knowledge from subsidiaries, knowledge loss, and the lack of learning.

> "*We lack new radical ideas, and we don't really have a process on how we should gather these kinds of ideas. But we want to do this, and we are looking at different possibilities of how we can put ourselves in a position where we get also radical development, not only incremental stuff as we do today*." (Product manager, company Alpha)

> "*What we would like to have and I think we miss in this department is that when we have made something new, it is very hard for us to distribute that to everybody so that they know what is made of new things[…] Why not learn from what we did instead of forgetting, and trying to do that once again[…]The way it affects us is that the projects are worked out more slowly than it should be because we have to do many things once again instead of reusing it. The effectivity of the design is slowed down because just maybe a small change is making you start from the zero instead of starting from five*." (Export and application manager, company Beta)

In order for companies to orchestrate knowledge for innovation, they need to develop the KO process such that knowledge acquisition, evaluation, dissemination, and utilization are all in place. Only by having a complete process, knowledge is systematically acquired from subsidiaries and is transformed into innovation. Additionally, KO process for innovation is a *familiar process*. Familiarity was found to be associated with *role allocation, knowledge relevance between HQ and subsidiaries, and cultural understanding*. Even though in most of the case companies, familiarity is created due to a long history of working with subsidiaries, the results showed that it needs to be developed. The findings suggested that allocation of knowledge-related roles to specific people whose main responsibilities are facilitation of KO between HQ and subsidiaries, involvement of the relevant people in KO process such that they can easily understand each other, and management of the cultural distance by admitting the cultural differences and communicating and collaborating with subsidiaries according to their culture, enable companies to create familiarity with KO process and as such develop their KO process.

One good example of a familiar KO process is the one which is conducted through idea ambassadors in company Alpha. In company Alpha, some people are allocated as idea ambassadors to continuously acquire and share knowledge from different subsidiaries. Assigned people are mainly the ones who have a good connection with subsidiaries due to earlier collaboration with them or a long history of working with them. These people are familiar with the culture of the subsidiaries that they are communicating. Idea ambassadors communicate with the people in subsidiaries who possess the relevant knowledge to share.

The following quotes show how the afore-mentioned attributes (i.e., role allocation, knowledge relevance, and cultural understanding) are emphasized by the interviewees.

> **Role allocation**, "*We have appointed someone who has the task of doing this (idea collection and sharing). There are a number of people working with this, and then we just have to rely on them. They are doing their base job. They are product mangers*." (Product manager, company Alpha)

Role allocation, "*We have some people whose job is to look for new ideas [...]. In particular, we have one person in my department that we are placed in between sales, R&D department and engineering […] That means he is often the one who people in the subsidiaries will call and say please we need this product for our market, we have the ideas, and so on*." (Director of feed milling division, company Beta)

Knowledge relevance, "*When it comes to innovation, then it will be more and more details, and if you need more detailed information, you look around the organization and you pick up from the organization (and) from the persons who are specialized in different knowledge. You simply take this knowledge out of these experts and put it together to a project. And these experts can be sitting in a lot of places, but you know that these people have a certain knowledge and they are expert in a certain area.*" (Project manager, company epsilon)

Knowledge relevance, "*When people are from the same area with the same technical knowledge, interaction would be easier*." (Director of feed milling division, Company Beta)

Cultural understanding, "*It is important for us to understand the subsidiaries' requirements. We are moving to the place to take the knowledge back to Denmark. It is an ongoing process in our company. It is not easy to adapt to the (subsidiaries') culture and traditions*." (Director of feed milling division, company Beta)

Cultural understanding, "*Reverse Knowledge sharing very much depends on the culture of the country […]. Due to the culture they (subsidiaries) have, we need to adapt and to do what is needed […]. In the near future, we would have cultural awareness workshop*." (Global sales director, company Epsilon)

Strategy

A clear strategy for product excellence and KO are two aspects emphasized in KO for innovation, evidence of which is provided as follows: putting the focus on product development and innovation moves the attention of companies towards the importance of the dynamic knowledge flow from subsidiaries as internal sources are not enough. In order for companies to acquire external knowledge from subsidiaries to be transformed and utilized for innovation, a clear KO strategy in which knowledge acquisition and learning are emphasized is needed.
The following quotes by interviewees highlight the importance of strategy in KO.

"*In our next strategy, we will focus more on communication. By having this, we also need to be more precise about how we want to collect the*

> *inputs, (and) where can we seek the information*." (Vice president business support, company Delta)

While a clear strategy for product excellence and KO was found to be a key attribute of KO for innovation, we found earlier in our study that two key factors affecting companies' strategies: *the type of the industry* and *market trends.* Our evidence showed that *the type of the industry* that companies are operating in plays a significant role in choosing either operational capabilities or innovation capabilities as a dominant strategy. The results indicated that the introduction of innovation in conservative industries such as marine industry can be difficult. The companies operating in conservative industries mainly put the focus on the improvement and modification of the existing products, as their customers are not open to big changes. These companies often focus on their operational capabilities and choose a reactive strategy aiming at keeping the current situation. On the other hand, those companies operating in fast-growing industries select a proactive strategy in which they aim at advancing organizational results and being more innovative.
Market trends also affect companies' strategy for moving towards either operational capabilities or innovation capabilities. For example, some of our case companies (company Gamma and Epsilon) are operating in energy markets in which the recent trend has been focused on NOx reduction. As such, companies need to be in line with this trend and focus on manufacturing of new products covering the market trends in order to survive in a competitive market. To this end, they have started being more proactive by taking a dynamic view of the use of inter-firm objects to access high-value knowledge flow from subsidiaries. The impact of these two factors on the selection of strategy by companies could be further studied in future research.
The following selected quotes from the interviewees exemplify the role of industry types and market trends in the selection of strategy by the companies.

> *"Now the trend is going more towards having non-fossil fuels for example, gas for combustion instead of oil, so that is a trend. Then, the strategy from the manager and the company is that we should go to that direction and prepare ourselves and products, and develop the products that can support gas combustion. So that is strategic way based on trends and environmental requirements."* (Product and technology manager, company Alpha)

> *"I am in marine business, and one thing that is very important in marine business is reliability. Because when a ship is on the sea it is not possible to call anyone to come and fix the product. So, it is very important that the product is working, and it is stable and reliable. So, radical innovation? nobody wants to buy it. Because it is too different from what they know and what has been proven to work."* (Global sales director, company Epsilon)

The use of inter-firm objects

The significant role of the dynamic use of inter-firm objects as a key to KO for innovation has been largely discussed and emphasized in this thesis. Here, we discuss the key components of the dynamic use, i.e., the collaborative relationship and the two-way knowledge flow, which are identified based on the evidence.

Collaborative relationship

Our findings showed that in the case of innovation, building a collaborative relationship between HQ and subsidiaries through the dynamic use of inter-firm objects is largely emphasized by the companies. We identified that the collaborative relationship between HQ and subsidiaries through the use of inter-firm object is built on a lower level of control from HQs over knowledge flow and activities (a balanced authority), trust, and frequent interaction between HQ and subsidiaries.

A balanced authority between HQ and subsidiaries

As widely discussed earlier, HQ's control over subsidiaries does not provide companies with high-value and diverse knowledge from distributed subsidiaries. Our findings implied that many of the case companies are moving towards creating a balanced authority between HQ and subsidiaries. The evidence shows that in the situations where HQ's control over subsidiaries is low and subsidiaries have a balanced authority in the MNC network, subsidiaries tend to collaborate with HQs and share more knowledge compared to the ones which are either fully controlled by HQs or fully independent of HQs. Based on the evidence, a balanced authority between HQ and subsidiaries creates a sense of belonging for subsidiaries by which they feel that they are connected to the whole network with a shared identity and goal.

However, the necessity of some level of control over subsidiaries through the use of inter-firm objects was stressed by the interviewees.

In the case of innovation, the certain degree of control by HQs was found to be mainly in relation to the type and the amount of knowledge which is shared with subsidiaries and the people who should have access to shared knowledge rather than in relation to specifying the tasks and predefining knowledge to be acquired from subsidiaries. According to the vice president key account and business support in company Delta:

> "*I think the companies in the future would be successful if they are good at knowledge sharing, innovation, cooperation with partners. But still, keeping the key business and making sure that they are not losing that because they have been too open. It is a balance of being open and still to be close*."

Some levels of control from HQs allow them to protect the core knowledge and prevent knowledge leakage. The findings also identified that the level of control over subsidiaries depends on the age of HQ-subsidiaries relationship. If the HQ-subsidiaries relationship is at its early stage, HQ tends to have more control over knowledge sharing. As HQ-subsidiaries relationship evolves over time and the trust is built, HQ gives more authority to subsidiaries.

