CROSS-INDUSTRY COLLABORATION

How to Boost Innovation Capability

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BRANSCHÖVERSKRIDANDE SAMARBETE

Hur innovationsförmågan kan förhöjas

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Sammanfattning

På den globala marknaden är konkurrensen mellan företag hög. Detta ställer krav på flexibilitet och innovationsförmåga hos etablerade företag, för att dessa ska kunna överleva. Det finns olika sätt att uppnå flexibilitet inom en organisation, men ett sätt som inte kräver särskilt stora interna förändringar är genom samarbete med andra företag. Ett sätt att undvika konkurrens och skaffa nya perspektiv är att fokusera på branschöverskridande samarbete mer specifikt. Utifrån detta har denna studies syfte varit att utforska hur företag använder sig av branschöverskridande samarbete för att höja sin innovationsförmåga.

I och med att branschöverskridande samarbete är ett område inom forskningen som fortfarande är relativt outforskat används en utforskande ansats i studien. Den litteraturstudie som genomförts hanterar innovation i allmänhet, samarbeten mellan företag och specifikt branschöverskidande samarbeten.

I studien har också 17 kvalitativa intervjuer genomförts på 15 företag som har erfarenhet av branschöverskridande samarbeten. Intervjuerna var semi-strukturerade och syftade till att beskriva konkreta exempel av branschöverskridanade samarbeten samt fånga respondentens företags attityd mot samarbete i ett generellt perspektiv.

I resultatet återfanns variationer i hur företagen använder sig av branschöverskridande samarbeten. Utav alla respondenterna så gör vissa det för att komma åt teknologier, vissa för att undersöka nya värden och vissa för att komma åt nya marknader.

Dessa, och fler resultat diskuteras sedan mot befintlig litteratur, där diskussionen utgör underlag för de slutsatser som sedan dras.

Slutsatserna visar att företag i Sverige kan utvecklas i sin användning av branschöverskridande samarbeten, för att lära sig att maximera effekterna på företagens innovationsförmåga.

Nyckelord: Branschöverskridande samarbeten, förtroende, gränsöverskridande, innovationsförmåga

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CROSS-INDUSTRY COLLABORATION

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Abstract

On the global market the competition between firms is increasing. This require established firms to be flexible and innovative. There are different ways of achieving flexibility without critically changing a firm's capabilities, out of which one is interfirm collaboration. A way to also avoid competition and gain new perspectives is to engage in cross-industry collaboration. With this in mind, the purpose of this thesis has been to explore how firms engage in cross-industry collaborations to boost their innovation capability.

Considering that cross-industry collaborations is a relatively unexplored area within current research, an explorative approach is used in this thesis. The frame of reference that was conducted deals with innovation in general, interfirm collaboration and cross-industry collaboration specifics.

In this thesis 17 respondents, with experience in cross-industry collaborations, belonging to 15 firms have been interviewed. The interviews were semi-structured and intended to capture examples of cross-industry collaborations and the respondent firm's general attitude towards collaboration.

The results reflect that firms use cross-industry collaborations in different ways. Out of all the respondents some engage in them to access technologies, some do it to explore potential values, and some do it to gain access to new markets.

These results, and more, are then discussed in comparison with current literature, which makes the basis for the conclusions later drawn.

The conclusions show that firms in Sweden can and should develop cross-industry collaboration strategies, to be able to maximise the effects on the firms' innovation capabilities.

Keywords: Cross-industry collaboration, innovation capability, trust,

FOREWORD

This master thesis was written by Eric Thunberg and was conducted within the master programme of product innovation management at the Royal Institute of Technology.

I would like to thank my supervisor at Scania, Kristoffer Andersson, for the trust you have shown me throughout the thesis work. Also, I would like to thank Jennie Björk for professional feedback and flawless guidance within the research world.

I am glad that so many firms could contribute to this thesis, and for the positive feedback I have gotten in the process. I want to express my gratitude towards all the respondents that contributed to my thesis, your participation made the study.

Lastly, I would like to thank family, friends, and Louise especially, for the patience you have all shown and for the support.

Eric Thunberg

Stockholm, June 2015

'...people and firms need outside sources of cognition and competence to complement their own. That is the fundamental reason why inter-firm linkages are important, especially for innovation.'

- Bart Nooteboom

NOMENCLATURE

Abbreviations

IPR	Intellectual Property
NDA	Non-Disclosure Agreement
PD	Product Development
R&D	Research and Development
TM	Technical Managers

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 BACKGROUND 1
1.2 SCANIA'S FUTURE AMBITIONS 2
1.3 PURPOSE 3
1.4 DELIMITATIONS 3
1.5 DISPOSITION 3

2 METHODS 5

2.0.1 METHOD OVERVIEW 5

2.1 PRE-STUDY 6
2.1.1 ORIENTATIONAL INTERVIEWS 6

2.2 LITERATURE SEARCH 6
2.3 DATA COLLECTION 8
2.3.1 QUALITATIVE INTERVIEW 8
2.3.2 CONSTRUCTION OF THE INTERVIEW GUIDE 8
2.3.3 EXAMPLES OF CROSS-INDUSTRYLLABORATIONS 8
2.3.4 GENERAL APPROACH COLLABORATION 8
2.3.5 INTERVIEWED COMPANIES 8
2.3.6 FINDING THE RIGHT INTERVIEWEES 9
2.3.7 INTERVIEWS: EXECUTION 10

2.4 DATA 11
2.5 ANALYSIS OF INTERVIEW MATERIAL 14
2.6 METHODS DISCUSSION 15
2.6.1 RESPONDENT SAMPLE 15
2.6.2 INTERVIEW GUIDE DESIGN 15
2.6.3 STUDY DESIGN 16
2.6.4 INTERNAL AND EXTERNAL VALIDITY 17
2.6.5 RELIABILITY 17

3 FRAME OF REFERENCE 19

3.1 INNOVATION 19
3.1.1 THE DIFFERENT FACES OF INNOVATION 20
3.1.2 EXPLORATION AND EXPLOITATION 21
3.1.3 OPEN INNOVATION 22

3.2 COLLABORATION 23
3.2.1 TYPES OF COLLABORATIVE ARRANGEMENTS 23
3.2.2 INCENTIVES TO COLLABORATE 25
3.2.3 REASONS TO NOT COLLABORATE 26
3.2.4 TRUST AND RISK-TAKING IN COLLABORATION 27
3.2.5 SUCCESSFUL COLLABORATION 28

3.3 CROSS-INDUSTRY COLLABORATION SPECIFICS 31
3.3.1 IMPLICATIONS ON INNOVATION PERFORMANCE 31
3.3.2 INITIATING CROSS-INDUSTRY COLLABORATIONS 32
3.3.3 OPTIMAL COGNITIVE DISTANCE, WHAT TO LOOK FOR 33

3.4 THEORETICAL FRAMEWORK AND RESEARCH QUESTIONS 35
3.4.1 RESEARCH QUESTIONS 35

4 RESULTS **37**

4.1 PRE-REQUISITES FOR COLLABORATION **37**
4.2 TYPICAL FORMS OF COLLABORATIONS **38**
4.2.1 CO-CREATION 38
4.2.2 EXTENDED CUSTOMER / BUYER RELATION 39
4.2.3 VALUE CHAIN 39
4.2.4 EXPLORATIVE NEW TECHNOLOGY INCUBATIONS 40
4.2.5 METHODOLOGY- / COMPETENCE SHARING 40

4.3 SECRECY, IP AND INITIAL OPENNESS **41**
4.4 INTENTIONS AND EXPECTATIONS **42**
4.5 RESOURCES ALLOCATED **43**
4.6 PARTNER DIVERSITY **44**
4.7 PRODUCTS AND BY-PRODUCTS FROM COLLABORATION **44**
4.8 THE FUTURE OF COLLABORATION **45**
4.9 FEATURED INTERVIEWS **46**
4.9.1 RESPONDENT 3 46
4.9.2 RESPONDENT 16 47
4.9.3 RESPONDENT 17 47

4.10 SUMMARY TABLES **48**

5 ANALYSIS & DISCUSSION **53**

RQ1: WHY DO FIRMS ENGAGE IN CROSS-INDUSTRY COLLABORATIONS? **53**
RQ2: WHAT ARE THE DIRECT AND INDIRECT VALUES THAT FIRMS CAN EXTRACT FROM CROSS-INDUSTRY COLLABORATIONS? **55**
RQ3: HOW DO LARGE FIRMS IN SWEDEN ENGAGE IN CROSS-INDUSTRY COLLABORATIONS TODAY? **56**
RQ4: WHAT ARE THE IMPLICATIONS ON A FIRM'S INNOVATION CAPABILITY IN THE RELATION TO THE USE OF CROSS-INDUSTRY COLLABORATIONS? **57**
RQ5: WHAT IS THE FUTURE OF CROSS-INDUSTRY COLLABORATIONS IN SWEDEN? **58**

6 CONCLUSIONS AND RECOMMENDATIONS **61**

6.1 CONCLUSIONS **61**
6.2 RECOMMENDATIONS **63**
6.3 A GUIDE FOR CROSS-INDUSTRY COLLABORATION **64**

7 FUTURE RESEARCH **65**

8 REFERENCES **66**

APPENDIX A: INTERVIEW GUIDE **I**

FIGURES AND TABLES

Figure 1, A description of the thesis process 5
Figure 2, The purpose and pre-study together defined the scope of the thesis 7
Figure 3, The process and outcome of contacting potential respondents 10
Figure 4, The respondents' department inherence 13
Figure 5, The respondents' perceived level in the hierarchy in their organisation 13
Figure 6, Innovation in an organisation. (Crossan & Apaydin (2010)) 20
Figure 7, Change and novelty levels of innovation (Henderson & Clark, 1990) 21
Figure 8, The typical collaborative interfaces of a firm (Schilling, 2010) 24
Figure 9, The sub-steps of the partner selection process (Brunswicker & Hutschek, 2010) 32
Figure 10, the cross-industry innovation process, as interpreted by Gassmann and Zeschky (2008) 33
Figure 11, A model of optimal cognitive distance (Wuyts, et al., 2005) 34
Figure 12, Cross-industry collaborations explored 61

Table 1, A short description of the companies that contributed through interviews 11
Table 2, Relationship definitions and trust (Carbonara, 2002) 27
Table 3, A checklist for successful collaboration (Borden & Perkins, 1999) 30
Table 4, A summary of the results from interviews 1-6 49
Table 5, A summary of the results from interviews 7-12 50
Table 6, A summary of the results from interviews 13-17 51

1 INTRODUCTION

The hypercompetitive climate that challenge firms today is a result of increased globalisation. Firms that once thrived in their respective markets are challenged by new and innovative companies and whole industries are overturned by radical innovations. Large firms can no longer rely on business-as-usual, but needs to be flexible and continuously search for new values. This is the reality of many large firms in Sweden, as the tides turn.

1.1 BACKGROUND

While an ever increasing competition due to globalisation is a fact, firms have the choice to either oppose change, or embrace it. In a hypercompetitive setting firms need to innovate more rapidly and more efficiently, while prices have to be driven down and customer values be maximised (Goeltz, 2014). A firm that choses to embrace globalisation can, even with the risks involved, develop novel business cases from opportunities globalisation brings. To embrace globalisation a firm has to be flexible – the values that the firm delivers need to comply with what the market wants. Being flexible entails renewing and evaluating the intellectual capital.

The contradiction in this, however, is that intellectual capital, the collective knowledge of a firm, is a valuable and especially the so called core competence (Harrison & Sullivan Sr, 2000). It is so valuable that some firms even list it in the balance sheet. So, if intellectual capital is the most important part of a firm's value, source of competitive advantage etc., how can it become flexible without harming the value of a firm?

Rather than trying to create new knowledge from scratch using internal resources, firms can choose to engage in collaborations with other firms, and thus gain access to new intellectual capital. The choice of collaboration partner and type of collaboration will affect what a firm can learn and also the novelty of the knowledge in relation to the firm's current intellectual capital.

The different faces of collaboration are in fact so many, that it is hard to tell beforehand what the resources put into the collaboration actually will generate for the firms. To be able to predict the value created of an investment in an exploratory activity, such as collaborations, is something many firms struggle with. Without a correct value appreciation an investment in collaboration has great risks involved, and probably will the investment in the exploratory activity not occur. However, Enkel and Gassman (2010) conclude that *cross-industry innovation should be established as a method to systematically explore innovation efforts in incumbent companies*, which really stresses the need for firms to appreciate explorative collaborations.

So, what if there was a way to better appreciate the value of potential collaborations, and have clear guidelines on how to manage collaborations to optimise output? Most likely this would render better financial returns on such investments and potentially be a way to keep renewing the firm's intellectual capital to meet with customer needs.

This master thesis is conducted in Swedish industry, at a large, process-controlled, automotive firm with a successful past and innovation ambitions. It is thus in this perspective the thesis is conducted, as one method of realising *Scania's future ambitions*.

1.2 SCANIA'S FUTURE AMBITIONS

Scania is a Swedish automotive company with presence in over 100 countries, with production units in Europe and Latin America. Out of some 42,000 employees about 3,500 are employed within research and development at the head office in Södertälje, Sweden. Scania has three main areas of business: heavy trucks, buses and engines. (Scania, 2013)

As a company, Scania has historically performed well in fuel economics and delivered solid, high quality products. Scania's products keep scoring high in tests (Scania, 2014), but in later years competition has intensified, and Scania's position as the top performer can no longer be taken for granted.

Scania has a strong tradition in ways of working to thank for much of the success in later years, but traditions can also be an obstacle for change. Recently, the transportation industry has had to change to keep up with new emissions requirements, pushing truck manufacturers to innovate further.

In other industries the globalisation enabled overturning innovations leading to the fall of many large companies. Such an overturning change has yet to come for the automotive industry. Some think that self-driving trucks will revolutionise the logistics industry as we know it, and that change already has begun. (Weiss, 2014)

Scania itself recognises that a change will come, and that it possibly will change who Scania's user and customer will be. To be ready when change come Scania has worked with future scenarios, where trucks drive themselves in train-formations. In the evolution of the automotive industry nothing but change is certain; just look at what *Über* has done with the taxi industry and what *airbnb* has done to the vacation home industry.

The annual report for 2014 makes clear that Scania is not waiting for this change to come, but are working pro-actively to be prepared when change comes. This is Scania's viewpoint regarding future access to competence:

> "The competencies we have today will not be the same as the ones needed in 2020. As we move from being a product-focused company, Scania is preparing for a shift in competencies and the need for a broader and more diverse perspective to meet future challenges. Collaboration with academic institutions is one way to tap into new knowledge." (Scania, 2014, p. 15)

The quote points out three important parts of becoming more innovative: firstly, that Scania wants to become more flexible in their competence to better meet customer needs. Secondly, that diversity is an important part of that same flexibility. And thirdly, that a way to meet these needs are through collaboration.

In collaboration, a way to increase diversity is to look for collaboration partners in other industries, where the so called cognitive distance is farther. However, to collaborate with partners that are different from your own firm is associated with challenges. Differences in processes, communication and expectations makes collaboration harder, but if the collaboration is managed correctly the returns would be much greater than those of a collaboration with a firm that have much in common with your own firm.

With this in mind, and the challenges that Scania and its industry faces, it becomes clear that guidelines for cross-industry collaboration is key to excel in the automotive industry in the future. Within current research there are yet many aspects of cross-industry collaborations that are unexplored. Thus, to be able to produce such guidelines for cross-industry collaborations, an explorative study of the subject is needed.

1.3 PURPOSE

The purpose of this thesis is to explore how firms engage in cross-industry collaborations to boost their innovation capability.

1.4 DELIMITATIONS

Below are the explanations to the delimitations of the study:

[1] The study is limited to 30 hp equivalent to 20 weeks of full-time work
[2] The study is focused solely on cross-industry collaborations.
[3] The term cross-industry refers to any industry that does not directly or indirectly compete with a company's current industry.
[4] A collaboration in this thesis is defined as an interaction between two or more parties in which all parties contribute and learn from each other.
[5] The findings of this thesis is to be delivered in form a practical guide to engage in cross-industry collaboration, for managers within Scania's R&D department to use. The guide, however, is not part of this thesis, but still Scania's perspective on cross-industry collaborations will be considered in the scope.

1.5 DISPOSITION

- Introduction
- Methods
- Frame of reference
- Results
- Analysis and Discussion
- Conclusions and recommendations
- Future research
- References
- Appendix

2 METHODS

The following chapter describes by which means the purpose is intended to be fulfilled. A pre-study was conducted to understand the interesting dimensions of cross-industry collaboration in relation to the purpose of the study. With the knowledge gained from the pre-study the relevant fields of literature was identified and analysed. This was later supplemented by a qualitative interview study that dug deeper into how some large firms in Swedish industry uses cross-industry collaboration to boost innovation capability.

2.0.1 METHOD OVERVIEW

Since the area of study, cross-industry collaborations, is an area within the literature that is relatively unexplored, the methods are described thoroughly, in order for the reader to gain full insights in to the

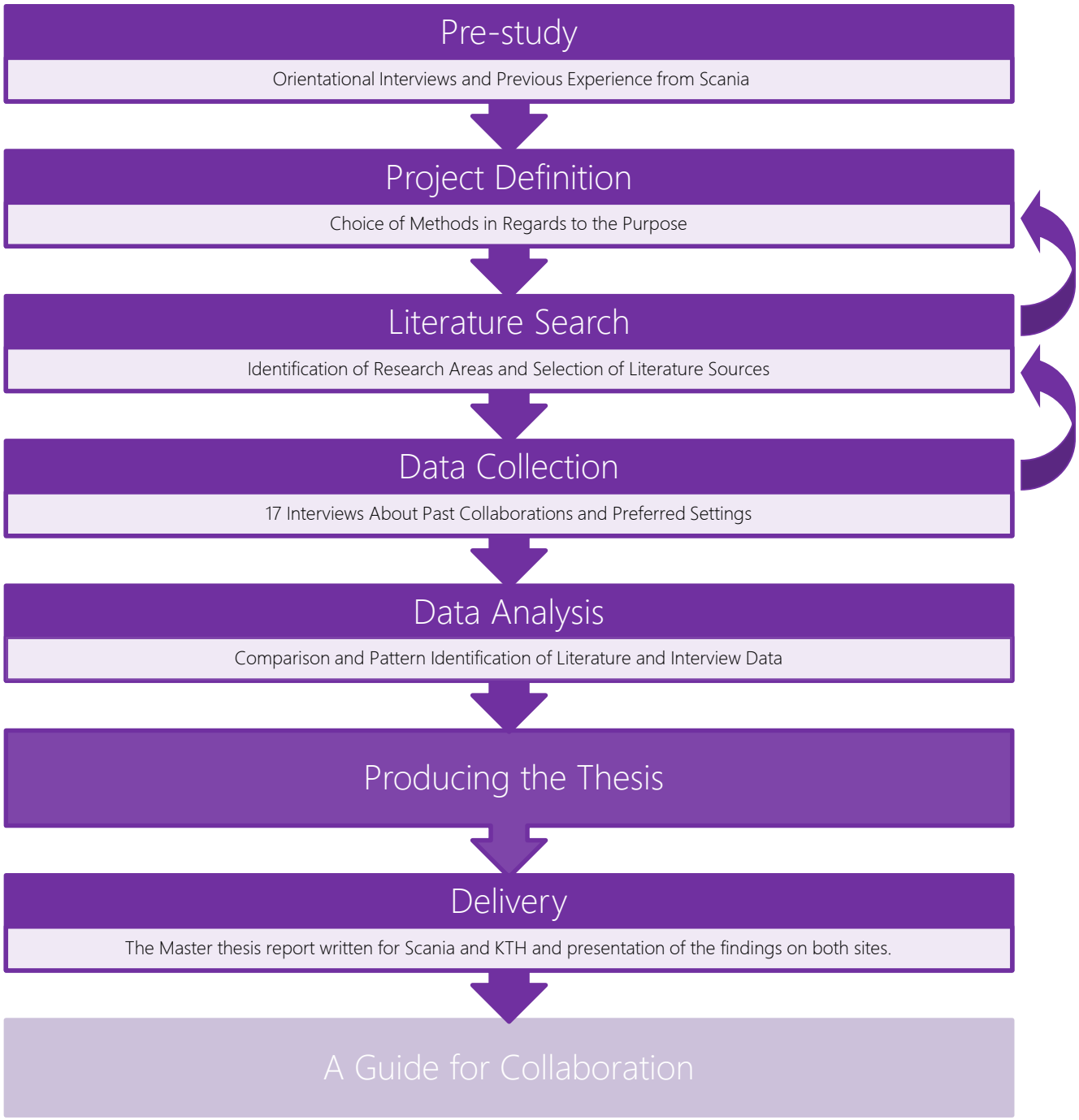

Figure 1, A description of the thesis process

explorative process. The process is both a sequential and an iterative process and is briefly explained in Figure 1.

