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Scaling up Downstream Visibility

- A Case Study on How to Improve the Supply Chain by Enhancing Information Exchange

Master of Science Thesis in the two Master's Programs
Management and Economics of Innovation & Supply Chain Management.

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Abstract

Customer expectations are changing, competition is increasing, and globalization and digitization are altering traditional supply chains. This pushes companies to achieve higher flexibility, speed and accuracy and for this, information sharing has become vital. Many manufacturing companies have started to acknowledge the potential value it can bring, where one of these is the global manufacturer of bearings, SKF. Since 2016, the company has run the project "SKF SC 4.0", which intends to enable visibility of customer data in order to improve their supply chain. Even though SKF are in the frontier with this transformation compared to competitors, an industrialized and finalized solution is far away. Therefore, it was of interest to identify challenges needed to be solved in order to achieve a scalable SKF SC 4.0 solution, applicable to the wide range of customers SKF collaborate with.

The purpose of the thesis was to create a basis on how SKF can accomplish scalability for an industrialized SKF SC 4.0 solution. The study was broken down into two research questions, where the first one concerned what main challenges that SKF should primarily address to be able to achieve scalability. The second research question was how to create a customer classification model to be used as a guidance when choosing what customers that are the most appropriate to integrate into the scalable solution.

The main part of the data collection in this research consisted of semi-structured interviews with SKF employees, customers previously or currently involved in the project and external project consultants. In parallel with this, a literature study was conducted which provided inspiration and guidance on how to approach the study as well as a foundation for analyzing the empirical findings with.

The result of the thesis indicated that there are five main categories of challenges that SKF need to consider in order to successfully create a scalable SKF SC 4.0 solution. These categories are; *Dealing with Project Management Issues*, *Managing Internal Relationships, Managing External Relationships, Coping with IT and Data Management Challenges* and *Handling Geographical and Cultural Differences*. The challenges within these have formed a basis for a customer classification model, that aims to act as a guidance for SKF when choosing suitable customers for a SKF SC 4.0 collaboration. The model was shaped based on two main factors; the business impact and the supply chain complexity it brings to the collaboration. From today's perspective, the most beneficial type of customer to target is a customer that indicates high *business impact* and low *supply chain complexity*. Even though the study is specific to the case of SKF, the thesis can be seen as inspiration for a broader industry audience and for guidance for future research.

Keywords: Supply Chain Visibility, Supply Chain 4.0, Information Sharing, Scalability

Table of Content

1 Introduction

This chapter aims to provide the reader with a brief background in order to further understand the aim and research questions. It begins to touch upon topics relevant to the study, followed by a short presentation of SKF and the company's current projects related to the study area. Finally, the problem statement and research questions will be presented.

1.1 Increased Visibility through a Digitized Supply Chain

Changing customer expectations, increasing competition, globalization and the progression of digitization is altering traditional supply chain behaviors, which in turn creates new, disruptive business models across a wide industry landscape (Alicke et al., 2016). To cope with these changed requirements, supply chains will need to go towards becoming more flexible, quicker, accurate, granular and precise (Alicke et al., 2016). This need for adaptability has driven supply chain evolution into a concept describing a completely digitized supply chain, called Supply Chain 4.0 (SC 4.0). Alicke et. al., (2016, p.3) define the SC 4.0 concept as:

> *"Supply Chain 4.0 – the application of the Internet of Things, the use of advanced robotics, and the application of advanced analytics of big data in supply chain management: place sensors in everything, create networks everywhere, automate anything and analyze everything to significantly improve performance and customer satisfaction".*

According to Alicke and Hoberg (2016), implementing SC 4.0 successfully can generate four key value opportunities: process improvements, increased flexibility, exploitation of data and increased customer experience. This new digital supply chain concept consists of many core elements, where efficient supply chain visibility is central (Schrauf and Berttram, 2016). With a high level of visibility, where data is shared across echelons in the chain and between supply chain partners, companies can gain benefits such as improved inventory management, higher sales, better understanding of demand, improved capacity utility and reduced bullwhip effects (Kaipia, 2017). Achieving a high level of visibility in a complex supply chain is a difficult task, with many actors involved and many sources of information, where both human intelligence and technical sophistication will be crucial to manage (Schrauf and Berttram, 2016). In order to carry out this efficient information exchange that visibility indicates, a digital approach is a must (Schrauf and Berttram, 2016).

1.2 SKF and the Problem Statement

SKF AB (SKF) is a bearing manufacturing company that was established 1907 and is currently present in over 130 countries. For a company such as SKF, the supply chain function plays a crucial role. The shift in supply chain standards where digitization and integration are in focus has put SKF into an urge for change. Speed and flexibility are key factors to remain in the frontline of the industry of bearings due to increasing competition, and therefore, managing efficient visibility in the supply chain is of high importance.

In order to increase visibility through the supply chain, SKF started a Supply Chain 4.0 initiative, hereby referred to as "SKF SC 4.0", in late 2016. The project is focused on the downstream supply chain, even though improvements will indirectly affect the end-to-end supply chain. The vision of SKF SC 4.0 is presented below.

- *Optimize the supply chain by understanding the real end-user demand*
- *Transform the role of supply chain inventories*
- *Shorten the value chain by increasing delivery precision*
- *Better service levels and higher flexibility*

The objective in SKF SC 4.0 is to use data from SKF and the following three customer segments: Original Equipment Manufacturers (OEMs), distributors and end-users, to create one common data view to optimize and customize the downstream supply chain. By collecting this data, SKF will be able to increase accuracy of customer demand in terms of more flexible deliveries. In other words, SKF will in an earlier stage know what and when the customer will need a product or service. To be able to succeed with SKF SC 4.0, SKF believe there is a need for this data driven, externally integrated and collaborative supply chain that is applicable not only to a few customers but ideally to all of them.

In the progress of finding a potential scalable solution and in turn reach the SKF SC 4.0 vision, SKF is currently engaged in four Proof of Concepts (PoC) that are either ongoing or about to start with various customers and supply chain characteristics. Each PoC has the purpose to test a SC 4.0 concept to increase data exchange between SKF and a customer. With a successful data exchange enabling access to data such as maintenance plans, sales data, work orders, spare part lists, inventory plans and consumption history, SKF will be able to increase visibility towards the customer segments and in turn predict and plan their production of bearings more accurately. The wanted outcome of the PoCs is to find what is necessary to create a scalable and industrialized solution that is feasible to apply to SKF's large amount of customers. Since each PoC also is highly resource demanding, it is vital to create a model on how to scale up a cost-efficient SKF SC 4.0 solution that considers aspects such as IT-feasibility and customer adaptability. In order to create this scalable solution that brings SKF further into the process of digital transformation, the first step is to investigate and identify what challenges that lay ahead. The second step is to evaluate the aspects of customer classification, and create a guideline to help deciding on how to prioritize in what order customers should be integrated in the final SKF SC 4.0 solution.

1.3 Aim & Research Questions

The purpose of this thesis is to create a basis on how SKF can accomplish scalability for a future industrialized SKF SC 4.0 solution. This will be done by answering the following research questions.

- *What challenges are most valuable for SKF to primarily address and use as a starting point when building a successful scalable solution?*
- *When integrating customers into the SKF SC 4.0 solution, what factors should be the basis of prioritization and further on result in a customer classification model?*

2 Methodology

In the following chapter, the methodology of this study will initially be described by providing the reader with an overview of the research process. The process will then be described more in detail, starting with the origination of the study, followed by a demonstration of the selected research design and method. Further on, the method of the data collection and data analysis is presented, followed by a discussion on the research quality rigor. Critique of the research methodology will finalize the chapter.

2.1 Research Process

The process of the research study has consisted of four different phases and this is demonstrated in figure 2.1. The phases of the study were used to structure the conduction of the master thesis, which was written simultaneously, and all phases were returned to during the process in order to adjust details in the study. Each phase will be described further in this chapter.

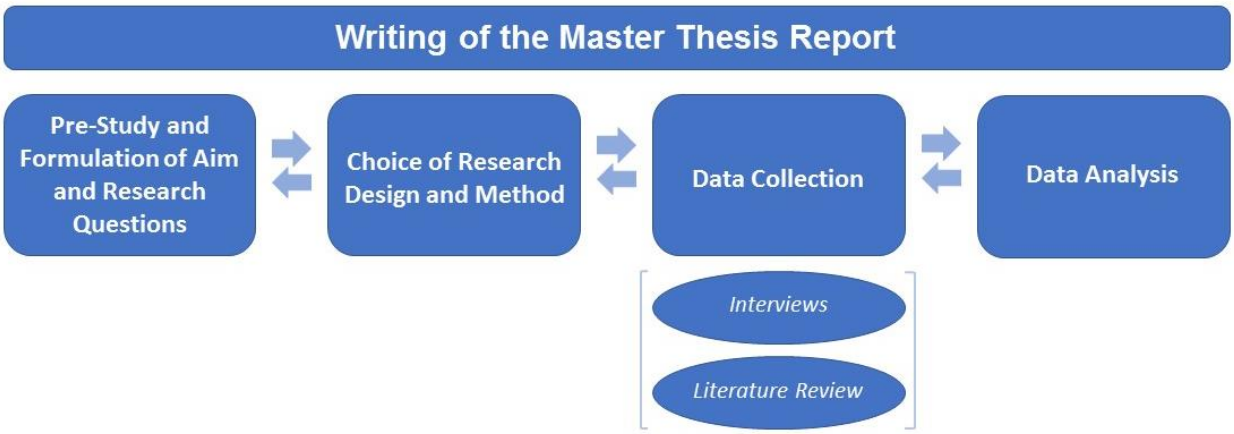

Figure 2.1. *Demonstration of the Research Process*

2.1.1 Pre-Study and Formulation of Aim and Research Questions

The thesis has been written for the company SKF with involvement in the SKF SC 4.0 initiative, which is managed at the Logistics and Demand Chain department. The main location for the writing of this master thesis study was at the company's headquarters. This provided the privilege to experience the company culture, join meetings and have a high exchange of company knowledge by being able to meet people involved in the project or in other relevant positions at the company. Therefore, a brief understanding of the project was obtained including a view of the company's perception on the main problems and vision. This was an important part of the pre-study, and in combination with this, a pre-study literature review was conducted. The pre-study reading consisted mainly of SKF project material, but also reports and articles about visibility, information exchange across supply chain actors and supply chain collaborations. In conclusion, all the above mentioned segments of the pre-study made it possible to form a draft on the aim and research questions of the master's thesis, although these have naturally been revised along the process while more knowledge and insights have been gained.

2.1.2 Choice of Research Design and Method

When the preliminary aim and research questions were set, a search for an appropriate design and method of the research was performed. Trochim et. al. (2016) argue that research design is used to structure the research and to demonstrate how all important elements of the research interacts to address the core problem statements. In order to accomplish this and to conduct a suitable recommendation for SKF, the case study research design was chosen as appropriate.

According to Bryman and Bell (2011), the most common use of the term *case* is in reference to a geographical location, such as an organization or a workplace. What is also described is that what distinguishes a case study from other research designs is the focus on a bounded situation. Yin (2014) further argues that a case study research design is appropriate when the research questions of the study aim to answer a present circumstance. These arguments were used for determining that the case study research design method was appropriate for the case of SKF, since the problem and the research questions was specifically defined within the scope of the organization and its boundaries, as well as dedicated to specific circumstances.

2.1.3 Data Collection

This section will further explain the process of the data collection, which was conducted through both primary and secondary data. The primary data was gathered through semi-structured interviews with both employees of SKF and external actors, all involved and with different sets of knowledge of the SKF SC 4.0 project. A set of literature was collected with the purpose to be used in a later analysis of the empirical findings. The theoretical framework was a result of several different types of sources, such as reports, scientific articles and books.

2.1.3.1 Interviews

Bryman and Bell (2011) argue that a case study design most often favors a qualitative data collection. The authors further state that unstructured interviews and observations are common components of this type of data collection since those methods in general provides a deep understanding of the case. By studying up on semi-structured interviews it became clear that this method was appropriate for the case study of SKF. Bryman and Bell (2011) explain the interview method as covering a list of pre-determined topics, but allowing the interviewee with a great deal of leeway in how to respond to the questions. This way, the interviewer may collect additive but unexpected information. The method also provides freedom to the interviewer to ask follow-up questions during the interview, which was highly necessary in order to gain a broad perspective in the case of SKF. The interviews were held iteratively and most of the interview objects were present at SKF during the time of the research, which made it possible to easily ask complementary questions to the interview objects. The other interviews were held either via Skype or at the interviewees' offices.

In order to create a nuanced perspective of the situation, actors involved in SKF SC 4.0 with different backgrounds were interviewed, starting with participants of the project management team. This was helpful since it partly helped shape questions to interview objects with more narrow knowledge in the project. Further, other actors at different relevant functions at SKF

were interviewed as well as customers. This included one customer from a finalized PoC (Volvo PoC), and one customer and the intermediary from an ongoing PoC (Holmen PoC). In addition to this, two consultants involved in the SKF SC 4.0 were interviewed where one of them wanted to be anonymous and is further referred to as *Company X*. All interviews were recorded in order to make sure that no relevant information was lost. Table 2.1 presents the interviews that were held during the research.

Name	**Role**	**Company**	**Further referred as in this report**
Jan Levander	SC 4.0 Project Manager at SKF	SKF	SC 4.0 Project Manager
Christer Cedervall	Director of Logistics and Demand Chain	SKF	Director of Logistics and Demand Chain
Matthias Pallhuber	Director of Demand Chain	SKF	Director of Demand Chain
Carl Pucher	Country Manager Sweden at SKF Business Consulting	SKF	Director of SKF Business Consulting
Axel Baarlid	Business Analyst and at SKF Business Consulting	SKF	SKF Business Consultant
Gibril George	Customer Service	SKF	Customer Service Representative
Glenn Geidemar	IT Project Manager	SKF	IT Project Manager
Mike Strilziw	Supply Chain Manager in the Lüchow Factory	SKF	Factory Responsible
Linus Waltherius	Key Account Manager	SKF	Key Account Manager
Robert Jansson	Director of PipeChain SCM Business Unit	PipeChain	PipeChain Consultant
X	Supply Chain Consultant	X	Supply Chain Consultant
Sofie Skeppstedt	Project Manager Logistics	Volvo Powertrain	Volvo Representative
Hannes Teder	Strategic Purchaser	Holmen	Holmen Representative
Hans Ringqvist	VMI Planner	Sverull	Sverull Representative

Table 2.1. *A presentation of all the interview objects*

2.1.3.2 Literature Review

To gain understanding of the research topic and to be able to perform a well-grounded analysis, a narrative and iterative literature study have been conducted before it was compiled into a theoretical framework. For a qualitative study like this one, a narrative type of literature search is a more time effective and suitable method compared to using a systematic method (Bryman and Bell, 2015). The collection of literature was an iterative process along the whole study since the selection of literature partly depended on the outcome of the interviews, and vice versa. It was therefore of high importance to be open-minded, starting with a wide search to identify central topics and be able to slightly change direction if necessary. When the scope and aim were further developed and relevant topics identified, the most essential literature was collected, and then described in the theoretical framework chapter.

The data was mainly collected through public databases such as "Google Scholar" and the online library database provided by Chalmers University of Technology. In addition to this, lecture material from the department of Technology Management and Economics at Chalmers University of Technology have been used. To be able to find relevant literature, there was a need for using keywords. "Supply chain 4.0", "supply chain collaboration" and "information sharing" are a few examples of those keywords that have been used in the phase of collecting literature. These were further used and during the progress, new keywords were generated along the way. To be able to support the empirical study and to create a well-grounded analysis, the literature consisted of several topics. Some of these were to identify the enablers, challenges and benefits within supply chain. Digital tools as enablers for supply chain collaboration and information sharing as well as broader topics as change management and project management are also necessary to include.

2.1.4 Data Analysis

After the data collection, the first step in the analysis of qualitative data was the process of preparation (Easterby-Smith et al., 20). Easterby-Smith et al. (2015) argue that the data should be prepared and organized in a way that will facilitate the future process, which means it will be sorted in a systematic way, preferably filed with labels. This was done through dividing data content according to the theme of the research questions of this paper. After the structure was set, a content analysis was performed. This was an approach that is both suitable for hypothesis testing and building of new theories since it *"aims at drawing systematic interferences from qualitative data that have been structured by a set of ideas or concepts"* (Easterby-Smith et al., 2015, p. 188).

