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Customer Adoption of Data-Driven Services:

A Model for Customer Prioritization

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I. ACKNOWLEDGEMENTS

This study has been carried out as a master thesis during the spring of 2018 at the Faculty of Engineering at Lund University (LTH). The thesis crowns and finishes our education in Industrial Engineering and Management at the university. It has been written in collaboration with Tetra Pak Processing Systems AB (hereafter referred to as TPPS).

This project has helped us apply what we have learned at the university in practice, and given us valuable insights and experience from the industry. It has also given us a chance to further increase our knowledge of the manufacturing industry and the food industry, as well as the area of after-sales service.

First of all we would like to express our gratitude towards TPPS for letting us write our thesis in collaboration with them and especially Fredrik Sagerstedt for all the support throughout the study. A huge thanks as well to the sales managers at TPPS that devoted time to helping us in the process.

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II. ABSTRACT

Title
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Background
In the latest years, developments in technology has created new opportunities within the area of after-sales services. Examples of such developments are the Internet of Things and Big Data, which can be used e.g. for predictive maintenance. Combined, the developments imply that there is potential gain for an OEM in using the IoT, Big Data and a transformed business model in their after-sales service offering. For OEMs operating within less mature industries it becomes of interest to explore these possibilities within their existing customer relationships. There are many aspects that need to be decided upon in this exploration, but one important aspect is which customers to begin with when developing and deploying the offering.

Purpose
The purpose of this thesis is to suggest a model that can be used by OEMs to find out which of their customers would most likely adopt data-driven service offerings.

Methodology
In order to fulfill the purpose of the thesis, a literature review was conducted to find out what affects a customer's interest in a data-driven service offering. The results from the review were then used to suggest a model that could be used by OEMs for customer prioritization. The model was finally applied in a case study.

Conclusions
The customers' interest in a data-driven service offering can be divided into two parts, which in this thesis are called Potential and Receptiveness. The former is based on the benefits the customer can get from implementing a data-driven service offering and the latter is based on factors affecting whether the customer is ready to adopt a data-driven service offering or not. These can be scored with the help of sub-areas and the scores can be used as a discussion basis for a prioritization of customers.

Keywords
After-sales service, Big Data, customer prioritization, data-driven services, Internet of Things, Original Equipment Manufacturer, Product-Service System, servitization

III. LIST OF DEFINITIONS

Big Data
Large amounts of data, e.g. collected via sensors, that can be analyzed in order to draw conclusions and among other things create predictive algorithms.

Data-driven services
Services offered by an OEM to its customers, made possible by gathering and analyzing data from the customer's equipment.

Original Equipment Manufacturer (OEM)
A company that produces equipment and parts used in manufacturing processes.

Performance-based contract
A type of contracting where the payment from the customer to the provider of the service is based on agreed upon performance levels.

Product-Service System (PSS)
Integrated solutions to enhance the product offering with services in order to increase the total value proposition.

Servitization
A trend in which manufacturing firms adopt more and more service components in their offerings.

The Internet of Things (IoT)
A new paradigm where things and objects can communicate and interact with each other using e.g. sensors and tags.

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1. INTRODUCTION

This first chapter starts with a background for and description of the problem the thesis will address, followed by the thesis's purpose, research questions, and delimitations. Finally, an overview of the disposition of the thesis is presented.

1.1 Background

Many companies have by now come to see and understand the value of after-sales service. The numbers on after-sales vary, but even though it on average only generates 24 % of a company's total revenue, it stands for 45 % of the profits (Viardot 2007). General Motors have even indicated that they generated more profit from their $9bn revenue in after-sales than they did from their $150bn revenue from car sales. For some B2B businesses, after-sales service can even represent up to 80 % of total revenues (Viardot 2007). This stresses the importance of having a strategy for the after-sales service offering. Despite this, examples can be found where companies have not realized that their service contracts do not cover the costs of carrying them out, or that they've been giving huge unwanted discounts (Bundschuh & Dezvane 2003). To summarize, there are large potential gains in a well managed after-sales service offering, and equally large potential losses in a badly managed one.