Trust

Another component of the collaborative relationship is trust. Our finding showed that HQ and subsidiaries engage in collaboration when they trust each other. Specifically, in the acquisition of knowledge from globally distributed subsidiaries trust was found to be critical, as it enhances HQs' ability to easily communicate and collaborate with subsidiaries to acquire high-value knowledge. All the interviewees emphasize the role of trust in building the relationship and knowledge sharing from subsidiaries. According to Global sales director in company Epsilon,

> "*I think a very important aspect of knowledge sharing is trust and relationship, especially in some parts of the world. I am using a lot of my time for the training to convince these guys (in the subsidiaries) that I am just one of you and here to help you to be successful.*"

Frequent interaction between HQ and subsidiaries

Frequent interaction between HQ and subsidiaries plays a key role in building a collaborative relationship among them. Our findings showed that interaction through the use of inter-firm objects is a critical factor in facilitation of KO process. High level of interaction between HQ and subsidiaries through the dynamic use of inter-firm objects facilitates the acquisition of knowledge from subsidiaries, and provides them with a shared understanding such that misinterpretation is avoided. Also, dissemination of knowledge is not possible unless through the regular interactions. The frequent interaction between HQ and subsidiaries and building a shared understanding among them through the dynamic use of inter-firm objects facilitate the co-creation of knowledge in which HQ and subsidiaries try to jointly create mutually valued knowledge.

However, our evidence showed that the frequent interaction needs to take place among the right persons from HQ and subsidiaries and all the interactions do not necessarily result in the collaborative relationship and successful knowledge sharing. Moreover, when people who know each other due to familiarity created through clear roles and relevant knowledge interact with each other, their interactions facilitates KO process.

Two-way knowledge flow

One of the key dimensions of the dynamic use of inter-firm objects which differentiates it from the static use is the two-way knowledge flow between HQ and subsidiaries. As we discussed earlier in this thesis, the important role of knowledge flow from subsidiaries to HQ and its positive impact on innovation and competitive advantages of HQs is widely recognized (Ambos, et al., 2006; Rabbiosi & Santangelo, 2013). Based on the evidence from the case companies, the flow of knowledge from HQ to subsidiaries is usually unproblematic, as it is controlled by HQs. The problematic and the most challenging part of knowledge sharing between HQ and subsidiaries was found to be the knowledge flow from subsidiaries. The results showed that adopting a control-oriented approach by HQs leads to insufficient or missing knowledge flow from subsidiaries.

Our findings suggested that through the dynamic use of inter-firm objects in which inter-firm objects are used as a basis for building collaboration between HQ and subsidiaries, the flow of high-value knowledge from subsidiaries is high. Here, knowledge flow from subsidiaries is not based on what is specified and predefined by HQ. Rather, knowledge flow from subsidiaries aims at adding to the existing knowledge resources and improving the creation of new knowledge.

The collaborative relationship between HQ and subsidiaries including a balanced authority, trust, and frequent interactions between HQ and subsidiaries, which were explained above, plays a significant role in the facilitation of two-way knowledge flow between HQ and subsidiaries through the dynamic use of inter-firm objects. The following figure summarizes our final model of KO for innovation.

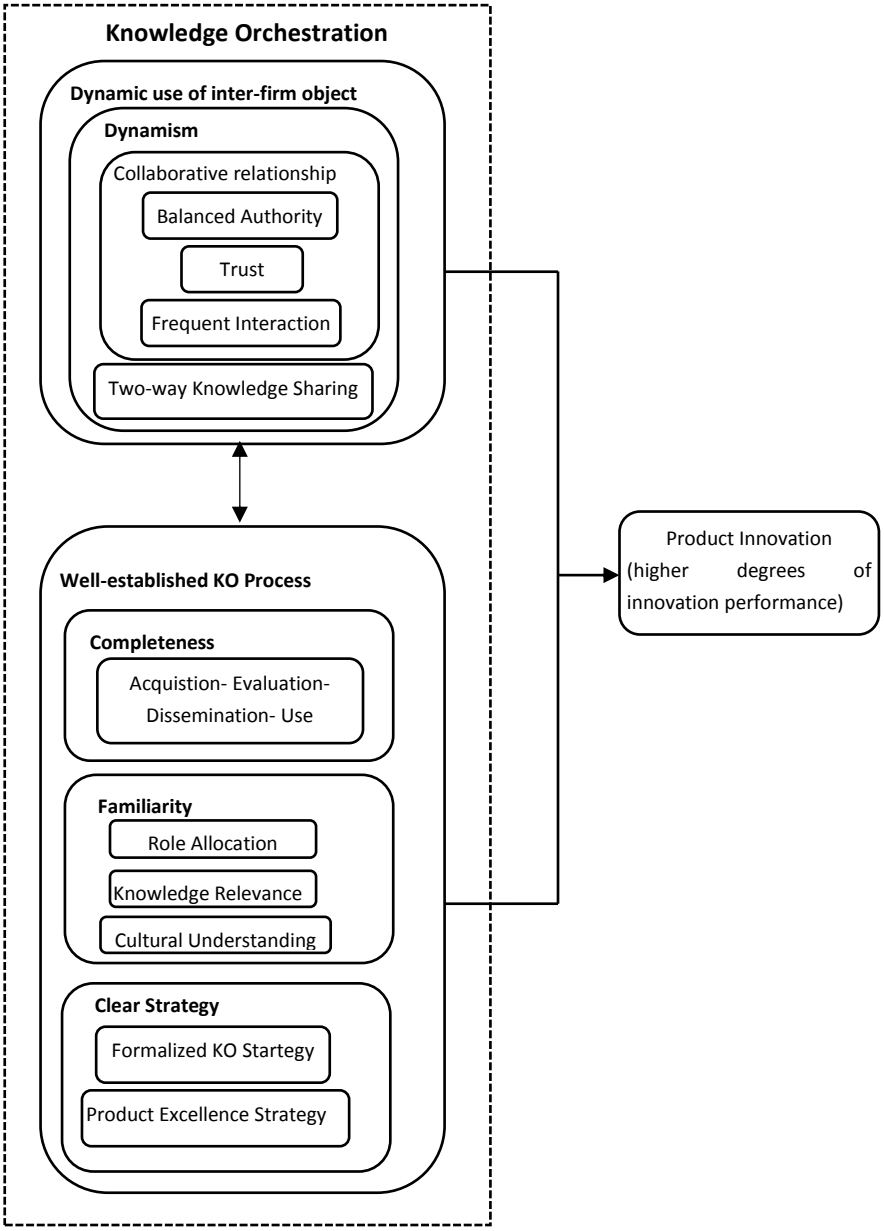


Figure 6-2 A final model of knowledge orchestration for innovation

6.2. CONCLUSIONS

The main findings of this PhD study have been outlined in the preceding section. However, in this section, we would like to highlight some key conclusions demonstrating the significance of this study.

This study is significant for several reasons. While a globally distributed operations network offers interesting possibilities for headquarters to capture diverse and heterogeneous knowledge from subsidiaries for successful innovation, orchestrating knowledge in such networks requires companies to establish an appropriate approach to KO favoring innovation. We proposed that the combination of the dynamic use of inter-firm objects and a well-established KO process enables companies which are operating in a distributed operations network to orchestrate knowledge from globally distributed subsidiaries for innovation. We believe that orchestration of knowledge in such way can be regarded as innovation capability for companies by which higher degrees of innovation performance is reached. With the dynamic KO based on the "dynamic/well-established" approach proposed in this study, companies enhance their capability to acquire high-value knowledge from globally distribute subsidiaries, to expand on it, and to create better impact based on the new knowledge, thus enabling them to develop the ability to generate high level of innovation performance, i.e., product innovation. As such, to be able to perform KO in such way (dynamic/well-established) is considered as innovation capability for companies. By doing so, the findings of this study lead to a new perspective on the relationship between two key domains i.e., knowledge management and innovation management.

The findings of this study also shed light on the dynamic role can be played by inter-firm objects in building a collaborative relationship between HQ and distributed subsidiaries. By focusing on the use of inter-firm object than on inter-firm object in itself, this study suggests that instead of spending lots of time and money on applying different kinds of inter-firm objects, companies need to consider: What is happening within and around inter-firm objects? How people interact with inter-firm objects and with each other through the use of inter-firm objects? Do people adapt to the use of inter-firm object? Do people communicate enough and share enough knowledge through inter-firm objects? What kinds of resources need to be allocated to facilitate knowledge sharing through inter-firm objects? What encourage subsidiaries to share radical ideas? Do people know the right people to whom they share the knowledge with? How to disseminate knowledge such that relevant people have access? What are the barriers to knowledge sharing? Do the company has the right strategy for KO and are people aware of that? and many more questions. By considering these, companies move towards the establishment of a process around inter-firm objects and create value out of them by better using them than by replacing them with one another.