2.1 PRE-STUDY

The chosen explorative approach to the purpose of this study demands a higher level of openness initially, and clear direction further into the project. Collaborations between firms come in many configurations and vary much in their nature. As a consequence of this the potential scope has been vast. To break the area of study into a reasonably large scope needed answering many questions. Questions like "what should be the purpose of the collaborations" and "what sizes of firms should be in the scope of the study" had a high impact on the direction of the thesis. A pre-study was conducted in order to create direction and manage the scope of the thesis as early on as possible. Noteworthy, in this context, is that the thesis authour have had previous experience with the firm during two summer innovation internships.

The fact that this Master Thesis is written in close collaboration with Scania, and would ultimately render a practical guide for Scania to engage in cross-industry collaborations would have to be the basis of how it should be conducted. No matter how many the partners in any collaboration, Scania would always be a participant and thus would one party in collaboration always be a large firm.

2.1.1 ORIENTATIONAL INTERVIEWS

To be able to set more of the unknown parameters further investigation was needed, especially from Scania's perspective. Therefore, a total of six orientational interviews was conducted with key people of Scania R&D. Four of them was with so called *technical managers*, senior engineers that support basic functions in the R&D organisation. A TM is typically responsible of a certain technological area, exempli gratia acoustics, and has a responsibility to assimilate and spread new knowledge in the organisation. These interviews were to a great extent explorative and was aimed towards mapping knowledge flows within Scania, as well as get insights to their relation to cross-industry collaborations.

Furthermore, an interview was conducted with a manager in charge of academic- and research relations. Although academic relations are, due to chosen limitations, out of the scope already, these collaborations may include several firms in different industries. The point of the interview, however, was to understand the Scania-interface towards external parties. Again, the deliverable to Scania in form of a guide needs a detailed description of how Scania do and would like to manage external relations, no matter the industry of the partner in collaboration.

An additional perspective was provided in the sixth interview, which was with a doctoral student in innovation management. The student had been on Scania for almost five years and provided a fresh set of eyes on the organisation and exemplified a set of cross-industry collaborations that Scania had engaged in recently.

2.2 LITERATURE SEARCH

Understanding the interface that Scania have towards external parties and also having examples of recent collaborations in mind, the direction of the study became clearer. As previously mentioned, one part of the interface was clarified and with recent examples of collaborations that Scania engaged in, it

was easier to identify the areas of research that would explore how firms best engage in cross-industry collaborations to boost innovation capability.

Using google scholar[1], the first searches were for the terms (in different orders and combinations):

Inter-firm, collaboration, cooperation, cross-industry, interorganizational, innovation

Furthermore, in the search results emerged other areas affiliated with cross-industry collaborations. Consequently, these areas needed to be investigated and this time around the terms searched for were these:

Cognitive distance, exploration and exploitation, knowledge management, trust, open innovation, strategic alliances, radical, disruptive, breakthrough

To sum up the findings in the search for literature: there is a vast amount of literature relevant to the study and the challenge lay in defining a clear scope that would contribute to not only to the literature, but also to Scania.

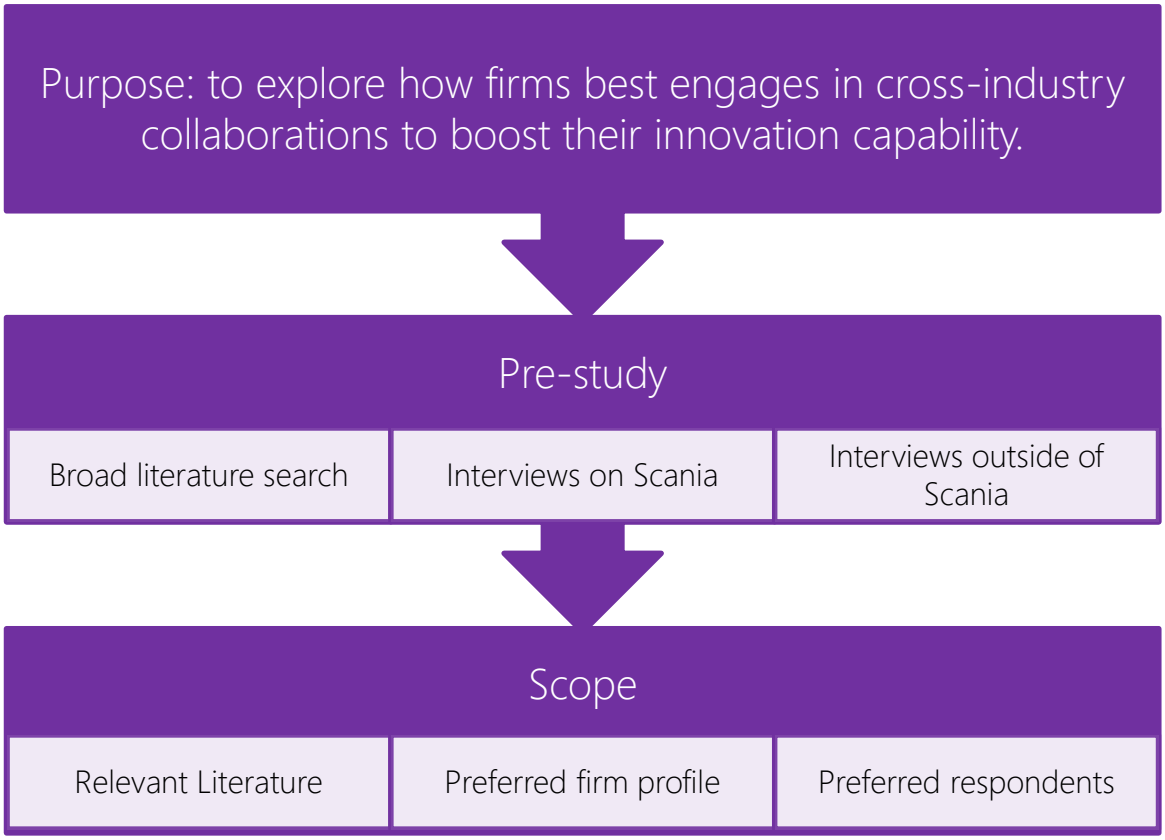

Figure 2, The purpose and pre-study together defined the scope of the thesis

[1] http://scholar.google.com

2.3 DATA COLLECTION

2.3.1 QUALITATIVE INTERVIEW

In order to answer the research questions, and in regard to the complex nature of collaborations and the wide scope, a qualitative study is best suited. Whereas a quantitative methods generally answer specific questions upon which certain conclusions can be drawn, a qualitative study gives deeper insights, and better captures information that might otherwise be overlooked. (Eisenhardt, 1989)

2.3.2 CONSTRUCTION OF THE INTERVIEW GUIDE

The main focus in the construction of the interview guide was to reflect the exploratory approach to the subject of cross-industry collaboration. Thus, a semi-structured setting for the guide was chosen, as to enable the respondents to elaborate around the given subject. The interview guide is attached as APPENDIX A: Interview guide

For Scania and the purpose of the study the interview guide was separated into two sections: *Examples of Cross-Industry Collaborations* and *General Approach to Collaboration*.

2.3.3 EXAMPLES OF CROSS-INDUSTRYLLABORATIONS

This section was aimed to get the interviewee to think of concrete examples of cross-industry collaborations. The thought of this was to get a detailed picture of what cross-industry collaborations could look like at the company. To understand the collaboration better the questions touch on intial expectations, collaborations-setting, how the initial contact came to be and what the direct and indirect benefits were etc.

2.3.4 GENERAL APPROACH COLLABORATION

In the general approach section the respondent was asked questions regarding what relation and strategies that his / her company had with cross-industry collaborations. The questions in this section would answer if the company was open for collaborations, and what needed to be fulfilled in order for the company to collaborate.

2.3.5 INTERVIEWED COMPANIES

The companies that contribute to the qualitative part of this thesis were chosen because of their relation to cross-industry collaborations and/or because of their influence in the Swedish market. In this thesis, a relation to cross-industry collaboration is interesting if:

a. *The firm engages in cross-industry collaborations mainly for knowledge creation and value extraction rather than marketing purposes.*
b. *The firm is and has been a major player in Swedish industry for a long time.*
c. *The firm's sales model involves closer collaborations with companies in varying industries.*
d. *The company is considered innovative, either because of a history of successful innovations or by an innovation index rating.*

In the search for companies that fit with any of the above requirements a total of 33 companies were identified as matches and ultimately contacted with interview requests.

2.3.6 FINDING THE RIGHT INTERVIEWEES

The first challenge in contacting the companies identified as relevant to the study was to make a profile of the ideal interviewee. Most of the potential firms had more than 4,300 employees and finding the best match for an interview would be complicated.

Ideally, the interviewee would have experience from cross-industry collaborations with players in many different industries. This because, naturally, respondents with more experience from cross-industry collaborations would have more common insights than those who have only experience from few. Additionally, these respondents should be in a manager's position and to some extent work with development. This was to try and match the findings with Scania's interests, since the guidelines produced in this thesis should be an aid in helping R&D managers to manage cross-industry collaborations.

To make sure each company had the same basis for decision a contact template was made. Due to the chosen, explorative approach this template was made somewhat diffuse, as to let the companies themselves find the person they thought fit best with participating in an interview. In general, the method described by Voss et al. (2002) was used to find the respondents. The words used in the contact request form to describe the interview person was: *manager, preferably within the R&D department, with experience from interfirm-collaboration.* More than this, the respondent was asked to contribute a one hour interview about their experience from inter-firm collaboration and open innovation.

The first contact attempt was via e-mail to each companies' respective info adress (for example info@company.com). Out of ten contacted companies three replied with requests for more information about the interview. Even though the companies were provided with additional information about the interview none of them ended up being able to participate in an interview.

Instead, the interviewees that have contributed to this study were found by the following to methods:

- *Either the academic supervisor, the commissioner at Scania or the authour of this thesis had people in their personal network in many of the chosen companies, who was contacted with requests to help find a suitable interviewee within their respective firm.*
- *The firms assessed as suitable for interviews were contacted through LinkedIn[2], a professional networking site. On this site it was possible to search for possible respondents at each company, and contact them directly. These professionals were asked to recommend a suitable respondent for the study, and in some cases they recommended themselves for an interview.*

These ways of contact were successful, as all but four people had responded to the contact request after one initial e-mail and one reminder. Below is a summary of the success rate of interview requests through the three aforementioned ways of contact, see Figure 3.

[2] http://www.linkedin.com

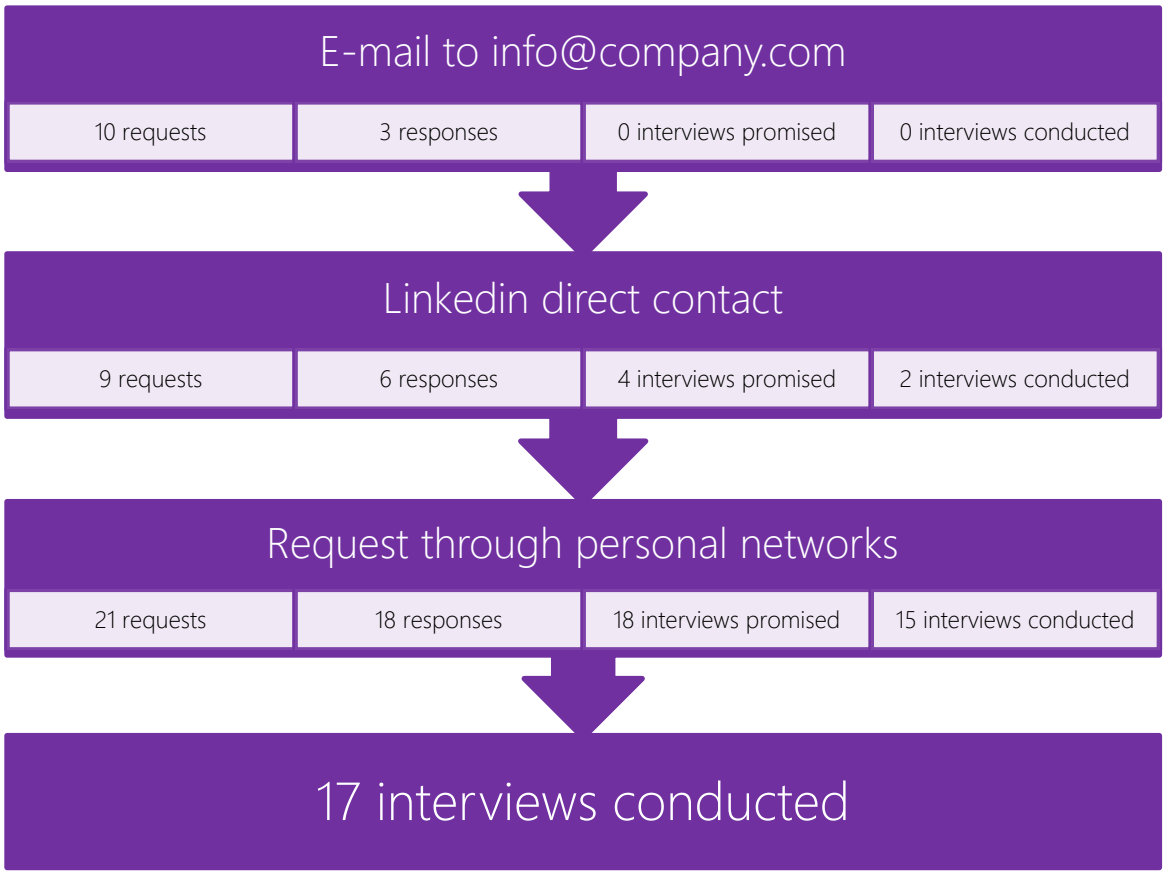

Figure 3, The process and outcome of contacting potential respondents

2.3.7 INTERVIEWS: EXECUTION

The interview guide was supplied for the interviewees just prior to each interview, as to let them prepare if they so wished. However, the interview guide was merely used as support in most of the interviews. The interviews could be described as semi structured, open ended interviews. The choice to let interviews be open ended was to reflect the exploratory approach to cross-industry collaboration, since cross-industry collaborations is such a complex phenomenon, and thus enable deeper interviews.

To start off the interview both the Interviewee and the Interviewer introduced themselves and their roles. The Interviewer then described the scope of the interview and clarified definitions, such as what a cross-industry collaboration is defined as. When both the Interviewee and the Interviewer agreed on definitions came the body of the interview. In most interviews the Interviewer started off by asking the Interviewee to elaborate around a cross-industry collaboration that the the respondent had been close to. From then on the Interviewee reflected on different aspects of the collaboration and at times the Interviewer would ask specific questions to steer conversation to the areas of study. Thus the Interviewee chose what parts of said collaboration him / her thought was of importance, within the scope of the study.

A bit into each interview the respondent was asked questions regarding strategies with collaborations and general willingness to cooperation with other firms. Specific questions regarding what their respective firm required from any collaboration, and what was preferred.

Lastly, the respondent was asked if he or she wanted to add any comments or had any personal reflections regarding the study itself.

2.4 DATA

A total of 15 companies have contributed to the thesis through a total of 17 interviews, off of which 2 were conducted at Scania. The companies, and some key figures are presented in Table 1.

Table 1, A short description of the companies that contributed through interviews

Company	Main Industry	No. of employees	Occurence of 'innovation' in financial annual report 2013	2014	Est.
ABB AB	Power and Automation	140,400	15	20	1988
Alfa Laval	Heat transfer, separation and fluid handling tech	17,500	3	2	1883
Assa Abloy	Intelligent Lock and security solutions	44,000	34	77	1994
Benify	Employee benefit systems	200	-	-	2004
BillerudKorsnäs	Packaging solutions	4,300	8	48	2012
Electrolux	Home Appliances	60,000	71	69	1919
Ericsson	Telecommunications	118,700	26	22	1876
Google	IT-solutions	55,400	11	11	1998
Innventia	R&D Forest raw materials	210	-	-	2003
Lantmännen	Agriculture	8,000	26	22	2001
Microsoft	IT-solutions	128,000	5	14	1975
Sandvik Coromant	Tooling solutions	8,000	20	21	1942
SCA Hygiene Products	Personal hygiene	44,000	70	91	1929
Scania CV AB	Heavy trucks and buses	42,000	6	20	1900
Sony Mobile	Consumer technology, Medical equipment, etc.	7,100	17*	-	2001

The audio from each interview was recorded to better secure data and actual quotes. The length of the interviews ranged from about 32 to some 80 minutes, totalling in 13 hours and 43 minutes. Seven of the interviews were conducted via the phone and thus, due to technical faults, the reception made single words unhearable. The interviews were transcribed shortly after they were conducted, and complemented with the notes taken during interview.

In order to place the collected data in better context each respondent was asked to state which corporate function he or she belonged to, and which level they were on in their organisation. They estimated their corporate level on a scale from one to ten, in which one is the first line of employees and ten is the ceo. The estimated organisational level is presented in Figure 5 and their corporate inherence is presented in Figure 4. Note that the respondents' responses have not been altered or analysed in any way, but reflect the exact response from the respondent.

As seen in Figure 4 most respondents stated that they belonged to the R&D department of their firm. Furthermore, some of the respondents work within sales and marketing, while some other respondents inhere in more specific departments. One of the respondents belong to the *market and innovation* department.

The level of the respondents is shown in Figure 5. Their responses range from the third to the eighth level. The most number of respondents at any level is the seventh level, which comprise 5 individuals. Over all, the spread has no clear overweight towards either the low or the high level employees.

Participating in the study were 15 males and two females, or circa 88% males and 12% females.