The content analysis was then the basis for the analytical framework of this study. The data from the interviews, which laid ground for the empirical data, together with the theoretical framework were organized and categorized after criteria derived from the research questions. Further were different subsections created within the first research question to identify different challenges within SKF SC 4.0. The empirical data was then evaluated and compared with the theoretical framework. Similarities and dissimilarities were identified to explore links and gain insight in how to answer the first research question. The content analysis was appropriate in this exploratory study, since it allowed to explore patterns gathered from the data itself

(Easterby-Smith et al., 2015). Further, the outcome of the first research question was then partly used as a ground for conducting the customer classification model. This in order to answer the second research question of the thesis.

2.2 Research Quality Rigor

Braun and Clarke (2013) state that no *absolute* criteria exist for determining the quality of a qualitative research. Although, certain criteria must be examined in order to ensure high quality. Four criteria can be seen as the most critical for a case study research method: *reliability, construct validity, internal validity* and *external validity* (Behling, 1980), and these have been applied for quality rigor in this certain case study.

"Reliability is the extent to which measurements are repeatable – when different persons perform the measurements, on different occasions, under different conditions, with supposedly alternative instruments which measure the same thing" (Drost, 2011, pp.106). It is difficult to know if the results would turn out the same with other researchers' executions. It is highly unlikely that the study would have turned out the same if made at another occasion, since the project is of an uncertain nature in itself. Although from this occasion seen, the interview objects are many and provides insights from different perspectives, which could be argued for that it increases the chance of reflecting the real situation. Making sure that literature is up to date is also a difficult task today since the knowledge and theories on the subjects touched upon are moving forward rapidly. However, since multiple sources have been used to ensure trustworthiness of the information, *reliability* should be considered as high in this context.

Construct validity concerns the question whether the research measurement has measured what it intended to (Eriksson and Wiedersheim-Paul, 2014), and if the results represent what the measure really was aimed to answer (Bryman and Bell, 2015). To ensure validity in the interviews, the majority of the interview questions were held with all of the interviewees. Some of the facts stated in interviews were available double check in PowerPoint presentations and conductions of documents kept in the company's databases, which was used to compare results from the data collection as well. Since the research study aimed to investigate the future of SKF SC 4.0, the interview questions were formed to speculate around questions of a state that doesn't exist today. This made it difficult to do a deeper validation of the data collection.

Internal validity concerns the existence of causal relationships, which affects the results of the study (Gibbert and Ruigrok, 2010). To fulfill this criterion, Gibbert and Ruigrok (2010) explain that clearly defined research questions are of high importance to understand possible causes for the result. Theory triangulation is recommended as well, which encourages the use of several sources to validate the empirical findings of the study (Gibbert and Ruigrok, 2010). The interviews were held with actors involved from many different angles connected to the project; actors with different hierarchical levels, internal SKF project members and externally involved actors; both customers and system providers. This provided a wide range of inputs and helped validate the findings. The collection of literature consisted of processing a large variety of sources that were able to confirm the validity of each other. Discussions of the results were held

with both the university supervisor and the company supervisor, which helped in validation purposes.

External validity refers to if the results can be generalized beyond the specific context and applied to a population (Braun and Clarke, 2013). This can be challenging for many case studies since it often cannot be statistically applied to a population, which was also the case in this master's thesis. However, since the topic is relatively new among similar industries, the study can be seen as inspiration for a broader industry audience and to provide a guidance for future research.

2.3 Critique of the Research Methodology

This research had the purpose to identify the challenges for a future scalable SKF SC 4.0 solution. However, since SKF are in a such early state of the project, this research tends to be rather speculative. Since the thesis investigates a subject based on a future situation with many uncertainties, the scope tended to get rather broad. The scope of the thesis was mainly based on requests from SKF, and therefore the research required a broad literature review including wide topics as project management, change management, supply chain management. Due to this wide scope the research couldn't obtain such depth as it would have with a narrower scope.

Regarding the methodology of data collection, critique could be pointed at the choice of interview objects. All the interviewees have been or are currently involved in SKF SC 4.0, this could imply that the result may have become biased. Therefore, there is a risk that the identified challenges would have been different with another set of interviewees. On the other hand, other potential interviewees that weren't involved in SKF SC 4.0 wouldn't have had enough insight in subject to contribute to the data collection. The interviewees that are customers to SKF; Volvo, Holmen and Sverull, were all mainly chosen due to strong relationships with SKF. It could be argued for that the empirical findings, and henceforth the results, would have become more thorough with a larger amount of interviewed customers. It could have been valuable to interview customers with less relationship strengths and without previous engagement in SKF SC 4.0 to get their opinions as well. The possibility of such interviews existed, although these potential interview objects were assumed to not have enough knowledge and insight in the SKF SC 4.0 project to be able to strengthen the results.

The authors of this study performed interviews with four other industrial manufacturing companies, with the aim to understand and gain inspiration from their Supply Chain Digitization Strategy. These companies were asked if they had any similar initiatives as SKF SC 4.0. However, the outcome of the interviews was evaluated to not add valuable empirical data in order to answer the research questions. Therefore, the material from these interviews was excluded from the study.

3 Theoretical Framework

This chapter presents the theoretical framework that this study is based upon. Several challenges were highlighted in the empirical study and in order to properly analyze these, a set of theoretical areas need to be covered. To a large extent, these challenges involve how to handle transformation processes and theory of these areas will initiate this chapter. This includes broader subjects such as project management and change management. This is followed by literature about supply chain management, which includes theory on business collaborations, information sharing and intermediary roles in particular. Since the aim of this paper involves scalability, the thesis concerns how to decide the degree of customization. Therefore, a small section of literature on customization within IT-solutions is also included in this literature review. Finally, a section called *conceptual framework* is presented which summarizes how the theoretical framework is used as a basis for the coming analysis.

3.1 Project Management

> *"A project refers to a value creation undertaking based on a specific mission, which is completed in a given or agreed timeframe and under constraints, including resources and external circumstances"* - Project Management Association of Japan, 2005 (Maylor, 2010, p.5)

There are many definitions of what a project is and how it should be executed. However, common is that all projects have certain characteristics. One of the characteristics is uncertainty (Maylor, 2010). This factor gives the project manager a major challenge to work with since the future certainty cannot be predicted. The uncertainty may deal with costs of people or material, or whether a project or parts of it even is achievable (Maylor, 2010). Another aspect where uncertainty lies within is the time it takes to finalize a project. The uncertainties may be related to the process or outcome of the project and in many cases; the challenge is, as Maylor expresses it, that "we don't know what we will find until we get there" (Maylor, 2010, p.156).

To determine what is a project or not, the described characteristics above are useful. However, when deciding what type of project we are dealing with and how to continue with its process, a basic classification considers volume and variety (Maylor, 2010). Volume deals with quantity throughput for the process and variety is the number of variations possible throughout the process. When a project's nature is low-volume and a high variety, the project type is called first-timers (Maylor, 2010). These kinds of projects involve more risks and uncertainty. Volume and variety versus project type is shown in figure 3.1.

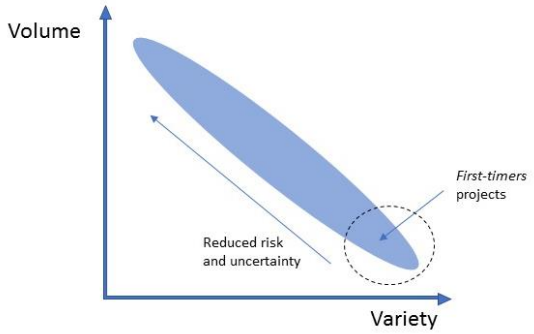

Figure 3.1. Volume vs. Variety in Projects. Adapted from Maylor (2010).

Maylor (2010) states that there are four common phases in project management, forming the 4D model. The first phase is *Define the project* and includes the project- and organizational strategy including a definition of goals. *What* and *Why* something is to be done are fundamental questions in this phase. The second phase is *Designing the project process.* The key issues of this phase are the modeling and planning, resource analysis, making estimations, conflict resolution and justifications. The fundamental questions of this phase are how the project plan will be executed and who will be involved. The third phase is how to *Deliver the project* where the key activities in this phase involve the organization, control, leadership, problem-solving and decision-making. The fundamental question that is to be answered in this phase is how the project should be managed operationally and on a day-to-day basis. The fourth and last phase is *Develop the process*. It regards the assessment of the process and the project outcome where evaluation and changes are in focus.

When executing a project, there are risks in each phase. Particularly in *first-timers* project, when it could be more difficult to plan a project, it is important to handle scope management. In Scope Management, there are three elements - the initiation, the scope plan and the scope change control, and all these form a basis of the following planning and management of the project work (Maylor, 2010). If not managed properly, there is a risk falling into a *Scope Creep*. That is a phenomena used to describe when the ”original purpose subtly changed on many subsequent occasions until no longer resembled the original concept” (Maylor, 2010, p.101). To avoid the scope creep, it needs to be managed by the project manager from the start. Another important factor is that all parties of the project have agreed on the purpose of the project and what needs to be done (Maylor, 2010).

In all kinds of projects, estimates are necessary to plan the project both in terms of money, time and resources. This because there are always uncertainties, therefore estimations are needed to be done. However, there are different approaches on how to make estimations and a risk when doing this is to fall into *wishful thinking* (Maylor, 2010). This is when decisions and beliefs is based on whatever might be pleasing to imagine instead of relying on evidence, reality or rationality to be the basis of a decision. According to Maylor (2010), people tend to lose credibility for the system and its facts and figures and rely more on gut feeling while working under pressure.

When working in a new and untested project where time is difficult to estimate, it is common that deadlines are either loosely set with room for safety time or not set at all. Having an insufficiently set deadline can imply risks of excessively expanding the time of the project since the Parkinson’s Law indicates that “an activity will expand to fill the available time” (Maylor, 2010, p.159).

3.2 Change Management

All organizations go through change, but some handles it better than others. Kotter (1995) observed leaders and organizations through their transformational change and combined success factor into a methodology. This methodology is an eight step process for leading change

and is based on a people-driven approach. This means that in order to create engagement among people in an organization, a reason for change needs to be understood (Kotter, 1995). The eight step model are divided into three parts, where the first three is about creating a climate for change. The next three steps handle how to enable and engage the organization. Finally, the last two steps deal with implementing and sustaining change. Below, the eight steps of the Kotter Change Model are presented.

1. Establishing a sense of urgency
2. Creating the guiding coalition
3. Developing a vision and strategy
4. Communicating the change vision
5. Empowering broad-based action
6. Generating short terms wins
7. Consolidating gains and producing more change
8. Anchoring new approaches in the culture

Organizational result is driven by individual change and therefore is the ADKAR model allowing leaders and change management teams to focusing on the activities that will start with the individual (Prosci, no date). ADKAR model, founded by Jeff Hiatt, is a framework that stands for awareness, desire, knowledge, ability and reinforcement, and outlines the journey through change. Every step is a goal, and must be achieved in order for sustainable change to happen. The model is applicable to every single employee within an organization independently of their position (Prosci, no date). Aguirre et al. (2004) also highlight the importance of the individual, and write that real change happens at the bottom of an organization.

In organizations' transformational change processes, there are some barriers working against innovation and change. Silos is one of the biggest (Govindarajan, 2011). A silo mentality is according to Business Dictionary (2018) "a mind-set present when certain departments or sectors do not wish to share information with others in the same company. This type of mentality will reduce efficiency in the overall operation, reduce morale, and may contribute to the demise of a productive company culture". Ribeiro et al. (2016) write that a silo can exist in specific job functions, be geographic or knowledge-based, and in many industries, silos enhance the productivity. In organizational change, silos are opposing change since it unable communication between departments and it especially slows down change when a company wants to create a new digital platform (Ribeiro et al., 2016). Transformation efforts tends to fail when separate parts of the company fail to work together towards shared goals and visions (Ribeiro et al., 2016). According to Gleeson (2013), it is the executive leaders' and management's responsibility to help their teams with a mind-set to break down destructive organizational barriers like silos.

Huynh (2017) describes that in order to succeed with a huge impact across an entire organization, it may be needed a specific management team to drive the work and bring the stakeholders together during different phases of transformation. Pinto and Slevin (1989) highlight the importance of a finding a *champion* in order to proceed with a successful project

implementation, and define a *champion* as "a person within the organization who uses power entrepreneurially to enhance project success". Huynh (2017) agrees of its importance in order to avoid inefficiencies that disrupt the project. A *champion* has four characteristics, where the first one is having personal or positional power in the organization (Pinto and Slevin, 1989). Secondly, they are willing to use that power to benefit in the project and thirdly use the power in a non-traditionally or entrepreneurially way. The fourth is that a *champion* goes beyond their expected and traditional work responsibilities.

3.3 Supply Chain Management

The main goal of a supply chain is to meet customers' requests while at the same time generating profit for the company. A supply chain consists of all parts needed to meet customers' requests, directly and indirectly (Chopra and Meindl, 2013) and those parts most often include suppliers, manufacturers, transportation, warehousing, retailers and customers. The concept referring to a chain can today be misleading and should instead preferably be thought of as a network since this demonstrates the reality in a broader sense, where multiple actors belonging to each stage need to be managed and coordinated efficiently (Chopra and Meindl, 2013). This is demonstrated in figure 3.3 below.

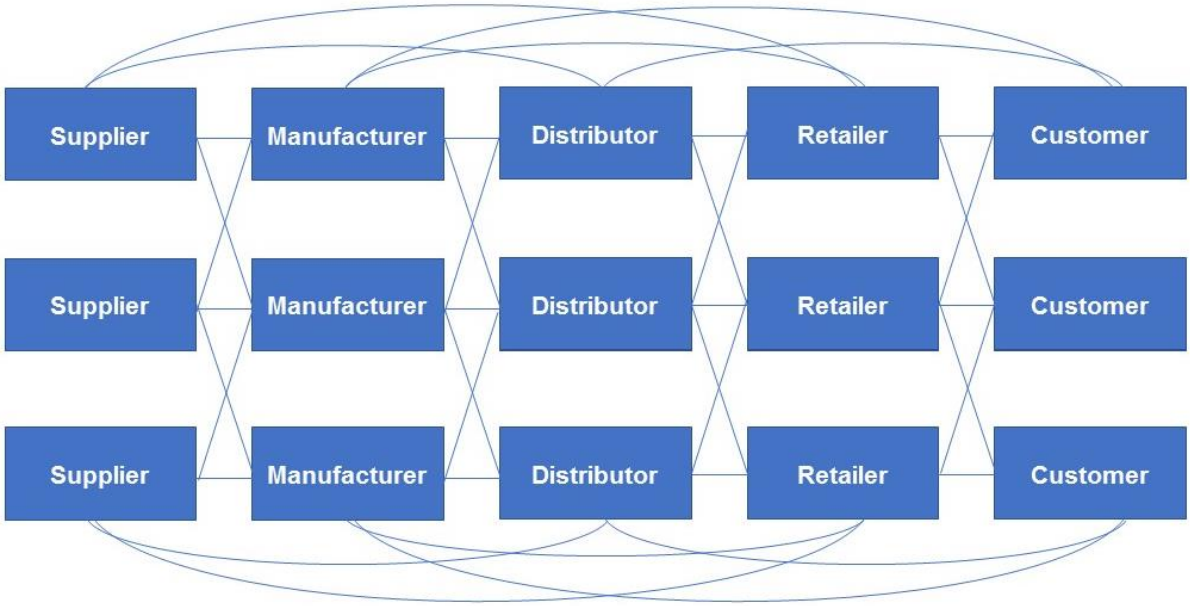

Figure 3.3. *Demonstration of a Supply Chain Network (Adopted from Chopra and Meindl, 2013)*

The length and complexity of different supply chains vary depending on the company and its characteristics. Nonetheless, each stage of the chain is connected through three types of flows; monetary flows, material flows and information flows (Chopra and Meindl, 2013). Chopra and Meindl (2013) state that these flows are highly important to visualize in both directions and the management and design of them is highly connected to the success of supply chain management.