The model of KO for innovation which is suggested in this study contributes to the efficiency and effectiveness of a globally distributed operations network for several

reasons. First, by advancing access to subsidiaries' knowledge and transforming that into innovation, commercial success is also provided. The evidence from the case companies identified a larger margin for innovative products compared to improved products. Second, by establishing a well-performed KO process and the dynamic use of inter-firm objects, the cost of knowledge sharing is reduced; The evidence from the case companies shows that companies which lack a well-established process allocate lots of human and financial resources to improve knowledge sharing between HQ and subsidiaries. Developing a well-performed process for KO helps companies share and acquire knowledge with the less waste of time and cost efforts, and eliminate redundancy and extra resources allocated to KO. Third, by improving KO, companies can get the most value from their knowledge resources and as such the more efficient production and manufacturing, which is a major aspect of operational efficiency, will be achieved. Fourth, adopting the dynamic/well-established approach to KO enables companies to benefit from global resources and capabilities, thereby improving the efficiency by creating more value for the customers and the effectiveness by doing things differently to flourish in the fast-changing markets. Fifth, working together and collaborating with subsidiaries through a collaborative relationship encourages the flow of knowledge from subsidiaries and as such result in the effective creation of new knowledge and learning. Sixth, the dynamic model of KO offered in this study improves the relationship and knowledge sharing between HQ and subsidiaries and consequently improve the effectiveness of the entire global operations network. This contributes specifically to the realization of transnational strategy identified by Bartlett and Ghoshal (1989) (see Figure 3-1). According to Bartlett and Ghoshal (1989), transnational companies operate as the integrated and interdependent networks in which the mutual development and dissemination of knowledge are emphasized, and subsidiaries act as centers of excellence (Bartlett & Ghoshal, 1989; Harzing, 2000). Seventh, by having a well-established KO process in place, more transparency is created in terms of roles, strategy, availability, and accessibility of knowledge. This creates effectiveness in all parts of the network as people know what to do and in which way.

The model of KO for innovation proposed in this thesis enables companies to acquire subsidiaries' knowledge through the collaboration, to better utilize knowledge resources, and to achieve better impact based on the new knowledge i.e., innovation. By doing so, companies can move from home-based capability exploitation towards home-based capability augmentation (Kuemmerle, 1997). Companies which focus on home-based augmentation absorb diverse knowledge from distributed locations, create new knowledge, and transfer such knowledge to home-based company. Whereas, companies with the focus on the home-based exploitation develop knowledge at home-based company and transfer it to distributed locations (Kuemmerle, 1997). This study also contributes to organizational learning, as "organizational learning is both a function of access to knowledge and the capabilities for utilizing and building on such knowledge" (Powell, et al., 1996; p. 118).

6.3. THEORETICAL CONTRIBUTIONS

The findings of the thesis make several contributions to different literature. First, by focusing on the different use of inter-firms, the findings of this research add to the literature on cross-boundary collaboration (Carlile, 2004) and organizational studies (Orlikowski, 2007) suggesting that there is a need for investigation of the dynamic role of objects. Specifically, by drawing on the boundary object perspective to investigate the dynamic use of inter-firm objects in the facilitation of collaboration between HQ and subsidiaries, it contributes to our understanding of the applicability of the boundary object perspective to the global knowledge management literature.

Secondly, proposing that different use of inter-firm objects is associated with different outcomes in terms of innovation performance, our findings extend and compliment prior studies (Alavi & Leidner, 2001; Vaccaro, et al., 2010) that link the outcomes of inter-firm objects to the ways they are used.

Thirdly, examining the relationship between knowledge orchestration approaches and different degrees of innovation performance, this research adds to the studies on innovation (Akram, et al., 2011) investigating the role of knowledge management to create innovation (Deverell & Lassen, 2006). In particular, by relating innovation to knowledge orchestration in a global setting (i.e. HQ and distributed subsidiaries) in the context of MNCs, the findings of this study support Jiménez-Jiménez et al. s' (2014) suggestion that further studies on managing the flow of knowledge for innovation in the context of MNCs are needed. More specifically, by introducing the dynamic/well-established approach to KO by which companies can achieve higher degrees of innovation performance, we contribute to the existing literature discussing that the potential of knowledge management to affect innovation and achieve competitive advantage increases significantly with effective approaches (Gloet & Samson, 2013).

Fourthly, while previous studies largely assert that subsidiaries' knowledge is critical for HQs' competitive advantages and innovation performance (Nielsen & Michailova, 2007; Mudambi, et al., 2014; Piscitello & Rabbiosi, 2004), the way that such knowledge can be orchestrated to create innovation for HQs is largely overlooked. Our study examines how globally distributed knowledge from subsidiaries is orchestrated in MNCs network for innovation and as such contributes to our understanding of knowledge orchestration favoring innovation.

Fifthly, the results of this study add to and expand the growing literature on knowledge transfer within MNCs suggesting that subsidiaries play a key role in the creation of innovation for MNCs (Rabbiosi & Santangelo, 2013; Piscitello & Rabbiosi, 2004; Yamin & Otto, 2004).

Finally, the main contribution of this study is to the research field of innovation; our findings offered a very particular model of KO (a combination of the dynamic use and the well-established KO process) which is considered as innovation capability for the companies through which they can reach higher degrees of innovation performance. Innovation capabilities are considered being critical to reach a superior innovation performance (Yeşil, et al., 2013). This PhD study offers a different way of thinking about innovation capability in the MNCs context by bridging knowledge management and innovation field. Extant studies on innovation capability focus on it as an internal process at firm level (Samson & Gloet, 2014; Börjesson, et al., 2014), or as open innovation in which knowledge is integrated from customers or global suppliers (Lin, et al., 2010; Swink, 2006) whereas our study sees the particular way of KO taking place between HQ and subsidiaries as innovation capability within the MNCs network, which adds to the research advancing the notion of innovation capability research (Iddris, 2016), specifically, in the global context. This contribution is very significant because in many multinational companies, innovation capabilities have come to prevail over operational capabilities (Doz, 2016), and innovation creation tends to originate from the contribution of network members (in this study HQ and subsidiaries) whereas a single company scarcely possess all the resources for creating innovation (Iddris, 2016).

6.4. MANAGERIAL IMPLICATIONS

As suggested in previous studies, managing the flow of knowledge from globally distributed subsidiaries is critical for HQs' competitive advantages and innovation creation. Therefore, issues concerned with companies' ability to orchestrate knowledge from globally distributed subsidiaries within the MNCs network are of significant managerial importance and relevance. In particular, gaining a very good understanding of the circumstances leading up to the effective knowledge orchestration favoring innovation is critical for international management.

With respect to the use of inter-firm objects, our findings suggest that the dynamic use of inter-firm objects through which companies build a collaborative relationship between HQ and subsidiaries can benefit MNCs in the long term. Moreover, our findings identify that through the static use of inter-firm objects, companies may achieve some short-term benefits aiming at subsidiaries' control, but it does not provide them with the diverse and heterogeneous knowledge of subsidiaries. Only through the effective collaboration among various stakeholders, companies draw on diverse knowledge and expertise to create new competencies and synergistic solutions to complex problems (Carlile, 2004; Levina, 2005).

While the dynamic use of inter-firm objects facilitates the collaboration between HQ and subsidiaries and two-way knowledge flow between them, the mere dynamic use of inter-firm object does not provide companies with higher degrees of innovation performance. Our findings suggest that both the dynamic use and a well-established

KO process should be in place to orchestrate knowledge for innovation. This enables MNCs to enhance their understanding of the KO within a global operations network and accordingly increases the likelihood of developing new products based on knowledge captured from subsidiaries. The findings of this study provide managers with some valuable insights into a systematic acquisition and effective utilization of knowledge from subsidiaries.

Our results also suggested different approaches to KO applied by companies (Figure 3-2) which provide some helpful insights enabling managers to select the KO approaches according to their innovation strategy. Companies whose focus are on standardization and modification of the existing products can choose either the static use and well-established KO process approach or the dynamic and ad-hoc KO process approach. On the other hand, companies whose focus are on innovation and new product development are required to adopt a dynamic and well-established approach to KO.

6.5. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

In relation to the findings of this PhD study, several avenues for future research are suggested as follows:

- This study investigates knowledge orchestration taking place between HQ and subsidiaries within the MNCs network from HQs point of view, and all the interviews are conducted with HQs in Denmark. Taking into consideration subsidiaries' point of view can provide a better understanding of knowledge orchestration in a globally distributed operations network, therefore leaving space for future research.

- The findings of paper 3 showed a relationship between different approaches to KO applied by companies and different degrees of innovation performance. Future studies can aid theory building by empirically testing the proposed relationships.

- It is emphasized by this study that it is the use of inter-firm objects which is important in the facilitation of knowledge orchestration than inter-firm objects per se. Nevertheless, our evidence from the case studies showed that some inter-firm objects lend themselves more to the dynamic use whereas some others lend themselves more to the static use. For example, the inter-firm objects in which people are involved such as meetings, phone-calls, expatriate managers, and training, lend themselves more to the dynamic use. On the other hand, excel sheets and documentation lend themselves to the static use. Further studies can be conducted to find the relationship between different types of inter-firm objects and their level of dynamism in relation

to the use. Moreover, future studies can focus on the investigation of which types of inter-firm objects are prone to be purely used as boundary objects.

- This study investigates KO within MNCs at a macro level, that is, the project level. As knowledge is largely tacit and individually possessed, future studies can investigate KO within MNCs by taking a micro-foundation approach, through which they investigate how individual-level factors impact KO within MNCs. Moreover, by reducing knowledge orchestration phenomenon to individual actions and interactions and by taking into account their behaviors and motivation, future research can contribute to micro-foundation studies.

BIBLIOGRAPHY

Abdulsomad, K. (2014). The transformation of multinational corporations (MNCs) from an innovation perspective: some notes on the theories of MNCs. *AI & Society, 29*(3), 415–426.

Akram, K., Siddiqui, S. H., Nawaz, M. A., Ghauri, T. A., & Cheema, A. K. (2011). Role of Knowledge Management to Bring Innovation: An Integrated Approach. *International Bulletin of Business Administration, 11*(11), 121-134.