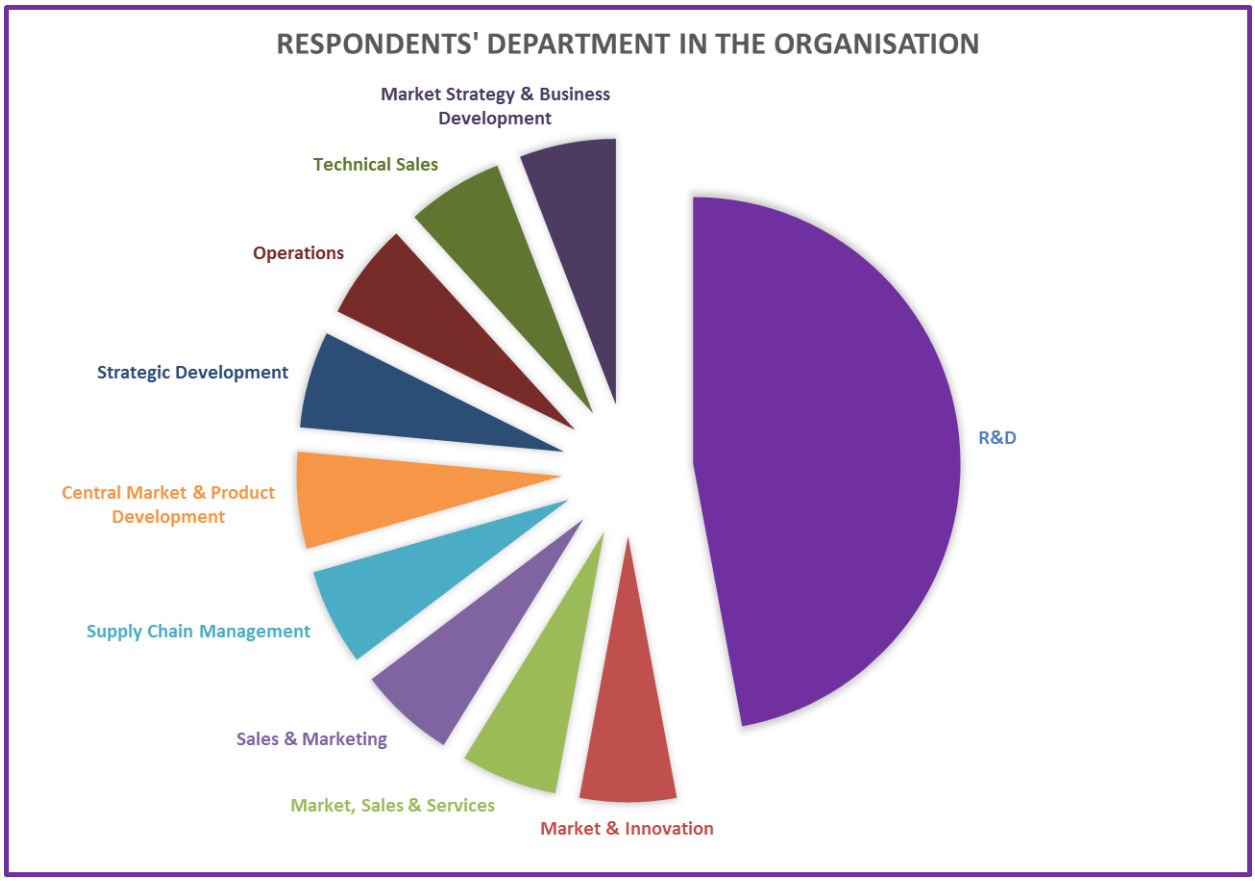

Figure 4, The respondents' department inherence

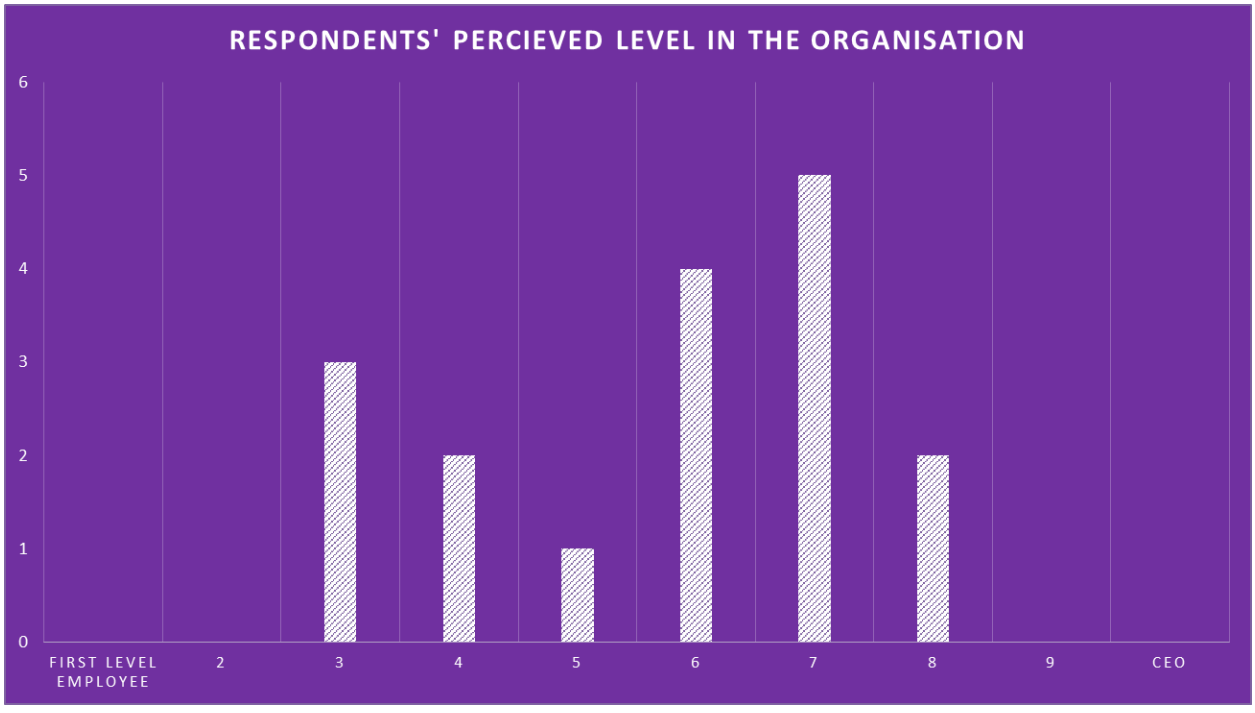

Figure 5, The respondents' perceived level in the hierarchy in their organisation

2.5 ANALYSIS OF INTERVIEW MATERIAL

It is important to notice that the interview data is subjective in each respondent's perspective, and does not necessarily represent the respective firm's official point of view. The data was by choice anonymised to enable each respondent to speak freely around collaboration without the need to hold back essential information. Still, the data collected, and important to the study, was concerning collaborational forms and preferences, rather than specifics about strategy and collaboration findings.

The empirical data acquired through qualitative interviews has been analysed for patterns and in relation to each respondent's position at the firm. The structure of the analysis emerged as more respondents were interviewed. This was crucial, since this study was performed with an explorative approach. Moreover, the audiofiles from the interviews were listened to by the authour several times, in order to capture any additional data, and refresh the memory of the themes in the interviews. Each time an interview had been listened to, the authour's reflections were collected with the transcription of said interview.

As the data was gathered similarities and classifications of the collaborations emerged. Most collaborational settings had equivalents in other firms, and thus they formed a group together. Here, the authour focused mostly on the setting of the collaboration, such as small/large firms or networks, and the initial reasons for collaborations.

The large mass of data gathered in the interviews were overwhelmingly voluminous, and each respondent had provided interesting holistic pictures of their experiences with cross-industry collaborations. Thus, the hardest part initially was to select which data was to be included in the study. To address this, the material needed a structure that was relevant to the research questions.

Furthermore, patterns had emerged in the interviews, around which topics the respondents thought would contribute to the study. Although the areas were not applicable to all respondents, there were recurring themes that for many respondents had crucial impact on cross-industry collaborations. The recurring themes that the respondents had brought up in the interviews fit as possible responses to the research questions, and thus was a suitable structure to use.

To get an overview of the large amount of data all the results were summarised, sorted by company, in relation to the emerged areas of study, as can be seen in Table 4, Table 5, and Table 6. The areas of study that had emerged made it easier to find patterns and also compare how the respondents' examples differed. All in all, the analysis of the large amount of research data followed the recommendations of Eisenhardt (1989) for the equivalent case study analysis.

The areas of study, and the gathered results, were then assigned to their specific research questions to which they had a possible impact on. With the research questions as a basis for analysis, the literature that corresponded to each of the respondents answer data were gathered and compared to the literature.

2.6 METHODS DISCUSSION

2.6.1 RESPONDENT SAMPLE

The sample of respondents contributing to this thesis is presented in section 2.4 Data above. The sample highly reflects the personal networks through which most of the respondents were found, see Figure 3. This, however, should not be considered a weakness of the thesis, but rather a strength. Since most of the respondents had some connection through the authour's contacts to the authour, most respondents would also be open and able to speak in confidence. The authour's contacts mostly had trustful relationships with respondents, and through recommendation, most of the respondents chose to trust the authour. Moreover, since most respondents were in the authour's contacts' personal network the cognitive distance was relatively low. As many of the respondents also knew innovation management practices it became easier to reach mutual understanding.

Regarding the selection of respondents the sample was fitting; firstly, the initial request to each contact person was to be directed to the person within the firm most suitable to answer questions about cross-industry collaboration, with experience from such collaborational settings. In some cases the initial contact assessed themselves as this person and in some cases another person within the firm was recommended.

Secondly, in all cases except one, the representatives of the firm chose how to interpret which person in what position was most eligible to answer the questions, since they were not asked for a specific role, but rather to answer the questions provided. And third, the respondents were, because of the semi-structured, open ended interview format, able to steer the interview towards their experiences, and view on cross-industry collaboration. In this setting the firms themselves were the ones defining the scope. This reflects the explorative approach to cross-industry collaborations well.

The explorative approach used in the study reflects that cross-industry collaborations is yet to be understood, both by the academia and the industry. This is confirmed in the interviews, even though most firms in this thesis are large international players, it seems that their experience with cross-industry collaborations vary, even within the firms.

2.6.2 INTERVIEW GUIDE DESIGN

The interview guide was designed to let the respondent speak freely about a collaboration, or several, that they thought of as an example of cross-industry collaboration. This was intended to let the respondent think of a concrete example. This was the most successful part of the interviews, since the stories were about real collaborations, and the details in the stories were many. Not only was it a good start for the respondent to get into the right mindset, but this setting also let the authour get details about the firm's actual practice, rather than strategy.

Furthermore, the interview guide had a second part, in which the respondent should try to describe the general collaborative interface of his/her firm. This part came second, because the respondent had already then thought of an actual collaboration, and most likely reflected upon several others. In this section the respondents sometimes had a hard time stating the actual strategy of the firm. A strategy can be harder to relate to, but the respondents would somehow have a picture of how the company

behaves in interaction with other firms. By making statements about the firm's behaviour in collaborations the respondent would then convey his/her picture of the firm's interactional behaviour.

In reflection of how the interview guide was designed it well captured the themes that the respondents wished to mediate, in an explorative approach. Furthermore, it was a good choice to reflect on previous cross-industry collaborations the respondents had been part of. As stated above, the respondents were asked if they wished to add anything, or add comments of their own. Not in one interview did the respondents state completely new information here, which implies that the respondents thought the subject was sufficiently covered.

2.6.3 STUDY DESIGN

The exploratory study was performed with an abductive apporach and in retrospect the study had both strengths and possible weaknesses.

It is recommended to be two persons conducting a master thesis within the master program of product innovation management. To single-handedly write the thesis was chosen both due to that this was a continuance of a summer internship the author conducted at Scania the summer before, and because the authour had no prior collaboration with any of the students in the masters programme. It would have been hard to predict the outcome of a study performed with another individual with no previous experience from each other, mainly because the persons' ambition levels may differ.

However, the study was made with only one authour, a setting that allowed for the authour to be flexible in how the scope of the study developed. This was a strength, once again, in relation to the explorative approach. Furthermore, since the interviews were conducted all by the authour and the authour only, there was a consistency through all interviews. In a study performed by more investigators, all interviewers need to make sure they conduct the interviews in similar manner to each other (Voss, et al., 2002). Moreover, the authour has conducted some 40 interviews within similar settings before, which is to be considered a strength.

There are of course disadvantages of being only one authour; firstly, the authour had no one to discuss details of the study with, but the supervisors. There is now way to know how this affected the study, but the authour had much correspondence with both supervisors, as well as other people associated with the study. Moreover, the authour had previous experience from interviewing and of Scania, which helped much. The previous experience was from two innovation capability evaluation projects conducted, during a total of 16 weeks.

The other main disadvantage of being only one investigator was that the workload at times was extensive and hard to manage. Having been two authours the workload would probably have been more manageable.

Regarding the choice to conduct this thesis with an explorative approach, it matches the maturity in the study area the firms have shown. If the study would have covered, for example, IPR in cross-industry collaborations only, then there would still have been too many unknown parameters surrounding to draw unambiguous conclusions. In the chosen setting, firms were able to tell the whole story surrounding cross-industry collaborations to really reflect how firms today handle cross-industry collaborations. Suppose that the study would have been non-explorative and regarding a subject that the authour associated with cross-industry collaborations, but not the firms. In relation to this it was a

much better setting to let the respondents tell their firm's history. Moreover, for explorational studies, such as this thesis, Voss et al. (2002) recommends unfocused and in-depth case studies of the subject.

2.6.4 INTERNAL AND EXTERNAL VALIDITY

Firstly, what needs to be considered, for both validity and reliability, is that this is an explorative study, that explores a phenomenon that is becoming increasingly interesting to scholars. However, in the way this study has been conducted, with the resources available, the conditions have been as good as can be.

Internal validity relates to causality (Bryman & Bell, 2015). In this study an explorative approach has been used to study cross-industry collaboration. In that aspect, the aim of this master thesis has not been to prove that x gives y, but rather to find out what x and y is. Even less was x and y assumed parts of the study, but was discovered through the abductive study design.

To create transparency in the study the authour chose to present as much of the interview data as possible without presenting it all. This was made so that readers of the thesis would be able to follow the analysis work and even find new patterns in the data themselves.

One potential weakness in the internal validity would be that all respondents were chosen because of their participation in cross-industry collaborations, and that interviewing firms that have not engaged in such collaborations would enrich the study. This, however, is an intentional limitation. If firms would want to use the findings in this thesis for engaging in cross-industry collaborations, the starting-point would be to see how other firms have done before them. The relative immatureness firms have within this research area still speaks for that the results in this thesis is somewhat diverse and represents a broad sample.

The external validity relates to generalisability of the results beyond the specific research context (Bryman & Bell, 2015). As touched upon above, this study is intentionally aimed at exploring how firms use cross-industry collaborations, which is why only such firms were chosen. This means that the applicability of these results on firms that do not engage in cross-industry collaborations is unknown.

However, firms should consider the conclusions drawn in the thesis regardless, since the firms participating in the study are successful firms, with lessons learned from cross-industry collaborations.

The selection of firms that contributed to this thesis are all presented in Table 1. Most participating firms are similar to each other because they are highly technological firms. However, these firms all have collaborated, some with firms much different from them. This may well mean that the results are applicable in Swedish industry in general, at least as long as one of the collaborating firms is a high-tec firm. All of the firms have international presence, but most examples of cross-industry collaborations are within Swedish industry. This could mean either that firms in Sweden are more collaboration friendly, or that the contributing firms are more likely to collaborate with firms they have a prior relation to.

This means that the findings are most likely applicable to cross-industry collaborations in Sweden in general, but that the results' applicability in other geographical markets is unknown.

2.6.5 RELIABILITY

The consistency of the measure of a concept is referred to as the reliability (Bryman & Bell, 2015). To reflect on the repeatability of the study it needs to be stressed that an explorative approach was used.

The methods of data collection was consistent, with the same interviewer in each interview. The abductive approach and open ended interviews let each respondent control the themes in the interview. If all the interviews were to be re-conducted with the same respondents, at the same time, and with the same interview guide, the result would surely be mostly identical, even with another interviewer.

Since cross-industry collaborations is relatively new to many firms, there would surely be some differences if the study would be conducted a year, or more, afterwards.

The patterns later found in the analysis speaks for that the result is repeatable. If single respondent's examples of cross-industry collaborations stood out, and no patterns were found, then the study would most probably not be repeatable. But, as patterns were identified with several respondents, the method is likely to be consistent, and most probably repeatable.

Moreover, the method section and the result section of this thesis is intentionally made as transparent as possible, so as to let others build on, or re-conduct the study. Thus, the reliability of this thesis is, with the exploratory approach in mind, relatively high.

3 FRAME OF REFERENCE

The following chapter starts out by, firstly, describing innovation in general terms. We build upon the definition to distinguish between forms of innovation depending on origin and novelty. Through discussion of exploration and exploitation we find that collaborations may well be a way for firms to survive in the long term. Further into the chapter we explore interfirm collaborations; how firms collaborate, and why they should. Lastly, we look into cross-industry collaborations and deal with the specific terms firms should consider.

3.1 INNOVATION

We established in the background that firms need to address innovation in order to survive in competitive markets. Thus, we need to build a basic understanding of innovation in the firm's perspective. Furthermore, we look into where innovation happens and differences in novelty of the value created. This is needed in order to better understand what collaborations can contribute, as we move on.

It was Schumpeter, an economist, who coined the term innovation in the 1920. He defined it to be *a new good; a new method of production, a new market; a new source of supply; or a new organisational structure*. The definition has been criticised for being too broad, making anything an innovation, regardless of the actual level of novelty. However, the complexity of the term leaves room for discussion regarding levels of novelty, necessity, what a successful implementation is and how diffusion comes to affect the innovation. (Crossan & Apaydin, 2010)

In an attempt to develop a common definition of the term Baregheh et al. (2009) have analysed present definitions to find differences and similarities. It seems differences in origin and the type of innovation captured by the definition differs, and finding a common definition may fall short because of disciplinary differences. However, to address the growing similarities in business practice among different industries, the authors conclude in the following definition:

> "Innovation is the multi-stage process whereby organizations transform ideas into new / improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace."
> (Baregheh, et al., 2009)

Even here, with a short definition, the term appears fuzzy. It is clear, however, that innovation involves several parts of the process that leads to an innovation. Moreover, the definition implies that whether firms develop products, services or processes, the final achievement is to create value for the own firm. In order to better understand where value can be created and how value is created a more thorough study of the different faces of innovation is needed.

3.1.1 THE DIFFERENT FACES OF INNOVATION

Innovation as such, brings value to an organisation no matter if it is by process-, product- or service innovation. The main difference here lies within where the innovation itself takes place, rather than the novelty or value the innovation brings. However, to find where an innovation occurs, may help to also find why it occurred and also where innovations does not occur. Crossan and Apaydin (2010) have, through thorough reviewing of existent literature on innovation, created a multi-dimensional framework of organisational innovation, see Figure 6.

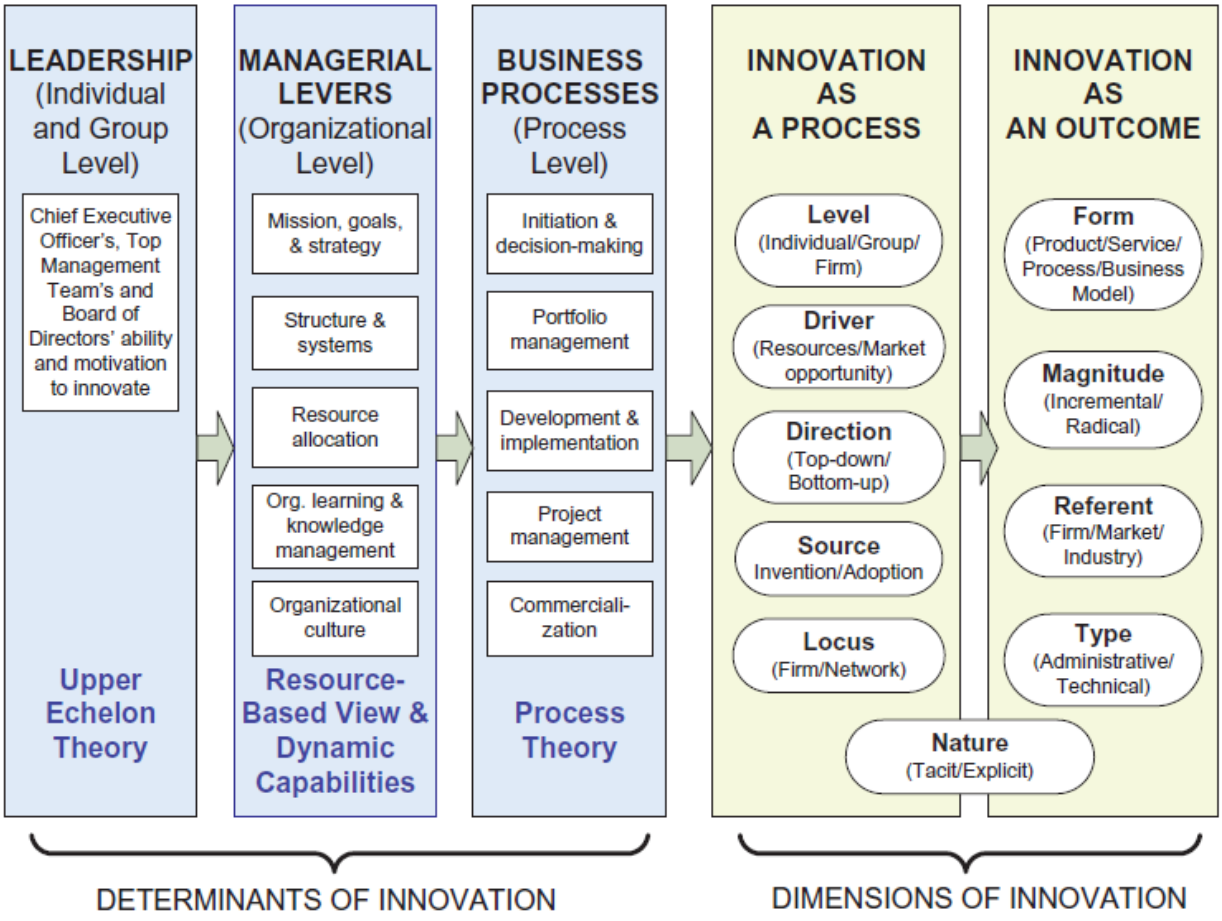

Figure 6, Innovation in an organisation. (Crossan & Apaydin (2010))

Here, Crossan and Apaydin (2010) make distinctions between innovation as a process and as an outcome. Moreover, the innovation pre-face, in their model known as *determinants of innovation*, identifies underlying processes that affect innovation capability. In relation to the purpose of this thesis, to explore cross-industry collaboration for innovation, the firms themselves may be able to manage such collaborations, if they better can understand how said collaborations affect innovation capability.