3.3.1 Supply Chain Networks and Business Collaborations

According to Håkansson and Ford (2002), a network can be visualized as a web, where a number of nodes are connected to each other by threads. The nodes illustrate business units, such as e.g. manufacturing companies, suppliers etc., and the threads demonstrate the relationship between them. All participants in the network are becoming more and more interdependent and affect each other directly or indirectly (Håkansson and Ford, 2002). Håkansson and Ford (2002) argue that no business relationship is static and therefore needs to be maintained, and to understand each individual relationship fully, the whole network and its context need to be understood. Ericsson (2018) states that digitalization has impacted new ways for companies to reach customer satisfaction, where the nature of competition has gone from supply chain competition to competing between networks.

Hingley (2005) describes that during the recent decades there has been a shift in how firms tend to manage their business relationships. The traditional transactional exchange, also so-called arms-length relationship, has become less emphasized and instead a close collaborative partnering approach has been more and more brought into the light of business-to-business literature (Hingley, 2005). An arms-length relationship tends to focus mainly on market price, while a collaborative relationship instead focuses on lowering the total cost of ownership (Hoyt and Huq, 2000). Hoyt and Huq (2000) highlight that long-term relationships based on a win-win premise is more beneficial for both firms in a long-term perspective, while an arms-length relationship can be beneficial short-term. Hoyt and Huq (2000) emphasize the importance of mutual trust for a win-win system to work. Further, Hoyt and Huq (2000) argue that a collaborative relationship involving activities such as forecasting, replenishment and planning also supports the development of flexibility, responsiveness, and low-cost and low volume manufacturing.

A collaborative approach strengthens features such as mutuality, trust and collaboration (Hollesen, 2003). Hollesen (2013) also claims that partnership results in a sharing of mutually achievable goals for those involved. Hingley (2005) states that no business is an island, which indicates that businesses needs to collaborate with other actors in their business network to be successful. It is further argued that it is a balance between power and trust in each relationship and this issue consists in every interdependent relation to some extent, whereas there also exists conflicts and cooperation in each of these relationships (Hingley, 2005). Emerson (1962) describes power as the ability to affect another part to act in a way that they would not have acted in otherwise.

3.3.1.1 Collaborations in International Contexts

Having globally spread business networks is a fact for many firms today, while also a key factor for succeeding with business collaborations in this context is having strong relationships with national and global suppliers and customers (Johansson and Vahlne, 2009). Johansson and Vahlne (2009) push that mutual commitment in a relationship is important for an internationalization process. A relationship is an informal process and a social construction between involved parties, and can be viewed as a long-term investment built over time (Johansson and Vahle, 2009). The larger the psychic distance is between the parties, the more

difficult it is to build a new relationship (Johansson and Vahle, 2009). Ojala (2015) states that the term psychic distance can be explained as the involved actors' perceptions of disturbances in information flows between companies, often between foreign markets (Ojala, 2015). These disturbances can be caused by differences in geography, culture, language, time difference, industrial development and more, and the bigger the perceived differences are; the longer is the psychic distance (Ojala, 2015).

When starting a collaborative relationship in a foreign market it is beneficial to have insight in the market's geographical and cultural area in order to shorten the psychic distance and thereby gain so called *insidership* (Johansson and Vahlne, 2009). To effectively collaborate across geographical markets, Johansson and Vahlne (2009) argue that having human resources with insight in the involved market context and culture is an effective way of decreasing psychic distance.

3.3.2 Information Sharing

Supply chain management is an effective way of creating value for customers, however as earlier mentioned, no single agent could optimize the supply network alone (Fiala, 2005). There is an increasing trend of specialization and a drive for optimization within each single supply chain unit (Fiala, 2005), which calls for collaborations between actors in supply chain networks. Further discussed is that locally efficient decisions can be inefficient from a global perspective and to be able to ensure long-term sustainable businesses. To operate within today's dynamic networks, information sharing is critical to be able to coordinate actions (Fiala, 2005), reduce uncertainty and improve efficiency (Huong Tran et. al, 2016). Information sharing is an effective tool when facing challenges in both local and global markets and exchange of information in supply chains improve operational-, financial- and supply chain performance (Huo et. al, 2014). Fiala (2005) argues that sharing of customer demand data has significant effects on the bullwhip effect in a producing company, which is described by Wang and Disney (2016) as a supply chain effect where order variability increase as orders move upstream. Fiala (2005) also states that information sharing leads to shorter lead times, decreased batch sizes and centralized information.

Despite the benefits, there still exists hesitation among those actors requested to share information (Houng Tran et. al, 2016). The fear of sharing information often involves security risks, reliability and competitive inferences (Huong Tran et. al, 2016). Further argued is that the willingness to share data is central to reach completely satisfied end-customers and to minimize total costs of the supply chain. Moreover, to succeed with supply chain collaborations it requires trust, commitment, partnership coordination, joint problem solving and communication quality between the exchanging parts, which can only can be achieved through a willingness to share data (Du et. al, 2011).

3.3.3 Intermediaries in Distribution Networks

As earlier touched upon, the activities of a supply chain aim to meet customer demands by providing them with products. Jonsson and Mattsson (2013) claim that in order to succeed with this, a producing company needs to achieve following four benefits:

- Value processing of material input into finished products.
- Making products available to purchase at the right place.
- Making products available to purchase at the right time.
- Enabling the transaction of ownership of delivered products to customers.

Jonsson and Mattsson (2013) further state that to achieve these benefits in a cost efficient way, there are gaps that need to be considered and filled when shaping the producing company's distribution structure. These gaps exist between producing companies and customers and can be filled using intermediaries, such as distributors, retailers, wholesalers etc. These intermediaries, also called middlemen, buy goods from a producing company and sells those to consumers (Shevchenko, 2004). Large companies with a large customer base have historically played an important role where it has been difficult to trade goods directly between the producing company and end customers (Shevchenko, 2004). The gaps Jonsson and Mattsson (2013) discusses are:

- Pace gap. This emerges when companies produce in a different pace than customers consume or purchase the products.
- Quantity gap. Companies often produce large quantities of their products for economic reasons, which often do not match the quantities that sole customers demand.
- Distance gap. This gap arises due to that producers are geographically tied to some locations, while customers are spread out on many different markets.
- Assortment gap. This gap exists when customers demand a broad product assortment that one sole producer cannot financially handle to provide.
- Variety gap. This emerges when customers request a larger variety of products than what producers can financially defend and deliver to customers.

Jonsson and Mattsson (2013) argue that distributors can take on different roles to bridge each gap in a cost-efficient way. The authors state that one alternative role can imply that companies deliver directly to a local intermediary close to the effective market, which handles deliveries of the quantities to the customers on the market and manages inventories of the producing company's products. Another intermediary role can be more focused towards customer support (Jonsson and Mattson, 2013). This could mean providence of technical support or managing other service commitments in order to provide customers with good service despite a lack of geographical closeness. Another type of role is when intermediaries represent and sell products from different companies (Jonsson and Mattsson, 2013). The purpose of this role is to enable customers to purchase goods produced by different companies all at one supplier, while the number of contact points between the producing company and the customer also reduces heavily (Jonsson and Mattson, 2013).

3.3.3.1 Changing Roles for Intermediaries

New world trends and conditions affect distribution systems and to adapt to these changes, the roles within them constantly changes (Gadde and Hulthén, 2011). According to Jonsson and

Mattsson (2013), these changes lead to both a decrease and an increase of intermediaries' importance in the system. The meaningfulness and value of intermediaries has during the recent years been questioned and the concept "disintermediation" has emerged, describing cutting out the middleman with a belief that companies can be more efficient without them (Jonsson and Mattsson, 2013). Further argued is that by reducing a middleman, the function does not disappear but instead is replaced by another actor in the supply chain or the company itself. Gadde and Hulthén (2011) state that the technical development is a large factor for change in both distribution roles and specialization of actors in supply networks. The interest in disintermediation originates partly from the advance of information sharing between actors in the chain, and the ability to reach out and collect information from customers without going through a middleman, and therefore cut the extra costs an intermediary implies (Jonsson and Mattsson, 2013). Although, Jonsson and Mattsson (2013) further highlight that the roles of intermediaries change as an effect to the trend of specialization in supply chain networks and the increasing demand for customized products. The first role mentioned above of an intermediary, of which it acts as a local intermediary responsible for inventory and deliveries, can according to Jonsson and Mattsson (2013) be expected to decrease in importance. The decrease is explained as that companies today have an ability to get higher access to customer data, has better transportation systems and can deliver smaller quantities directly to customers (Jonsson and Mattsson, 2013). The distance gap has also been easier to fill thanks to the IT development since order information can be exchanged through digital systems (Jonsson and Mattsson, 2013). Although the authors state that in order for companies to stay competitive, a providence of high technical service and similar services will remain of high importance and the importance of this role is growing. According to Jonsson and Mattsson (2013), with an increasing trend towards specialization among actors in supply networks it becomes more important among intermediaries to act as consolidators. Common for companies is to strive for a reduction of their supplier base, and this kind of intermediary role enables customers to buy several different products from the same intermediary at one purchase point (Jonsson and Mattsson, 2013).

3.4 Customization within IT-Solutions

When a specific customer need is met due to modification of the process of delivering wide-market goods or services, it is called mass customization (Investopedia, 2018). Further, it is a technique of marketing and manufacturing that delivers mass produced products with low unit costs in a way that combines flexibility and personalization (Investopedia, 2018). According to Safizadeh et al. (2000), it is a trade-off between cost and customization since the more customized a product is, the more resources it takes. The challenging part in customization is to create a high customization level without escalating costs (Hegde et al., 2005). The customization often touches the product or service, but it could deal with the process of delivering this. Deakins (2015) writes about the customization within ERP-systems and its complexity. He stated that customization can seem like a good idea in a short-term perspective when it aims to solve a specific problem, however, it can be harmful in a long-term perspective since it risks to carry a high level of complexity. Deakins (2015) mentions that changes, that seems to be small, can affect the entire system which not always is obvious from the beginning.

In addition to this, these smaller changes could make it even harder to rapidly follow new business opportunities if the operations need to run differently than the past. Deakins (2015) says that in order to build a long-term solution that allow the business to grow, the ERP-software needs to decrease the chances of long-term costs of customization, which implies a lower degree of customization.

3.5 Conceptual Framework

The literature study was summarized and concluded into a *conceptual framework* which can be seen in figure 3.5. This together with the empirical study was used as a foundation for the analysis of this master thesis. Based on four main theoretical areas; Project Management, Change Management, Supply Chain Management, which includes three sub-areas; business collaboration, information sharing and intermediary roles, and lastly Customization within IT-solutions, the challenges for SKF SC 4.0 were analyzed. These challenges, belonging to five different categories, are illustrated by the five lower rectangular boxes in the figure. The arrows connecting the four theoretical areas with the five challenge areas, illustrates how the theoretical framework was used to conduct the analysis. To continue, the challenges were used partly to conduct a customer classification model, which the theoretical framework therefore permeates.

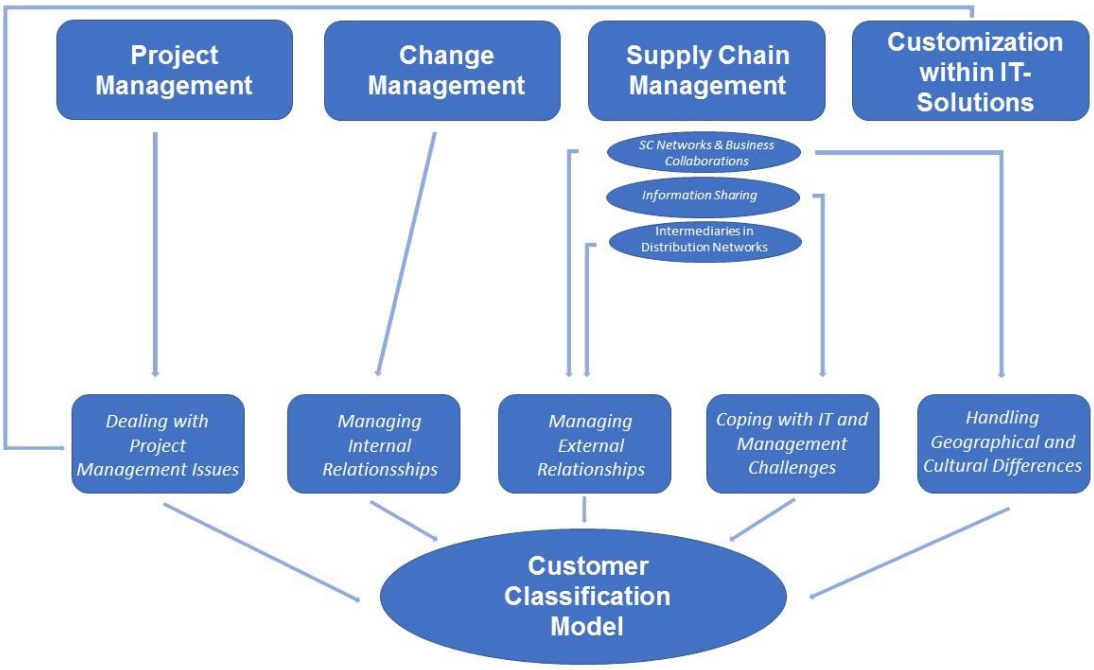

Figure 3.5. *The Conceptual Framework of the Study, Illustrating how the Theoretical Framework was Used Through the Study.*

4 Empirical Study

In this chapter, the empirical data collected throughout the study will be presented. It includes the background of the SKF SC 4.0 and PoCs, followed by a presentation of the identified challenges.

4.1 SKF SC 4.0

In this section, the project background will be presented including the concept definition and goals. Lastly, it gives the reader a better understanding of the PoC concept, and what PoCs SKF have done or are currently doing.

4.1.1 Project Background

The originator of SC 4.0 is the Director of Logistics and Demand Chain. He initiated the concept in late 2016 and his initial goal was to improve the logistics through the whole supply chain, by generating information from all parts. The idea is to use real time internal and external data in order to receive information in an early state, which makes it easier to check and control the supply chain. In order to reach their vision, SKF wants to increase transparency of inventory data and goods flow from SKF's production location to the customers' point of consumption. To be clear, the main focus is for SKF to receive customer data and thereby SKF will be able to provide value through higher service levels.

The concept definition is "Use data from SKF, OEMs, distribution and end-users to create one common data view to optimize and customize the end to end-supply chain". However, currently the SKF SC 4.0 is limited to focus on the downstream supply chain and thereby this limitation concerns the master thesis as well. In the project description, the vision and long term goal are stated like below:

- Optimize the supply chain by understanding the real end-user demand
- Transform the role of supply chain inventories
- Shorten the value chain by increasing delivery precision
- Better service levels and higher flexibility

Since the start in 2016, two Proof of Concepts have been finalized and three are up and running during spring 2018. Currently, the core of the SC 4.0 project team consists of two SC 4.0 Project Managers, one IT Project Manager and Consultants from SKF Business Consulting. Since the start of the project, the team have not been consistent and some team members have started later and some have quit. According to the team, the vision of the concepts of SC 4.0 is clear, however the way to reach a 100 % SC 4.0 state is more difficult and diffuse. The concept does not include a manual on how to reach the vision, instead it is an iterative process where they are testing a proof of concept. In the proof of concepts, sub teams are created and form a group that runs the proof of concepts. These includes more employees from SKF, and depending on what kind of PoC it is, roles such as Key Account Manager, Factory Responsible, Inventory Planners and others are included. External people from partner companies and consultants are also a part of the PoCs.

The expected value outcome from the PoCs and the whole SC 4.0 are different in some aspects. Since there is no clear recipe on how to reach a SC 4.0 state, SKF is trying out concepts in different PoCs. The aim is to explore different solutions and systems, hit the pitfalls to be able to avoid them later, and reach one or several SC 4.0 solutions that are replicable to a large variety of customers.

4.1.2 Proof of Concepts

Below, the three customer segments; OEM, distributor and end-user, are presented. Is also includes some details about the previous and currently running PoCs.

4.1.2.1 OEMs

For SKF there are two types of OEMs. The first one is automotive customers where there generally is a long planning horizon and most customers have a current EDI-solution that has existed for many years. The second OEM customer type has shorter planning schedules than automotive customers, and behave more similar to a distributor. An OEM is generally cleaner and more straightforward to work with compared to an end-user and this is mainly because of the communication and the absence of distributors. The demand is usually more consistent and due to an often well-done forecast from the OEM, it is easier for a company like SKF to plan and produce the needed orders.