Alavi, M., & Leidner, D. E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly, 25*(1), 107-136.

Almeida, P., & Phene, A. (2004). Subsidiaries and knolwedge creation: the influence of the MNC and host country on innovation . *Strategic Management Journal, 25*, 847–864.

Ambos, T. C., Ambos, B., & Schlegelmilch, B. B. (2006). Learning from foreign subsidiaries: An empirical investigation of headquarters' benefits from reverse knowledge transfers. *International Business Review, 15*(3), 294-312.

Andersson, U., Forsgren, M., & Holm, U. (2002). The Strategic Impact of External Networks: Subsidiary Performance and Competence Development in the Multinational Corporation. *Strategic Management Journal, 23*(11), 979–996.

Andersson, U., Forsgren, M., & Holm, U. (2007). Balancing subsidiary influence in the federative MNC: a business network perspective. *Journal of International Business Studies, 38*(5), 802–818.

Arias, E. G., & Fischer, G. (2000). Boundary objects: their role in articulating the task at hand and making information relevant to it. (pp. 1-8). Wollongong: International ICSC Symposium on Interactive and Collaborative Computing, University of Wollongong.

Asmussen, C. G., Foss, N. J., & Pedersen, T. (2011). Knowledge Transfer and Accommodation Effects in Multinational Corporations: Evidence from European Subsidiaries. *Journal of Management, 39*(6), 397-1429.

Asmussen, C. G., Foss, N. J., & Pedersen, T. (2013). Knowledge Transfer and Accommodation Effects in Multinational Corporations: Evidence from European Subsidiaries. *Journal of Management, 39*(6), 1397-1429.

Baliga, R., & Jaeger, M. (1984). Multinational corporations: Control systems and delegation issues. *Journal of International Business Studies, 15*(2), 25-40.

Barrett, M., & Oborn, E. (2010). Boundary object use in cross-cultural software development teams. *Human Relations, 63*(8), 1199-1221.

Bartlett, C. A. (1986). Building and managing the transnational: The new organizational challenge. In M. Porter (Ed.), *Competition in Global Industries* (pp. 1114-1146). Boston: Mass: Harvard Business School Press.

Bartlett, C. A., & Ghoshal, G. (1989). *Managing across Borders: The Transnational Solution.* Boston: Harvard Business School Press.

Baškarada, S. (2014). Qualitative case study guidelines. *The Qualitative Report, 19*(40), 1-18.

Bechky, B. A. (2003). Sharing meaning across occupational communities: the transformation of understanding on a production floor. *Org. Sci, 14*(3), 312–330.

Bellamy, C. (2011). *Principles of Methodology: Research Design in Social Science.* Sage.

Bergman, M., Lyytinen, K., & Mark, G. (2007). Boundary objects in design: An ecological view of design artifacts. *Journal of the Association for Information Systems, 8*(11), 546-568.

Bernard, R. H. (1995). Unstructured and semi-structured interviewing. In *Research methods in anthropology: qualitative and quantitative approaches (2nd Edition)* (pp. 208-236). Walnut Creek, California: AltaMira Press.

Bessant, J. (2003). *High-Involvement Innovation: Building and Sustaining Competitive Advantage.* West Sussex.: John Wiley.

Betz, M. (2010). The secret life of machines – boundary objects in maintenance, repair and overhaul. *8th international conference on Pervasive Computing, Lecture Notes in Computer Science*, pp. 174-191. Helsinki, Finland.

Birkinshaw, J., & Hood, N. (1998). *Multinational Corporate Evolution and Subsidiary.* London: Macmillan.

Birkinshaw, J., & Pedersen, T. (2008). Strategy and Management In MNE Subsidiaries. In A. M. Rugman (Ed.), *The Oxford Handbook of International Business (2 ed.).* Oxford.

Birkinshaw, J., Ambos, T. C., & Cyril, B. (2017). Boundary Spanning Activities of Corporate HQ Executives Insights from a Longitudinal Study. *Journal of Management Studies, 54*(4), 422–454.

Birkinshaw, J., Holm, U., Thilenius, P., & Arvidsson, N. (2000). Consequences of perception gaps in the headquarters-subsidiary relationship. *International Business Review, 9*, 321-344.

Björkman, I., Barner-Rasmussen, W., & Li, L. (2004). Managing knowledge transfer in MNCs: The impact of headquarters control mechanisms. *Journal of International Business Studies, 35*(5), 443-455.

Blomkvist, K. (2012). Knowledge management in MNCs: the importance of subsidiary transfer performance. *Journal of Knowledge Management, 16*(6), 904 – 918.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Börjesson, S., Elmquist, M., & Hooge, S. (2014). The challenges of innovation capability building: Learning from longitudinal studies of innovation efforts at Renault and Volvo Cars. *Journal of Engineering and Technology Management, 31*, 120-140.

Cantwell, J. (1989). *Technological Innovation and the Multinational Corporation.* Oxford: Basil Blackwell.

Cantwell, J. (1994). Introduction: transactional corporations and innovatory activities. In CANTWELL J (Ed.), *Transactional Corporations and Innovatory Activities.* London: Routledge.

Cantwell, J., & Mudambi, R. (2005). MNE competence-creating subsidiary mandates. *Strategic Management Journal, 26*, 1109-1128.

Carlile, P. R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science, 13*(4), 442-455.

Carlile, P. R. (2004). Transferring, translating, and transforming: an integrative framework for managing knowledge across boundaries. *Organization Science, 15*(5), 555-568.

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. J. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum, 41*(5).

Chang, E., & Taylor, M. S. (1999). Control in multinational corporations (MNCs): The case of Korean manufacturing subsidiaries. *Journal of Management, 25*(4), 541-565.

Cheng, Y., Madsen, E. S., & Liangsiri, J. (2010). Transferring knowledge in the relocation of manufacturing units. *Strategic Outsourcing: An International Journal, 3*(1), 5-19.

Chini, T. C. (2004). *Effective Knowledge Transfer in Multinational Corporations.* New York: PALGRAVE MACMILLAN.

Cohen , W. M., & Levinthal, D. A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly, 35*, 128-152.

Collis, J., & Hussey, R. (2009). *Business Research: A Practical Guide for Undergraduate and Postgraduate Students* (3 udg.). Palgrave Macmillan.

Curado, C., & Bontis, N. (2006). The Knowledge-Based View of the Firm and Its Theoretical Precursor. *International Journal of Learning and Intellectual Capital, 3*(4), 367-381.

Davis, J. P., & Eisenhardt, K. M. (2011). Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly, 56*(2), 159-201.

Davis, L. N., & Meyer, K. E. (2004). Subsidiary research and development, and the local environment. *International Business Review , 13*(2), 359–382.

Deverell, A., & Lassen, A. H. (2006). The Challenge of managing Knowledge in Innovative Organizations: Internal Versus External Knowledge Acquistion. In B. Donnellan, T. Larsen , L. Levine, & J. DeGross (Eds.), *International Federation for Information Processing (IFIP), Volume 206, The Transfer and Diffusion of Information Technology for* (pp. 157-178). Boston: Springer.

Dobrai, K., Farkas, F., Karoliny, Z., & Poór, J. (2012). Knowledge transfer in Multinational Companies – Evidence from Hungary. *Acta Polytechnica Hungarica, 9*(3), 149-161.

Dodgson, M. (1993). Learning, trust, and technological collaboration. *Human Relations, 46*, 77-95.

Doz, Y. L. (2016). Managing international operations: From organisational structures to mental structures and from operations to innovations. *European Journal of International Management, 10*(1), 10-24.

Doz, Y. L., & Prahalad, C. k. (1991). Managing DMNCs: a search for a new paradigm. *Strategic Management Journal, 12*, 145-164.

Du Plessis, M. (2007). The role of knowledge management in innovation. *Journal of Knowledge Management, 11*(4), 20-29.

Duguet, E. (2006). Innovation height, spillovers and the growth at the firm level: evidence from French manufacturing. *Economics of Innovation and New Technology, 15*(4-5), 415-442.

Eden, L. (2009). Letter from editor-in-chief: reverse knowledge transfers, culture clashes and going international. *Journal of International Business Studies , 40*, 177–180.

Egelhoff, W. G. (2010). How the parent headquarters add value to the MNC. *Management International Review, 50*, 413-431.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review, 14*(4), 532-550.

Eisenhardt, K. M. (1991). Better stories and better con- structs: The case for rigor and comparative logic. *Academy of Management Review, 16*(3), 620-627.

Ernst, H. (2001). Patent applications and subsequent changes of performance: evidence from time-series cross-section analyses on the firm level. *Research Policy, 30*(1), 143-157.

Ferdows, K. (1997). Made in the world: The global spread of production. *Production and Operations Management, 6*(2), 102-109.

Fereday, J., & Muri-Cochrane, E. (2006). Demonstrating rigor using thematic anlaysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods, 5*, 80-92.

Fisher, C. (2004). *Researching and Writing a Dissertation for Business Students.* Essex: Pearson Education Ltd.

Foss, N. J., & Pedersen, T. (2004). Organizing knowledge processes in the multinational corporation: an introduction. *Journal of International Business Studies, 35*, 340-349.