Other than understanding *where,* and how, an innovation happens, for firms to invest in collaborations, there needs to be clear expectations of what levels of novelty and created value can be expected. In another perspective on innovation, briefly touched upon in Crossan and Apaydin's model as *type* and *magnitude*, Henderson and Clark (1990) makes distinction between four different novelty and usefulness levels of innovation. In the two-dimensional space four different categories of innovation emerges: incremental-, modular-, architectural- and radical innovation. The distinction between these are made

by assessing the levels of changes in *core concept* and changes in *linkages between core concepts and components,* see Figure 7.

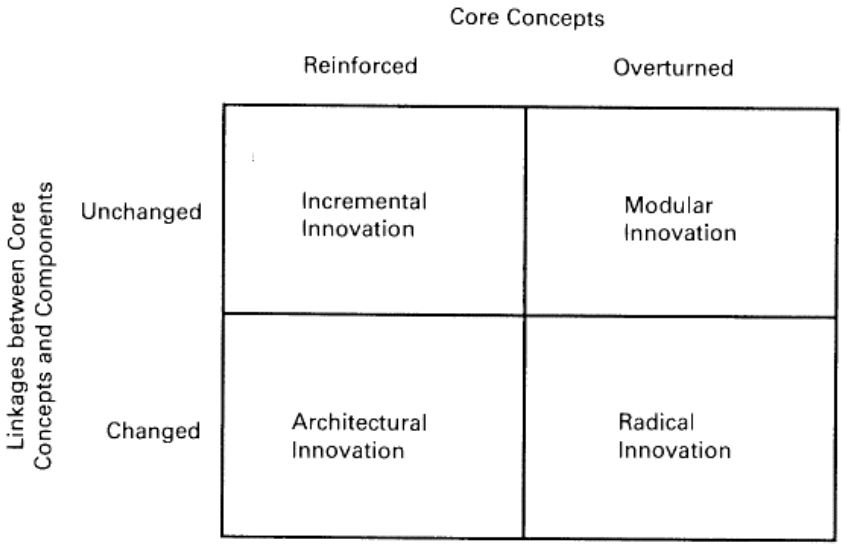

Figure 7, Change and novelty levels of innovation (Henderson & Clark, 1990)

On the two extremes are incremental innovation, which is defined by small changes commonly referred to as *business-as-usual*, while the direct opposite, radical innovation, implies huge technological leaps forwards. According to Crossan and Apaydin (2010) incremental innovations are typically within product and process innovations while radical innovation often is related to business model innovation. (Henderson & Clark, 1990)

The two middle-steps of innovation, in this definition, are architectural- and modular innovation. Architectural innovation is an innovation that have most components in common with older products, but the configuration of the components itself creates a novel value. The direct opposite, modular innovation, is an innovation that share its setup with previous product generations, but new components generate novel value.

We have investigated innovation in broad terms, and drawn distinctions between different types of innovation. For a firm to be able to manage resources for both radical- and incremental innovation, the typical activities associated with each need to be identified. Moreover, for the purpose of the study, it is necessary to identify the activities associated with collaborations in order to understand what specific settings in collaborations that creates novel value, and to which degree.

3.1.2 EXPLORATION AND EXPLOITATION

James G. March, pioneer within innovation management, coined he terms *exploration* and *exploitation* in 1991. He links them to two main activities within a firm; the *exploration* of new possibilities and the *exploitation* of certainties. In other words, exploration is typically concerned with creating new knowledge and risk-taking, whereas exploitation mostly concerns using existing knowledge and entail lower risks. (March, 1991)

Exploration and exploitation is not necessarily equivalent to research and development, as it might suggest, but rather concerned with the long-term and short-term perspectives of innovation. The conflict of balance in ambidexterity lie within trying to set goals and compare outcomes, when the

actual returns of explorative activities are harder to guarantee than those of exploitative ones. (Lund Stetler, 2015)

Overcoming this difficulty is key, as history have taught us that firms must find a balance between exploration and exploitation in order to survive now and in the long term. This ability referred to as being *ambidextrous*. O'Reilly and Tushman (2013) find that although both activities are necessary, it is not always necessarily a choice between the two, meaning that some activities entail both. Firms today struggle to prioritise activities, and exploitation goes before exploration (Lund Stetler, 2015). This might suggest that activities involving both exploitative and explorative elements are a good way for firms to become ambidextrous.

Nonetheless, it remains to be investigated, what relation cross-industry collaboration have with exploration and exploitation. Li, et al. (2008), who have made an effort into defining the terms more in detail, find that common interpretation is that exploitation is associated with searching for familiar, mature, current or proximate knowledge. Moreover, exploration is described as the search for unfamiliar, distant and remote knowledge. In regards to innovation output the authours find that 'local search provides a firm with advantages in making incremental innovations, while distant search might bring opportunities for a firm to achieve radical innovations' (Li, et al., 2008, p. 115).

We have established here that exploration is vital, but hard to prioritise in many firms. Since exploration refers to leveraging external knowledge we will look further into the paradigm of open innovation, in the next section.

3.1.3 OPEN INNOVATION

This far, we have explored the term innovation, in its meaning and structure, and later on draw conclusion that radical innovations mostly are the result of exploratory searches for new knowledge. Moving on, in exploring cross-industry collaboration for innovation, to focus on the R&D settings, because the implications drawn on this study is intended for managers within R&D, according to a set delimitation.

Open Innovation is a term describing a firm opening up parts or the whole of R&D to externalities, outside of the firm. The concept was promoted by Henry Chesbrough to reflect a change in R&D setting emerging in 2003 (Chesbrough, 2003), a paradigm shift from closed to open R&D. The idea behind the concept is that firms need not and should not rely exclusively on their own R&D, and try to successfully leverage the discoveries of others. Chesbrough and Kardon Crowther (2006) even goes as far as stating that "firms that fail to exploit such external R&D may be at a severe competitive disadvantage" (Chesbrough & Kardon Crowther, 2006, p. 230). The question following is what firms can do to exploit external R&D.

Chesbrough and Kardon Crowther (2006), continue to establish that some parts of the knowledge created internally in a firm is absolutely necessary to be able to successfully exploit externally created knowledge. Their findings show that open innovation is not employed primarily for cost reduction or as outsourcing, but a way to leverage external complementary research, and that R&D should not be completely outsourced.

Moving on from the general term of open innovation, we shall focus entirely on exploring interfirm collaborations. The next chapter deals with the general approach to interfirm collaborations.

3.2 COLLABORATION

At the heart of this thesis lies collaboration, within the purpose of *exploring how firms use cross-industry collaboration to boost innovation capability*. In relation to this, this chapter is used to openly explore collaboration, in terms of how to collaborate; why to collaborate; why not to; how trust affects collaboration; and what defines successful collaborations.

3.2.1 TYPES OF COLLABORATIVE ARRANGEMENTS

There are almost inifinite ways two or more firm can collaborate in. Some parameters are degree of commitment, allocated resources, intentions, knowledge flow, personnel flow, funding, etcetera. To explore how firms best engage in cross-industry collaborations, we need firstly to understand *how* firms can collaborate. The five most used settings for inter-firm collaboration are listed by Schilling (2010): strategic alliance, joint venture, licensing, outsourcing and collective research organisations.

Strategic alliances can refer to any form of relationship between firms. The collaboration can vary in time commitment and include contracts or simply be entirely informal arrangements. enhance a firm's flexibility. (Schilling, 2010)

A joint venture is a partnership, often resulting in the creation of a new business entity, in which participating firms have significant equity stakes. Joint ventures are not considered in this thesis, however, because joint ventures are typically managed on corporate level, since this thesis is intended for R&D managers, as mentioned in delimitation five. (Schilling, 2010)

Licensing is a lightweight form of collaboration in which a firm agrees to license proprietary technologies, trademarks, copyrights, etcetera, to another firm or licensor. Nor is this collaborational agreement interesting to the thesis since the firm interaction in this arrangement is minimal. (Schilling, 2010)

Outsourcing is typically used if a firm does not have sufficient competencies, facilities or scale to be able to, on their own, to develop new technological innovations. Firms in an outsourcing collaborational setting can choose to evolve the collaboration into a strategical alliance. (Schilling, 2010)

Lastly, a form of collaboration is collective research organisations, such as trade associations, university-based centers, and private research corporations. Typically, these organisations are initiated by governments or industry association. (Schilling, 2010)

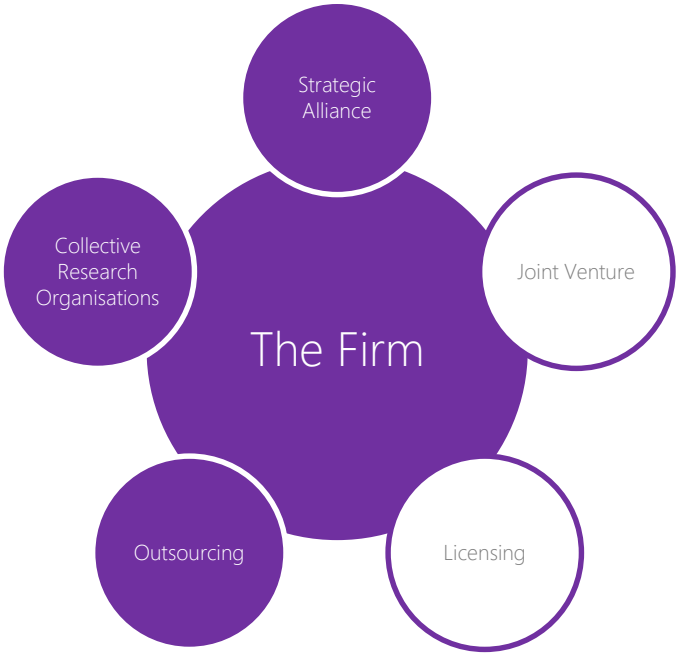

Figure 8, The typical collaborative interfaces of a firm (Schilling, 2010)

There are, however, other forms of collaborations that firms can engage in than Schilling mentions. According to Hagedoorn and Schakenraad (1990) the modes of interfirm collaboration are joint ventures, research corporations, joint R&D agreements, technology exchange agreements, direct investment, customer supplier relations and one-directional technology flows. In comparison with Schillings collaboration modes we find many similarities and new distinctions. Within the category of joint R&D are shared resource research pacts and other joint development agreements. Furthermore, technology exchange agreements cover technology sharing, cross-licensing and mutual second sourcing. Another important category is customer-supplier collaborations. Hagedoorn and Schakenraad (1990) distinguish between the sub-categories *co-production, co-makership* and *contracted research agreements.*

Furthermore Jörgensen et al., (2011) lists additional areas in which collaborations exist; e.g., innovation, marketing, innovation and sales. In the study he focusses on innovation activities, and especially in the fuzzy front end of innovation. These types of collaborations are typically explorative, and the products of the collaboration are yet to be found.

Yet another form of collaboration is collaborations within the value chain (Meca & Timmer, 2008). These collaborations helps the firms in the supply chain to coordinate their efforts towards end-customer needs. An extension of supply chain collaborations are value chain collaborations. The difference here lies within collaborations with firms that affects the supply chain in a broader sense. (McLaren, et al., 2002)

We conclude that collaborations come in many variations, but that the setting is merely a way to acquire something specific from collaboration. In relation to this, the incentives for collaboration becomes interesting.

3.2.2 INCENTIVES TO COLLABORATE

Inter-firm collaboration can offer a firm several advantages. In short, a collaboration with another firm potentially gives your firm access to the capabilities and knowledge of the collaboration partner, which could be both faster and cheaper than to develop said capabilities on your own. Within these capabilities are resources, such as physical resources, funds, know-how, IPR access, access to customer base, etcetera entailed. However, it needs to be stressed that these are hypothetical gains of collaboration, and that there are many parameters that influence the actual product of collaboration. (Schilling, 2010) (Mowery, et al., 1996)

Rhodes et al. (2003) list some reasons, especially for small-large firm collaborations, to collaborate. Through collaboration the smaller firm will gain access to the financial resources of the larger firm. Moreover, the larger firm has most likely developed processes, while both firm's infrastructure can provide benefits. In return, the smaller firm most likely lack processes, that makes the firm flexible, and speedy, that is contagious. Furthermore, the smaller firm will through collaboration be associated with the larger firm's strong brand and industry reputation.

Schilling (2010) compare different collaborational settings in terms of speed, cost, control, etcetera. She finds strategic alliances to vary in terms of cost, speed and the leveraging of the other firm's competencies. However, they offer potential to both leverage existing competencies and develop new ones. This means that a well-managed strategic alliance have much potential compared to internal development, that typically is associated with high costs and low speed.

Moreover, notable in the comparison is that outsourcing provides limitations in developing new competencies, and that research organisations, despite high potential, typically are slow.

Schilling (2010) further elaborates the advantages of collaboration. Firstly, collaborations can potentially help obtaining skills and resources faster that the firm would on its own. Secondly, the flexibility is enhanced, by reducing asset commitment. A firms resources are adapted for delivering what their customers want, and should the need change, so would the resources and assets. Collaboration thus makes a firm less sensitive to intense competition.

Third, and depending on how close the firms are in collaboration, a firm can obtain valuable knowledge from their partner, but also create new knowledge, the firm could not have developed on its own. Fourth, a collaboration will reduce risk and costs associated with a project. This is especially important in expensive and high-risk projects. And lastly, firms may use collaboration as a way to create common standards. If many firms in an industry or eco-system agree on a standard, then other will most certainly have to follow in order to compete.

Huizingh (2011) have reviewed open innovation and found two types of reasons for firms to open up R&D effort, that confirm the incentives above. The two categories of reasons a firm chooses to collaborate are offensive goals, such as stimulating growth, and defensive goals, such as risk and cost reduction. Furthermore, the benefits from collaboration are reaffirmed by Park and Kang (2013) and Hagedoorn and Schakenraad (1990).

3.2.3 REASONS TO NOT COLLABORATE

All in all, there are many reasons why firms should choose to collaborate with other firms. However, there are risks and drawbacks associated with collaboration, that firms should consider prior to collaboration. Schilling (2010) lists a few of the drawbacks and risks in collaborations:

- To protect proprietary technologies. If your firm's competitiveness is based on the IPR and know-how of the firm then a collaboration might harm the firm more than create new benefits. Collaborate only with the firms that do not have the capabilities to utilise the knowledge shared in the collaboration to compete with your own firm.
- Stay in control of development and use. With two or more involved partners, differences in intentions can create conflicts about technology or product of the collaboration. For example Honda was invited to be part of a emissions and fuel reducing collaboration. However, Honda did not join because the firm was worried it would limit their own development. Thus, a way to stay in control is to avoid collaborations with potential technology lock-ins.
- Building own capabilities. To let R&D efforts stay in-house lets the firm develop its own new capabilities and know-how. This is a valuable for the firm, and this way the created value stays within the firm.
- The capabilities are already available. Many firms choose to collaborate in order to get access to capabilities, IPR, funds ,etcetera. The case, however, when a firm holds all capabilities needed themselves is another. The incentives for collaboration are much less and going solo would potentially be better.

Furthermore, Park and Kang (2013) have studied technology alliances. In their concluding statements the find that technology alliances induces indiscriminate alliance strategies and reduces internal R&D capacity. Despite this, however, they make the remark that firms should still engage in technology alliances, just make sure to have a solid alliance strategy and weigh in pros and cons of the collaboration as factor affecting that same strategy. Lastly, the conclude that firms should avoid developing an alliance addiction, an opinion supported by Huizingh (2011).

Perhaps due to the same reasons a recent study by Tavassoli et al (2015) comparing innovation strategies to innovative output found that neither product innovation, process innovation nor innovation in general is positively affected by external R&D. The only exception is collaborations with suppliers, but the effect of such collaborations is also small. Their recommendation is to focus solely on internal R&D capabilities, provided that the research can be confirmed, although they point out that their results do not comply with earlier studies.

Despite the risks and potential drawbacks associated with collaboration firms still choose to engage in them. This could be an implication that collaborations need be managed better and perhaps to a greater extent than today. An important aspect to look more into would be risk-taking, trust and the interplay between trust and risk in collaboration. How can firms protect themselves and still be attractive collaboration partners?

3.2.4 TRUST AND RISK-TAKING IN COLLABORATION

The choice to open up to collaboration exposes a firm to potential harm from the collaboration partner. Nevertheless, if a firm wants the benefits of collaboration, it needs to accept a certain risk. Playing a major role in decisions to collaborate or not is trust, both interpersonal and interorganisational. In this section we look at what the implications are firms, when it comes to balancing risk and openness.

Table 2, Relationship definitions and trust (Carbonara, 2002)

Relationship type	State of trust	Motivating force	Outlook	Behavior	Potential outcomes
Collaborative	Highly invested	For the good of the whole	Synergy	Responsible	Breakthrough innovation
Cooperative	Transaction oriented	For successful project outcomes	Win-Win	Willing	Preconceived success
Competitive	Reluctant or cautious	To look good	Win within rules	Shrewd	Compromise
Adversarial	Distrust	Not to lose	Win at any cost	Cut-throat	Unpredictable

Hattori and Lapidus (2004) describe four different levels of interaction depending on the trust level between the collaborators, see Table 2. With lower levels of trust comes several drawbacks. Competitiveness increases, the firms feel exposed and the outcomes of collaborations are hard to foresee. On the other hand, as mutual trust increases as do the integration and mutual interest, potentially rendering breakthrough innovations.

The view of trust as a collaboration-enabling factor is shared with Zaheer et al., (1998) that finds firm performance to increase with trust. Furthermore they define interorganisational and interpersonal trust, and find an interdependence between, despite the differences. Nooteboom (1999), however, thinks there can be too much trust in a collaboration, but that trust is important in lowering transaction costs.

Vagen and Huxham (2003) suggests that unequal power relations between the firms in collaboration can hinder trust in collaborations as one feels more vulnerable. In contrast to other studies they have studied, they find that trust is not necessary for successful collaboration, but instead firms must work to build trust when opportunity exists and learn to manage the lack of trust.

For firms, trust and contracting are complementary. However, where trust is lacking contracts can be complementary, but not the other way around. Blomqvist et al. (2005) have developed recommendations for firms to balance trust and contracting in collaborations, in order minimise risk and still maximise the benefits from collaboration.

There are many benefits for a firm to choose contracting. Intellectual property and intellectual capital are, for many firms, critical assets, especially in knowledge based competition. Opening up to another firm makes the firm and its competitive advantage exposed to threats. Furthermore, firms that put their

competitive advantage at risk are sure to want rights to the products of collaboration as well. That is why contracting can be an enabler. When contracts are set, the intentions and outcomes are clear, and mutual trust is not as needed. (Blomqvist, et al., 2005)

Blomqvist et al (2005) highlights the difficulty in contracting in collaborations that have uncertain outputs, especially when contracts are limiting the collaboration to the degree when both firms are tied in their co-development. To avoid unnecessary and conflicted contracting firms should put effort in building trust in the early interactions. This is especially important if the firm intends the collaboration to last, and not as important for short term relations. Some firms choose the collaborate with partners they have previous experience from, because they have established trust inbetween (Huizingh, 2011).