For SKF, one Proof of Concept has been completed in the OEM segment. The PoC has been performed with Volvo Powertrain, and is further referred as the "Volvo PoC". As an appointed system provider, PipeChain was selected partly due to Volvo's long experience working with them. The PoC was initiated in the end of 2016, before it was up and running in Mars 2017. Through the PoC, SKF got access to Volvo's daily, weekly and monthly production data in PipeChain and in July, 4 months later the PoC was finished. After this, an evaluation started on how to continue to work with SC 4.0 even after the PoC-phase. Both parties experienced that the PoC led to improvements in KPIs and their collaboration. However, after the PoC was finalized, it came through that there were some sync issues during the PoC, which it currently under development to fix.

4.1.2.2 Distributors

In the distributor customer segment, the goal is to cooperate and help the distributors by planning and managing their inventory levels. For this segment, Vendor Managed Inventory (VMI) is a common way of working, and especially for all the global and biggest customers. For the distributor segment, SKF started a PoC in January 2018 focusing on one of their biggest customers - a global industrial supplier of bearings, pneumatics, hydraulics and mechanical power transmission products. Currently, SKF are in Phase 1 which is the process of digitizing the manual work of creating an order proposal. The order proposal, which will be generated through a supply chain planning software called SO99, should not only be based on the sales data and forecasts but also look at SKF and their capacity. In other terms, create a proposal based on what SKF can produce and deliver. In the end, the aim is to improve the service level.

Phase 2 in the PoC is to include the customer and provide it with insight to SKF's inventory data as well. The solution will also be available for SKF factories, so they are prepared for potential future orders.

4.1.2.3 End-Users

Regarding this segment, today there are two scenarios. One is when SKF receives data directly from end-users, the other is when SKF receives data from a distributor who handles the end user. In the latter scenario, the goal is to get additional information from the end-user as well. Other than from order-book and forecast, the data from the end user will arise from condition monitoring which will tell the status of the bearings through sensors placed on the bearings. It can help SKF not only to calculate when a new bearing must be produced but also give information regarding what service the bearing needs. SKF have applied condition monitoring to some customers in other projects within the company to test the concept. However, the technique has a far way to go before it can be introduced in the PoCs and SKF SC 4.0 solution since SKF needs to figure out how to use and to benefit from the information.

Currently, there is one end-user PoC in progress which is with the paper mill company Holmen and its distributor Sverull. The PoC is further referred as "Holmen PoC". Holmen, Sverull and SKF have had a long standing and tight relationship, which was one factor of why SKF choose the mentioned customers. As a partner in the PoC, SKF appointed Optilon as a consultancy firm. The initial PoC meeting was held in May 2017, and a second workshop focused on process mapping and data was held in August 2017. The solution then has been developed since November 2017, and was ready in April 2018. The result of the PoC is not given yet, but the goal was to receive a complete real-time view, including product availability, of the whole downstream supply chain. End customers demand- and planning changes should therefore be immediately assessed, not only to SKF but also their distributor Sverull. The solution should also be able to support maintenance planning at Holmen and inventory planning at Sverull and SKF.

4.2 Identifying Challenges in SKF SC 4.0

This section presents the empirical results conducted from interviews, concerning the challenges of the scalable SKF SC 4.0 solution.

4.2.1 Uncertainties and Confusion within the Project

At a digitization workshop at SKF Management, it was decided to perform 80 PoCs. According to the majority of the interviewees at SKF, that was not realistic at all. Too little money approved and only a handful employees in the SC 4.0 project team, the IT Project Manager implies it is a company governance issue. Another example he mentions occurred when they had the initial meeting in the Volvo PoC. They had just got approval for one PoC but then the representatives from the SC 4.0 project team started to discuss three different PoCs. It was a minor problem but the IT project manager thinks it "symbolizes that they in the beginning did not really know what they were doing". The Factory Responsible in Lüchow also mentions that his expectations in the beginning of the PoC were large, but on the way it rapidly got smaller

and smaller. The IT Project Manager states that there is a challenge to perform a speed in the projects when there are not enough resources to utilize.

When doing a project like SC 4.0, the overall goal is clear but the IT Project Manager believes it has been quite unclear how to reach it and that the business side's directives have been obscure. The "not knowing of how to do it" is also mentioned from other interviewees. The IT Project Manager also states that it is rare to kick-off a project with criteria like in SC 4.0 and that it gets messy in their normal routines. He experienced that some KPIs were decided but when not knowing exactly what the next step is, you often end up in a situation and ask yourself "And what happens now?". For example, he believes that the Volvo PoC could have achieved more in 15 months if more effort was put in the beginning to construct a better "How". In addition to this, The IT Project Manager brings up another example of uncertain project directives regarding the Volvo PoC. When the Volvo PoC was finished, SKF continued developing the Volvo solution even though the plan from the beginning was to close it down since a PoC is only aimed to be a temporary pilot. The PipeChain Consultant states that they are not used to working with a client with such unclear directives as SKF and that it is more common to have a clearer business case to follow. The SC 4.0 process is iterative and explorative with a great vision, but PipeChain says that SKF sometimes feels insecure and that they need to decide what they want to do with the information that a SC 4.0 solution can carry out. He also mentions that it is important to make a plan with the "what" and "how". The Volvo Representative mentions that it has been hard to to concretize the "how" even though they believe they have improved during the work within the Volvo PoC.

The Director of Logistics and Demand Chain, which initiates the SC 4.0, admits that a clear directive on what the solution will look like doesn't exist from the beginning. He says that after each meeting, they know more and more what they want and what they actually can do. He says that there might not even be one single solution in the end, but several solutions if SKF's customers are too different. The SKF SC 4.0 is a project where ideas are tested and evaluated. The uncertainty is a challenge, and the PoCs and the SKF SC 4.0 solution are dependent on many actors both inside SKF but also customers. According to the Director of Logistics and Demand Chain, it is hard to create a business case on this unclear and open-ended situation. He continues by saying that to get money from the management team, they need to prove how to make money from it. In this case, the Director says that they cannot prove anything and he does not know how long time it will take. The IT project manager says that it has been a formal problem to get money approved, and that the SKF governance has hindered the pace of the project. According to the Director of Demand Chain there is always a challenge in supply chain to measure values since parameters like customer experience is hard to evaluate.

The Director of Demand Chain believes that what is happening in the PoC with Volvo and PipeChain is only an upgrade of an already existing EDI-solution, and that it cannot be defined as a Supply Chain 4.0 solution as the industry call it. He does not agree on the positivity regarding SC 4.0 and believes that today the team is not working for a revolutionary solution, instead the SC 4.0 has become a process of doing small changes and improvements - and a dream of industry 4.0 is not in sight. The Volvo Representative agrees that it is no revolutionary

or new way of working, instead they are using and understanding the information in a new way. The Factory Responsible in the Volvo PoC is agreeing to some extent even though he puts it slightly different. He says that the Volvo PoC has led to improvements but that the factory in Lüchow and its machines are made for mass production. Even though there would be a great visibility connection to the customer, the factory would not be able to meet the flexible demand since the machines are not flexible enough. The IT Project Manager believes SKF often look at replacing processes and systems instead of looking at how they actually want to have it. He says there is a lack of catching new possibilities and with SKF SC 4.0 "they are trying new things but at the same time they do not". The Key Account Manager driving the Holmen PoC says that their PoC has been successful but right now they are also doing continuous improvement work. It is when they have achieved an automation process for non-planned articles and succeed with the condition monitoring that they can talk about a real SC 4.0 state.

A topic that has been brought up by many interviewees is the degree of customization and whether SKF should assume that customers will adapt to their terms and solution, or the other way around. The Supply Chain Consultant states that the design of the future applicable SO99 solution should be approximately 80 % finished and 20 % is left to customize for differences between each customer. They further state that to create a solution that is flexible and suitable for many different types of customers is always a challenge, because the solution can't be too standardized and open-ended to fit all customers. The Factory Responsible argues that SKF cannot expect customers to easily adapt to SKF's systems. Customers probably have own IT systems and processes that they want to continue using and the customer's system need to be able to be integrated with SKF's solution. Although the IT Project Manager says when choosing which customers to target, SKF needs to choose customers that are willing to adapt and use SKF's solution, otherwise it might be to resource demanding. In the Volvo PoC, the Volvo Representative had a positive experience with a well-functioning collaboration. However, Volvo felt that they were able to set the pace of the project to some extent. She further mentions that it is important as a customer to have a willingness to solve problems and increase transparency, possess soft skills and be partnership minded. This could imply that the customers need to drop some of their principles as well. She further argues that this can be difficult for the customer, but that it can be challenging for SKF if many customers hold a firm grip around their principles and working standards. The Director of Logistics and Demand Chain stresses the importance of choosing customers that are large enough to provide value to SKF from a SKF SC 4.0 integration. The Director of SKF Business Consulting and the SC 4.0 Project Manager agrees on this, saying that the larger the customer, the more potential impact it has on SKF. This is partly due to economies of scale. The two interviewees also state that it is important to look at what improvement potential a SKF SC 4.0 collaboration would imply. Meaning by this; if a SKF SC 4.0 solution could solve the friction that influences the performance of the previous collaboration, this is a preferred customer to target.

The IT Project Manager says that when the Volvo PoC was finished they continued developing the Volvo solution even though the plan from the beginning was to close it down. He further states that this was confusing since a PoC is to be seen as a test project during a certain period of time and afterwards, it is supposed to be closed down for evaluation. In the OEM segment,

the Volvo PoC has been based on a VMI solution based on the customers' production plan. However, the PipeChain Consultant says that this solution might not fit all the OEM customers and that they recently experienced this during the initial meeting in another PoC with another large OEM customer. Another concern brought up by the Factory Responsible is whether to expand the project by integrating customers into one, already SC 4.0 tested factory, or to integrate all SKF factories that connects to one customer. He believes the right way to go is to approach both ends simultaneously. He also states that SKF should continue the project progress by integration another automotive customer, and that this also depends on that SKF's relationship with this customer is strong. His vision is that there will be one project team for each customer in the future, consisting of someone from the factory and someone with expertise within the SC 4.0 project. The IT Project Manager states that testing another PoC with Sverull and another customer would be a good way to go since this will be less complex than the last PoC with them.

4.2.2 Relationships within SKF

An aspect many interviewees have brought up is the importance of engaged employees involved in the project and the process to develop and succeed with SKF SC 4.0. The Customer Service Representative says that the SKF SC 4.0 project team cannot achieve the full potential without help from all the involved departments at SKF. The IT Project Manager, the Customer Service Representative and the SKF Business Consultant further mention that people today think too little outside their own silos and that will be a challenge to overcome. A common sentence mentioned from several interviewees are "What's in it for me", and that anyone who wants to sell in a project to a co-worker needs to be present. The interviewed Key Account Manager says that it is not enough to record a video and post on the SKF intranet "Spider", instead you need to deliver the message in person. The SC 4.0 Project Manager highlights the importance of transformation and education during the process of creating a scalable SKF SC 4.0 solution. There will be some kind of changed responsibility and that people need to be open-minded to this. In addition to this, the IT manager highlights that it is important that the business side of the team informs the IT side with what data that is relevant and needs to be delivered. If the business side is unclear, the IT side ends up in a limbo position and that is partly the case in the Volvo PoC.

The Director of Logistics and Demand Chain says that there are no conflicts or differences in opinions regarding SC 4.0, instead the problem is unawareness. This is partly a conscious decision since he does not want to bring too much attention to the project before they can present some results. He would like a successful PoC before he states all the benefits with SC 4.0, since there are many actors he needs to sell the project to. According to the interviewed SC 4.0 Project Manager, it is very important to sell the idea of SC 4.0 to the sales department and the Key Account Managers since, in the future, it might be their job to convince the customers regarding being involved in SKF SC 4.0. He also points out the importance to create incentives to the sales people, because there are many departments that want to influence them to put focus their incentives. Customer Service is also a part of the SC 4.0 solution, and the Factory Responsible states that the collaboration with them could have been better during the Volvo

PoC. He believes the lack of cooperation is due to their struggling with the implementation of SAP in Sweden, factory distractions and a large amount of new employees.

Regarding who will be the SKF person selling the solution to the customer, the Key Account Manager at SKF argues that SKF need a central unit that are responsible for the implementation of SKF SC 4.0 solution. This in order to avoid the risk of creating locally adapted solutions that will be difficult to scale. The Director of Supply Chain is uncertain if the sales department could handle selling the SKF SC 4.0 concept to customers due to lack of supply chain knowledge. The Key Account Manager on the other hand, don´t think it will be a problem unless they do not get a smaller education regarding SKF SC 4.0. The Supply Chain Consultant says that SKF are unique in the way that the majority of the salesforce understands the supply chain since it is a prerequisite to be able to sell the SKF products. However, they also highlight the importance of getting the right people in the team and that they also have the available time. The Volvo Representative mentions that SKF had a good team composition during the Volvo PoC, and they had the required skills, e.g. a Customer Service employee had previous experience in the system PipeChain.

The consultant from the external system supplier PipeChain states that the SKF governance structure can be a challenge. The IT Project Manager continues on this argument and says that since SKF is large and global, it is more complicated to perform transformation projects. He also states that internal politics and hierarchy can be factors that slows down the process, where one example is that financials must be approved by higher management. This requires more time and hence delays the process, which breeds irritation and declining expectations. The Director of Logistics and Demand Chain mentions the difficulty of timing and prioritization of internal projects. Some projects may obstruct or hold back wanted changes within SKF SC 4.0 and the implementation of SAP for SKF is one example of this.

4.2.3 Customer Relationships

Common for all the interviewees is their opinion on the importance to deliver and convince customers (OEMs, distributors and end-users) of the value they can gain from the solution. The SC 4.0 solution is a two-way solution and it must be interesting enough for the customer to invest needed resources. If the customer value is not clear, the SC 4.0 Project Manager says that SKF needs to work harder to show that. The Customer Service Representative believes it will be a big challenge to convince the customers to be a part of the SC 4.0, and that it is important to be open and clear regarding the cost structure. To be able to reach out to customers, the SC 4.0 Project Manager says that there is a need for a “local champion”. A local champion is an SKF employee that has a good relationship with the customer and are willing to run the transformation process of SC 4.0. The IT Project Manager says that these champions might also have a better clue on what customers that have potential to become suitable to integrate into the SC 4.0 solution.

The interviewee at Holmen says that when SKF presented the PoC, they could have been better at focusing on the customer value. They felt like SKF were very clear but focused on their own improvements. He would have wished for better preparation and that SKF would not be so

theoretical in the conference room. An optimal solution according to him would be one simple enough to be explained in a one to two-hour meeting where the biggest gains are shown and possible project plan is presented. The Key Account Manager in the Holmen PoC believes many employees at the customer company have been involved in the meeting, and that is it a challenge to gather them all and compress the meeting. Volvo, another PoC customer, on the other hand was satisfied and experienced that SKF really did a good job selling the PoC. However, she mentioned that they got really excited when SKF asked because they previously had trouble in their relationship before, due to that SKF have been inflexible and slow. The distributor Sverull says that SKF could have improved the reach out of customer value. In the Holmen PoC, they believe SKF were clear about the vision but could have been better at explaining the distributor value. Sverull believe that it is something SKF needs to work on when scaling up their solution especially since it later will not be a PoC that they will sell. The meeting should also be short and brief. Sverull mention the importance to be careful with future distributors since some might be suspicious of future ulterior motives of cutting the distributor out of the chain, and therefore SKF need different ways of approaching different customers.

The PipeChain Consultant and the Director of Logistics and Demand Chain also highlight that it is a challenge to address the right people at the customer company. The latter one says that it might not be the purchaser, instead someone with more supply chain knowledge. It is not only a question of reaching out to the right employee at the customer company, according to the SC 4.0 Project Manager it is vital to pick a company with improvement potential and whose size of orders are big enough. It also a matter of how efficient the company's factories are and their quality of maintenance. The Director of Logistics and Demand Chain highlights the importance of the customer company's willingness to proceed with the implementation of SC 4.0 and that they understand the value of such implementation. The Factory Responsible mentions that it might be more profitable to work on the relationships and customers where problems exist due to better improvement possibilities. The Volvo Representative agrees on this, and admits they wanted to start the PoC with SKF due to big improvement potential. The Key Account Manager says that big customers that are structured, clear and systematic are good to target but also customers that have critical equipment and where production stops are expensive. The Director of SKF Business Consulting, the Factory Responsible states that the complexity of the footprint a customer has is important to take into consideration as well. By this they refer to the amount of nodes, such as factories and warehouses that a company needs to integrate into the SKF SC 4.0 solution. If this amount is high, the customer becomes more complex to collaborate with. The PipeChain Consultant also argues for the increased complexity of a large footprint.