Fransson, A., Hakanson, L., & Liesch, P. W. (2011). The underdetermined knowledge-based theory of the MNC. *Journal of International Business Studies, 42*, 427-435.

Frenz, M., Girardone, C., & Letto-Gillies, G. (2005). Multinationality matters in innovation: the case of the uk financial services. *Industry and Innovation, 12*(1), 65-92.

Frost, T. (2001). The geographic sources of foreign subsidiaries. *Strategic Management Journal, 22*(2), 101–123.

Gama, F., Sjodin, D. R., & Frishammar, J. (2017). Manging interorganizational technology development: Project management practices for market- and science-based partnerships. *Creativity and Innovation Management, 26*(2), 115-127.

Ghoshal , S., & Bartlett, C. A. (1990). The multinational corporation as an interorganizational network. *Academy of Management Review, 15*(4), 603-626.

Ghoshal, S., & Bartlett, C. A. (1988). Creation, adoption and diffusion of innovations by subsidiaries of Multinational Corporations. *Journal of International Business Studies, 19*(3), 365-388.

Ghoshal, S., & Nohria, N. (1989). Internal differentiation within multinational corporations. *Strategic Management Journal, 10*(4), 323-337.

Gloet, M., & Samson, D. (2013). Knowledge Management to Support Systematic Innovation Capability. (pp. 1530-1605). Hawaii: 46th Hawaii International Conference on System Sciences.

Gooderham, P. N. (2007). Enhancing knowledge transfer in multinational corporations: a dynamic capabilities driven model. *Knowledge Management Research & Practice, 5*, 34-43.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*(2), 109-122.

Gulati, R., Nohria, N., & Zaheer, A. (2000). Strategic networks. *Strategic Management Journal, 21*, 203-215.

Gupta, A. K., & Govindarajan, V. (1991). Knowledge flows and the structure of control within multinational corporations. *Academy of Management Review, 16*(4), 768–792.

Gupta, A. K., & Govindarajan, V. (2000). Knowledge flows within multinational corporations. *Strategic Management Journal, 21*(4), 473-496.

Hamel, G. (1991). Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal, 12*, 83-103.

Harzing, A. (2000). An empirical test and extension of Bartlett and Ghoshal typology of Multinational Companies. *Journal of International Business Studies, 31*(1), 101-120.

Hirsch, S. (1965). The United States electronic industry in international trade. *National Institute Economic Review, 24*, 92–97.

Hoffmann, W. H., & Schlosse, R. (2001). Success factors of strategic alliances in small and medium-sized enterprises—An empirical survey. *Long Range Planning, 34*(3), 357-381.

Huang, E. Y., & Huang, T. K. (2013). Exploring the effect of boundary object on knowledge interaction. *Decision Support System, 56*, 140-147.

Håkanson, L., & Nobel, R. (2001). Organizational characteristics and reverse technology transfer. *Management International Review, 41*(4), 395-420.

Iddris, F. (2016). Innovation capability: A systematic review and research agenda. *Interdisciplinary Journal of Information, Knowledge, and Management, 11*, 235-260.

Inkpen, A. C. (1996). Creating knowledge through collaboration. *California Management Review, 39*(1), 123-140.

Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of management review, 30*(1), 146-165.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360.

Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24*(4), 602-611.

Jiménez-Jiménez,, D., Martínez-Costa, M., & Sanz-Valle, R. (2014). management practices for innovation: a multinational corporation's perspective. *Journal of Knowledge Management, 18*(5), 905-918.

Johnston, S., & Paladino, A. (2007). Knowledge Management and Involvement in Innovations in MNC Subsidiaries. *Management International Review, 47*(2), 281-302.

Katila, R., & Ahuja, G. (2002). Something old, something new: a longitudinal study of search behavior and new product introduction. *Academy of Management Journal, 45*(8), 1183-1194.

Kirsimarja, B., & Aino, K. (2015). *Knowledge-based view of the firm: theoretical notions and implications for management.*

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization science, 3*(3), 383-397.

Kogut, B., & Zander, U. (1993). Knowledge of the firm and the evolutionary theory of the multinational corporation. *Journal of International Business Studies, 24*(4), 625-645.

Kuemmerle, W. (1997). Building effective R&D capabilities abroad. *Harvard Business Review, 75*(2), 61-70.

Kuemmerle, W. (1999). The drivers of foreign direct investment into research and development: An empirical investigation. *Journal of International Business Studies, 30*(1), 1-24.

Lagerström, K., & Andersson, M. (2003). Creating and sharing knowledge within a transnational team—the development of a global business system. *Journal of World Business, 38*(2), 84-95.

Lassen, A. H., & Laugen, B. T. (2017). Open innovation: on the influence of internal and external collaboration on degree of newness. *Business Process Management Journal, 23*(6), 1129-1143.

Lassen, A. H., Gertsen, F., & Riis, J. O. (2006). The nexus of innovation and radical innovation. *Creativity and Innovation Management, 15*(4), 359-372.

Laursen, K., & Salter, A. (2014). The paradox of openness: appropriability, external search and collaboration. *Research policy, 43*(5), 867-878.

Lee, C. P. (2007). Boundary negotiating artifacts: Unbinding the routine of boundary objects and embracing chaos in collaborative works. *Computer Supported Cooperative Works, 16*(3), 307-339.

Lee, R. P., Chen, Q., Kim, D., & Johnson, J. L. (2008). Knowledge transfer between multinational corporations' headquarters and their subsidiaries: Influences on and implications for new product outcomes. *Journal of International Marketing, 16*(2), 1-31.

Leifer, R., McDermott, C. M., O'Connor, G. C., Peters, L. S., Rice, M. P., Veryzer, R. W., & Rice, M. (2000). *Radical Innovation. How Mature Companies can Outsmart Upstarts.* Boston: Harvard Business School Press.

Leonard-Barton, D. (1990). A dual methodology for case studies: Synergistic use of a longitudinal single site with replicated multiple sites. *Organization science, 1*(3), 248-266.

Levina , N., & Vaast, E. (2005). The emergence of boundary spanning competence in practice: Implications for implementation and use of information systems. *MIS Quarterly, 29*(2), 335-363.

Levina, N. (2005). Collaborating on multiparty information systems development projects: A collective reflection-in-action view. *Information Systems Research, 16*(2), 109-130.

Li, L. (2004). *knwoledge transfer within western multinationals' subsidiary units in China and Finland: The impact of headquarter control mechanisms, subsidiary location and social capital.* Swedish School of Economics and Business Administration, Department of Management and Organization, Helsinki, Finland.

Li, L., Barner-Rasmussen, W., & Björkman, I. (2007). What difference does the location make?: A social capital perspective on transfer of knowledge from multinational corporation subsidiaries located in China and Finland. *Asia Pacific Business Review, 13*(2), 233-249.

Lin, R. J., Chen,, R. H., & Chiu, K. K. (2010). Customer relationship management and innovation capa-bility: An empirical study. *Industrial Management & Data Systems, 110*(1-2), 111-133.

Low, K. Y., & Ho, E. Y. (2016). A Knowledge-based Theory of the Multinational Economic Organization. *Long Range Planning, 49*(6), 641-647.

Magnusson, M. G. (2004). Managing the knowledge landscape of an MNC: knowledge networking at Ericsson. *Knowledge and Process Management, 11*(4), 261-272.

Martinez, J. I., & Jarillo, J. c. (1989). The evolution of research on coordination mechanisms in multinational corporations. *Journal of international business studies, 20*(3), 489-514.

Miles, M. B. (1979). Qualitative data as an attractive nuisance: The problem of analysis. *Administrative Science Quarterly, 24*(4), 590-601.

Morse, J. M., Barrett, M., Mayan, M., & Olson, K. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative Methods, 1*(2), 13-22.

Mudambi, R. (2002). Knowledge management in multinational firms. *Journal of International Management, 8*(1), 1-9.

Mudambi, R., & Pedersen, T. (2007). Agency Theory and Resource Dependency Theory: Complementary Explanations for Subsidiary Power in Multinational Corporations. *SMG Working Paper No. 5/2007*.

Mudambi, R., Piscitello, L., & Rabbiosi, L. (2014). Reverse knowledge transfer in MNEs: subsidiary innovativeness and entry modes. *Long Range Planning, 47*, 49-63.

Nicolini, D., Mengis, J., & Swan, J. (2012). Understanding the role of objects in cross-disciplinary collaboration. *Organization Science, 23*(3), 612-629.

Nielsen, B. B., & Michailova, S. (2007). Knowledge management systems in multinational corporations: typology and transitional dynamics. *Long Range Planning, 40*, 314-340.

Nobel, R., & Birkinshaw, J. (1998). Innovation in multinational corporations: control and communication patterns in international R & D operations. *Strategic Management Journal, 19*(5), 479-496.

Orlikowski, W. J. (2007). Sociomaterial practices: Exploring technology at work. *Organizational Studies, 28*(9), 1435–1448.

Oswick, C., & Robertson, M. (2009). Boundary Objects Reconsidered: from Bridges and Anchors to Barricades and Mazes. *Journal of Change Management, 9*(2), 179-193.