The role interpersonal trust should not be underestimated, however. According to Nooteboom (1996), collaborations initiated on personal trust may suffer when the collaborating persons build greater trust towards each other than with their organisations. A way to deal with this is personnel turnover, but also this can harm the collaboration.

It is clear that trust and risk are two factors in collaboration that utlimately define the success of collaboration. Firm can manage these factors, however, by selecting the right partner in collaboration. The partner selection process is dealt with later on. First, we look into what defines successful collaborations.

3.2.5 SUCCESSFUL COLLABORATION

The purpose of this thesis is to explore how firms use cross-industry collaborations for higher innovation capability, thus this section is intended to find what the current implications for interfirm collaborations are. The first thing for firms to consider prior to collaboration is if the firm have the required resources to commit to the collaborations (Schilling, 2010). All collaborations need adequate resources to be productive for the firm. If not, the intentions of the firm should be questioned.

There are a few implications on what defines successful collaborations in the literature, off of which we will look at a few. Hattori and Lapidus (2004), for example, lists a few of the success factors according to one of their respondents: trust, shared goals, shared language, a desire to participate, genuine roles, openness and listening, and passion for the process.

A more academic approach is presented by Mattessich and Monsey (1992), that define six factors affecting the success in collaborations. These are: environment, membership, process/structure, communications, purpose and resources. These factors, in turn, have sub-factors that Mattessich and Monsey have connected to the impact and relevance of each main-factor.

The *environmental* factors are: history of collaboration or cooperation in the community, collaborative group seen as a leader in the community and political/social climate favourable. The sub-factors of the *membership* factor are: mutual respect, understanding and trust; appropriate cross-section of members; collaboration as the self-interest of the members; and the ability to compromise. (Mattessich & Monsey, 1992)

The *process and structure* factors are: member-shared stake in both process and outcome; multiple layers of decision-making; flexibility; development of clear roles and policy guidelines; and adaptability.

The *communication*-related factors are: open and frequent communication; and established informal and formal communication links. (Mattessich & Monsey, 1992)

Continuing, the factors of *purpose* are: concrete, attainable goals and objectives; shared vision; and unique purposes. Lastly, the factors related to resources are: sufficient funds; and having a skilled convener. (Mattessich & Monsey, 1992)

Overall, not going into too much detail here, Mattessich and Monsey (1992) deal with recurring themes of collaboration. For firms that wish to evaluate current collaborations Borden and Perkins (1999) have developed a checklist and scoreboard for collaborations. The checklist is presented in Table 3, and shows all the categories having influence on collaborational success.

This far into the literature review we have studied collaborations in general – how firms collaborate; why and why not they collaborate; trust and risk in collaboration; and lastly what defines successful collaborations. In order to fully investigate the purpose we need to understand how cross-industry collaborations differ from other forms of collaborations. The next chapter deals with the implications for firms engaging in cross-industry collaborations.

Table 3, A checklist for successful collaboration (Borden & Perkins, 1999)

Communication	•Open and clear communication. Process for communiation between meetings
Sustainability	•Plan for sustaining membership and resources
Research and Evaluation	•Needs evaluation and progress metrics
Political Climate	•Decision making and environment surrounding power is positive
Resources	•Access to needed resources (capital, environmental, in-kind, financial and human)
Catalysts	•The collaboration is needed in relation to its purpose
Policies/Laws/Regulations	•Changes in the firms' organisations have been made to ease collaboration
History	•The firm have a history of working cooperatively and solving problems
Connectedness	•Those that engage in the collaboration are well connected in their respective organisation
Leadership	•The leadership facilitates and supports team building
Collaboration development	•There is a communication system and formal information channels that permit the exploration of issues, goals and objectives

3.3 CROSS-INDUSTRY COLLABORATION SPECIFICS

This far, we have touched upon collaboration in general, and learned that firms that search wider for collaboration partners have higher innovation performance. A wider search, of course, implies that the firm goes beyond industry borders in search for collaboration partners. Already here have we established the formulation of the purpose of the study; that cross-industry collaborations have the potential to boost innovation capability. When a firm has identified a partner to collaborate with, what then? And furthermore, what is cross-industry collaboration and what are the implications for firms wanting to engage in cross-industry collaborations?

Cross-industry innovation is when a firm imitates existing solutions from other industries and transform the solutions to meet the needs of the firm's current market or products, according to Enkel and Gassmann (2010). More than a firm being able to assimilate the capabilities of other firms, cross-industry collaborations also include when a firm tries to push its technologies or solutions to other industries. The two settings are referred to as *out-side in* and *inside-out* processes. The difference here is in the potential output of the collaboration: collaborations in which firms acquire knowledge from another firm leads to higher innovativeness, whilst technology push across industries generates additional turnover with little effort. A third archetype of open innovation is termed *coupled processes,* which describes a close and formal collaborational setting, for example co-development partnerships. (Brunswicker & Hutschek, 2010)

Gassmann et al. (2010) have through a study of cross-industry collaborations found managerial implications for managers. The first implication is for firms that depend strongly of their suppliers' input, to proactively look beyond their inherent technological trajectories for potentially interesting collaborations. Moreover, the firms engaging in cross-industry collaborations need to be aware of the uncertainty involved, and try and minimise the risks.

Gassmann et al. (2010) continue to recommend collaborating firms to establish an adequate contractual framework, that aligns the interests and goals of the parties. It is important to beforehand agree on how to deal with intellectual property and technologies that might emerge in the collaboration. Moreover, to make sure to connect the organisations properly, the interface in-between needs to function in a way that enables effective collaboration. Here, Gassmann et al. (2010) thinks that a single person interface is suitable, to keep the collaboration going.

3.3.1 IMPLICATIONS ON INNOVATION PERFORMANCE

Enkel and Gassman (2010) find that cross-industry collaborations do indeed contribute to innovation performance in a positive way. Furthermore, cross-industry collaboration mainly leads to breakthroughs and radical innovation rather than incremental innovation. However, they fail to prove their hypothesis of co-dependence of 'more' radical innovations and higher cognitive distance.

A condition for cross-industry collaborations to boost innovation is to have common goals in the collaboration – such goals can outweigh shortcomings in other areas. According to Gassmann et al. (2010) this is especially important in collaborations that aim for radical innovation development within collaborations of firms that are different from each other.

However the benefits of cross-industry collaborations, how many firms do engage in this type of collaborational setting? In a recent study of the Swedish forestry industry by Abraham & Göranson

(2014), a clear change in the years 1990-2010 with a decrease in competitor collaborations and an increase in cross-industry collaborations have emerged.

3.3.2 INITIATING CROSS-INDUSTRY COLLABORATIONS

As mentioned in the background, explorative activities, such as cross-industry collaborations, need structure in order to maximise probability of success. To address this, Brunswicker and Hutschek (2010) have developed a process for the use of cross-industry collaboration in the fuzzy front-end of innovation projects. It is a two-step process divided into the *selection* phase, in which interesting firms are identified, and the *ideation* phase, describing a multi-firm ideation process.

As seen in Figure 9, The sub-steps of the partner selection process the selection phase consists of 5 sub-steps to find collaboration partners. The first one, market trend analysis is the very beginning in which the firm identify trends and future market requirements by interaction of the R&D, marketing and business development departments.

When the future needs of the firm are identified a *competence analysis* is performed. In this sub-step, the firm analyses its own competencies and compares the with the future needed competencies. The gaps identified, within core, critical or contextual competence, are where the firm should choose to *open up*.

In the following *abstraction* phase the firm should think beyond its own industry and solutions, and try to view the needs from an independent perspective. The model for cross-industry collaboration in Figure 10 describes how a well performed abstraction can create new values and business opportunities (Gassmann & Zeschky, 2008).

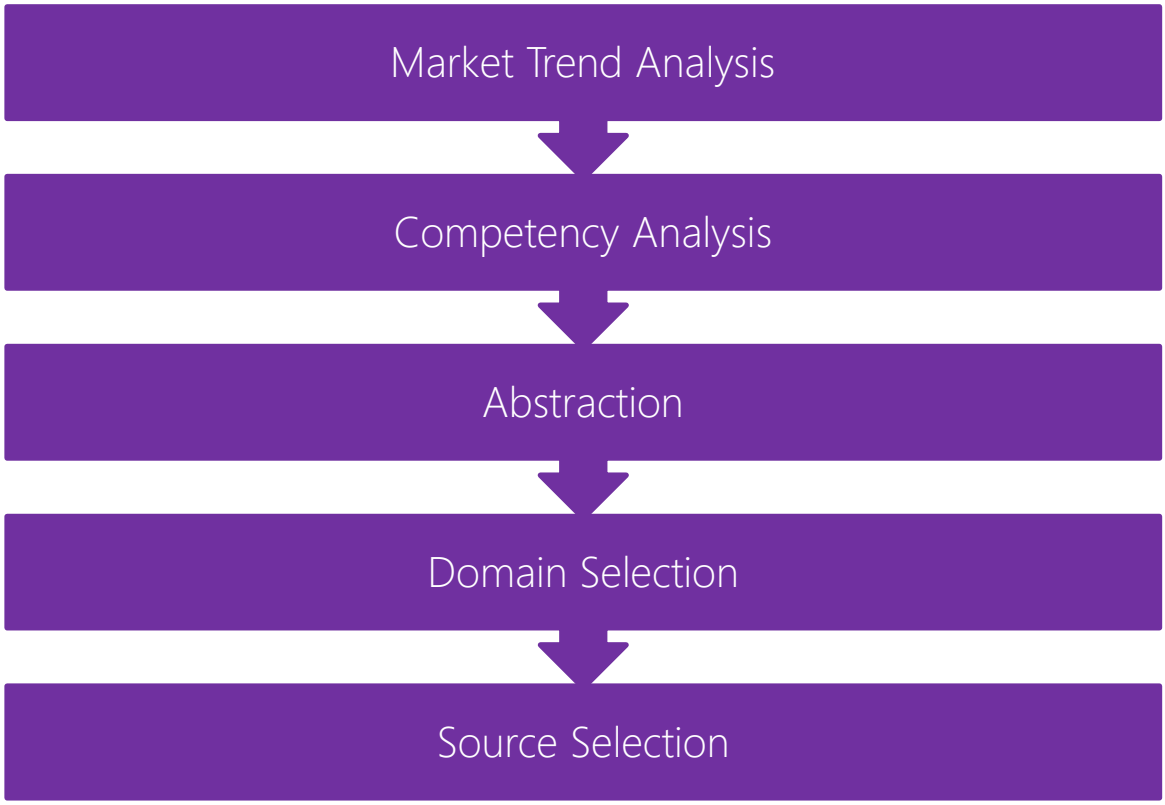

Figure 9, The sub-steps of the partner selection process (Brunswicker & Hutschek, 2010)

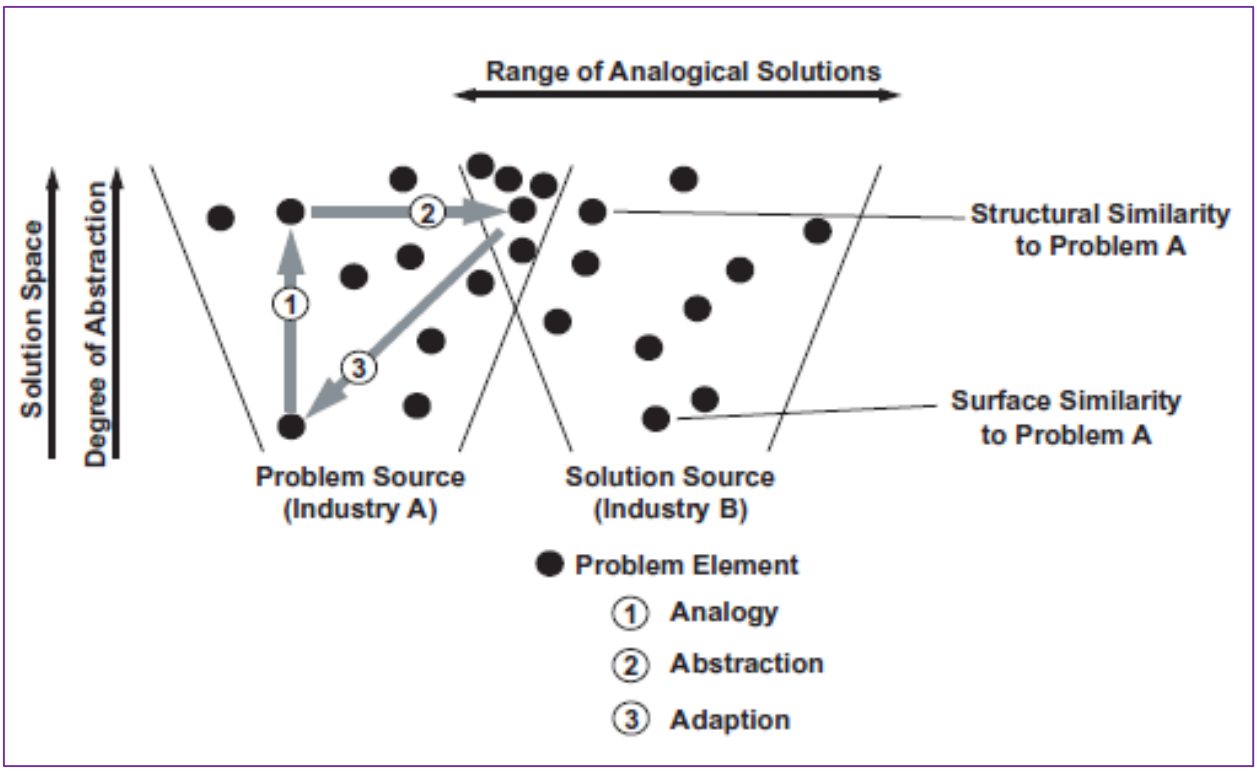

Figure 10, the cross-industry innovation process, as interpreted by Gassmann and Zeschky (2008).

Second to the abstraction phase comes the *domain selection phase,* in which the firm identifies potential search domains. The search for a structural fit should take technological distance, the proximity of functional markets, maturity, R&D intensity and dominant innovation type (process or product). In the last phase of selection the potential candidates in the domains are identified. An analysis of cultural and language fit can be made in this phase, should these aspects matter.

The choice of partner in collaborations can seem an abstract process overall, but with an intention to create novel value to a firm Cruz-Gonzáles et al (2015) conclude that 'overall, the wider the search for external knowledge, the higher the firm's innovation performance', ultimately relating greater openness with greater innovation capabilities. Greater openness does not necessarily mean more collaboration partners but rather a wider spread among the partners. This implies that a firm, in order to get a good enough payback of a collaboration, the partner in collaboration must be able to contribute and complement the firm's knowledge.

Here we have touched upon a structural approach on how the partner selection should be carried out and where to look. In the next section we investigate the psychological perspective in an organisational viewpoint, as described by the concept of cognitive distance.

3.3.3 OPTIMAL COGNITIVE DISTANCE, WHAT TO LOOK FOR

To really succeed in cross-industry collaboration it is necessary to be able to identify which firms potentially can bring your firm the most benefits. In this section, the term cognitive distance is explained, and current implications on optimal cognitive distance are presented.

Cognitive distance is a psychological term describing the heterogeneity between two firms' human resources (Nooteboom, et al., 2007). It is a fuzzy psychological construct that is easy to understand by

concrete examples, but is not as easily measured, and recommendations are hard to give (Wuyts, et al., 2005). However, if the cognitive distance between two firms is small, the two firms are probably in the adjacent industries and their human resources are probably similar in terms of education, sex, etcetera. On the other extreme, if the cognitive distance is far between two firms there are also probably major differences in industries, firm size, human capital and products and processes.

Obviously, to seek a partnering firm to which the cognitive distance is minimal would be optimal, just in terms of getting along and understanding each other. However, with short cognitive distance, the similarities between the two firms would mean that the collaborating firm probably could contribute very little to the other firm. The recommendation that Nooteboom, et al. (2008) make is that firms must seek the optimal cognitive distance when looking for partners. The optimal distance, however, varies and depends on the breadth of technical knowledge of both firms. '*The more one knows the further away one has to look for novelty*'.

In a study by Nooteboom et al. (2007) they compare innovation performance with the cognitive distance. The key finding is that the innovativeness in output conforms to an inverted U-shape, see Figure 11; the more alike two companies are the better they understand each other, and in turn the

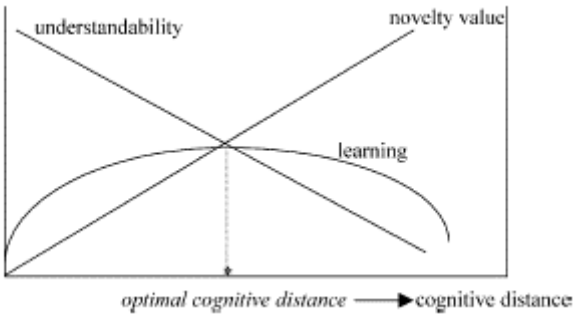

Figure 11, A model of optimal cognitive distance (Wuyts, et al., 2005)

companies cannot contribute to each other with much new knowledge. In the other end of the 'U' are companies that differ much from each other; they hardly speak the same language and struggle to understand each other, but provided they do both firms can learn greatly from the other. What needs to be understood is that there is a trade-off to be made between the opportunity of novelty value and the risk of misunderstanding. According to Wuyts et al. (2005) the opportunity lie within diversity and that novelty of the value created increases with cognitive distance.

Interestingly, Darr and Kurtzberg (2000) finds that business strategy has a major impact on knowledge transfer in collaborations. This is a study made on small firms, but the idea that two firms applying similar business strategies understand each other better than two who don't makes sense. A strong enough strategy becomes the perspective of a firm and thus two firms applying the same strategy, for example pricing strategy, should be able to understand each other better. This implies that business strategy have a strong impact on the cognitive distance of two firms. Optimal distance is definitely something to consider when firms engage in collaborations, both for intercommunication as well as the level of novelty in the value created in collaboration.

3.4 THEORETICAL FRAMEWORK AND RESEARCH QUESTIONS

In the frame of reference we have explored literature that in some way relates to the subject of this study, to explore how firms use cross-industry collaboration to boost innovation capability. Thus we have established a fundamental understanding of innovation; where innovation happens, and what the implications are for different novelty levels of innovation output. Furthermore we looked into exploration and exploitation, two terms associated with innovation and firm activities, in order to be able to classify collaborations in relation to innovation.

The chapter following deals with collaboration in general. What can firms expect from collaborations, what are the dangers of interfirm collaborations, and what implications are there for firms to relate to. We find that there are indeed value top be captured in collaborations, but pitfalls as well. Firms must manage collaborations and purposefully engage in collaborations. We find collaborations as an activity of the more explorative kind, which implicates that firms should engage in collaborations for long term survival.

Lastly, we touch upon the specific conditions that apply to cross-industry collaborations. The findings here speaks towards that cross-industry collaborations are different from other forms of collaborations. They differ mainly in risk-taking and novelty of the value extracted. Furthermore, in the wide selection of potential partners, we dig into the aspects firms should consider when looking for collaboration partners, such as the optimal cognitive distance.

3.4.1 RESEARCH QUESTIONS

Moving on an with the intention to build on the knowledge around cross-industry collaborations we have yet to decide which areas are interesting to look further into. With basis in the purpose of the study, to explore how firms use cross-industry collaborations to boost innovations capability, we must apply an explorative approach here as well.

With delimitation 6 in mind, that this thesis is intended to give guidelines to Scania R&D managers for cross-industry collaborations, we must relate to conditions in Swedish industry and explore within the Scania perspective. In relation to this, it is important for Scania to understand why cross-industry collaboration is worth to apply. Thus we investigate why firms, who are applying cross-industry collaborations in Swedish industry, do so.