In the last few years developments in technology have created new opportunities for companies and their service offerings. One of the mentionable developments that has received a lot of attention is the emergence of what is called the Internet of Things (IoT). There are many definitions of the IoT, but de Senzi Zancul et al. (2016) define it as a new paradigm where things and objects can communicate and interact with each other using e.g. sensors and tags. An example of a great benefit with the IoT is that it can help generate and collect data from the sensors. Such collection of huge amounts of data is usually referred to as Big Data, which can be analyzed in order to draw conclusions and e.g. create predictive algorithms (de Senzi Zancul et al. 2016). These opportunities and technology can be used by original equipment manufacturers (OEMs) to create predictive models of the equipment's performance, which can be used to optimize the maintenance of them (Canizo et al. 2017).

In recent years, a new business model for OEMs has emerged. This business model transforms the business from supplying products to supplying a service instead. As an example, Rolls-Royce has transitioned from selling aeroplane engines to selling "power by the hour", meaning that the customers pay a fixed amount for each hour that the engines are used. In this offering, Rolls-Royce takes all the costs for the maintenance and support of the engines.

Combined, these developments imply that there is potential gain for an OEM in using the IoT, Big Data and a transformed business model in their after-sales service offering. By using these solutions to gather and analyze data predictive maintenance algorithms could be created, which can provide the customer with e.g. higher uptime and cost savings, for which the OEM can charge a premium, thus creating value for both parties.

In literature, there is not one agreed upon concept that unambiguously and fully describes these opportunities. There are however a handful closely related concepts that together cover the opportunities to a large extent. These have been used throughout this thesis to find literature that could be studied in order to answer the research questions. Therefore, the reader should be acquainted with them, which is why they are presented below. The offerings that could be developed from these opportunities will in this thesis hereafter be referred to as data-driven service offerings.

Product-Service System (PSS)

PSS is a concept that initially was defined by Goedkeep et al. (1999, p.18) as "a marketable set of products and services capable of jointly fulfilling a user's need". Since then several other definitions have been provided, e.g. by Colen and Lambrecht (cited in Alotaibi 2016, p. 26), who define PSS as: "integrated solutions to enhance the product offering with services to increase the total value proposition". In other words, the concept is a description of how an OEM bundles their product and their service. In later years, Baines et al. (2007) have introduced three different types of PSS mentioned in literature:

- Product-oriented PSS: Traditional selling of the equipment along with additional services such as maintenance, repair and training.
- Use-oriented PSS: The ownership of the equipment remains with the OEM and the customer pays for the amount of usage.
- Result-oriented PSS: The ownership of the equipment remains with the OEM and the customer pays for the performance level of the equipment.

The result-oriented type represents the most popular interpretation of PSS (Baines et al. 2007). Hereafter, the use of PSS will refer to this interpretation of the concept.

Servitization

Another important concept in understanding the business context of OEMs and their customers is servitization. It is defined as "a trend in which manufacturing firms adopt more and more service components in their offerings" (van Looy, cited in Huxtable & Schaefer 2016, p.47). Specifically for OEMs this means that they shift from supplying equipment to instead delivering the capability of the equipment and using their knowledge about the equipment to continuously improve this capability. Servitization often involves elements such as pay-for-use, long-term contracts, risk management and commitments to process improvements from the OEM (Baines & Shi 2015). Baines et al. (2007) argue that PSS is a special case in servitization, whereas the terms are used synonymously in other literature (Meier & Roy 2010). This stresses the close relationship between the two concepts.

Industry 4.0

Industry 4.0, or the fourth industrial revolution, is an expression that has been heard more and more in the last few years. It stems from a strategic initiative by the German government launched in January 2011 (Bartodziej 2017). The idea behind the concept was that there had been so many technical innovations in the recent years that these when used in conjunction would be able to spark a fourth industrial revolution. What characterizes this revolution is information and automation enabled by the Internet of Things. (Bartodziej 2017)

1.2 Problem Description

As can be seen in the background there are examples of industries where firms have been successful in using data-driven service offerings and have created an increased value for themselves and their customers. There are however also examples of industries where this development has not yet started. For OEMs operating within less mature industries in this regard it becomes of interest to explore these possibilities within their existing customer relationships. There are many aspects that need to be decided upon in this exploration, but one important aspect is which customers to begin with when developing and deploying the offering. The customers of an OEM can differ dramatically from each other, implying that some customers might be more eager than others to adopt data-driven service offerings. Therefore, it becomes relevant to prioritize between customers and identify which customers would most likely be interested in and benefit from exploring the new possibilities. Doing so requires an understanding of what factors could affect whether or not a customer adopts data-driven service offerings. The existing literature on this subject is generally more focused on examining the process of creating and selling data-driven service offerings from the OEM's perspective, describing benefits, challenges and key considerations for OEMs choosing this path, than it is on the customer's perspective.