During the interviews, there have been mixed opinions regarding the distributors. The Director of Demand Chain says that SKF should put themselves in front of the customer, eliminating the distributor in the long-term. Both the SC 4.0 Project Manager and IT Project Manager agree on the fact that the role of the distributor might become less valuable in the future but also mention that the distributors sell differential products and services to the end user that SKF neither can nor want to provide which implies a continuous purpose of the distributors' existence. They both highlight the fact that the distributor historically has had a certain role, and it is sensitive to work towards less distributors. The Supply Chain Consultant, who works tightly with both

SKF, the end-user and distributor, believes it could be a challenge to get the distributor on board with a solution like SC 4.0, but have not experienced it during the Holmen PoC yet. In the Holmen case, the distributor and end user have a very tight relationship, and the distributor plays a part SKF cannot manage themselves today. The Director of Logistics and Demand Chain is speculating that the distributor probably will exist in the future as well, but the business model will to be modified. The distributor Sverull says that in the beginning of SKF SC 4.0, they were worried about their future role in the chain. However, they believe the information sharing in general is good in order to reach a more optimized supply chain. The PipeChain Consultant has interpreted SKF's directives as that SKF wants to take over the responsibilities of a distributor, but yet not remove the distributor from the chain, for which the consultant argues that SKF needs to decide and be clear about what they want and how they want to deal with the distributors.

4.2.4 IT and Data Management

In this section, the empirical findings from interviews regarding information and challenges related to IT and data management are demonstrated. It includes four categories; IT governance, data format and quality, choice of solution providers and willingness to share data.

4.2.4.1 IT Governance

The SKF SC 4.0 is an iterative project and it has therefore been difficult to give clear directives on what needs to be done in different departments. The IT Project Manager says that it has been difficult to proceed with the IT development of the solution since the project management team hasn't been certain of how to proceed with the project. This is problematic since resources and time risks to be poorly allocated. The Key Account Manager argues that SKF generally has a time consuming and slow-paced approach to implementing IT-solutions, which has a lot to do with security and caution of sharing information. Although he emphasizes that a technical prerequisite is the existence of data based systems with the right size and capability. He also argues that data integration should be a quick and easy procedure to set up, but the examples that have succeeded with this before often evolve local solutions that is not suitable globally and difficult to scale up.

SKF works continuously with improvements within IT, where implementation of SAP is one example. The SAP implementation is resource demanding and will be ongoing during a long period of time. The IT Project Manager and the Factory Responsible argues that SKF's internal implementation of SAP affects both business and IT-resource utilization. They further state that an uncertainty exists on how the SKF SC 4.0 project and the SAP implementation should be coordinated to work alongside each other. The SKF SC 4.0 project is dependent on the decisions made regarding SAP which is a challenge for SKF, where initiatives overlap and contradicts with each other. The IT Project Manager also states that there is a corporate policy that doesn't allow updates on old systems, which makes the systems slow and sluggish to use. According to the same interviewee, this could affect SKF SC 4.0 by slowing down the progress and implementation of the SKF SC 4.0 project.

The Factory Responsible involved in the Volvo PoC in Lüchow, claims that SKF's IT- and ERP-systems are old and adapted to a mass production manufacturing style with stable order books and large orders. He further argues that a SKF SC 4.0 way of working on the other hand demands flexibility and ability to produce small batch sizes. He states that in order to achieve a successful SC 4.0 solution, SKF needs to invest in both modern, flexible and agile IT-systems and new machines. From a factory perspective, he argues that the PoC was a good incentive since it provided an understanding about potential improvement areas. The IT Project Manager agrees with the Factory Responsible on the old and inflexible IT-systems and believes SKF needs to make large investments in this. He further states that the inflexible IT-systems becomes a problem when the goal is to achieve real-time data exchange and to sync data efficiently, which was a problem identified in the Volvo PoC collaboration and wasn't discovered until 6 months after the PoC-period was closed. The IT Project Manager pushes the argument that the main issue is not IT but more an ambiguity of direction and management of the project.

4.2.4.2 Data Format and Quality

The IT Project Manager states that the main challenge of creating a system for a scalable SC 4.0 solution is not a technical issue, but that the challenge rather lies within finding customers who can deliver data in a file with a format that is manageable by SKF. The Supply Chain Consultant and the PipeChain Consultant state that one of the biggest challenges regarding data management is to get access to the right data, right format, in real time and of good quality from every sole customer. Before starting up a PoC or collaboration, a sanity check has to be made in order to check if the customer is IT mature so that the collaboration will be smooth and easy.

The IT Project Manager within SKF experiences that the customers that are smaller in company size tend to have less developed IT-systems and sometimes less structured data management. This data could be unstructured, in the wrong formats or of manual shape, such as documented in physical paper documents. The IT Project Manager also experiences that larger companies are generally more technically mature and have more experience with data exchange, although large companies tend to be more inflexible due to large IT-functions within the company. The Key Account Manager further stresses that in the early state of industrialization of the solution, customers with well-structured and organized data are easier to approach and that this can be easily investigated through a conversation with the customer. The Supply Chain Consultant further states that it is more difficult and time consuming to start a project implementation at customers with a lot of manual work, since then what first needs to be done is a restructuration of their working procedures before an SC 4.0 solution can be implemented.

4.2.4.3 Choice of Solution Providers

The Supply Chain Consultant states that the system provider SO99 should be able to manage all three customer segments, instead of developing three individual solutions for each segment. The Supply Chain Consultant further states that this will save both time and budget when starting off new implementations and is needed when creating a sustainable and scalable solution. The second IT planning system which has been investigated as a possible fit for the SKF SC 4.0 solution is PipeChain. Whether it is possible to create one solution for all three customer segments with PipeChain is today unclear according to the PipeChain Consultant. The

concern is within the end-user segment, mainly because they experience SKF as uncertain or unclear on what SKF wants to achieve. OEMs and distributor can be seen as quite similar since the collaboration is directly made with those parts, but end-users differ in this matter since often distributors acts as a middle man between them.

The IT Project Manager within SKF believes SKF should aim to use one system for all customer segments in the future, but that SKF is far away from achieving this today. He thinks that technically this is manageable but that the main challenge behind this is how to manage the terms for the distributors and to get them to join in on the solution and share their data. He pushes the argument that when Volvo and SKF started collaborating through a PoC, Volvo had the freedom to set a lot of terms and choose to work with PipeChain, and he believes it would have been difficult to convince them to use SO99 instead. He further says that it will become a challenge to get a broad set of customers of different characters to follow SKF's directives and terms, which might be necessary when scaling up to an industrialized solution. The customer service representative agrees on that one solution to all customers might be difficult and states that SKF is too large and has too many different types of customers to find one solution that will fit all customers. The Factory Responsible also agrees on this and says that the implementation will be difficult to standardize too much since many customers differ from each other, even though when customers operates within the same industry.

The Director of Logistics and Demand Chain states that in order to be able to create a scalable solution, several standard working processes need to be identified in each segment through carrying out the PoCs. These standard processes for all customer segments needs to be relatively similar to each other and it need to be an IT solution that is agile enough to fit with these. While choosing which customers to collaborate with next in the PoC-state, it is important to choose collaborative customers that are similar to the ones that SKF has already succeeded with in order to identify some patterns. When this is set, the company should further explore customers very unlike to what they have achieved before in order to develop the SC 4.0 solution even more. He is clear about that this not only applies to the PoC phase, but also when the scalable solution is up and running. The Director of Logistics and Demand Chain also states that it will be much easier to sell the solution to new customers once this is in place. He continues with saying that if SKF cannot find common factors across customers and customer segments, SKF will need to sell different types of solutions, which probably will be too expensive to justify the SKF SC 4.0 arrangement.

4.2.4.4 Willingness to Share Data

The PipeChain Consultant argues that what sometimes is standing in the way from accessing the correct data is the customer's willingness and abilities to share it, and this is critical to achieve a SC 4.0 solution according to the majority of the interviewees. The Director of Logistics and Demand Chain mentions that the customer willingness could depend on what customer segment they belong to (OEMS, distributors or end-users), since some customers want to cooperate with more than just one supplier. OEMs are usually not like that. However, the Director also says he does not know since they have not tried to sell the solution yet but one important thing that applies to all cases are the importance of accomplishing a waterproof

solution before selling it to a broad set of customers. This since if they sell something that they cannot deliver, the customer will lose faith in SKF. The IT Project Manager mentions that SKF have a protective thinking regarding their own data, and if they are going to demand the customer share it, they might have to be more open to share data as well.

The Sverull Representative argues that there are few obvious benefits with sharing information with SKF and that the main reason for joining the PoC is mainly due to the strong relationship between them and SKF. One expected benefit is that customer data will be visible through a computerized system and not exchanged by, for example, a phone contact. Today, the end-user Holmen provides the distributor Sverull with order data, where Sverull in turn contacts SKF. The Sverull Representative states that information sharing is generally not a big issue as long as there is trust that the information will stay within the customers' and SKF's hands. He pushes the argument that SKF, Holmen and Sverull have a strong and long-lasting relationship.

According to the Director of Logistics and Demand Chain, the OEM customers probably will be the easiest ones to get data from. This is because they are used to direct selling and there are already a Just in Time (JIT) tradition and a system between the companies. Especially in the automotive industry, EDI-solutions have existed for many years. The same interviewee states that usually, the OEMs also buy a much less variety of products. The distributors vary a lot depending on the size of them. Smaller ones are probably the easiest to cooperate with since they tend to be more sensitive and dependent in order to survive. The Director of Logistics and Demand Chain also argues that although there is a risk for those distributors that they also lack of resources for it. The multi-brand distributors can be perceived as relatively arrogant, and will probably say "we are already better at this than you are". Some of them do not want to "put all their eggs in one basket" as well, and favor some suppliers. The SC 4.0 Project Manager says that this will be even more difficult in a foreign country than in Sweden if you do not have a cooperative distributor. Regarding end-users, he further states that it depends whether they have a distributor in between themselves and SKF. If they do, it could be harder for a SC 4.0 solution to take place.

4.2.5 Geography and Cultural Differences

Several of the interviewees see geography and cultural differences as a possible challenge when implementing a scalable solution throughout the whole world. However, most interviewees argue that these challenges are generally small compared with other ones. The Factory Responsible mentions that in order to roll out a solution and manage it, physical presence is necessary and that it might not be possible to have SKF SC 4.0 project leaders with deep knowledge within the subject on spot to manage the integration. This is a matter of time and resource allocation, but the SC 4.0 Project Manager also stresses that the integration of the solution must be applicable and adaptable to the culture and languages it acts within. Within SKF's network there are about 15-20 different languages to take into account and the SC 4.0 Project Manager mentions that it is common to develop solutions in English and translate it into local languages. The SC 4.0 Project Manager believes this can indicate incorrect or misleading language translations of the solution. Another aspect is that updating systems in several different languages might be more resource demanding than updating only one. The Director

of Logistics and Demand Chain states that SKF is used to dealing with these kinds of challenges due to their long experience and international presence, but stresses that difference between business models may be a bigger issue across country borders. For example, in the United States multi-brand distributors are common and in Brazil it is more common selling only SKF's products and the distributors generally have a historical relationship based on high loyalty to SKF. The Sverull Representative mentions that in Sweden where he works it is common to have high trust in collaborations but that it might not be similar in other countries and that this has to be taken into account.

The IT Project Manager states that it is less challenging to deal with countries that have more cultural similarities, such as European countries or North America. The IT Project Manager states that implementation of a solution in some countries might need some adjustments in business approach. He further explains that this could be due to misunderstandings regarding cultural behaviors, business hierarchy and work processes. The Factory Responsible explains that Chinese clients or partners doesn't use contracts as northern countries do, that there are underlying differences in meanings, behaviors and interpretations of dialogues. Although, the SKF SC 4.0 Project Manager states that Asia, Middle East and Africa are generally more open to try new concepts, but that they might not always be aware of what they're saying yes to. He further argues that it is difficult to recommend a geographical area to focus on and that SKF needs to be open minded for implementations everywhere. This is since the structure and aim of the project still is very unclear and that SKF may not stick to the working processes in the future as they are currently having. He mentions that working with areas that manages to communicate well in English is a good idea since it is then easier to sell the project, create understanding within the customers and to follow up on the progress. The Key Account Manager also argues that local modifications cannot be allowed in a too broad sense when scaling up a solution, since the different working processes will probably eventually branch out too much and it will be difficult to make joint changes.

The Factory Responsible argues that neither language nor distance is a problem, although culture, market structure, organizational setups and internal and external politics can be barriers when obtaining a collaboration across country borders. He states that in order to manage smooth implementations world-wide, SKF should create high-skilled local responsibilities during the implementation phase. An issue highlighted by the Supply Chain Consultant is that the broadband connection can be a problem when working with customers on some geographical locations. Customers with ADSL systems and poor broadband connection is difficult to cooperate with since IT systems require it to function. Poor screen resolution among customers' computers could also be a hindrance when working with SO99.

5 Analysis

In the following chapter, the analysis of this master's thesis will be presented. It is based on the theoretical framework and the empirical data of this report. Part one of the analysis aims to primarily address research question 1 where the main challenges of SKF SC 4.0 are analyzed. However, to answer research question 2, part one is used as a basis when forming a customer classification model. The customer classification model is conducted in order to provide SKF with a guidance for which customers to choose for SKF SC 4.0 collaborations, especially useful in an early state of commercialization of the solution.

5.1 PART ONE: Challenges within the Scalability of SKF SC 4.0

This part of the analysis is divided into five sections, which corresponds to the five main areas of challenges that has been identified in the empirical study and the theoretical framework.

5.1.1 Dealing with Project Management Issues

In this section, challenges within managing projects will be analyzed. In particular, it concerns the uncertainties in the SKF SC 4.0 and how to deal with customization issues.

5.1.1.1 Striving in an Uncertain and Confusing Project Environment

The project type of SKF SC 4.0 is a *first-timer* according to the Director of Logistics and Demand Chain. SKF, or any other comparable company, have never done anything similar to this initiative before and SKF are not certain of what the end-result will turn out to be in the future. A common root cause of problems in *first-timer* projects are fundamental uncertainties**,** which Maylor (2010) emphasizes. These are usually related to the process or the outcome. In the case of SKF, they are relatively certain of the outcome and what they want to achieve. The majority of the interviewees agree on the vision of SKF SC 4.0 and what they want to achieve. However, the uncertainties are instead directly related to the process and how they should achieve and deliver it. Looking at the four phases of project management that Maylor (2010) presents as the 4D model; Define it, Design it, Deliver it and Develop it, it is clear that SKF have defined the project but that the project design might not be sufficient enough. When this happens, the third and fourth phases of the 4D model become harder to succeed with.

The uncertainties regarding the design phase is today a challenge when looking at how to achieve scalability of a SKF SC 4.0 solution. However, since SKF still are in the beginning of the SKF SC 4.0 development and only finished two PoCs, there is no know-how for how a scalable solution could be formed yet. According to Maylor (2010, p.156), a common challenge is that "we don't know what we will find until we get there" and due to this, SKF cannot fully define what the solution will turn out to be in the future. During a project phase, where uncertainties are large and high work pressure among employees is common, it is important for SKF to not fall into *wishful thinking* (Maylor, 2010). This could be classified as a symptom of a used planning method that are not sufficiently robust, and it is important for SKF to be aware of this risk. A practical example is to set up milestones and strive to meet these.

The uncertainties of SKF SC 4.0 do not only include the design phase of the project, but the whole business plan. When not working with a traditional business plan like in the SKF SC 4.0 project, the normal processes gets fuzzy, which the IT Project Manager confirmed during the interview. The project might take longer time and cost more due to these uncertainties and in this way, the lack of a clear business case could potentially threaten the future of SKF SC 4.0. Normally, a work breakdown provides a modelling of the project process (Maylor, 2010). This is done in the PoCs but not clearly in the overall SKF SC 4.0 project. According to Maylor (2010), the estimation of a project planning is a key part. However, when doing a new and untested project such as SKF SC 4.0, the details are not certain enough to build a well-grounded business case to support the plan. Therefore in this case, SKF might not gain value from creating a business case on unrealistic guesses. This is what happened when an SKF Management Team said that 80 PoCs was to be done. According to the interviewees at SKF, this was not realistic at all and a number taken out of the blue, and it could be argued for that having more unsupported estimations like this is contradictory with an efficient way to run a project as SKF SC 4.0.