RESEARCH QUESTION 1

What are the reasons firms engage in cross-industry collaborations?

Furthermore, on the same theme, as the practical reasons for the use of cross-industry collaborations may differ from the literature description, we must explore the values firms are extracting.

RESEARCH QUESTION 2

What are the direct and indirect values that firms can extract from cross-industry collaborations?

As established with collaborations they come in most forms and sizes. Thus, we should dig deeper into how firms engage in cross-industry collaborations today, especially to find industry practice implications.

RESEARCH QUESTION 3

How do large firms in Sweden engage in cross-industry collaborations today?

In relation to the subject, we need to establish what the implications of the innovation capability are for firms. In what way should cross-industry collaboration be used as a tool for optimal innovation output?

RESEARCH QUESTION 4

What are the implications on a firm's innovation capability in the relation to the use of cross-industry collaborations?

And lastly, cross-industry collaborations are yet to be fully explored by the industry and researchers. Firms are still learning how to manage cross-industry collaborations which is why it is important to look into improvement areas.

RESEARCH QUESTION 5

What is the future of cross-industry collaborations for firms in Sweden?

4 RESULTS

In this chapter the empirical data from the qualitative interviews are presented. The data is presented in general themes that have emerged during the interview period and a part that is for the respondents' particular insights on cross-industry collaborations. The data presented here is intended complement the current literature and provide valuable input in regards to the research questions. Note that the data is anonymised even though participating firms are presented. The sex of the respondent is not made anonymous for better readability.

4.1 PRE-REQUISITES FOR COLLABORATION

In this chapter the pre-requisites for collaboration are presented, such as a return on investment-guarantee, or exempli gratia access to some of the intellectual property of the collaboration partner. These are the terms that in the initial state enable collaboration.

Respondents 15,1 and 2 have an open approach towards collaborations in general. To them the value creation is a motivator for collaborations – respondent 1 says it is for personal motivation whilst respondents 2 and 15 both belong to firms that encourage value creation. Respondents 1, 2 and 15 all have attractive capabilities that can help develop other firms' capabilities.

Two of the respondents, namely respondent 5 and 13, claimed it to be critical for any collaboration to have a clear connection to the firm's current business. Respondent 13 collaborates mainly with smaller firms and entrepreneurs as an incubator for new technology, and the relevant technologies are those that fit well strategically. Respondent 5 however mentions strategic fit as a criteria, even though all who wishes to collaborate are given the chance to present their proposal. Even so, the criteria is not absolute as strategic fit is a matter of perspective.

Two of the respondents, 4 and 3, make clear that any collaboration is made more interesting if the collaborating party has a driven collaboration-'champion'. Respondent3 wants this champion to have personal motivation to excel and ensure a productive collaboration, rather than enforcing the champion's own firm's strategy. According to respondent 4 a driven champion can overcome obstacles related to IPR conflicts. Respondent 16 have in a previous collaboration experienced a lack of drive in the collaboration, which ultimately led to the disbanding of the collaboration.

Respondent 1 and 9 both have had experience from collaborations where the partner's personal commitment and fit enabled a deepening of the collaboration, beyond initial intentions.

In choosing collaboration partner respondent 8 have chosen partners because of their capabilities and knowledge. In this specific case respondent 8 had a clear vision with collaboration and had thus found partners matching the capabilities needed. As goes for respondent 15 the collaborations are value chain oriented, and the collaboration partner is chosen because of the firm's role in the eco-system. Also, if other large firms are engaged in a collaboration, the collaboration becomes increasingly interesting to respondent 15's firm. As respondent 16's firm have capabilities that could create synergies with other firms it is clear that it is the resources and capabilities of a partner that makes them interesting. Respondent 16's firm is large and have the capability to scale business on their own, which is why most collaborations are initiated small to investigate the business opportunity.

The importance of having a clearly set agenda in collaboration is stressed by respondent 9, 12, 13 and 14. All of the respondents stressing this highlights the dangers of collaborating without clear intentions, mostly high costs in relation to collaboration output.

For respondent 5, 11 and 14 it is especially hard to collaborate with competitors. Respondent 14's firm have before been fined for collaborating with a competitor, which is why this especially critical in collaboration. Moreover, respondent 5 and 11 find it harder to collaborate with competitors, since competition has increased much recently. There is a great scare in letting competitors come by business critical information or missing out on IPR advantages.

Especially for collaborations that involve small firms / entrepreneurs and a larger incubative firm it is critical that IPR are settled beforehand. If the smaller firm / entrepreneur cannot show clear ownership of the intellectual property in collaboration there can be no deal, according to respondent 13. Also respondent 4 claims this is of utmost importance. If the small firms / entrepreneurs offer something that is not theirs to offer then the collaboration is off, is the viewpoint of both respondents.

Even if it ultimately is essential to firms, only a few have listed the promise of profitability as a pre-requisite for collaboration. In the competitive industry that respondent 1 is active in it is necessary for the firm to be profitable in most actions, even if his personal motivation is value creation. Also respondent 12 is in a similar situation – the industry requires that initiatives have business potential, even if it is not absolutely necessary, it is a prioritisation.

Respondent 15 thinks of profitability as second to value creation, but still regards business potential as a determinant in collaboration.

4.2 TYPICAL FORMS OF COLLABORATIONS

In this chapter the typical forms of cross-industry collaborations of the respondents are presented. The five main types are: co-creation, extended customer/buyer-relation, methodology/competence-sharing, explorative new technology incubations, and value chain collaborations.

4.2.1 CO-CREATION

Co-creational collaborations are the collaborations where two or more partners with competence and capabilities combine these to create a new product, or in the early stage investigate the potential in doing so.

Respondent 7 and 8 have positions in which they engage in co-creational collaborations. The typical collaboration that respondent 7 engages in is technology fusions, in which they combine their products and solutions with another firm's product or solution in order to create something new.

Respondent 8 engaged in a collaboration, with current suppliers, to create a common vision to cope with the future challenges in his firm's industry. The partnering firms use the common visualisation to co-develop new products to meet with the predicted future challenges.

4.2.2 EXTENDED CUSTOMER / BUYER RELATION

This section entails collaborations that are extended customer/buyer relations with partners not already in the value chain.

Respondent 1 collaborates cross-industry wise and acts as a one man interface in-between his firm and other firms. The firms that collaborate want the specific solutions that respondent 1's firm can offer, and in that his firm see opportunity to supply their solutions to that firm. The capabilities of respondent 1's firm become available through him, and the result of the collaboration is a solution customised to the collaborating firm's needs.

Parts of the solution that respondent 16's firm developed have potential in other industries, which is why he has contacted local firms to present their solution. From there on both firms have worked to investigate the potential and applicability of the solution. From respondent 16's perspective the potential in this collaboration is to become a provider of the service the other firm wants.

Respondent 9 was in need of a specific technological solution, and was in search for a partner that could deliver the solution. A partnering firm was contacted, and the solution was delivered as wanted. The partnership was so successful that respondent 9's firm decided to extend the partnership to new projects. In return, apart from the sales, the providing firm said to have gained valuable insights into respondent 9 firm's industry because of the collaboration.

Respondent 17's firm provides a highly customisable product, and works with players in all industries. Most customers are unique and in different industries, and can provide valuable insights for respondent 17's firm to develop new product features.

Respondent 1, 2, 6 and 16 all work for firms that are used to using their specific capabilities to enhance other firm's efficiency and processes.

4.2.3 VALUE CHAIN

Collaborations within the value chain is becoming more common amongst large industrial firms. In this category most firms use collaborations in the value chain to come closer to the end-customer or create greater value through value chain innovation.

Out of the collaboration types identified here collaborations within the value chain are most common, exercised by seven of the respondents.

The firms of respondent 3, respondent 11 and respondent 12 all uses collaboration within the value chain to come closer to the customers. By better understanding the whole value chain's challenges and perspective of the end-customer, they can enhance their product and increase value creation in the value chain as well.

Respondent 5 collaborates in an VINNOVA-driven initiative, aimed towards enhancing the value creation in their eco-system. In this collaboration firms from different industries that depend on each other, and make a joint effort to maximise innovation capabilities in the value chain.

In trying to predict future industry challenges respondent 8 contacted two firms that were suppliers to respondent 8's firm. He engaged into collaboration with both firms, and through collaboration building future capabilities together.

Respondent 14 have collaborations with what the firm calls strategic suppliers. The purpose of this collaboration setting is to better understand the needs of respondent 14's firm and also gain competence in the suppliers technological area.

Respondent 15's firm engages in several VINNOVA funded project as a major player in its eco-system. VINNOVA initiated the projects to address challenges, often social, not only one firm can develop solutions to, but require collaboration within the value chain.

4.2.4 EXPLORATIVE NEW TECHNOLOGY INCUBATIONS

Typically, the firms in this category are large firms with capabilities that entrepreneurs and small firms wishes to leverage. The small firms seek a firm with scalable resources to make their invention an innovation.

Respondents 3, 4, 10, 13, 15 all work in larger firms, that have capabilities that small firms and entrepreneurs find attractive. So attractive, in fact, that these large firms have created a structured interface towards such potential collaboration partners.

The most notable example is respondent 13 that works specifically with small firms and entrepreneurs that want the capabilities of respondent 13's firm. Respondent 13 deals with the early stages of product development and in this mission respondent 13 searches for new technologies that are interesting to respondent 13's firm.

The other respondents, respondent 3, 4, 10 and 15, all belong to organisations that deals with these requests from small firms and entrepreneurs, but have themselves a more general collaborative role.

4.2.5 METHODOLOGY- / COMPETENCE SHARING

The firms that engage in these collaborations do it purely to develop methods, processes and gain new insights on business strategies.

Respondent 4 have experience from working with a completely different firm, in another industry, regarding methodology and process theory. He thinks that this type of collaboration is to prefer before hardware development collaboration, a type of collaboration that have a tendency to become heavy legally and create conflicts.

Both respondents 3 and 14 are members of cross-industry competence sharing networks. These networks consists of professionals, in their respective technological area / organisational function, who wish to excel. Typically methodologies are shared and the members can give each other input on case studies provided by the members. The network that respondent 14 is a member of will only allow the entry of a new member if all current member do not oppose.

4.3 SECRECY, IP AND INITIAL OPENNESS

In all 17 interviews the different aspects of NDA, contractual agreements and the level of openness have come up, either as enablers for collaboration, or as hinders.

The non-disclosure agreement, also known as the NDA, is a necessary part of any collaboration according to most of the respondents. In most cases the necessity to write NDA:s is either due to clear guidelines from the organisation to do so, or merely as a formality.

Respondent 15 emphasizes the importance of avoiding legal contracts and even NDAs in the early stages of collaboration. Normally, the information exchanged in the early stages is not sensitive enough and NDAs and legal contracts could harm the initiative. As discussions continue and concrete business models emerge the parties begin to discuss the legal aspects. Also respondent 3 wants to keep collaboration lightweight in the early phases, and to have informal discussions on what the possibilities of potential collaborations could be. Respondent 4 says that even if IPRs should be set early it is not all firms that are ready to deal with the issues of IPR that early on.

As much as legal contracts can make an obstacle in collaboration, they can also support the collaboration once set. Respondent 13 stresses the importance of legal contracts in collaborations that involve high potential business cases and IPR.

Respondent 7 have had a bad experience from a collaboration where legal aspects were not set in a sensitive phase – the collaborating firm had applied for a patent, on its own, for a technology the two firms had developed together. Since then, respondent 7 settles legal aspects early in collaborations. The contracts regulate slightly more than regular NDAs, and are necessary to the discussions initially.

In the typical collaboration for respondent 17, the firm gets access to sensitive information about the collaborating firm. This require initial trust, and non-disclosure contracts.

According to respondent 12 it is important to only address the terms in the contract that the potential and risk of the collaboration justifies, in order to reduce complexity. The more understandable a contract is, the greater the sense of security in the collaboration. Also, if complexity is kept low, the time to establish a contract will also be reduced – which can be a bottleneck for many firms, according to respondent 12.

It is especially when research institutes and academics are involved that legal contracts can slow down collaboration, is the experience of respondent 10.

Respondent 4 works at a large firm, and finds it to be especially difficult to collaborate with other large firms about hardware development, due to IPR. In the strategy of respondent 4's firm is to claim IPR in all collaboration, and if the collaboration partner also claims IPR the collaboration reaches a deadlock. The collision in interest here, however, lies in between the firms' strategies and the personnel involved in the collaboration. According to respondent 4, the collaboration itself is the priority to the collaborators, and IPRs come second. Respondent 4 wants collaboration to become easier, and think that it would be good for any firm to be known as collaboration-friendly.

A firm can also have a strong culture of patenting and owning IPRs, which is the case with respondent 16's firm. The collaboration examples that he lifted, however, did not develop into new business cases. The patents in one example all belonged to his firm, even though the patents were a result of the collaboration.

Respondent 9 engaged recently in a collaboration that had great openness intially, due to mutual trust and a personal fit between the collaborating parties. It made a difference that the partner was in a completely different industry, which is why the firms could use each others' capabilities to excel in their respective markets.

The lightweight characteristics of respondent 8's collaboration makes collaboration easier. The mutual trust and separate development minimise vulnerability.

Respondents 1, 4 and 15 lifted the problems with legal contracts in relation to more explorative collaborations. Explorative collaborations have uncertain outcomes and the legal contracts are typically made for collaborations that have controlled output, such collaborations that firms typically have with suppliers. To make it easier to engage in collaborations the respondents want to have specific contracts made for explorative collaboration, that are lightweight.

4.4 INTENTIONS AND EXPECTATIONS

This chapter presents what intentions and expectations a firm has in collaboration, or easily put: why firms choose to collaborate.

The results in this sections show a distinction in between. Firstly, there are firms that engage in collaboration out of mere curiosity, such as those of respondents 5 and 15. However, this does not mean that potential in collaboration is not a factor. The expected outcomes of fuzzy, explorative collaborations, typically those of respondents 5 and 15, is value creation. Thus, the intentions that these respondents have had is to take part in the large value chain collaborations, for value created in either society, knowledge creation or not missing out on business potential further ahead.

Other respondents that have not had product development as an expectation in collaboration are respondents 3 and 11. They have engaged in collaborations, within the value chain, to better understand the value chain itself, and come closer to the end-customer and its needs.

Respondent 12 also have the intention to better understand the value chain they are part of, but the main reason of the collaborations he engages in is product development, either directly or indirectly.

Respondent 4 have before tried to enter the Asian markets with little success. When one of their collaboration partners initiated a project in china they saw the opportunity to leverage themselves onto the market. The project would mean that some 10 million people in china would interact with respondent 4's products daily, and thus the expectation was that the project would make it easier for the firm to enter the Asian market.

Moreover, respondent 4 engaged in collaboration with another large firm in Swedish industry, not to co-develop, but to share strategy and methodology knowledge. There was no competitive relationsship between the firms, which was a pre-condition for the collaboration, according to respondent 4.

To create knowledge is a common theme in the interviews. Respondent 8 engaged in an alliance to better understand the challenges of tomorrow in the firm's industry, and to develop products to meet those challenges.

Respondent 2's firm have enabling capabilities, that they wish to share with other companies, to create knowledge, but also create business relationships. There is no need to guarantee a payback from collaborations, but rather the intentions that collaborations should create value for both firms.

Respondent 7 is especially curious of synergies and often engages in collaborations to evaluate a possible technology mix. The collaborations are typically to see if there is a technological fit, and evaluate business potential.

Respondents engaging in the so called explorative new technology incubations, namely 3, 4, 10 13 and 15, all do so because of the intention to exploit a new technology. The expectations however, are low. Respondent 13 says that about one in ten initiated contacts generate concrete value for his firm. Here, the intention is to create value to their firm through new innovations, but expectations are low, at least initially.

4.5 RESOURCES ALLOCATED

Below are the findings in terms of resources put into collaboration, in terms of time, money and manpower.

When it comes to resources allocated by firms in different collaboration it depends on the firms involved, and the type of collaboration. The common way, in the explorative collaborations, seems to be to start small, and as the potential of the collaboration increases also increase resources spent, according to respondents 1, 6, 8, 9, 12, 13 and 15.

However, there are small differences in between the respondents. Respondent 1, for example, functions as a one man collaboration interface. All communication go through respondent 1 and respondent 1 connects the collaborating firm with resources in respondent 1's firm. Respondent 1 has to, internally, request resources for the collaboration, as with any project the firm has internally. This way, if the collaboration is interesting enough to the firm, the resources will become available. If not, respondent 1 will try and find other solutions to the lack of resources. In a specific case respondent 1 did not get access to the resources needed, but connected the collaborating firm with another firm with the resources needed to continue collaboration.

In contrast to respondent 1, respondent 8 have whole groups assigned to the collaboration. Even so, as the firms in respondent 8's collaboration are large and have their own processes, which is why resources are kept with the firm. To not mix resources is possible because the collaboration is an extension of a normal product development collaboration, that each firm have capabilities to manage best themselves.

4.6 PARTNER DIVERSITY

The difference between the partners in collaboration affects the collaboration in many ways. This chapter deals with the diversity dimension on collaboration.

There is a great variation in how partner diversity come to affect collaboration success between firms. Respondent 12, for example usually collaborates within the value chain, with pre-known partners and a clear agenda, which according to respondent 12 makes mutual understanding easier.

Respondent 2, however, thinks that partner diversity is absolutely necessary for collaboration to be possible. If two collaborating firms are too alike, then either firm will eventually consider developing the capabilities themselves. The challenge is, according to respondent 2, to not be too different, however. Both firms must be alike enough to understand each other in communication.

The firms that engage in the explorative new technology incubation collaborations, respondents 3, 4, 10, 13 and 15, all talk about the challenges to, as a large firm, handle collaborations with small firms and entrepreneurs. Larger firms have processes and methods for product and business development, and usually move a bit slower than small firms. Small firms, however, are speedy and expect quick results and priority from the large firm. The respondents in the larger firms all think this is because of the inexperience of these collaboration partners.

Respondent 10 has recently had experience from a collaboration in which the participants had diverse backgrounds and mindsets. The rendered ideas and output from this collaboration were so high in novelty that none of them were thought of beforehand.

Also respondent 15, who works for a firm he thinks have much diversity in their workforce, says that diversity is essential to challenge conventional ideas.

The firms that contact respondent 6's firm do it to a certain extent because of his firm's well known diversity and unconventional way of thinking. Diversity, can in this case, be seen as a pre-condition for collaboration, and an enabler to collaborations itself.

4.7 PRODUCTS AND BY-PRODUCTS FROM COLLABORATION

Cross-industry collaborations can have additional benefits, that somewhat differs from the intentions of the collaboration.

In some collaborations the actual goal with the collaboration was not reached. However, respondent 16, who engage in two such collaborations perceived that real value still was created. Firstly, his firm applied for several patents in the collaboration – patents that the firm can make money on by selling the rights to use the patents to another firm. Secondly, the respondent was satisfied that he and his organisation learned much about the industry of the firm they collaborated with. By better understanding the industry, the threshold of one day developing capabilities in that industry has become much lower.

Respondents 1 and 9 both have been in collaborations initially, in a supplier / buyer setting, that later evolved into a better integrated collaboration. Thus the evolved collaboration itself was a by-product of the initial interaction.

Collaborations that are of the more explorative kind tend to have unexpected outcomes, which is why all products of a collaboration can be seen as by-products. Respondents 1, 3, 4, 6, 7, 8, 9, 10, 11, 13, 15 and 16 all have had low expectations on collaborations they have engaged in. The reason they engaged in them is of course of the potential in collaboration, but they showed an understanding of how complex collaboration can be. As the respondents expected less, the outcomes of the collaborations can be seen as unexpected. Respondent 16, for example, wanted to know more about a specific industry, and if his firm's business solutions were applicable in that industry. As it turned out the collaboration later disbanded, before any actual product from the collaborations were produced. Still, respondent 16 thinks that his firm gained much valuable knowledge, and applied for patents within the technological area, off of which his firm can create future revenue.