1.3 Purpose

The purpose of this thesis is to suggest a model that can be used by OEMs to find out which of their customers would be most likely to adopt data-driven service offerings.

1.4 Research Questions

Given the problem description and the purpose of the thesis the following research questions were decided upon:

1. What are the potential benefits with data-driven service offerings from the perspective of the customer?
2. What other factors could affect whether or not a customer adopts data-driven service offerings?
3. How can the answers to 1 and 2 be used by OEMs to prioritize between customers when developing and deploying data-driven service offerings?

1.5 Delimitations

After-sales service

Realizing that IoT and Big Data open up for possibilities related to many areas of a firm's activities, this thesis is limited to the domain of after-sales service.

B2B relationships

This thesis is limited to the relationship between an OEM and their customers, a strict B2B relationship. Therefore, B2C relationships will not be investigated.

Data gathering and analytics

What exact data is to be gathered from the equipment and what analyses should be made in order to create a viable data-driven service offering will not be discussed, since this is a question that more or less could be made into a thesis in itself.

Technology

This thesis will not investigate or discuss the technical aspects of data-driven services. Problems and challenges with e.g. connectability, compatibility, reliability, infrastructure and security of the technology will not be discussed. Generally, the required technology is assumed to exist and will hence not be regarded as a barrier affecting the customers' interest in exploring data-driven services.

Contracting

Contracting is something that most likely will be changed with the introduction of new service offerings. That area needs to be examined closely in order to bring any viable results, but possible contracts can only be developed after the offering and after a relationship has been established with the customer. Therefore, it has been excluded from this thesis.

System perspective

Some of the possibilities with data-driven service offerings arise from looking at manufacturing plants as a whole, with a system perspective (Bartodziej 2017). Since this thesis is limited to OEMs, which might not provide all the equipment in a factory, it will also be limited to looking at the equipment themselves and not the factory as a system.

Customer owns the equipment

One of the possibilities with the new technological solutions, which has also been pursued in many industries, is that of the customer renting the equipment as a service instead of buying and owning it. This development has been used as input and inspiration, but the model that has been created in this thesis has been developed assuming that this is not yet a viable option in the situation where the model is to be applied.

Internal use

The tool is supposed to be used internally within the OEM's organization with data that is already available. This means that the OEM's customers are not to be involved when using the tool.

1.6 Disposition of the Thesis

The thesis starts with an introductory chapter that explains the background of the subject and a few relevant concepts, and contains a problem description, the purpose of the thesis, research questions, delimitations and the disposition of the thesis.

The next chapter describes the methodology used in the project. Here the work process and the method used are described in detail, along with motives of why these were chosen. The work process is first described as a whole and then in more detail for each phase of the process.

The third chapter describes the theory used in the thesis. This chapter has been divided as to first describe the benefits that can be realized for the customer with a data-driven service offering, then present the factors believed to influence a customer's willingness to adopt such an offering. Some theory on how a prioritization between customers is also presented. Finally, some example cases of companies that have implemented a data-driven service offering are given.

The fourth chapter describes the first hypothesis of what a customer prioritization model could look like. The chapter starts with a summary of the model, then describes how it was constructed and the parts of the model in more detail. Finally, how the model is intended to be used is briefly presented.

The fifth chapter describes the application of the model in the case study that was conducted in the thesis. This chapter starts with a description of the case company and organization, along with a discussion of why this company was chosen. Then follows a description of the operationalization of the hypothetical model into a tool that was made in order for it to be applicable at the case company, including who were involved in the scoring, what changes were made to the hypothetical model, and what scoring instructions were used. Finally, the application process and its results are presented.

The sixth chapter is an analysis of the results from chapter 5. The chapter starts with a description of the analysis structure, where three questions that are to be answered are posed. These are then answered.

The seventh chapter starts with a discussion of the analysis method and results. Then follows discussions of the usability of the applied model and then the general model. Next, the relevance of the areas in the model are discussed. The chapter is concluded with a discussion of the credibility of the thesis and its results.