The Parkinson's Law says that "an activity will expand to fill the time available" (Maylor, 2010, p.159). Since the SC 4.0 does not have a clear business plan and time plan, it is possible that the actual time it takes to proceed with an PoC and SKF SC 4.0 expands. The IT Project Manager did state that he believes that the Volvo PoC had taken too long time to deliver and it might be possible due to lack of a real time plan. A challenge is to decide a reasonable timeline so that the SC 4.0 does not demand more time than necessary.

5.1.1.2 Determining the Degree of Customization

As earlier described, each customer integration into the SKF SC 4.0 solution is resource demanding. However, it is dependent on the degree of customization of the solution. The definition of a mass customization is "the process of delivering wide-market goods and services that are modified to satisfy a specific customer need" (Investopedia, 2018). However, SKF SC 4.0 is not dealing with the products and its marketing and manufacturing technique. It rather deals with the process of creating the products. Hegde et al. (2005) say a key factor is if a manufacturer can create higher customization levels without escalating costs. There is a trade-off between cost and customization (Safizadeh et al., 2000), and it should be discussed what the price of the SKF SC 4.0 implementation is allowed to cost for each customer integration. The IT Project Manager says that if the customer does not agree on the terms SKF set for the SKF SC 4.0, it might be better to not integrate the customer into the solution since it will be too resource demanding.

The opinion of the interviewees regarding customization differs to some extent, and there is a discussion whether how much SKF should adapt the solution depending on the customers' standpoint. The Supply Chain Consultant for example, suggested an 80/20 solution where 80 % should be fixed while the rest should be customized. Deakins (2015) is saying that customization in ERP system, which the SKF SC 4.0 solution will be, is great in a short-term since the customers' need will be fulfilled along the changes. However, in the long term it might be the worst way to solve a problem. Deakins (2015) continues saying changes in ERP systems

that initially seems small, often grows bigger. It creates complexities that result in high risk. It is quite clear that the degree of customization will be a challenge during the implementation of SKF SC 4.0 solution since customers have their own processes and systems. The Factory Responsible is not expecting the customers to just adapt to SKF. The Volvo Representative agrees that this could be difficult but highlight the importance of customers dropping some of their own principles and guidelines in order to create a solution together. This goes back to the relationship between SKF and its customers, and the better the relationship, the more trust does the customer have for SKF. In this case, the customer might be as cooperative as Volvo were when SKF wanted to initiate the Volvo PoC.

5.1.1.3 Balancing the Line Between a PoC and the Scalable Solution

In today's state, the strategy on how to execute PoCs and how to proceed after them is confusing to some extent, hence the difference between a PoC and how the scalable solution should be designed is unclear. Taking the Volvo PoC for example, in the start of the PoC the plan was to try out a concept and then close it down, in order to learn from it and get insights to the design of the scalable solution. In the reality however, the PoC wasn't closed down and it is now instead being developed for a continuous extension of the PoC into a set solution. This was not the plan in the beginning and it could be argued for that it might be more difficult to create a scalable solution from it since it might encourage customized solutions and this sort of solution developments might be costly in the future. When proceeding with the Volvo PoC, PipeChain will continuously be the system provider to the solution between SKF and Volvo. However, this could be a difficulty since another PoC might suggest another system provider. In this case, SKF have put themselves in a situation were they cannot provide the system to all three customer segments depending on previous decisions. In turn, one scalable solution will not exist due to this. In this case, SKF might jeopardize the future of having only one scalable solution. These actions SKF have taken during and after the Volvo PoC makes SKF in the risk of falling into a scope creep. This means that "the original purpose was subtly changed on many subsequent occasions until it no longer resembled the original concept (Maylor, 2010, p. 101). The scope and the results of the PoC do in turn affect the whole SC 4.0 solution. However, several interviewees mention that only one solution for all customer segments might not be possible, although, this conclusion cannot be drawn before more PoCs have been finalized and SKF have enough data to make a decision.

5.1.2 Managing Internal Relationships

In order to succeed with the upscaling of SKF SC 4.0, there is a must for all departments within the organization to be involved in the transformation. Due to experiences from the PoCs, the majority of the SKF employees involved in the SKF SC 4.0 state that engagement from all parts of SKF is a must. Getting everyone on-board is also one of eight parts of Kotter's world-famous theory in change management. In order to create incentives for all individuals at SKF and know what must be achieved for change in order to be successful, the ADKAR model created by Jeff Hiatt (Prosci, n.d.) could be used. It explains five different states, awareness, desire, knowledge, ability and reinforcement, which are parts of the individual's journey through change (Prosci, n.d.).

In order to be able to sell the project in the first place, a desire to change among the participants needs to be created and therefore an awareness of the outcome of the change needs to be communicated early. This is critical for the change (Prosci, n.d.). In the PoC, the Director of Logistics and Demand Chains has been careful with communicating details about the expected outcome for SKF SC 4.0 until results have been proven. This to avoid high expectations, which he believes could be good in a PoC phase. In the case of scalable solution on the other hand, the SKF SC 4.0 project team needs to create higher degree of awareness of the business reasons for the change. Important to note is that companies often don't change due to an own desire and want, instead they change because they often are forced to due competition, customers and advances in science and technology (Rick, 2014). The company transformation means transformation for its employees since it could imply changing the way of working, cutting work assignments etc. Kotter (1995) explains that a company can't expect their employees to mindlessly convert to new changes solely by sharing information about it in one direction. Instead, an organization needs to be open to feedback and be ready to discuss the changes. This goes in line with the reasoning from the Key Account Manager, saying that an informing video posted on the intranet is not enough to convince the employees of the benefits of the project. For such a huge and global company like SKF, it could be tempting to only discuss changes at top management level and not include all levels of the company, which could be harmful since it could be argued that real change happens at the bottom of an organization (Aguirre et al., 2014). "What's in it for me" is a common phrase used by several SKF employees, and it is vital for SKF SC 4.0 project to explain that to all involved parts.

Ribeiro et al. (2016) say that when and if separate parts of a company fail to work together with a shared mission, transformation efforts often do the same. The ground cause is silos within the company. As explained in the theoretical framework, silos can exist in specific job functions, be geographic or knowledge-based, and in many industries, silos enhance the productivity (Ribeiro et al., 2016). However, in organizational transformation, silos are opposing change since it unable communication between departments. Ribeiro et al. (2016, p. 6) also state that "a common example of silos slowing down change can occur when a company moves to a new digital platform". In the case of SKF SC 4.0, the IT Project Manager mentions that silos are a challenge due to local priorities and initiatives. It is easy to focus on improving your own department and its goals, but that might not be the best for the overall company. The challenge might be even bigger for a large and global company like SKF, since the bigger the company are, the more harmful are the silos (Rick, 2014).

Reducing the silos and managing to get all the employees involved is not the only challenge. Finding the right person for the job driving the transformation is as important. The SC 4.0 Project Manager highlights the importance of a *champion* and said that during the PoC, the transformation would not be possible without them. Huynh (2017) writes that it is a need of finding an owner of the project, and perhaps someone that is already involved in the subject and is able to coordinate everything that will happen and oversee it. Without the *champion*, inefficiencies are at risk and could lead to disruption. In the Holmen PoC, not only the project leader acted as a champion, the Key Account Manager played a vital role for driving the pace

and success of the project as well. The importance of a strong relationship for this kind of project has been highlighted earlier, and to achieve this, it could therefore be argued for that not only the project leader needs to be a *champion* but also the employee that holds the main contact with the customer. Today, it is not clear how these roles should be formed and what responsibilities they should bear since the project currently is in its PoC phase and it therefore remains to be decided.

5.1.3 Managing External Relationships

This subchapter highlights challenges regarding customer relationships. First, the importance of building strong relationships and communication of customer value is analyzed, followed by how SKF is up for challenges with intermediaries in the SKF SC 4.0 solution.

5.1.3.1 Building Strong Relationships and Communicating Customer Value

Evident from the empirical findings is that both SKF and external parts involved in SKF SC 4.0 is aware of that there is a lack of communication and conviction of what value customers will gain from the solution. What has been emphasized is also that the SKF SC 4.0 is a two-way solution aimed to benefit all parts involved. The empirical study also shows that several of the customers experience a lack of communication of the expected customer value and that SKF focus more on what value it will bring them instead of the customer. When implementing an SKF SC 4.0 solution, a strong relationship between customers and SKF has also been shown to be of high importance. Sverull argues that the reason for joining a PoC with SKF is mainly due to the strong relationship with SKF. Sverull also states that the incentives to join without this relationship would be low since there were few obvious benefits expressed in the project proposal. These features can be attributed to the arguments of Hoyt and Huq (2005), which are that having a collaborative relationship based on a win-win situation is beneficial for both parts in a long-term perspective, and that mutual trust is the key for it to work.

With this in mind and from the empirical results it is clear that a strong relationship with customers and an ability to communicate customer benefits is critical to be able to reach a broad customer base and to create an industrialized, scalable solution. One possible way to approach this challenge suggested from the SC 4.0 Project Manager is to have so-called *champions* involved in the selling phase and the implementation. In this case, in addition to the definition stated in the theoretical framework, this refers to an SKF representative that has good cognizance and knowledge of certain customers. These *champions* would have greater insight in the characteristics of the customer and the strength of the relationship than any other SKF employee.

5.1.3.2 Dealing with Changing Intermediary Roles

As can be found in the empirical study, both the representatives from the distributor Sverull and from the end-user push that SKF aren't clear on what value the intermediaries will gain from SKF SC 4.0. Sverull joined the PoC due to the close relationship between them and SKF and stated that they would have been more doubtful to join this type of collaboration without a strong relationship. Sverull also argued that SKF needs to improve the communication of

distributor value to be able to convince other customers to join in on the solution. Some interviewees fear that it could be difficult to engage those distributors that operates between SKF and an end-user in the future, due to the uncertainty of their future role in the collaboration and a fear of being excluded completely. The empirical study also shows that the uncertainty doesn't only lie within the customers, SKF has different opinions on what the distributors' roles will be in the future of this project as well. The Director of Demand Chain believes that the distributor should be eliminated long term, while the Director of Logistics and Demand Chain stated that they will play an important role in the future, although the role of a distributor will probably take a new form.

It becomes clear that for SKF to be able to lead the project forward and to understand how to sell the future scalable and industrialized SKF SC 4.0 solution to distributors, the roles and values of the intermediaries need to be clearly stated and communicated. In a selling phase it is also evident that SKF needs to be able to sell the solution without a strong relationship to lean back on. This is dependent on their ability to communicate both what value the distributor gains from it but also what SKF themselves will gain from using intermediaries. This can be attributed to the gaps between producing companies and consumers explained by Jonsson and Mattsson (2013). It is explained that these gaps need to be filled in order to reach the four fundamental supply chain benefits, as described in the theoretical framework. The authors further state that this needs to either be accomplished by an intermediary, or else by another actor in the chain or the producing company itself. It can be argued for that SKF should investigate in what distribution structure is most efficient for them. The interviews indicate that the discussion of the intermediaries' importance is sensitive due to long historical relationships, although on the other hand some project members don't seem to be clear on what value the distributors actually bring to SKF. It can be seen as vital for the company to clarify this, both for the customers' and the company's gain. Both the SC 4.0 Project Manager and IT Project Manager argued that SKF neither can nor want to provide the variety of products and services that their distributors do today, which according to them indicates a further purpose of intermediaries. This goes in line with the arguments of Jonsson and Mattsson (2013), that one intermediary role that is foreseen to have a growing importance in the future is intermediaries acting as consolidators. It can hence be argued for that distributors can be value adding to SKF since it is common to strive for supplier base reductions and customers might therefore choose suppliers that provide a big variance of products and thereby fulfill several purchasing needs. To capture these customers, it could be a vital strategic choice for SKF to remain their relationship with distributors. On the other hand, Jonsson and Mattsson (2013) argue that an increased information exchange could eliminate the need for intermediaries and handle functions of a distributor at lower costs, which could also be accurate in SKF's case. However, the role described by Jonsson and Mattson (2013), where intermediaries act to provide technical support and other services, could be a value adding purpose of the intermediaries. This especially for a large and geographically spread company like SKF in order to easily achieve high customer service across far distances.

5.1.4 Coping with IT and Data Management Challenges

This subchapter involves an analysis of challenges with IT and data management. Communication of directives from management to the IT department is handled first, where the

importance of finding customers with the right data quality is discussed next. Lastly presented is an analysis on the willingness to share data among customers.

5.1.4.1 Managing a Lack of Directives to the IT Department

The empirical study indicates that many of the challenges regarding SKF's internal IT- and data management are related to project management issues. As earlier mentioned, the SKF SC 4.0 initiative is of an iterative nature where strategic turns of the project are common. This makes it difficult for the IT department at SKF to develop a solution based on unclear directives, which can result in poorly allocated project resources and time. It is understandable that in order to reach a future scalable state of the SKF SC 4.0 solution, the IT department will need to receive clear directives from the project management team. It is also clear that another challenge for SKF lies within prioritizing time to the SKF SC 4.0 project even though other IT improvement projects, such as SKF's current SAP implementation, runs in parallel with it. The IT Project Manager mentioned that SKF's policy is to not update old systems. This could be problematic when developing an SKF SC 4.0 solution based on these old systems, which probably can slow down the progress of the project.

5.1.4.2 Finding Customers with the Right Data Format

As Fiala (2004) states, today's trend for specializing firms in a network and interdependent relationships makes it highly important for companies to collaborate. As is demonstrated in the theoretical framework it is vital to share information between local and global business partners to coordinate actions, reduce uncertainty and improve efficiency. To benefit from the perks of information sharing and to be able to set up a smooth information exchange with a broad set of customers, SKF need to overcome some barriers. Highlighted by interviewees are that a challenge is to find customers with the ability to deliver data in a format manageable by SKF. The data also needs to be of the right quality and in real-time. The Supply Chain Consultant suggested that before starting up a PoC collaboration with a customer, SKF should perform a short investigation of the IT maturity of the customer. When the IT maturity is approved by SKF, this would result in a smooth PoC collaboration. This idea could be appropriate for the future scalable solution as well, where SKF could set standards on what data criteria to fulfill before beginning collaborations with customers.

5.1.4.3 Approaching a Lack of Willingness to Share Data

Other findings from the empirical study is that what might be standing in the way of accessing information from customers is the willingness and ability to share it, which is seen as a critical factor for achieving a scalable solution among the interviewees. This opinion can be strengthened with the arguments of Houng Tran (2016), which is that the willingness to share data is central to reach completely satisfied end-customers and to minimize total costs of the supply chain. In other words, to lower costs, raise service levels and achieve a scalable solution, it is critical for SKF's customers to be willing to share their data. The success of SKF SC 4.0 can also be linked with what Du et. al (2011) state, that to achieve a successful collaboration it requires trust, commitment, partnership coordination, joint problem solving and communication quality between exchanging parts, and this can only be achieved through a

willingness to share data. It is evident that data sharing is a prerequisite for the future of SKF SC 4.0. The Director of Logistics and Demand Chain argues that the willingness to share can differ depending on what customer segment they belong to, where OEMs are expected to be the least complicated to receive data from. This is mostly because OEMs generally are more used to IT-system set-ups, where the automotive industry has long experience with working with EDI and other digital solutions. As mentioned in the analysis under section 5.1.3.2, intermediaries that lie between SKF and end-users could fear of their future purpose in the supply chain, and therefore not be willing to share data. This which can be attributed to what Huong Tran (2016) states, that fear of sharing information often involves security risks, reliability and competitive inferences. The empirical study also shows that multi-brand distributors could show resistance in sharing data with SKF, since opinions could be that they don't want to favor any suppliers, or that they don't see the purpose of sharing information with SKF. End-users that purchase SKF's products via intermediaries could be affected by the intermediaries' lack of willingness to share, although if end-users directly purchase orders from SKF, the willingness to share data could be higher.