Respondents 1, 3, 4, 8, 9 and 15 developed their business because of collaborations; some by deepening the existing collaboration, some found partners to engage in other collaborations with and some gained access to new markets.

Respondent 11's firm is a firm higher up in the value chain, and thus far from their end-customers. In the example provided by respondent 11 was engaged in a collaboration with South African firm in the other end of their value chain. The main intention with the collaboration was to get to know the market better, and secondly understand the other firm's challenges and possibly meet these needs.

In the collaborations of the explorative kind, respondents 1, 8 and 9 all had low first expectations on what their collaborations actually would render for the firm. They all connected with their contacts in the partnering firm on a personal and somewhat informal level. This was also part of the reason why the collaborations were sustained and were allowed to grow.

4.8 THE FUTURE OF COLLABORATION

In this chapter the respondents' thoughts on how cross-industry collaboration will come to function in the future.

As the respondents noted in chapter 4.3 legal issues have the ability to hinder successful collaboration. Respondent 9 especially, who thinks that collaborations in the future should be as lightweight as possible, to lessen the chances of disbanded collaborations due to administrative issues.

Furthermore, respondent 9 thinks that the interface in collaborations always should be one person from each firm, mainly. This way, all contacts go through the collaboration "champions" and the collaboration is kept manageable.

Respondent 1 says that firms before used to show off and brag about new technologies they had developed, at fairs. Nowadays, unlike then, firms especially show off their collaborations and partners, as a way to show success.

Especially respondents 2, 4, 13 and 15 thinks that collaborations, especially cross-industry, is the strategical choice firms must recognise to survive the globalisation. Before, firms could have business in

many industries and still excel. That later changed as firms needed to specialise further to stay competitive. As competition intensifies even further firms need also to specialise further, and be flexible in their capabilities. Respondents 2, 4, 13 and 15 all think that the flexibility comes with collaboration with firms that have the capabilities another firm wants. Firms must become absolute experts in their respective fields, and through strategic collaborations develop capabilities that will make them excel on their markets.

Respondent 4 thinks the challenge for firms in the future will be to choose collaboration partners to maximise output. Respondent 15 stresses the importance of not thinking in terms of products in the future, but in terms of solutions and value creation.

4.9 FEATURED INTERVIEWS

Each respondent had specific and interesting insights, however, some of the respondents willingly shared their expertise, that from their perspective can contribute real value and insights to this thesis. Three of the respondents', 3, 16, and 17, interviews are here presented because of their vast experience, special business model and/or specific efforts.

4.9.1 RESPONDENT 3

Respondent 3 is active within a typically strong, Swedish industry, and has seen the industry change in recent years, to address changes in customer needs. She says that collaborations are different now from how they used to be in the industry. Historically, the firms in the industry were very open and collaborated with competitors, in a very informal setting. This changed, however, as competition increased in later years. Nowadays competitors are not as open towards each other, and even less prone to collaborate. She says: "its infinitely much easier to collaborate with firms in other industries than competitors".

Now, instead, firms *must* collaborate, and with firms with complementary capabilities. Firms in other industries are that much easier to collaborate with because of the lack of competitiveness in-between, a critical difference with competitor collaborations. Moreover, respondent 3 thinks that collaborations with suppliers to a greater extent create incremental innovations while radical innovations require a more thorough search for collaboration partners.

She is especially fascinated in collaborations between small and large firms, as a way to increase innovation capability. In her industry the firms typically make large investments in machinery, which makes the firms inflexible and sensitive to changes in customer needs. It is to address this problem, especially, that collaborations with smaller firms are part of the solution, according to respondent 3.

Smaller firms are flexible and fast, lack bureaucracy and have higher productivity with smaller funds. The larger firms, on the other hand, are effective, have structure, have better funding, conducts their own research and have administrative skills. A successful collaboration between a small and a large firm would exploit each firm's strengths.

Regarding firm matureness she thinks that there is a difference in firms strategies and efforts. Firms that really wish to differentiate themselves and create novel value are also the ones engaging in the more exploratory collaborations. Moreover, to create lasting value from collaboration it is important to also sustain the collaboration until real value is created. It is easy to engage in collaborations, but it is much

harder to sustain collaborations. It requires that the driving people in the collaboration have not only career goals, but have an internal motivation to keep the collaboration going. People that have the highest ambitions are also the ones most likely to sustain a collaboration long term.

4.9.2 RESPONDENT 16

Respondent 16 works for a large international firm and is head of some 16 people. He has been involved in the development of a special capability, a capability that supports core activities of the firm. The idea behind the development of this capability is potentially interesting to completely different industries, which is why respondent 16 have initiated collaboration initiatives.

He contacted a local firm, much smaller than his firm, in an effort to evaluate his solution's potential in their industry. The intention here was to develop a solution that would work across the other industry, by understanding the industry through a smaller player. The collaboration initiative was taken on respondent 16's level and not on corporate level, which became an issue later on.

As soon as the organisation learned that the collaboration had happened other functions within the firm was upset, and thought that the initiative had not been approved by the organisation. The organisation questioned that resources had been put on a non-approved collaboration, resources that could have been spent on planned activities. However, the organisation later recognised the potential business value in the collaboration, and that the collaboration was interesting to the firm.

Despite applying for several patents within the area, and learning much about the potential in the technology the collaboration was about, the collaboration disbanded after four months. Lessons learned was that the technology was not as easily applied in their area, as respondent 16 initially had though. This, however, was not the reason of the disbanding. Respondent 16 felt the disbanding was due to insufficient prioritisation from the organisation. Planned activities went before the collaboration, and the internal promotion of the collaboration could not keep the collaboration going.

Despite the disbanding of the collaboration, respondent 16 still thinks that the collaboration gave much to the organisation. Not only did the firm learn much about the industry, in case it would consider developing business there, but it also got some patents approved, meaning that any firm that would try entering the same market would probably have to pay license fees to respondent 16's firm.

To take the initiative to engage in such exploratory activities requires flexibility from the organisation, and the potential to resource-light investigate business potential. By, through various initiatives of his, getting graduates to perform much of the work, he can lower the cost of projects and thus create a greater acceptance within the organisation of exploratory efforts.

Respondent 16 feels that his firm reaches out with collaboration requests more often than they are contacted by other firms. He wishes that other firms would take the initiative more often, but thinks this might be because other firms do not know what respondent 16's firm can really offer them.

4.9.3 RESPONDENT 17

Respondent 17 is quite special from the other respondents in this thesis. He works as key account manager for a firm that offers a highly customisable product. The interaction he and his firm has with other firms is not really collaboration, as in the same way other firms in this thesis are, but a closer buyer/supplier interaction. The customisability, and the applicability of his product in almost every

industry, forces his firm to closer collaboration with firms. Also, the firms that are customers of his, have established their own way of handling the problems his firm offer solutions to, which is why these firms have special demands on the actual integration and customisation of the product.

The many requirements and requests of their customer firms drive the development off their product, but also help develop the customer firms' processes forward. Respondent 17 says that the synergies are incredible and that all customers contribute to building the competence of the firm, and the product. The competence that his firm acquire through collaboration helps in offer customisable solutions to other firms in the same industries, and also develop new practices in industries that lag behind. The closeness with other firms in many industries have developed the product beyond what his firm initially intended it to be.

Respondent 17's firm has engaged in some collaborations with other firms, with the main goal not being to sell their solution to the firm they collaborated with. Larger corporations, with separate business divisions, that are inflexible and slow, let one or several of their divisions buy the solution from respondent 17's firm. By doing so, the larger firm gets to minimise risk in buying the product, and most solutions the larger corporation wants to use would already have been implemented within the smaller divisions. Thus, the motivation for respondent 17's firm to engage in the collaboration would be to build knowledge and develop their business with the larger firm, should they decide to use the product.

Moreover, respondent 17's firm collaborates with their suppliers in a way that attracts suppliers. The suppliers are connected, through his firm's solution, to the end customers. In this way, Respondent 17's firm does not charge nor pay the suppliers, but get the suppliers to also drive the product development themselves.

4.10 SUMMARY TABLES

The results from each respondent in key areas are presented in Table 4, Table 5 and Table 6.

Table 4, A summary of the results from interviews 1-6

Interview person	Pre-requisites for Collaboration	Typical forms of collaborations	Secrecy, IP and initial openness	Intentions and Expectations	Resources Allocated	Partner Diversity	By-products from Collaboration
1	Value creation opportunity and business case	Early phase: cross-industry collaborations, contributing expertise	NDA and contracts needed. Personal trust is a factor	Personal: Add value, Company: Business case	1 assigned resource, then additional and scalable resources within the organisation.	No real impact, because of the one-man-interface	Learned much about new markets. Collaboration grew beyond expectations
2	Value creation opportunity	Contributing expertise	Open to using capabilities to leverage other firms' business cases	Acquiring and creating knowledge		Partners must be different for collaborational success	
3	Driven partner Payback within certain time frame	All sorts, except with competitors	Great openness. Towards competitors great secrecy.	Come closer to end-user/customer. Find applications for inventions		Different firm cultures can create inter-personal issues.	Initiated customer/supplier relation
4	Driven partner. Fit with strategy and portfolio. IPR settled	Product development / Competence sharing / Business development	NDA early on. Organisation wants to own all IPR	Investigate how to sell a service, not a product. Business development			Explorative -> output unknown. Access to new market
5	Strategy related	Broad value chain collaboration, Vinnova initated	Generally open, not necessary to share sensitive information. IPR agreements critical to collaboration	To understand how innovations come to be in the industry			
6	A specific purpose	Methodology sharing and digital insights	Open unless about truly strategically sensitive information	Open to unexpected outcomes	Investments are kept separate, and resources are scalable	Usually partners want the insights and perspectives of this company's diversity	Knowledge creation

Table 5, A summary of the results from interviews 7-12

Interview person	Pre-requisites for Collaboration	Typical forms of collaborations	Secrecy, IP and initial openness	Intentions and Expectations	Resources Allocated	Partner Diversity	By-products from Collaboration
7	A specific purpose	Technology fusions	Generally important in the early phases. Have had bad experience in earlier collaboration.	To evaluate business opportunity, and technology potential.	Depends much on the project, but dynamic.	Process differences and inter-firm communication	
8	The partner should have specific knowledge	Future insights co-development	Open and informal. NDA.	Make a common prediction of future needs and solutions	Each firm assigned resources required for their part.	Different processes, but worked separately. Shared methodology	Collaboration to a greater extent than initially thought
9	A specific purpose, relevant to business strategy	Informal strategic alliance	High levels of openness. NDA initially. Personal trust an enabler	Find supplier of technological solution	Start small to get a feel. Assign resources dynamically.	Although different industries, a match in personality enabled good collaboration	Became strategic partner
10	A specific purpose	Large firm - small firm. Co-creation collaborations	Organisation requirements on NDA & contracts	Creation intentions but no real expectations		Differences in processes caused issues	Low expectations - mostly unexpected results.
11	No collaborations with competitors. A specific purpose	Value chain collaborations, and other large firms	NDA always, no need to share sensitive information	Understand the value chain, investigate business cases, gain market experience			Learned much, but the PD was not 100% successful
12	Profitability and streamlining opportunity. A specific purpose.	Value chain collaborations	High level of openness, Patents important if related to core business	Profitability, streamlining and product development	Start small and scale if promising	Work with pre-known partners to lower impact	

Table 6, A summary of the results from interviews 13-17

Interview person	Pre-requisites for Collaboration	Typical forms of collaborations	Secrecy, IP and initial openness	Intentions and Expectations	Resources Allocated	Partner Diversity	By-products from Collaboration
13	High maturity in technology, IPR settled, Business related technology	Incubation for external entrepreneurs and small firms	NDA required, Contracts about IPRs	Business opportunity, evaluation of technology potential	Depends on the business potential, scalability, shared	Partners small and unexperienced	
14	No collaborations with competitors. A specific purpose	Supply chain collaborations and Professional association networks	CIC: Open, but careful. In the professional competence network: great openness.	Maximize benefits from existing collaboration and gain new perspectives.		Same challenges, different perspective, same profession.	New perspectives, insights on other's challenges
15	Promise of profitability, other large firms involved	Broad cross-industry collaboration, Vinnova initiatives, Value chain collaborations	Super lightweight, not even NDA initially.	Open to what the collaboration can bring	Dynamic resources.More resources as potential grows.	Larger firms easy to collaborate with. Not the same with small entrepreneurial firms.	A way to find potential collaboration partners is through broad collaborations
16	Possible technology synergy.	Explorative: Contributes technology expertise		Intentions to find synergies. Expectations low	Use of inexperienced graduates for explorative projects	Physical proximity with partner lowered diversity impact	Learned much about new industries
17	Business opportunity only	Provides highly customisable product,	Contracts written at moment of the deal	Grow customer base		Interacts with the same function in each partnering firm	Every customer/partner provides new perspectives

5 ANALYSIS & DISCUSSION

The qualitative results in relation to previous literature are in this chapter discussed in terms of relations between the two. The comparison of literature and results is intended to give a deeper understanding of the interplay of practice and theory. The chapter is structured using the research questions as a base for the discussion.

RQ1: WHY DO FIRMS ENGAGE IN CROSS-INDUSTRY COLLABORATIONS?

We have established why firms generally choose to collaborate with other firms, through the study of literature on interfirm collaborations. In fact, the similarities with cross-industry collaborations are striking in comparison, but with other possible outcomes and risks. The obvious advantage with cross-industry collaborations is of course the non-competitive setting.

Competitive collaborations have several downsides. If two partnering firms in collaboration have similar capabilities, then the actual goal of the collaboration may actually be achievable without the collaboration, as respondent 2 stated. With lower interdependence between the partnering firms, since firms have enough capabilities themselves, it becomes harder to build mutual trust (Vangen & Huxham, 2003). Also, firms that have similar capabilities a prone to compete in markets where competition is intense.

Furthermore, the respondents that was engaged in cross-industry collaborations with partners with totally different capabilities, such as respondents 16, 6, 4 and 17, did not mention competitiveness at all as parts of their collaborations. This, despite some of them engaging in explorative collaborations.

Some firms show maturity and curiousness, for example those of respondents 1, 2 and 15 engage in cross-industry collaborations mainly for value creation. They have an understanding for cross-industry collaborations, that expectations are hard to have, but that successfully managed such collaborations creates value to the firm. As established in the literature, so are exploration activities in general, unless managed and prioritised (Lund Stetler, 2015) (Brunswicker & Hutschek, 2010).

Some other firms, but not respondents, seem to have yet to discover the strengths of cross-industry collaborations. On the operational level the respondents see the needs, and find solutions in possible collaborations with other firms. Despite good intentions some collaborations end up not being carried through. This was the case for respondent 16 – a collaboration that fizzled out because the organisation did not choose to prioritise the explorative initiative. This is also supported by Lund Stetler's (2015) finding that firms have a tendency to choose exploitation before exploration.

If competitive firms have similar capabilities, then firms in different industries can have complementary capabilities. As Schilling (2010) and numerous others stated in the literature, an important incentive for firms to collaborate is to obtain skills or access specific capabilities. This is also a theme in this thesis' results. The respondents that engage in *explorative new technology incubation* collaborations, such as 3, 4, 10, 13 and 15, do it for that specific reason. The small firm

wants the resources of the larger firm, and typically the larger firm wants the specific technology offer by the small firm.

More than capabilities, firms can engage in cross industry collaborations to understand markets better or generate necessary know-how. This was the case for respondents 11 and 16. The collaborations themselves contributed products and know-how beyond, but an important reason for the collaborations was to understand the market and business opportunities.

A factor to weigh in in why firms choose to engage in these kinds of collaborations is the person-to-person interaction. Respondents 3 and 4 said that driven people in the interface of collaboration can be an enabler. Thus, personal trust and other psychological reason affect the willingness of firms to collaborate.

Other than personal trust, firms sometimes choose to enter a collaboration because of the other firms that participate. For respondents 5 and 13, this was particularly interesting in explorative value chain collaborations.

It seems firms can choose to collaborate in many different settings, but emerging in this study is collaborations to gain access to specific capabilities, to evaluate or gain access to a new market, to evaluate a possible business opportunity or to create novel values across the value chain. Moreover, we have seen that trust plays a role in lowering the threshold in collaborations. Despite this, the most important aspect here is that cross-industry collaborations are not as much subjected to interfirm competition, and thus a safer way for firms to collaborate. The greater the differences in capabilties, the lesser the likely-hood of the other firm of compromising your firm's competitive advantage.

RQ2: WHAT ARE THE DIRECT AND INDIRECT VALUES THAT FIRMS CAN EXTRACT FROM CROSS-INDUSTRY COLLABORATIONS?

Clearly, there are value that firms can extract from cross-industry collaborations. However, there are direct values and indirect values, with the difference in the firm's expectations.

Firstly, collaborations can be good for the sake of learning how to collaborate, as a firm. This is supported in the literature by Mattessich and Monsey (1992), and Borden and Perkins (1999). Despite not going through with the collaborations that respondent 16 engaged into, he learned much about collaboration, how to behave towards the other firm, and how his own firm reacted. That is why also 'failed' collaborations can bring value. Moreover, in these collaborations respondent 16 secured patents in the area of collaboration, meaning that other firms wanting to enter that business area would probably have to pay royalties to respondent 16's firm.

To understand, or gain market access was a recurring theme with the respondents. Whatever the motive for collaboration, the knowledge created about other markets was valuable, even if the collaboration had not resulted in products or services. This supports the notion that firms that are more open also display a higher innovativeness through explorational activites (Li, et al., 2008). With this in mind, perhaps the goals with the respective collaborations are not the main purpose why firms should collaborate, but the additional values, and created knowledge.

Furthermore, collaborations that are explorative, and have not pre-known expectations of tacit output, are by definition sources of indirect values. Especially with the collaborations with clearly formulated common challenges, and no direct means by which these challenges should be met, such as those of respondents 5 and 15, are sources of unknown output. We know from the literature that these types of explorational activities have the potential to create breakthrough innovations. Some firms also used cross-industry collaborations in order to get to know their end-customers better, although the outspoken purpose of the collaborations were product development.

All in all, firms need to understand that cross-industry collaborations have direct values, and many more indirect values. Even when the potential output is known beforehand should the firms recognise that collaborations bring other values to the firm. As many of the respondents have said collaborations need clear agendas to function properly. However, it should be stressed that the main agenda needs not to be the only agenda in a collaboration.

RQ3: HOW DO LARGE FIRMS IN SWEDEN ENGAGE IN CROSS-INDUSTRY COLLABORATIONS TODAY?

As organised in the results chapter, the ways Swedish firms collaborate today can be categorised into five main categories.

These five categories used were: co-creation; extended customer/buyer relation; value chain; explorative new technology incubations; and methodology-/competence sharing. The categories mentioned here all correspond to current literature, but with other perspectives. It is clear from the differences in-between Schilling (2010), Hagedoorn and Schakenraad (1990), and Jörgensen (2011) that labels vary for collaboration settings. Perhaps these labels change over time, as to reflect how firms collaborate at the time, but it is more interesting to map *how* firms collaborate.

Most of the collaborations are between firms of comparable sizes, but this is not the case with the respondents engaging in the explorative new technology incubations (respondents 3, 4, 10, 13 and 15). However, these collaborational settings hardly change in-between different collaborations, and thus these collaborations are probably easier to manage with experience. This type of collaborations have clear purposes and do not contribute in unexpected ways, as with other interfirm collaborations.

A growing trend, also reflected among respondents 5 and 15 are value chain networks. These networks are typically government initiated, and have the purpose of dealing with issues firms cannot deal with on their own. Respondents 5 and 15's firms are engaged in these as experts in their field, just as the other participants. Over all, the goal with these network formations is to create greater value within the value chain, or meet future challenges.

Future challenges was also a reason for respondent 8 to collaborate. He engaged into collaboration to develop a common vision with suppliers. This was a way not only to steer future development within the industry, but also to make sure the experts in the respective fields contributed their knowledge.