Paterson, B. L. (2012). Within-Case Analysis. I G. D. Albert J. Mills (Red.), *Encyclopedia of Case Study Research* (s. 971-972). Thousand Oaks: SAGE Publications.

Pedersen, T., Petersen, B., & Sharma, D. (2003). Knowledge transfer performance of multinational companies. *Management International Review, 43*(3), 69-90.

Pesalj, B. (2011). Competitive advantages of multinational companies: a review of theoretical approaches. *Medjunarodni problemi, 63*(2), 237-259.

Pettigrew, A. M. (1990). Longitudinal field research on change: Theory and practice. *Organization Science, 1*(3), 267-292.

Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource.* New York: Harper and Row.

Phene, A., & Almeida, P. (2008). Innovation in multinational subsidiaries: The role of knowledge assimilation and subsidiary capabilities. *Journal of International Business Studies, 39*(5), 901-919.

Pihl, H., & Paulsson, A. (2014). The Omnipotent MNC – A Review and Discussion. In M. V. Torben Pedersen (Ed.), *Orchestration of the Global Network Organization (Advances in International Management)* (pp. 213-233). Emerald Group Publishing Limited.

Piscitello, L., & Rabbiosi, L. (2004). The impact of MNC's foreign activities on the innovative performance of the parent companies. Elsinore, Denmark: DRUID Summer Conference.

Poppo, L. L. (1995). Influence activities and strategic coordination: Two distinctions of internal and external markets. *Management Sci, 41*, 1845-1859.

Powell, W. W., Koput , K. W., & Smith-Doerr, L. (1996). Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Ad-ministrative Science Quarterly, 41*(1), 116-145.

Prahalad, C., & Doz, Y. (1981). An approach to strategic control in MNCs. *Sloan Management Review, 22*(4), 5-13.

Rabbiosi, L. (2011). Subsidiary roles and reverse knowledge transfer: An investigation of the effects of coordination mechanisms. *Journal of International Management, 17*(2), 97-113.

Rabbiosi, L., & Milano, p. D. (2005). The evolution of reverse knowledge transfer within multinational corporations. *Triple Helix, 5*.

Rabbiosi, L., & Santangelo, G. D. (2013). Parent company benefits from reverse knowledge transfer: The role of the liability of newness in MNEs. *Journal of World Business, 48*(1), 160-170.

Riis, J. O., Johansen, J., Waehrens, B. V., & Englyst , L. (2007). Strategic roles of manufacturing. *Journal of Manufacturing Technology Management, 18*(8), 933-948.

Samson, D., & Gloet, M. (2014). Innovation capability in Australian manufacturing organisations: an exploratory study. *International Journal of Production Research, 52*(21), 6448-6466.

Sawhney, M., & Prandelli, E. (2000). Communities of creation: managing distributed innovation in turbulent markets. *California Management Review, 42*(4), 24-54.

Slepniov, D., Waehrens, B. V., & Jørgensen, C. (2010). Global operations networks in motion: Managing configurations and capabilities. *Operations Management Research, 3*(3-4), 107-116.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal, 17*(52), 45-62.

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, translations' and boundary objects: Amateurs and professionals in Berkeley's museum of vertebrate zoology. *Social Studies of Science, 19*(3), 387-420.

Swan, J., Bresnen, M., Newell, S., & Robertson, M. (2007). The object of knowledge: the role of objects in biomedical innovation. *Human Relations, 60*(12), 1809-1837.

Swink, M. (2006). Building collaborative innovation capability. *Research-technology Management, 49*(2), 37-47.

Szulanski, G. (1996). Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm. *Strategic Management Journal, 17*, 27-43.

Søberg, P. V. (2010). Industrial influences on R&D transfer to China. *Chinese Management Studies , 4*(4), 322-338.

Søberg, P. V. (2014). Institutional Influences on R&D Collaboration in China. *International Business: Research, Teaching and Practice, 8*(1), 1-16.

Søberg, P. V., & Wæhrens, B. V. (2013). The Dual Role of Subsidiary Autonomy in Intra-MNC Knowledge Transfer. In T. Pedersen, L. Vals , & P. D. Jensen (Eds.), *The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization* (pp. 155-171). Copenhagen: Springer.

Søberg, P. V., & Wæhrens, B. V. (2014). Integration of Manufacturing and Development in Emerging Markets. In D. Slepniov, J. Johansen, & B. V. Wæhrens (Eds.), *Global Operations Networks: Exploring New Perspectives and Agendas* (pp. 225-246). Aalborg: Aalborg University Press.

Sölvell, A., Zander, I., & Porter, M. E. (1991). *Advantage Sweden.* Stockholm: Norstedts.

Sölvell, O., & Zander, I. (1995). Organization of the dynamic multinational enterprise. *International Journal of Studies of Management and Organization, 25*(1-2), 17-38.

Teece, D. (2007). The role of managers, entrepreneurs and the literati in enterprise performance and economic growth. *International Journal of Technological Learning, Innovation, and Development, 1*(1), 43-64.

Thomas, R., Sargent, L., & Hardy, C. (2008). *Power and participation in the production of boundary objects.* Working Paper Series, Cardiff Business School.

Tsai, K. H. (2009). Collaborative networks and product innovation performance: toward a contingency perspective. *Research policy, 38*(5), 765-778.

Tsai, W. (2001). Knowledge transfer in intra-organizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal, 44*(5), 996-1004.

Tsai, W. (2002). Social Structure of "Coopetition" within a Multiunit Organization: Coordination, Competition, and Intraorganizational Knowledge Sharing. *Organization Science, 13*(2), 179-190.

Tuckett, A. G. (2005). Applying thematic analysis theory to practice: A researcher's experience. *Contemporary Nurse, 19*(1-2), 75-87.

Usman , M., & Mat, N. (2016). Investigating the link between knowledge sharing and innovation capability. *Journal of Technology and Operations Management, 11*(2), 58-67.

Vaccaro, A., Parente, R., & Veloso, F. M. (2010). Knowledge management tools, inter-organizational relationships, innovation and firm performance. *Technological Forecasting and Social Change, 77*(7), 1076-1089.

Vernon, R. (1966). International investment and international trade in the product life cycle. *Quarterly Journal of Economics, 80*, 190–207.

Vernon, R. (1979). The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics,, 41*(4), 255–267.

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity.* Cambridge university press.

Wæhrens, B. V., Cheng, Y., & Madsen, E. S. (2012). The replication of expansive production knowledge: the role of templates and principles. *Baltic Journal of Management, 7*(3), 268-286.

Yahiaoui, D., & Chebbi, H. (2008). The limits of top-down transfers within a multinational corporation: the need for knowledge hybridization. *Journal of Innovation Economics & Management, 2*, 85-104.

Yamin, M., & Otto, J. (2004). Patterns of knowledge flows and MNE innovative performance. *Journal of International Management, 10*(2), 239-258.

Yang, Q., Mudambi, R., & Meyer, K. (2008). Conventional and reverse knowledge flows in multinational corporations. *Journal of Management , 34*, 882–902.

Yeşil, S., Koska, A., & Büyükbeşe, T. (2013). Knowledge Sharing Process, Innovation Capability and Innovation Performance: An Empirical Study. *Procedia - Social and Behavioral Sciences, 75*, 217 – 225.

Yin, R. K. (2003). *Case study research: Design and methods.* Thousand Oaks: Sage Publications.

Yin, R. K. (2009). *Case study research: Design and Methods.* Thousand oaks: SAGE publications.

Yin, R. K. (2011). *Qualitative Research from Start to Finish* (First edition udg.). Guilford Press.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review, 27*(2), 185-203.

Zander, I. (1999). Whereto the multinational? The evolution of technological capabilities in the multinational network. *International Business Review*, *8*(3), 261-291.

Zander, I., & Sölvell, Ö. (2000). Cross-Border Innovation in the Multinational Corporation. *International Studies of Management and Organization*, *30*(2), 44-67.

Zander, U., & Kogut, B. (1995). Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test. *Organization science*, *6*(1), 76-92.

Zhang, J., Di Benedetto, C. A., & Hoenig, S. (2009). Product development strategy, product innovation performance, and the mediating role of knowledge utilization: evidence from subsidiaries in China. *Journal of International Marketing*, *17*(2), 42-58.

APPENDICES

- Appendix A – Case analysis tables
- Appendix B – Selected quotations
- Appendix C – Transcription samples
- Appendix D – Coding samples
- Appendix E – Themes

Appendix A. Case analysis tables

The following tables are two examples of the case analysis tables provided for the company Alpha and company Beta. Similar tables are provided for all the case companies.