Hingley (2005) argues that a strong relationship between two parts strengthens features such as mutuality, trust and collaboration among them. As information exchange is a fundamental building block for a successful business relationship, the existence of willingness to share data is vital. SKF has PoC collaborations set up mainly with partners with a strong relationship to lean on, which could be seen as a reason for the success of the existing PoC collaborations. When scaling up the SKF SC 4.0 solution to customers without a well-established close relationship, the willingness to share data could become a larger issue for SKF to deal with.

5.1.5 Handling Geographical and Cultural Differences

The empirical study shows that there are some worries that geographical and cultural differences could be a challenge in the future when implementing the industrialized version of SKF SC 4.0. Although, the challenge has been emphasized as rather small compared to other challenges regarding the scalability. As earlier mentioned, it is common for companies today to have globally spread business networks and SKF is one of them, having many years of experience with international business. As Johansson and Vahlne (2009) argue, having strong national and global relations to business partners is a key factor for success in this context. What the authors also mention is that the larger the psychic distance is between business partners, the more difficult it is to establish a relationship. This factor could interfere when collaborating with customers from foreign markets. It can therefore be appropriate for SKF to have this in mind when choosing what customers to begin collaborating with in an early phase of the industrialization of SKF SC 4.0, when the company is still inexperienced on the area. The IT Project Leader experiences European countries and North America as being less challenging to collaborate with due to many cultural similarities, which is an indication of a perceived short psychic distance. Although, the SKF SC 4.0 Project Manager perceive Asia, Middle East and Africa as generally more open to trying new concepts, while adding that these customers may not always be aware of what dedication they sign up to. It could be argued for that SKF should consider these factors before starting to collaborate with a customer in a foreign market.

The Factory Responsible mentioned that when rolling out an implementation, SKF needs to have physical presence at the location, and it is understandable that this may be difficult in the beginning of the industrialization of SKF SC 4.0. This since the most knowledgeable and experienced staff is currently located in Gothenburg, Sweden, and it could be difficult to relocate this staff internationally from a time and resource perspective. Although it could also be argued for that once SKF has more experience from implementing SKF SC 4.0 to many different customers and when working routines and standards has been set, new implementations may be achieved quickly without a need for relocations of staff during longer periods of time.

Johansson and Vahlne (2009) state that when starting a collaborative relationship in a foreign market it is beneficial to have *insidership*. Having human resources with insight in the foreign market could help reduce the psychic distance and create a smooth collaboration between SKF and customers. These employees can share useful information about the market, deal with relational issues and establish relationships with the customers. This could be a way for SKF to gain *insidership* and hence simplify the establishment of a strong relationship in order to create a foundation for an easy SKF SC 4.0 implementation.

Well agreed on among the interviewees is that SKF will need to be open-minded for implementations in any geographical areas, and what is worth mentioning again is that geography and culture is considered to be a small challenge. Although, seen in the empirical study is that it is considered to be easier to communicate and sell the solution if customers can communicate in English. Also found from the empirical study is that a prerequisite for a smooth implementation of the solution is that customers need to have broadband connection and a screen solution on their computers that can handle the information exchange. Managing language translations and updates of the solution can also be seen as an inhibitory factor for a standardized SKF SC 4.0 solution, since SKF collaborates with many countries with different languages. The SC 4.0 Project Manager believes that this could generate misinterpretations of the system and that this would disturb the information flow.

5.2 PART TWO: A Customer Classification Model

In this chapter, a customer classification model has been conducted in order to guide SKF when choosing what customers that are the most appropriate and profitable to integrate into the scalable solution in a future state. There are several factors that affect the appropriateness of a customer integration and therefore, this model has been developed. It has partly been derived from the empirical findings and the analysis of the challenges within the scalability of SKF SC 4.0, but also takes other circumstances into consideration that affect the easiness of the customer integration. The model is presented in figure 5.2, followed by two sections where the included factors and meaning of the score results are presented. Lastly, a handful of SKF's customers have been graded to demonstrate an exemplification of the model's function.

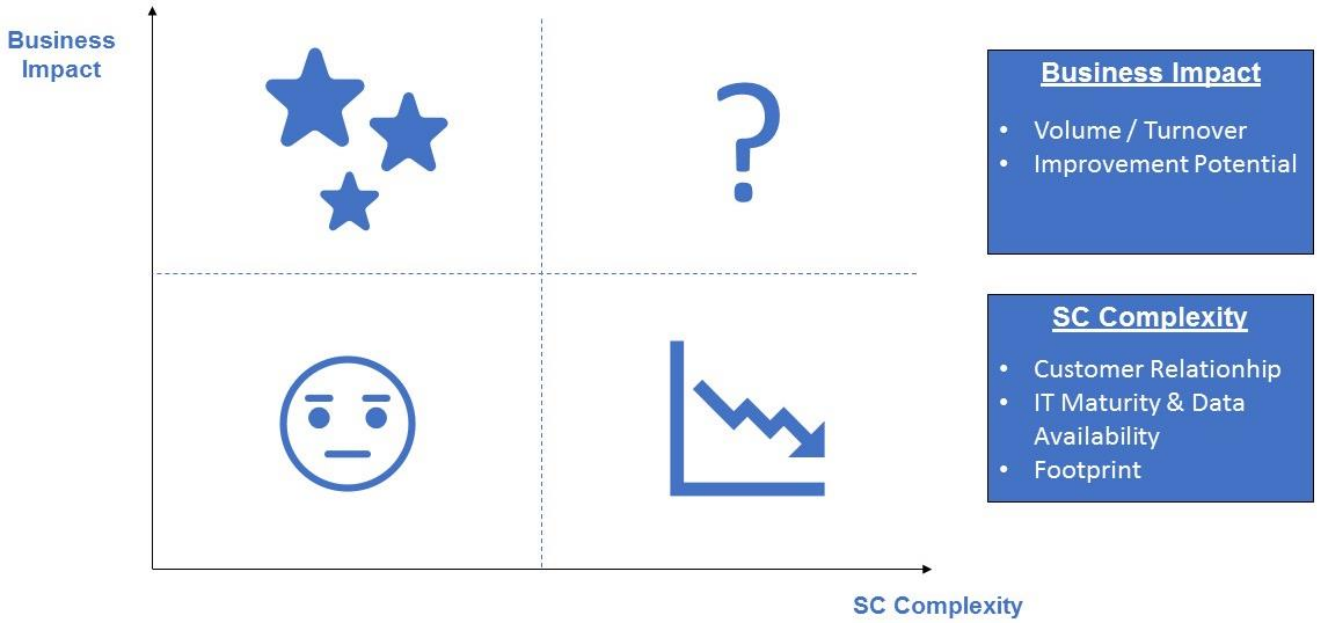

Figure 5.2. *The Customer Classification Model*

5.2.1 The Factors of the Model

The y-axis of the model represents the *business impact,* where this factor includes two parameters; *Volume / Turnover* and *Improvement Potential.* These parameters can each be graded on a scale of 1-10, where a high mean value for these parameters leads to a high y-axis position. This implies a positive *business impact* on SKF's business. The x-axis of the model demonstrates the degree of complexity the collaboration would imply, the *SC complexity*. The parameters forming this factor is *Customer Relationship*, *IT Maturity and Data Availability* and *Footprint*. The score grading system also applies here, however in contradiction to the y-axis, a low value on the x-axis is preferable. This because a low mean value indicates low complexity of the integration process and a high mean value indicates high complexity. In summary, a high value on the y-axis and a low value on the x-axis is therefore ideal characteristics of a customer to strive for. An explanation of the factors on each axis are further on presented.

Business Impact

Volume/Turnover: Evident from the empirical findings is that due to economies of scale, a customer with large purchases from SKF has a positive *business impact*. A large grading number on this scale therefore implies a positive *business impact* for SKF.

Improvement Potential: If the cooperation between SKF and a customer has friction and can be perceived to have potential to improve through the scalable solution, an SKF SC 4.0 collaboration is beneficial from this aspect seen. This is deduced from the empirical data, where improvement potential has been highlighted as an important factor to consider when choosing SKF SC 4.0 customers. A customer with large improvement potential is therefore valuable for

SKF and the customer. This was the case in the Volvo PoC, where Volvo accepted the invitation to join SKF SC 4.0 partly with hopes to ease friction from the previous collaboration. Apparent from the empirical study, improvements in KPIs, stronger relationships and future monetary savings could be the result of SKF SC 4.0.

Supply Chain Complexity

Customer Relationship
This parameter describes the complexity a customer relationship brings to a collaboration. As can be seen in part one of the analysis, strong customer relationships is a key for success in SKF SC 4.0. A high grading number in this model indicates a complex relationship. The parameter includes the level of trust and perception of the relationship, but also the customer's unwillingness to fully engage in a SKF SC 4.0 where data sharing is one example. The parameter also takes the need of customization into consideration as well as the psychic distance between a customer and SKF. The latter one has often been highlighted to have rather small negative impact by interviewees, but since it still could implicate some difficulties, it can be argued for as relevant to include in the model.

IT Maturity and Data Availability
In order for the solution to work smoothly, the data exchange between a customer and SKF needs to be managed properly. As discussed in part one of the analysis, data quality is important for the success of SKF SC 4.0. Customers with unstructured or manual management of data, incorrect data format or inability to reach real-time data exchange implies complexity in the integration process. This could be due to old and inert data systems that are more difficult to integrate with the solution. One goal of the SKF SC 4.0 initiative is for SKF to access data points earlier upstream the customer's supply chains which enables SKF with better material for planning production and deliveries. If this can be reached, SKF can generate more value from the solution. A high grading number on this parameter indicates poor IT maturity and data availability within the customer, and results in a possibly more complex collaboration.

Footprint
This parameter demonstrates the complexity derived from the infrastructure, or footprint, between a customer and SKF. As the empirical results imply, a collaboration demands integration of multiple connections and nodes, for example warehouses and factories, it indicates high complexity. With a large size of a company, complexity tend to increase and these companies can become inflexible and suffer from a slow-paced business environment. A collaboration with companies having these characteristics can become more complex when inflicting a transformation such as SKF SC 4.0. These aspects together formulate the footprint parameter, where a high grading indicate a complex footprint.

5.2.2 Meaning of Score Results
In this section, an explanation of each square in the customer classification model is described. It will also give an indication on what companies SKF should strive to integrate into their SKF SC 4.0 solution.

Upper Left Square - the *Stars*

Companies that end up in the upper left square are the *Stars*, which are the most beneficial companies to integrate into the SKF SC 4.0 solution. The business impact is strong and SC complexity is low. *Stars* are the companies SKF should strive to integrate into their SKF SC 4.0 solution.

Upper Right Square - the *Question Marks*

Question Marks are the customers placed in the upper right square. These have potential to highly positive impact SKF's business, however, these companies are more complex to integrate compared to the *Stars*.

Lower Left Square - the *Average Joes*

The companies within the lower left square is called the *Average Joes*, and their characteristics are that it neither makes a remarkable business impact, nor inflicts SC complexity on the collaboration. One could argue that integration of *Average Joe*s doesn't add significant value in an early state of SKF SC 4.0.

Lower Right Square - the *Non-Profitables*

The companies called the *Non-Profitables* are the ones ending up in the lower right square, and these are the companies SKF should avoid to integrate into the SKF SC 4.0 solution. This is due to low *business impact* while the SC complexity still is high.

5.2.3 Applying Example Companies to the Customer Classification Model

In this section, six different customers, two from each customer segment, are applied to the model to demonstrate examples of how real companies can be scored and placed in the model. As earlier described, the score system is based on the two factors *business impact* and *SC complexity*, constituting the two axes of the customer classification model. In a so called score table, the companies' characteristics and the basis of the scores are presented. This is demonstrated for *Company 1* in table 5.2, whereas the other five companies can be seen in Appendix *1*. The score system, including the appointed grades of the example companies, has been approved and partly co-developed with the Director of SKF Business Consulting and the SC 4.0 Project Manager.

Company 1		**Grade**
Company Characteristics		
Customer Segment	OEM	
Industry Type	Automotive	
Business Impact		
Volume/Turnover	Medium/large customer to SKF	7
Improvement Potential	Collaboration & many KPI's could be improved	6
	Placement on y-axis	**= 6,5**
SC Complexity		
Customer Relationship	Very good relationship to SKF	2
IT Maturity & Data Availability	Very good IT maturity and data availability	2
Footprint	Medium-sized footprint	4
	Placement on x-axis	= **2,7**

Table 5.2. *A Company Score Table*

The six exemplified customers are applied and presented in the customer classification model demonstrated in figure 5.3. This model provides SKF with indications on what types of customers should be prioritized when scaling up the SKF SC 4.0 solution.

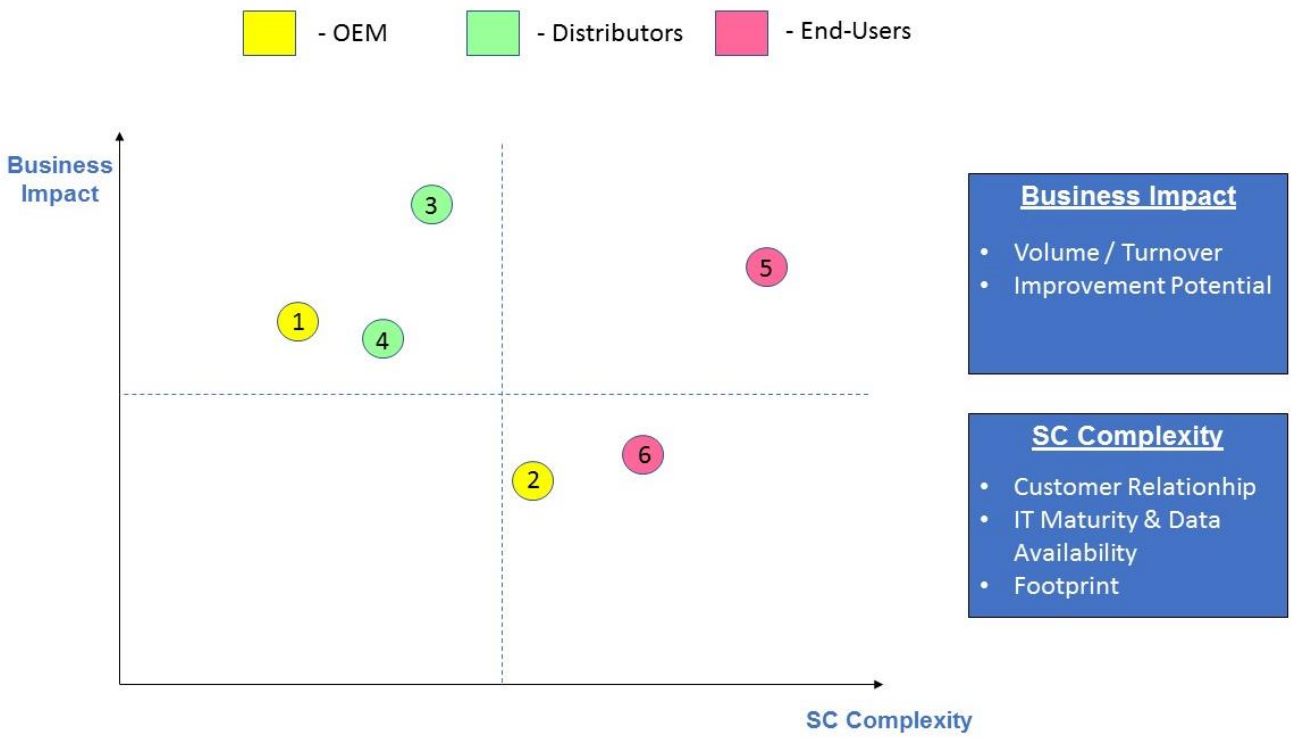

Figure 5.3. *The Customer Classification Model Including Applied Example Companies*

6 Discussion

In this section, the outcome of the customer classification model will be discussed followed by a short briefing on the authors' recommendations for further studies and development.