The respondents' firms have chosen to assign resources in two dimensions, amount and integration. Some firms chose to collaborate light-weight throughout the collaborations, and some chose to scale the resources as potential rose. Moreover, the firms had differences in how they handled mutual integration of the resources. Respondents 6 and 8, for example, kept resources separate as their own organisations had the capabilities, but the coordination was needed. Other firms have integrated to a greater extent, but the more integrated the firms were, the more noticeable was the lack of a common communications platform.

The way firms engages in cross-industry collaborations today seems to be a careful move towards learning to leverage external knowledge. Most of the respondents collaborate with firms they have had previous interactions with, which implicates that trust really is an enabler for collaborations. There are many settings in which firms can choose to collaborate, and as firms develop better capabilities for collaborations, probably then will also new collaboration settings emerge.

RQ4: WHAT ARE THE IMPLICATIONS ON A FIRM'S INNOVATION CAPABILITY IN THE RELATION TO THE USE OF CROSS-INDUSTRY COLLABORATIONS?

Regarding how cross-industry collaborations affect firm performance and innovation capability the literature and the interview study highlight some interesting pre-requisites. Within current literature the concepts of exploration and exploitation captures how firms efforts and activities to innovate require both. However, according to several sources firms struggle to balance these two, and explorational activities are often the ones down prioritised.

Already Enkel and Gassmann (2010) established correlations between cross-industry collaborations and innovation capability. They continue to say that cross-industry collaborations mainly leads to breakthrough innovations. Most respondents make no explicit remark of innovation expectations in cross-industry collaborations, but it is evident that these forms of collaborations are not referred to as business as usual.

This, in relation to the study of open innovation, comes as no surprise. As Chesbrough (2003) stated that firms that fail to exploit external knowledge will loose competitive advantage in the long term. As most collaborations are explorative, and firms need to explore to survive, it becomes evident that collaborations that are explorative, and successfully managed, will increase firms' innovation capability.

When it comes to the type of innovations, in the framework of Henderson and Clark (1990), they state that radical innovations are often the product of business model innovations. The cross-industry collaborations that the respondents exemplify entail business model innovations, which speaks for the findings of Enkel and Gassmann (2010). Especially in the examples within the value chain collaborations is the need for new business models evident in regards to a eco-system change.

It need to be stressed, however, that collaboration in general, and exploratory activities, need structure to successfully contribute to a firm's innovation capability. If a collaboration is not managed the right way, the risk is that the costs far exceed both the benefits of the direct and indirect values obtained. Still, cross-industry collaboration is a tool for firms to enhance flexibility and boost innovation capability, which is why firms should choose to engage in such collaborations.

RQ5: WHAT IS THE FUTURE OF CROSS-INDUSTRY COLLABORATIONS IN SWEDEN?

This section deals with what the challenges in cross-industry collaborations are, according to the literature and respondent, and what the respondents see as improvements.

It is clear, as stated by respondents 2, 4, 13 and 15 especially, that firms need to collaborate for long term survival. This is supported in the literature, and can be a connection between that collaborations mostly are explorative, and that explorational activities are needed for firms to survive. Firms need also to become more flexible, to meet the competition of the global markets. Flexibility can be achieved through collaboration (respondent 3) and can be very hard to achieve without collaborations.

Furthermore, as respondent 1 mentioned, firms changes focus from internal R&D efforts towards R&D through collaborations, at least in marketing purposes. It is clear that firms can appear more innovative through a collaborative image towards the market.

A recurring theme in the interviews were IPR and contracting, especially in the early phases of collaboration. Some respondents, especially the technology incubator firms (respondents 3, 4, 10, 13 & 15), have clear procedures and guidelines when engaging in collaboration. The power relation between the large and the small firms is a pre-condition for these collaborations. The smaller firms want resources and the large firms want access to technology and rights. Typically, the larger firms are not dependent on the small but, but rather the other way around. This enables the larger firm to make claims to the products of collaboration.

Especially respondent 15, but also other respondents, show progressive attitudes towards NDAs and contracts. He wanted no contracts whatsoever in the beginning of discussions about collaboration. Other respondents felt that heavy contracts and secrecy were hinders to collaborations, while respondent 5 and 13 felt contracts were absolutely necessary. Perhaps the difference here lies not within attitudes, but in difference in risks in projects. As Blomqvist et al (2005) finds, there is a balance between risk-taking and trust. Naturally, if you don't trust your collaboration partner you would want to contractually secure your end of the collaboration. Despite this, respondent 15 shows a great openness, and with him so do respondents 1 and 9, which has been an enabler. Once again, interpersonal trust and interorganisational trust is interlinked, and a trustful climate without NDAs and contracts initially, could build mutual trust.

Not only was the level of contracting regarded by some respondents as too comprehensive, but also too general. Thus, the organisations, should they wish to encourage cross-industry collaborations, should have specific contracts for specific collaborations. As we discussed above, cross-industry collaborations are typically non-competitive, which adds security to collaborations. Contracting should consider this, and the possible outcome of explorative collaborations. With lesser contracting comes more trust, and with more trust comes higher performance (Zaheer, et al., 1998).

As respondents 3 and 4 expressed in interviews, a driven initiator can be an enabler for collaborations. Furthermore, the experience of respondents 1 and 9 was that the one-person interface in the collaboration was the best interface. Perhaps this was because of the type of collaborations. The more share resources are within a collaborations, so should the connections be. However, the implications of respondents 1, 3, 4 and 9 are that cross-industry collaborations should have collaboration champions in the interface of collaboration. Moreover, they should have a passion for the collaboration and be well connected within the own firm.

Continuing, several of the respondents thinks that collaborations should have a set agenda to be successful, something that is supported by, for example, Hattori and Lapidus (2004). Also Park and Kang (2013) stresses the risks of engaging in more collaborations than are practically manageable. This calls for structural approaches from firms. It is probably no coincidence that Mattessich and Monsey (1992) have found that firms who have previously engaged in collaborations are more prone to success in collaboration. This, despite not evaluating what the firms are doing in collaborations, rather than that firms with experience from collaborating also are more successful in collaborations.

Overall, most respondents have found their collaborations partners within their own proximity, probably because firms wants trust to engage in collaboration. However, to maximise potential in cross-industry collaboration firms need to identify firms on their specific fit, through a selection process, such as the one provided by Brunswicker and Hutschek (2010). Firms must, in the future, dare to seek partners beyond their proximity to be able to maximise values created in collaborations.

All the findings within this area points towards the continuing development of firms' collaborational strategies. First, to make cross-industry collaborations part of the firm's innovation strategy, mostly in exploratory aspects. Then, as firms learn to suitably contract these collaborations, find driven collaborators, the right partners, and develop a collaboration strategy, then will new forms of cross-industry collaborations emerge.

6 CONCLUSIONS AND RECOMMENDATIONS

In this chapter, the conclusions drawn in the study are presented using the research questions as a basis. Building upon the conclusions, recommendations on more detailed solutions are presented.

6.1 CONCLUSIONS

The purpose of this thesis has been to explore how firms use cross-industry collaborations to boost innovation capability. In regards to this, the conclusions highlight the important aspects firms should consider in relation to cross-industry collaborations.

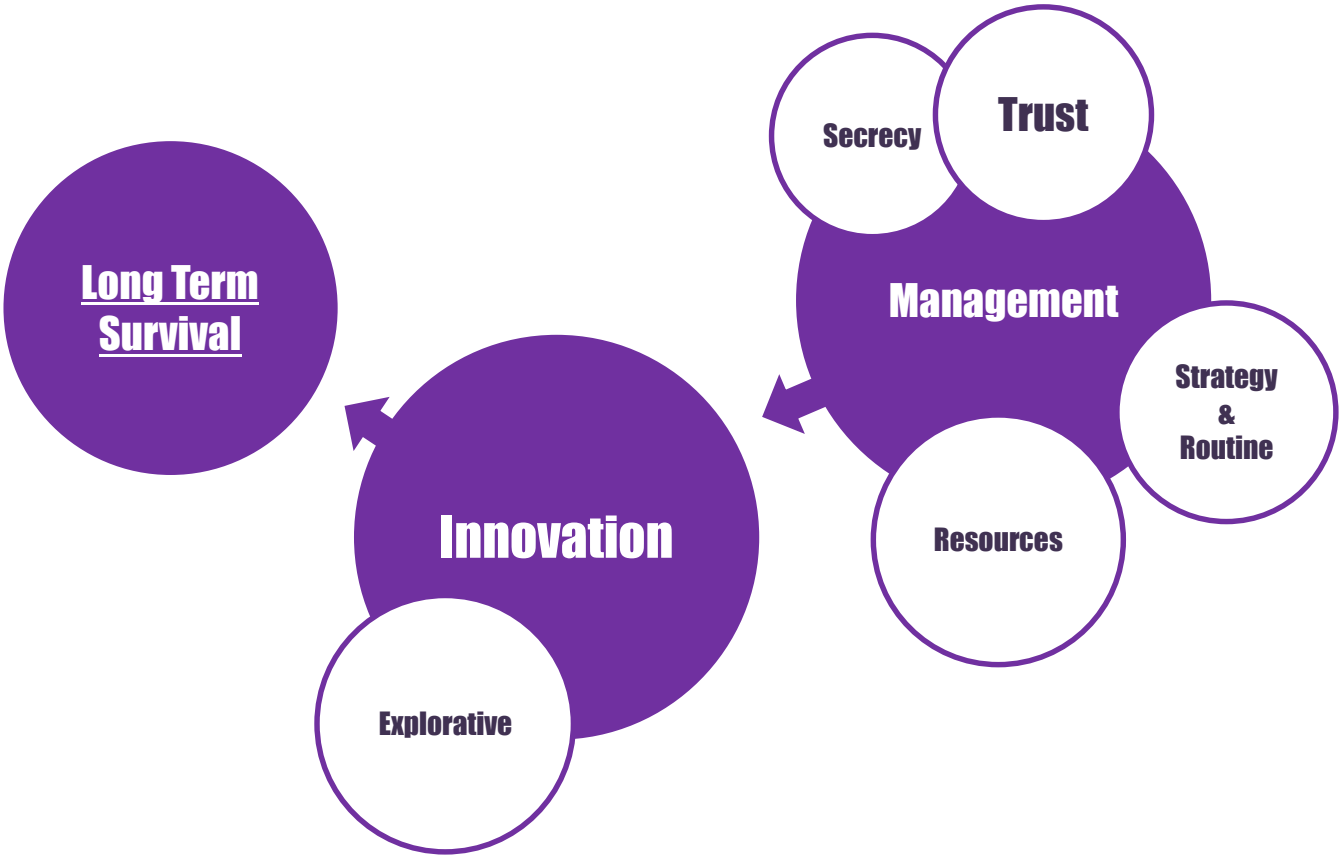

Figure 12, Cross-industry collaborations explored

Firstly, we have concluded that cross-industry collaborations have indeed the potential to boost a firm's innovation capability, see Figure 12. Mostly, it is the exploratory activities, such that require firms to open up, that relates to the innovation performance. Moreover, the exploratory activities are the ones that typically have the ability to render breakthrough, or radical, innovations.

It is important to stress the word *potential* here, since engaging in cross-industry collaborations do not automatically make a firm more innovative. To boost innovation capability through cross-industry collaborations firms must control and manage the collaborations. The conclusions here are:

- Cross-industry collaborations are to a high extent exploratory activities and require that firms recognise their long term value.

- Cross-industry collaborations have the potential to boost the innovation capability of a firm.

Firms must manage their secrecy policy – how they should handle IPR and NDAs, and how they should behave towards firms with varying capabilities.

The more different the other firm in a collaborations is from yours, the lesser the need for NDAs and contracts. This because a firm with completely other capabilities probably does not have the capability to use secrets from collaboration to develop their own competing business.

Moreover, interfirm, mutual trust has an impact on the collaboration, and can to a certain extent replace NDAs and contracts. Trust increases the benefits from collaborations, while the lack of trust can make collaborations useless and costly. The greater the trust between collaborating firms, the lesser the need for NDAs and contracts. The conclusion here is:

- As collaborations happens with partners with completely other capabilities, firms should focus on building trust for performance, and only deal with the absolute necessities in contracts.

As seen to resource allocation there are no clear implications on how much resources should be made available, but *enough*. However, in the early phases of collaboration, firms should start small to evaluate the potential of the collaboration, and then assign more resources as potential grows. The conclusion here is:

- There are no direct implications for resource use and setting in cross-industry collaborations, but practice in the industry is to start off small.

An important part in managing for an innovation capability boost is to develop a strategy and routine for cross-industry collaborations. Firms need to practice collaboration in order to develop collaborational skills. Developing a strategy and routine for cross-industry collaborations is crucial for firms to be able to increase their innovation capabilities. The conclusions here are:

- To become successful at cross-industry collaboration, firms must learn from engaging in cross-industry collaborations.

- Firms in Sweden use cross-industry collaborations today, but their maturity varies. Most firms have yet to develop strategies for cross-industry collaborations.

Moreover, firms should appoint collaboration champions. These should be motivated, and driven individuals, that are well connected within their own firm. The conclusion here is:

- **Firms should have collaboration champions that are passionate about collaboration and have a broad network within the firm.**

When managed rightly, cross-industry collaborations boost innovation capability in a way that increase the chances for firms' long term survival. The conclusion here is:

- **Cross-industry collaboration is an important tool for firms in competitive markets to secure long term survival.**

6.2 RECOMMENDATIONS

This chapter combines the conclusions and the discussion, to elaborate the implications for cross-industry collaborations.

Firstly, the recommendation for firms is to engage in cross-industry collaborations, provided that the firm has the capabilities to do so. Cross-industry collaborations have several advantages over collaborations with firms in the same industry. The most notable advantage is the lack of competitiveness between the collaborating firms. Less competitiveness enables greater inter-firm trust, and in turn better returns on collaborations. The least competitive partner to collaborate with is the one that have complementary capabilities, and not capabilities that makes them a future threat, as would be the case if the partner had similar capabilities.

However, firms with completely other capabilities are likely different from your own firm, and with high cognitive distance comes communication issues. These obstacles for communication can be somewhat alleviated if the partnering firm has a similar strategy, for example low cost, or high quality product strategies. Despite a high cognitive distance, firms can in partnerships with firms that have similar stragies find a common language.

In continuing, cross-industry collaborations, as with any form of collaboration, should have a clear agenda. Firms should not collaborate for the sake of collaboration, because it will cost more than it will generate in benefits. Cross-industry collaborations need also structure and routine for firms engaging in them to benefit. Set goals, a purpose, unify communications, define interfaces and deliverables. And most importantly, be clear with intentions and be honest with the collaboration partner. Mutual trust within collaborations boosts profitability and enables communication.

Since cross-industry collaborations typically should happen with firms with other capabilities the need for contracts and NDAs is less necessary. Instead, the firms should focus on building mutual trust, to the extent that both firms still feel comfortable. The contracts many firms use today are not designed for cross-industry collaborations specifically, and thus cover more than necessary in such collaborations. Firms need to develop special contracts for this type of collaboration, since the

outcomes are less predictable and the partnering firm is less of a threat. These contracts should of course reflect the firms' strategies, but needs the explorative perspective to not hinder collaboration.

A firm must also collaborate, in order to become a great collaborator. The authour's recommendation here is to start to collaborate small with firms in the value chain, or with pre-known firms. Then, as the firm establishes a collaboration behaviour the firm can start to search for specific partners, to meet specific needs. To start off with pre-known partners is a way to engage in explorative partnerships with mutual trust. If successfully implemented, the transition from value chain partners to any partner will enable the firm to gain explorative values from completely different industries, and secure long term survival.

Furthermore, the authour's recommendation is to appoint collaboration champions. Depending on the magnitude of the collaboration, of course, this champion should be well connected within his or her own firm, and be passionate about the collaboration. All initial contacts goes through this person, as to build efficient interfirm networks. This makes the other firm's organisation easily available for both firms, despite the likely very diverse organisations.

If the collaboration requires deep integration of the partnering firms the recommendation is to connect the firms through a common communications platform, preferably integrated with the existing communications network of the firms. To solely use a one-man interface would only be an obstacle in such collaborations, but still a necessary resource for guidance within the other firm's organisation.

Resource wise, firms in collaborations should always start small, and add resources as potential grows. This way, the stake for a 'failed' collaboration is not as high. In addition, most likely will collaboration become easier to engage in for firms, and fewer opportunities will be lost. As the initiator, make sure to establish any collaborations with the own organisation. If the collaboration becomes internally accepted, then resources will be easier to gain access to, and the collaboration will probably not suffer because of insufficient resources. Despite this, the initiative to collaborate should still lie with the ones wanting to engage in a collaboration, and not with the top managers of a firm. Once again – any partnerships will benefit from having driven collaboration champions.

Lastly, cross-industry collaborations should be a valuable tool within competitive industries to enable flexibility, and as part of a firm's innovation strategy. Firms can not rely on business as usual and just focus on eploitative activities, but needs to explore new opportunities. Cross-industry collaboration is not only a way to develop breakthrough innovations, but also a way to create perspective and gain access. With this in mind, cross-industry collaboration is a form of open innovation that involves less competition, but creates new valuable knowledge, and would thus be the way for firms to open up towards the environment.

6.3 A GUIDE FOR CROSS-INDUSTRY COLLABORATION

The delivery to Scania is a guide that from the set of recommendations above comprises a tool for managers within R&D to engage in cross-industry collaborations. In this version of the report the guide has been left out.

7 FUTURE RESEARCH

The following chapter contains recommendations for future research based on ambiguous results found in this report as well as other interesting research gaps that are interesting for firms that are curious on cross-industry collaborations. The research area of cross-industry collaborations have yet many dimensions to be explored. Based on this study, the authour finds the following areas to be of greater interest.

- *Resources depending on the collaboration setting. Current research, and this study, does not give clear guidelines on how resources should be made accessible depending on the type of collaboration. Some collaborations clearly require more resources than other, but it would be interesting to find patterns, if such patterns exist.*

- *How can collaboration initiators increase acceptance within their own firm? Several of the respondents in this study thought that it was hard to prioritise the collaboration, because it was not part of the actual strategy of the firm. How can acceptance for such initiatives become higher in the firms?*

- *Trust-based collaborations. Is there such a thing as trust-based collaborations? In which the firms have not written NDAs and contracts? Is it even possible for firms, and does it depend on the firms capabilities?*

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APPENDIX A: INTERVIEW GUIDE

ERIC THUNBERG
EN GUIDE FÖR LEDARE INOM FOU, *CROSS-INDUSTRY INNOVATION*

VT 2015
INTERVJUGUIDE

INTERVJU OM BRANSCHÖVERSKRIDANDE SAMARBETEN

NAMN: POSITION:

ÅR PÅ FÖRETAGET: ANONYM:

INSPELNING:

PÅ EN SKALA FRÅN 0-100, HUR INNOVATIVT TYCKER DU ATT DITT FÖRETAG ÄR?

EXEMPEL PÅ BRANSCHÖVERSKRIDANDE SAMARBETEN

- ☐ VILKA PARTER INGICK I SAMARBETET?
- ☐ VAD VAR ANLEDNINGEN TILL SAMARBETET? VEMS INITIATIV? (HUR?)
- ☐ VAD VILLE DE BÅDA PARTERNA FÅ UT AV SAMARBETET, DIREKT OCH INDIREKT?
- ☐ INOM VILKEN TIDSRAM?
- ☐ VILKA REGLER GÄLLDE FÖR SAMARBETET?
- ☐ TIDIGARE RELATION MELLAN FÖRETAGEN?
- ☐ VAR SAMARBETET OFFICIELLT? PÅ VILKEN ORGANISATIONSNIVÅ?

SAMARBETET

- ☐ HUR UTVECKLADES SAMARBETET?
- ☐ FICK NI UT NÅGOT OVÄNTAT AV SAMARBETET?
- ☐ HUR PÅVERKADE DET SAMARBETET ATT NI VAR VERKSAMMA INOM OLIKA BRANSCHER?

KUNSKAP

- ☐ VAD KUNDE NI TÄNKA ER ATT DELA MED ER AV?
- ☐ VAD VILLE NI INTE DELA MED ER AV? VARFÖR?
- ☐ HUR SKEDDE ÖVERFÖRINGEN AV KUNSKAP?