Company Alpha

Company Alpha: Knowledge acquisition

Knowledge acquisition	Involved people	Main inter-firm objects	Key issues
• A structured process for idea collection where the company Alpha gets input from also subsidiaries and everyone has the possibility to put the ideas (only structured through idea ambassadors and change request system) • Most of the improvement ideas are coming from change request, and most of the ideas for new products are collected by idea ambassadors	• Local idea ambassadors • Idea ambassadors are responsible for seeking the ideas in their part of the organizations and they need to talk to the people in their organizations • Ideas can come from any part of the organization	• People as idea ambassadors • Change request system • Idea generation forum • Emails • Workshops	• How to make sure that the company gets valid ideas from subsidiaries to secure our earning not for short-term but also long-term? • Lack of a process to gather radical ideas • Development of a structured knowledge sharing

Company Alpha: Knowledge evaluation

Knowledge evaluation	**Involved people**	**Main inter-firm objects**
Structured, after basic evaluation if something is interesting and the HQ wants to work with, it is sent to traditional stage-gate process for developing projects	• An idea generation forum: all the ideas will be ranked, and people give the feedbacks on ideas. • Product council: all stakeholders • Idea evaluation is done in collaboration with idea ambassadors (basic evaluation)	• The ideas are ranked in a simple excel sheet and there would be some additional document behind that that explains that information would be shared with whoever that wants to look at the ideas internally • Meetings between stakeholders called product council

Company Alpha: Knowledge dissemination

Knowledge Dissemination	**Involved people**	**Main inter-firm objects**
• Ideas are not shared on a structured basis • When a new product is released, then there are some training programs to share knowledge with subsidiaries, it is mainly one-way	• People who benefits from the new knowledge for their projects • HQ makes sure that the ideas are distributed between the entities that are participating in the projects • The new projects are not shared with the ones which have different products and market • New knowledge is shared if some part benefits from that	• Simple excel and word files • Product council (twice a year): all the relevant stakeholders for certain products areas gathered (10-15 people) and then one of the topic that they go through is the new ideas and what kind of new ideas have been prioritized

Company Alpha: Knowledge use

Knowledge Use	Involved people	Factors affecting the use
• Gap filler products • Newness target • Change in quality and existing products	• Most reverse knowledge comes from sales subsidiaries because they see the needs for products faster than operations people	• Purpose of the utilization is mainly based on the current trends • It is strategic way based on trends and environmental requirements • People at marine market are conservative • It is easier and faster to make more or less modifications of existing products because then the company does not need to go to the customers and let them know about completely new products

Company Alpha: Key aspects of KO

HQ-subsidiaries Relationship, Control	Strategy
• Subsidiaries are integrated part of product development process • Only control over Brazilian because they are part of company alpha organization • Australians are much independent than others • Documentation and drawings are mainly developed by HQ, and there might be some feedbacks from subsidiaries in development	• No template for knowledge management • Informal strategy from top managers based on the market trends

Company Beta

Company Beta: Knowledge acquisition

Knowledge acquisition	Involved people	Main inter-firm objects	Key issues
• It is based on the project which is running, and some situations which need some differences • There is no real set up for how to do this • Idea collection is 80 % in connection with the projects that the company has problem with them • Gathering feedback for running projects • Case-to-case idea collection	A person (Application manager) is looking for new ideas for building up the design of feed mills as effective as possible in collaboration with people who run the project	• Visiting • face to face talk • Participation in different exhibitions • Visiting plants working in real-life-	• In-house knowledge distribution • Lack of a system for distribution of new knowledge • When something is developed, since it is not well-documented, it would be difficult to be re-used • The risk is that the subsidiaries take their knowledge and the potential income and then they get independent of the HQ.

Company Beta: Knowledge evaluation

Knowledge evaluation	**Involved people**	**Main inter-firm objects**
A structured process	• R&D committee which consists of people from subsidiaries, R&D. sales, and the managers • People with practical knowledge and experience who know what works better, they get together at the same room to make the best evaluation of the ideas (a forum) • Depending on the products on the market, they can be people from subsidiaries	• Face-to-face • Brainstorming • Meetings

Company Beta: Knowledge dissemination

Knowledge Dissemination	**Involved people**	**Main inter-firm objects**
• Depending on the type of ideas, different people can be involved	• Application manager from design department, development department, and design engineers and discuss idea and make the prototype and test • PPU meeting 3-4 times a year that is development department plus sales plus application manager and some designer sitting together and have a project going on	• Man-to-man in-house sharing • Tech info and files • Written forms and verbal

Company Beta: Knowledge use

Knowledge Use	Involved people	Factors affecting the use
• Cash cows and innovative products • Ongoing improvements of standard products or Cash cows	• Application manager to pre-evaluate ideas, also searching what is available in the market	• Depending on what the company works on at that time • The qualification of people in different sites to see if they have stronger work, in this way company Beta moved the software to France • Convincing R&D people to make simple and basic product line where they aim to produce something which is good enough and people want to pay for and do it in a big volume • Market potential to be served with new products is different (for example Danes investigate in innovation, but Chinese prefer something simple that can be operated by unskilled labors

Company Beta: Key aspects affecting KO

HQ-subsidiaries Relationship, Control	Strategy
• HQ is trying to always have an open dialogue with the subsidiaries to present their opinions. • HQ tries to be neutral and make the best choice. • Matrix structure • HQ is trying to look at everything cross functional (sales, market situation, so on). • Understanding the subsidiaries' requirements (their needs for each individual market or operation) • A "balanced authority" is preferred	• Short decision-making process: facilitates the circulation of the ideas • Lack of clear strategy for KO

Appendix B. Selected quotations

The following tables show few selected quotations from the interviewees in different case companies and the categories they fit into. As the quotations which are provided based on the storytelling in the case companies are more than 30 pages, only a few examples are provided here.

Quotations fit within "Strategy"

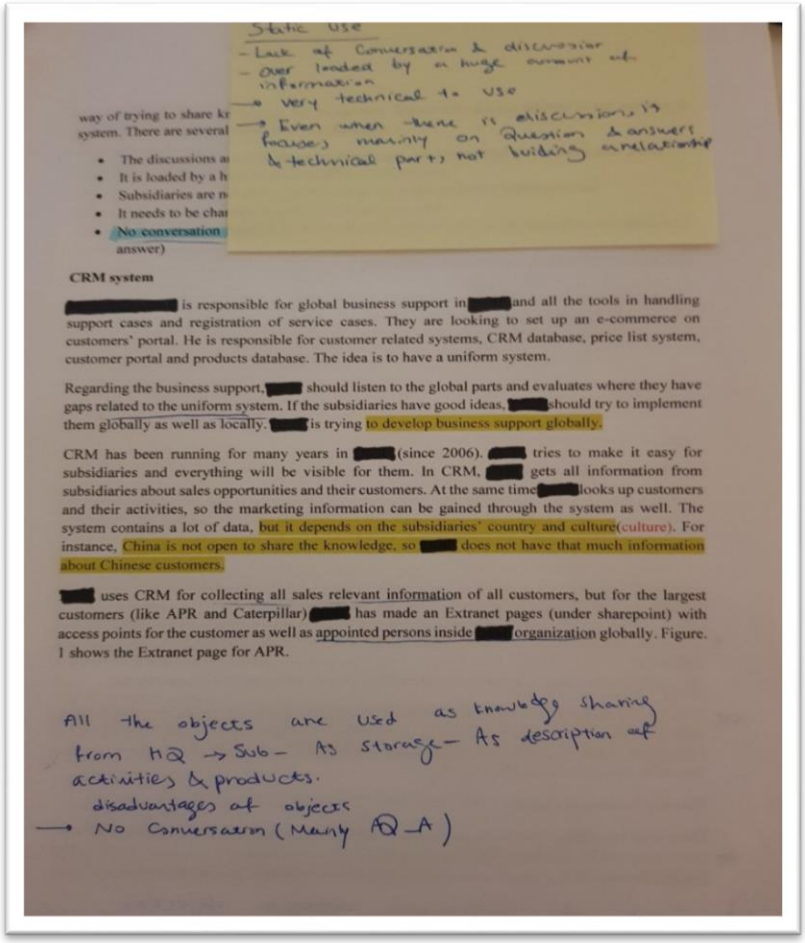
Company Gamma, Head of emission technology	**"***To scale up, we need to have a clear strategy and a better system than one-way training to a system with a lot of questions come and back."*
Company Delta, Vice president key account and business support	"*We need a new strategy for 2017 that would be called communication, where the knowledge sharing is part of this*."
Company Beta, Application and export manager	*"We don't have an overhead strategy called knowledge sharing among our group, but I think there is a lot of awareness about this."*

Quotations fit within "Need for external knowledge"

Company Alpha, Product and technology manager	**"***In a lot of cases innovation is based on internal knowledge, but also we are aware of starting up projects and being part of the projects that are going on together with external companies and universities in different projects. Because we know that we need to have some input from outside to think in different ways."*
Company Gamma, Head of technical department	"*At this time, maybe we need some more input because we are not so familiar with all new technologies we are doing now."*

Appendix C. Transcription samples

The following pictures show two pages of the transcriptions in which notes, codes, and understandings are included. To keep the confidentiality, companies' names and interviewee names are masked. The transcripts were precisely read several times and examined. Notes, codes, understandings, and potential patterns were manually provided by reading each transcription several times. The transcriptions provided for the main case companies are more than 200 pages.