Finally, the results from the thesis are summarized in conclusions in the last chapter. This chapter also includes a passage on whether or not the purpose of the thesis was fulfilled, a description of the academic contribution of the thesis, as well as directions for future research.

2. METHODOLOGY

This chapter explains the methodology of addressing the problem described in chapter 1. The chapter contains a detailed description of the work process, including considerations made along the way and the motives for the decisions made.

2.1 Summary of work process

The purpose of this thesis is to suggest a model for customer prioritization. Höst et al. (2006) suggest three general steps to follow in the process of creating a theoretical model, each with its own considerations that have to be made. The three steps are *model design*, *model implementation* and *model validation*. Model design includes decisions about delimitations for the model, what data to input to the model and what data the model should output. The abstraction level also has to be decided in order to avoid the model becoming too detailed or too abstract. Model implementation can consist of various things depending on the aim of the model. In this thesis the implementation step consisted of a case study where the model was applied. Model validation is supposed to conclude if the model generates reasonable results and that it describes the phenomena it models.

It is important to make sure that the credibility of the work meets a high standard. Höst et al. (2006) identify three areas of credibility that can be discussed. These are reliability (in the data collection with regards to natural variance), validity (if the correct systematic symptoms have been studied), and representativeness (that the conclusions are generalizable). These areas are important to remember throughout the whole work process, and have been used as guidance when making decisions.

The work process of this thesis has been designed based on the three steps suggested by Höst et al. (2006) and with the areas of credibility in mind. The following subchapters will in detail describe the work process of the thesis along with methodological considerations made in connection to the three steps. The full work process is visualized in Figure 1.

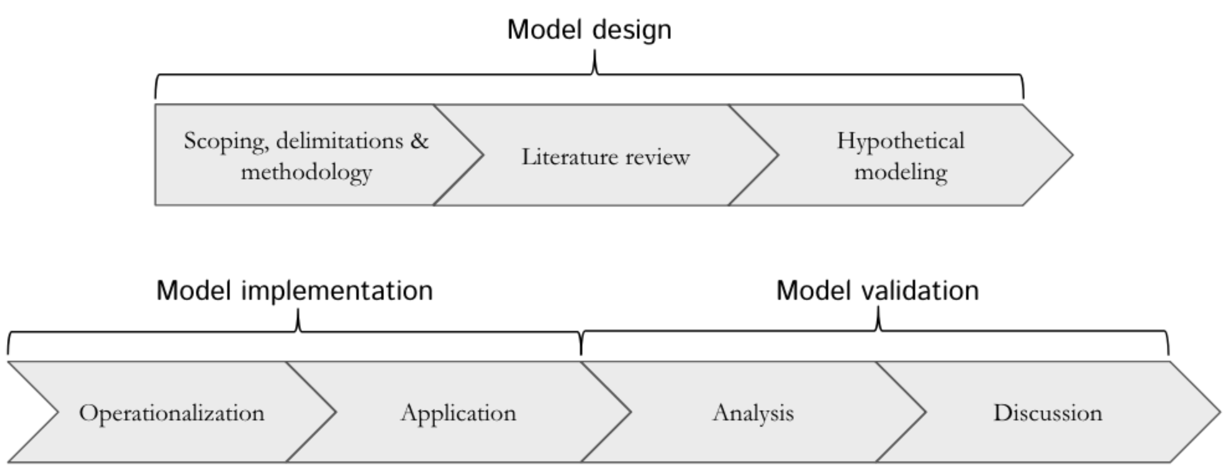

Figure 1. Summary of the work process

2.2 Model design

This section describes the work process and methodological choices made in connection with the model design. The model design was performed in three phases. First, the scope of the thesis along with delimitations and methodology was decided upon. Thereafter a literature review was conducted and finally a first draft of the model was created.

2.2.1 Scoping, delimitations & methodology

To explore the subject in general and get enough knowledge to establish a reasonable scope, an initial unstructured screening of existing literature was performed. This screening resulted in both motivating references confirming the relevance of the problem as well as relating references mapping out how this thesis would build on previous research. Research questions and delimitations were then formulated in dialogue with the supervisors from both LTH and the case company. The delimitations naturally followed from the case company's particular situation, but it was noted during the initial screening of literature that similar situations also exist in other firms, which further motivates the delimitations made. The input and output of the model were also decided upon in this phase. Given the purpose of the thesis, the methodology and work process elaborated on in this chapter were decided upon.