6.1 The Customer Classification Model

It is evident that there are many different factors that influence the success of a SKF SC 4.0 collaboration with a customer. For SKF to succeed with scaling up the solution, the company needs to target the right customers at the right time. Meant by this is that in the beginning when the PoCs have transformed and resulted in an industrialized solution, SKF will enter a new phase without much experience of implementing the scalable solution. Therefore, SKF should target the low hanging fruits, the *Stars*. As can be seen in the customer classification model, these have high positive business impact and low SC complexity, and should be relatively simple to collaborate with in an early phase. SKF should gain insights and experience from these collaborations to be able to later on manage the Question Marks, which are the customers with higher SC complexity compared to the Stars. When experience has been gained, the complexity of the *Question Marks* hopefully will be seen as diminished and the company will be able to handle more difficult integrations. There are potential within the *Question Marks*, however, SKF need to be careful before taking action for integration of these customers since the high SC complexity could negatively affect monetary and time resources of the integration. The *Average Joes* indicates less difficulty to integrate, however in an early phase these should be prioritized after the *Stars* and the *Question Marks* since the business impact is low and SKF won't gain remarkable value from this type of integration. In a future state when SKF has efficient routines and working standards for the scalability of SKF SC 4.0, the *Average Joes* might be even less complex which could speak for an easy integration process. Even though the business impact is low from these customers, SKF might gain value from using SKF SC 4.0 as a standard to all customers. However, the *Average Joes* are not recommended to prioritize. The *Non-Profitables* is from today's point of view not valuable enough to consider. SKF are today in a planning phase of a new PoC with *Company 2*, one of the companies that has been applied to the customer classification model, see figure 5.3. According to the model, the company has been classified in the category *Non-Profitable*s. SKF have chosen this customer as a PoC to gain new perspectives and this might be an insightful PoC, however it is not recommended as a target customer in an early phase of the industrialization of SKF SC 4.0. The reason for this can be explained by Kotter's eight step model for leading change, seen in section 3.2. One step for successful changes is to generate short wins, and this opposes aiming for *Non-Profitables*. However, the grading scores are not rigid thus the scores can change over time. If for example a *Non-Profitable* becomes a larger customer over time, the business impact will increase and the customer can transform into a *Question Mark*. Due to this, the model should be applied and used consequently to update the appropriateness of customers.

Due to the analyzed challenges, it could be discussed that the end-users with included intermediary, generally will be the most complex type of customer segment to apply to the SKF SC 4.0 solution. Those customers will probably end up in the right side of the model. In contrast to end-users, both OEMs and distributors are more difficult to generalize when it comes to the

placement in the model. OEMs from the automotive industry are generally easy to collaborate with due to long experience within digital solutions and will therefore probably most often be seen as *Stars*. However, non-automotive OEMs risk to imply more complexity. Big differences within a segment also exists within the distributor segment, since SKF collaborates with a wide range of distributors in terms of size. The size affect both the *Business Impact* and the *SC Complexity* of a distributor, and the placements in the model can hence differ widely.

6.2 Future Studies and Development

As described before, the thesis's aim and research questions has been concerning a future state, and the created customer classification model aims to provide a guidance for this. However, further on in the process of SKF SC 4.0, it could be of interest for SKF to develop and expand the model. Some of the factors and parameters that form the model today may be exchanged or further extended. The current model is simple to use and an idea for further development could be to enable the factors and/or parameters with individual weights in the score system to increase the reflection of the real-life situation. The parameters could even be divided into the smaller segments that they are built upon today and then score these with different weights. A suggestion of this is that psychic distance may weigh less than the customer's unwillingness to fully engage in SKF SC 4.0. These weights could be updated depending on what the situation looks like and what influences the SKF SC 4.0 solution during the time of the use. In order to further develop the customer classification model, SKF needs to continue the PoCs to be able to learn and gain insights from them. In this way, a first prototype of a scalable solution can be created, hence the model can be tested and updated according to identified improvements. A further development should also be to create guidelines on how the parameters should be scored in the model in order to create a consistent and standardized score system. This way, the risk of misinterpreting the score system of the model can be diminished.

7 Conclusion

In this chapter, the conclusion of this study will be presented. This is demonstrated through a division of the two research questions of this master thesis.

RQ1: ***What challenges are most valuable for SKF to primarily address and use as a starting point when building a successful scalable solution?***

The challenges within SKF SC 4.0 that has been identified during this research study has been divided into five subject areas; *Dealing with Project Management Issues, Managing Internal Relationships, Managing External Relationships, Coping with IT and Data Management Challenges* and lastly *Handling Geographical and Cultural Differences*. Within each subject area, identified challenges are presented.

1. Dealing with Project Management Issues

Due to the characteristics of the SKF SC 4.0, creating a clear business plan is a difficulty. The project is an iterative initiative with no clear answers and this creates a great amount of uncertainties. A challenge for SKF is how to cope with these uncertainties and learn how to work in an explorative and new project environment. SKF are big and global, and have standardized processes on how to cooperate between business and IT perspectives. These processes have historically been well-functioning, however with these new project characteristics the routines need to change. This is a barrier that needs to be overcome.

Another challenge within the project management area is what degree of customization should be allowed with each customer. Since the initiative involves a wide range of customers with many differences, the solution must be customized to some extent. However, it is a challenge to decide the appropriate degree of customization. There is a need for a balance between a scalable solution that is applicable to all customers and a more customized solution which is more beneficial for each individual customer. The later one is however more costly and will make the system more complex, which could negatively impact the solution in the future.

Thirdly, SKF needs to be more clear on what distinguishes a PoC from the scalable solution. In order to succeed with the goal of creating a scalable solution, customizations and adjustment too early in the project phase might hinder a future solution. Since it today isn't clear what the future solution will look like, it is important to keep all the options open and not limit the design in a too early and uncertain state.

2. Managing Internal Relationships

In order to create a climate for change and succeed with the transformation within SC 4.0, SKF are standing in front of a challenge based upon the ability to get all the employees involved. It is hard to accomplish this since people tend to be comfortable doing what they always have done. Creating a high degree of awareness of the reason behind the change is important. If all the involved people don't have the same mission and goal, the transformation is likelier to fail. In order to reach out to the employees, it is vital to not only share information, but instead,

confirm that it is received in the right way. It is relevant for the project management team to be open to feedback from different perspectives in order to create an open environment and be able manage change with all project participants on board.

During the SKF SC 4.0 transformation and SKF is shifting towards a digitized strategy it is important to avoid working in silos since it tends to enhance the productivity and oppose change. There is a risk for putting too much focus on local priorities and initiatives, and therefore it is important for SKF's upper management to remind employees to not only focus locally, but see the bigger picture and also prioritize SKF SC 4.0. Having the right person at the place is hereby vital. Since the project is a new and untested, there must be a local drive making sure everything follows the project plan.

3. Managing External Relationships

The importance of a well-established relationship in order to scale up the SKF SC 4.0 solution has been emphasized through this thesis. It is evident that SKF so far has collaborated with customers in PoCs where strong relationships already exist and a challenge that stands ahead is to figure out how to approach customers without this foundation to stand on. In such an uncertain project nature as this, it is today difficult for SKF to straightforwardly communicate what value customers will gain from the solution. Although without this communication, it is challenging to engage customers to participate at all. Evidently, SKF needs to find a way on how to communicate customer benefits and build strong long-term relationships. A suggested way to do this is to involve *champions* in both the selling phase and implementation of the solution.

Creating engagement can be especially challenging when it comes to intermediaries involved in the end-user collaboration due to a fear of being phased out of the supply chain, and to not fulfill any purpose for SKF in a future state. SKF should evaluate the purpose of their intermediaries and a possible conclusion can be that intermediaries will remain important for the company, but play a different role in the future.

4. Coping with IT and Data Management Challenges

Some challenges regarding IT and data management are connected to project management issues. The first challenge highlighted in the thesis is that the uncertainty and iterative nature of the project affects the communication of directives to the IT department on how the solution should be designed. This in turn creates inefficiencies and poor resource allocations. Moreover, in order to create a smooth information flow between SKF and customers, the essential data needs to be of the right format and quality. Finding customers under these conditions is not a given and in order to make sure that the collaboration has potential to succeed, a pre-evaluation of the potential customer and its data should be executed.

Information sharing is a fundamental building block of the SKF SC 4.0 and if customers are not willing to share their information with SKF, the solution won't work. Therefore, this challenge is vital to address. The degree of willingness to share data often depends on the customer segment, where OEMs, especially in the automotive industry, are expected to be the

most willing to share data due to the segment's generally high experience within EDI systems. Intermediaries in connection to end-users are expected to be the least willing to share data. The willingness to share data can be expected to increase with an increased strength of business relationship, hence the importance of building strong long-term relationships should once again be emphasized.

5. Handling Geographical and Cultural Differences

SKF is large with a globally spread business network and the company has intentions on spreading the SKF SC 4.0 solution throughout this network. To succeed with the implementations globally, SKF must be aware of the challenges that needs to be overcome in order to build strong business relationships. Long psychic distances can be one of these, which can be mitigated by having *insidership* in the specific market on each integration location. This challenge is important to have in mind in an early phase of commercialization, when choosing which customers to start collaborating with. Other factors that can simplify a collaboration in an early state is to ensure that communication in English is possible, there exists broadband connections and computer screen resolutions to support the information flows both ways. In addition to this, SKF needs to learn how to standardize efficient updates of the SKF SC 4.0 system across multiple languages to avoid misinterpretations.

RQ2: ***When integrating customers into the SKF SC 4.0 solution, what factors should be the basis of prioritization and further on result in a customer classification model?***

The factors that constitutes the evaluation of what customers to choose for integration into the SKF SC 4.0 solution are *Business Impact* and *SC Complexity.* Each of these factors consists of several parameters. Business Impact depends on the customer *Volume / Turnover* and *Potential Improvements*, in contrast to *SC Complexity* which depends on *Customer Relationship, IT Maturity and Data Availability* and *Footprint*. When a potential customer has been evaluated and graded according to a score system, it's placed in a Customer Classification Model, developed by the authors of this thesis. The model, which can be seen in figure 6.1, contains of four different square. Customers placed in the *Stars* should be the most preferable to target in an early state of the scalable solution since this indicates a high *business impact* and low *SC complexity*. The *Question Marks* can be seen in the upper right square of the model, which implies high impact on SKF's business but more complex to integrate. However, when SKF has more experience with SKF SC 4.0 integration, the SC complexity can potentially be lower. Therefore, the *Question Marks* could be interesting to evaluate as targets in a later stage. Customers placed with neither high *business impact*, nor high *SC complexity*, are the *Average Joes.* SKF is not recommended to focus on these due to low added value. Lastly, companies SKF should avoid integrating are the *Non-Profitable* since they are complex to integrate and have low *business impact*. The generated value from an integration of these customers would not be worth the effort spent. A conclusion drawn from the research is that the end-users probably will end up in the right side of the model and be more complicated to apply to the SKF SC 4.0 solution. In contrast to end-users, both OEMs and distributors are more difficult to generalize when it comes to the placement in the model. This is because these customers can often widely differ within each segment.

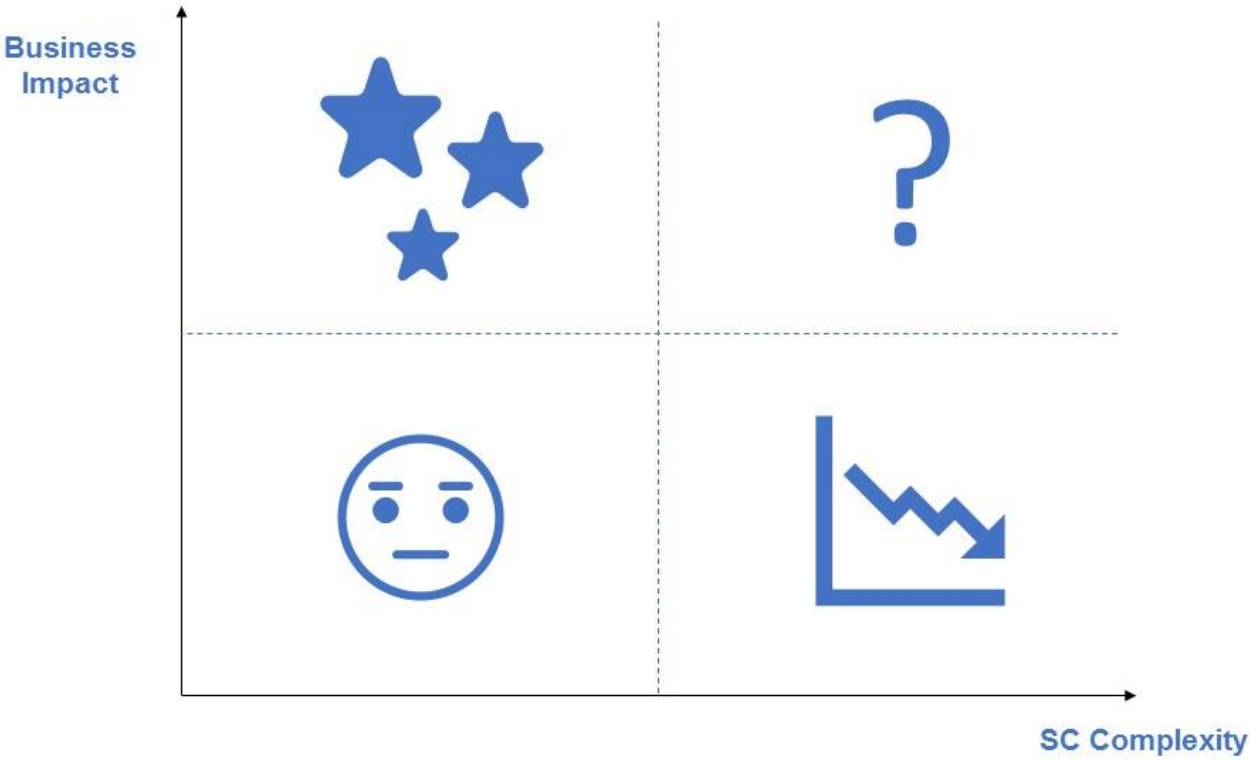

Figure 6.1. *The Customer Classification Model*

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Appendix

Company 2		**Grade**
Company Characteristics		
Customer Segment	OEM	
Industry Type	Industrial	
Business Impact		
Volume/Turnover	Small customer to SKF	3,5
Improvement Potential	Average	4
	Placement on y-axis	**= 3,8**
SC Complexity		
Customer Relationship	Good relationship to SKF	3
IT Maturity & Data Availability	Medium IT maturity and data availability	6
Footprint	Quite complex footprint	7
	Placement on x-axis	= **5,3**

Company 3		**Grade**
Company Characteristics		
Customer Segment	Distributor	
Industry Type	Global gigantic aftermarket distributor, world top 1	
Business Impact		
Volume/Turnover	Gigantic customer to SKF	10
Improvement Potential	Great potential for improved KPIs	8
	Placement on y-axis	**= 9**
SC Complexity		
Customer Relationship	Very good relationship to SKF	2
IT Maturity & Data Availability	Very good IT maturity and data availability	2
Footprint	Very complex footprint	8
	Placement on x-axis	= **4**

Company 4		**Grade**
Company Characteristics		
Customer Segment	Distributor	
Industry Type	Swedish distributor, world top 20	
Business Impact		
Volume/Turnover	Large customer to SKF	7
Improvement Potential	Average, but always things to improve	5
	Placement on y-axis	**= 6**
SC Complexity		
Customer Relationship	Tight relationship, long history	2
IT Maturity & Data Availability	Modern systems, good structure - good maturity	3
Footprint	Quite complex footprint, many nodes	6,5
	Placement on x-axis	= **3,8**

Company 5		**Grade**
Company Characteristics		
Customer Segment	End-user	
Industry Type	European industry customer, steel producer	
Business Impact		
Volume/Turnover	One of the biggest end-user customer	8
Improvement Potential	Great potential with more visibility	7
	Placement on y-axis	**= 7,5**
SC Complexity		
Customer Relationship	Quite bad, hard to create a tight relationship	8
IT Maturity & Data Availability	Very protective and low IT & data maturity	9
Footprint	Complex organization, quite complex footprint	7
	Placement on x-axis	= **8**

Company 6		**Grade**
Company Characteristics		
Customer Segment	End-user	
Industry Type	Paper-mill, Swedish part of the company is a SKF customer	
Business Impact		
Volume/Turnover	Quite small customer in relation to others	3
Improvement Potential	Decent, but big potential with more visibility	6
	Placement on y-axis	**= 4,5**
SC Complexity		
Customer Relationship	Quite bad, hard to create a tight relationship	8
IT Maturity & Data Availability	Very protective and quite low IT & data maturity	7
Footprint	Mediocre	5
	Placement on x-axis	= **6,7**