Static use
- Lack of Conversation & discussion
- over loaded by a huge amount of information
- very technical to use
- Even when there is discussions it's focuses mainly on Questions & answers & technical parts not building a relationship

way of trying to share kr
system. There are several
- The discussions a
- It is loaded by a h
- Subsidiaries are n
- It needs to be cha
- No conversation
answer)

CRM system

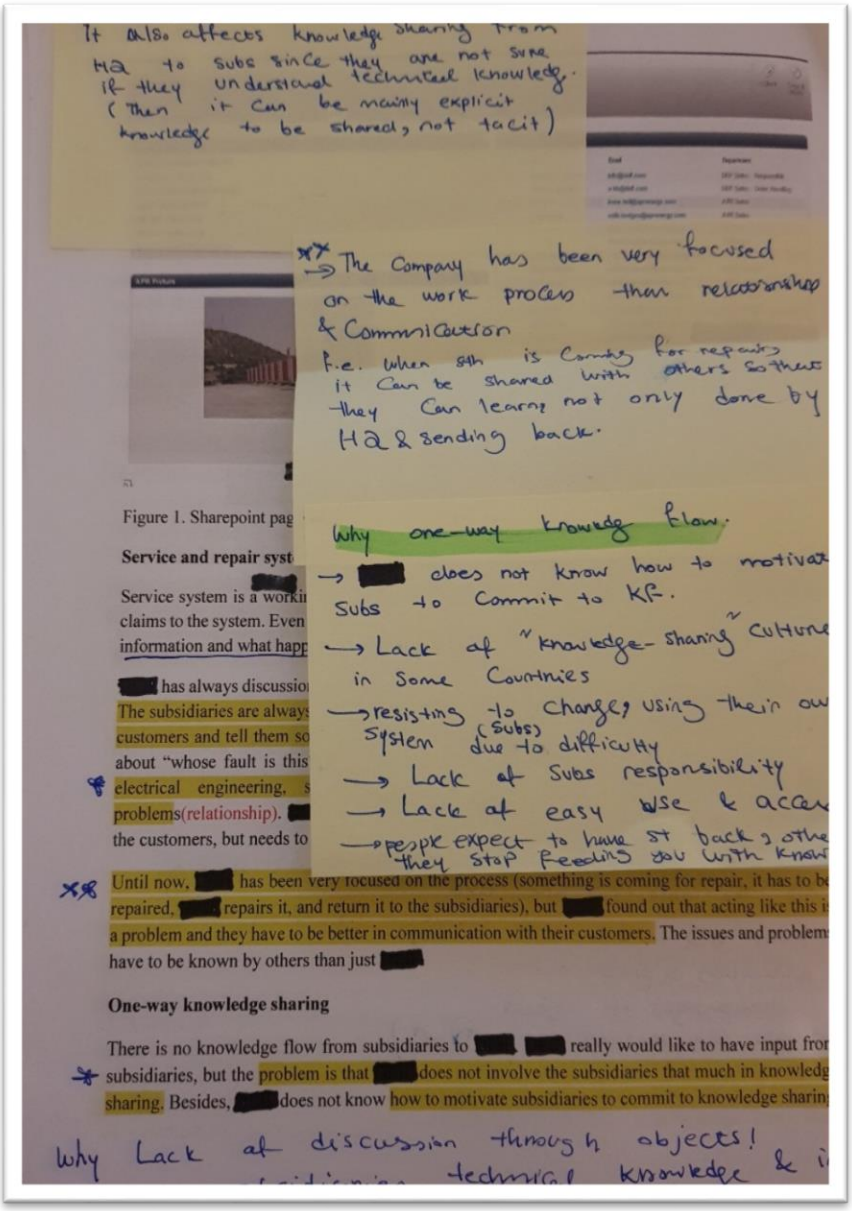
[redacted] is responsible for global business support in [redacted] and all the tools in handling support cases and registration of service cases. They are looking to set up an e-commerce on customers' portal. He is responsible for customer related systems, CRM database, price list system, customer portal and products database. The idea is to have a uniform system.

Regarding the business support, [redacted] should listen to the global parts and evaluates where they have gaps related to the uniform system. If the subsidiaries have good ideas, [redacted] should try to implement them globally as well as locally. [redacted] is trying to develop business support globally.

CRM has been running for many years in [redacted] (since 2006). [redacted] tries to make it easy for subsidiaries and everything will be visible for them. In CRM, [redacted] gets all information from subsidiaries about sales opportunities and their customers. At the same time [redacted] looks up customers and their activities, so the marketing information can be gained through the system as well. The system contains a lot of data, but it depends on the subsidiaries' country and culture(culture). For instance, China is not open to share the knowledge, so [redacted] does not have that much information about Chinese customers.

[redacted] uses CRM for collecting all sales relevant information of all customers, but for the largest customers (like APR and Caterpillar) [redacted] has made an Extranet pages (under sharepoint) with access points for the customer as well as appointed persons inside [redacted] organization globally. Figure. 1 shows the Extranet page for APR.

All the objects are used as knowledge sharing from HQ → Sub – As storage – As description of activities & products.
disadvantages of objects
→ No Conversation (Mainly HQ–A)



It also affects knowledge sharing from HQ to subs since they are not sure if they understand technical knowledge. (Then it can be mainly explicit knowledge to be shared, not tacit)

The Company has been very focused on the work process than relationship & Communication

f.e. when sth is coming for repair, it can be shared with others so that they can learn, not only done by HQ & sending back.

Figure 1. Sharepoint pag

Service and repair syst

Service system is a worki
claims to the system. Even
information and what happ

has always discussio
The subsidiaries are always
customers and tell them so
about "whose fault is this
electrical engineering,
problems(relationship).
the customers, but needs to

Why one-way knowledg flow.

→ does not know how to motivat
Subs to commit to KS.

→ Lack of "knowledge-sharing" culture in some countries

→ resisting to change, using their ow system (subs) due to difficulty

→ Lack of subs responsibility

→ Lack of easy use & acce

→ people expect to have st back, othe they stop feeding you with know

Until now, has been very focused on the process (something is coming for repair, it has to b repaired, repairs it, and return it to the subsidiaries), but found out that acting like this i a problem and they have to be better in communication with their customers. The issues and problem have to be known by others than just

One-way knowledge sharing

There is no knowledge flow from subsidiaries to , really would like to have input fro subsidiaries, but the problem is that does not involve the subsidiaries that much in knowledg sharing. Besides, does not know how to motivate subsidiaries to commit to knowledge sharin

Why Lack of discussion through objects!

Appendix D. Coding sample

The following table illustrates an example of codes developed based on the data from the case companies.

An example of codes developed

Data extract	**Coded for**
"From the day that we sat up our subsidiaries, we more or less micro-managed everything from HQ." "Power is in the hands of HQ in Denmark. A lot of structures and work procedures are created in Denmark." "Products, documents, and materials specifications, which are more appropriate to be used in different countries, are developed at HQ in Denmark and are sent to subsidiaries" "The subsidiaries have no authority to do changes." "In a long-term, objects are used to control because the overall goal is to have things done in a best way, in a most efficient way, and less time consuming."	Control
"There is no knowledge flow from subsidiaries to our company. we really would like to have input from subsidiaries." "At this time, maybe we need some more input because we are not so familiar with all new technologies we are doing now." "The licensees may have knowledge about how engines are running and the information of how many engines are running, but they are not really transferring that knowledge so that everybody can reflect on it."	Lack of knowledge flow from subsidiaries Small or inadequate knowledge flow from subsidiaries

"The knowledge flow from the subsidiaries is quite small compared to the knowledge flow from the HQ to the subsidiaries."	
"There is a cultural barrier that we should be aware of when we are dealing with the subsidiaries. We need to know the differences between them." "Sometimes it can be difficult to have knowledge sharing because they (subsidiaries) want to keep it and do not want to share and they are afraid that the job would be taken from them. In that case, it is very difficult to open them up and share their experience." "I try to understand where they (subsidiaries) are, which culture they have, how they think to make trust relationship. It takes time, but I should adapt." "We passed problems regarding language and cultural differences. We have been a global company for more than 30 years…We are global harmonized company and know how to act and react in a global company." "we try to say that company Delta does not have one culture and we have many cultures and we need to be aware of that. Having this in the mind, make us open to do dialogue.	Culture Cultural understanding

Appendix E. Themes

An example of identified themes

Evidence	Code	Theme
• The annual meetings with subsidiaries would be very important to make a trust relationship • Knowledge sharing is not only about technical sharing, it is also about knowing each other for further collaboration • Workshops and meetings are used to build a trust relationship with subsidiaries • People at HQ are asked to make relationships through the tools and not only focusing on the business stuff • More relationship maker tools are used to have the possibility to discuss the ideas • Not controlling subsidiaries and having open dialogue with them help HQ to create a better relationship with subsidiaries and motivate them to share more radical ideas	Inter firm objects are used to build trust relationship and interaction	Collaborative relationship through the use of inter-firm objects
• The meetings are not like that people from HQ talk and share, and subsidiaries listen. Rather, high level of subsidiaries involvement in knowledge sharing is also part of the meetings • The new developed IT-based system is used as the basis in which subsidiaries can share and discuss their ideas and receive feedbacks on it • Idea ambassadors share HQs' knowledge with subsidiaries and bring back subsidiaries' ideas and feedbacks to HQs	Inter-firm objects are not used only to transfer knowledge from HQ to subsidiaries but also to gather knowledge from subsidiaries	Two-way knowledge flow through the use of inter-firm objects

ISSN (online): 2446-1636
ISBN (online): 978-87-7210-114-9

AALBORG UNIVERSITY PRESS