2.2.2 Literature review

The aim of the literature review in general was to increase the knowledge about what research has been performed and make sure that the model builds on previous research. More specifically it was aimed at providing a basis for answering the research questions by finding mentionings of the following things in academic literature:

- benefits that lead customers in the direction of purchasing data-driven services ex-ante as well as realized customer benefits from purchasing data-driven services
- factors affecting whether or not a customer customer adopts data-driven services, both enabling and inhibiting
- how one can prioritize between customers in general, or how models for such prioritizations can be created

A systematic approach to the literature review[1] was not used since it was considered too time consuming in relation to its contribution. Instead, an iterative search process was used where search words and phrases were narrowed down to find publications with a high degree of overlap with this thesis in terms of background, problem description, purpose and research questions. The literature review was conducted primarily by using Lund University's database for books, publications, articles and journals (LUBSearch). Regarding reliability, Höst et al. (2006) acknowledge the importance of being thorough and meticulous when collecting the data. In order to increase the reliability of the

[1] Here, a systematic approach refers to an extensive literature review including elements such as setting up detailed review criteria beforehand and counting occurrences of certain words or phrases

thesis, all benefits and factors were sought in more than one source to ensure it was not isolated to a certain setting. It was considered more important to generate a large set of possible benefits and factors for customer adoption rather than making certain that everything would be directly applicable to the model. Therefore, at a later stage of the literature review publications with a more distant relationship to this thesis were examined.

2.2.3 Hypothetical modeling

In this phase benefits and factors for customer adoption found in the literature review were used to create a hypothetical model. Since the model is not meant to be specific to a certain industry it was acknowledged that not all the benefits and factors affecting customer adoption retrieved from the literature study would apply to all possible situations. Therefore, in order to increase the level of abstraction, a decision to group the benefits and factors for customer adoption into larger areas was made. Finally, in order to be able to visualize the output from the model, the larger areas were grouped into two axes in a matrix.

2.3 Model implementation

The implementation of a theoretical model can be done in various ways depending on the study. As described by Denscombe (2009), one of the instances when a case study is suitable is when a theory, such as a model, is to be tested to see how it can be used in a real setting. Furthermore, Höst et al. (2006) argue that the use of a case study is suitable when doing a study that aims to describe a phenomenon or an object in depth, especially when the phenomenon is difficult to isolate from its surroundings. Research question 3, how to prioritize between customers when developing and deploying data-driven service offerings, is very dependent on the company and its surroundings. For these reasons, the implementation of the model was made through a case study. When it comes to representativeness of a case study it is usually difficult to generalize the results since the situation studied is just one isolated occurrence of the phenomenon and might not at all look like other occurrences. However, the closer the case study resembles the context that is to be generalized, the more representative are the results (Höst et al. 2006). Therefore, in order to improve representativeness it is important to choose the case company with care so that it displays the key characteristics of the general phenomena. The choice of case company will be further elaborated upon in chapter 5.1.2.

The model implementation was performed in two phases. First, the hypothetical model from the model design was operationalized and adapted into a usable tool so that it could be used within the case company. Second, the tool was applied on a number of the case company's customers.

2.3.1 Operationalization

In order for the model to be applied on the case company the abstraction level had to be lowered, and it had to be adapted to the case company's situation. This was primarily achieved by creating scoring criterias for each area that was to be scored. Whenever possible these criterias where based on available quantitative data in order to reduce the risk of the results being too dependent on the person scoring the customers. Decisions were also made about excluding areas and merging areas. The whole operationalization procedure was iterative. The model was at different occasions presented for two sales managers at the case company, the supervisor at the case company and the supervisor at LTH. Between each of these presentations the model was revisited and revised based on the feedback received.

2.3.2 Application

According to Höst et al. (2006) a better picture of the studied phenomenon as well as an increased validity can be obtained by using triangulation, i.e. to use several methods for gathering and analysis of data. The validity of the results will be elaborated on in chapter 7.5.2. In this thesis the data from the model application was collected both in the form of quantitative scores on the customers that the model was used on, and qualitative data in the form of feedback from the sales managers that used the model. To collect the quantitative data a scorecard was built in Excel where customers could be imported from the CRM system, scored in each of the areas in the model and then visualized in a matrix based on the scores. A number of sales managers responsible for different geographical customer segments were then asked to score their customers in this Excel file according to the scoring criterias that had been established in the model operationalization. In order to collect the qualitative data they were also asked to provide feedback on how easy it was for them to understand the model, whether or not it was easy or difficult for them to score the customers based on the criteria and how well the model output matched their intuitive feeling for which customers should be prioritized.

2.4 Model validation

Finally, the model was validated. In the validation phase the model is to be tied back to the initial phenomenon and an analysis of whether or not the model gives a correct and reliable description of the phenomenon is done (Höst et al. 2006). The validation in this thesis was performed in two phases. First the data from the model application was analyzed. Then, based on this analysis, the validity, reliability and usability of the model was discussed.

2.4.1 Analysis

In this thesis, whether or not the model gives a correct description of the phenomenon, i.e. a correct customer prioritization, was difficult to analyze. This is because there was no other known information about the case company's customers' interest in data-driven services that the model output could be compared to. Given research question 3 it was however not deemed necessary to analyze this, since the model is just supposed to be a suggested way of prioritizing between customers. Still, in order for the hypothetical model to be useful, it is important to ensure that it is possible to make a customer prioritization based on the model output, that the design of the model is valid and that the output from the model is reliable. Therefore the analysis was aimed at answering the following questions:

a. Can the model be used as a basis for customer prioritization?
b. How valid is the design of the model?
c. How reliable is the model output?

To answer these questions data from the model output was analyzed. The methods for these analyses will be elaborated upon in chapter 6.1.

2.4.2 Discussion

Based on the analysis the validity, reliability and usability of the model were discussed and suggestions were given for how to improve these. When possible these suggestions were generalized to be applicable to situations outside of the case study that was performed in the model implementation. According to Höst et al. (2006), the degree to which the results from the case study are generalizable depends on how closely the case study resembles other contexts where the model could be applied. This will be further elaborated on in chapter 7.5.3.

3. THEORY - LITERATURE REVIEW

This chapter describes the theoretical framework used in the thesis and constitutes the literature review of the model design phase, visualized in Figure 2. The chapter starts with summarizing customer benefits from data-driven services as well as other factors that could affect whether or not a customer adopts data-driven services. Next, the theoretical basis for the customer prioritization is described. Finally, a few of examples of firms that have developed and deployed data-driven services and what they have been able to realize for their customers as a result are given.

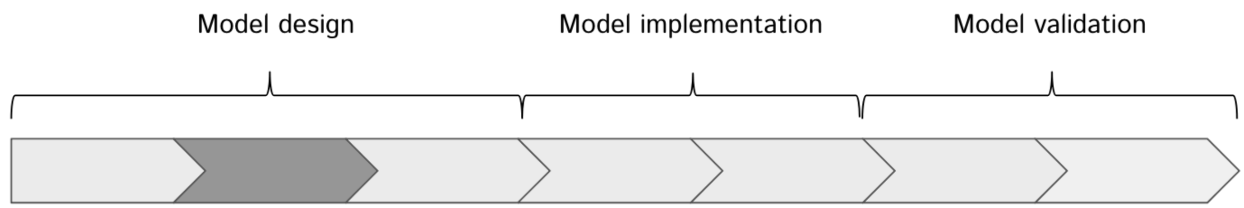

Figure 2. Position of chapter 3 in the work process

3.1 Benefits from data-driven services

This subchapter provides a basis for answering research question 1 by summarizing benefits from data-driven services that have previously been mentioned in literature in connection with PSS, servitization and Industry 4.0. These benefits will later be used in the construction of the hypothetical model presented in chapter 4. Both benefits that ex-ante lead customers in the direction of purchasing data-driven services, as well as realized customer benefits from purchasing data-driven services are summarized here. The headings in this subchapter are meant to facilitate the reading of and are not directly related to the hypothetical model in chapter 4.

3.1.1 Cost savings

Bartodziej (2017) states that there is a substantial potential for the manufacturing industry from Industry 4.0. In a report by PriceWaterhouseCoopers the authors state that the importance of developing industrial internet solutions is high for all companies, regardless of their size, in order to not fall behind the competition (Geissbauer et al. 2014). Estimates are still hard to make on the exact economic potential of Industry 4.0, but according to a study by the German Federal Association for Information Technology, Telecommunications and New Media (BITKOM e.V.), the gross value added in the mechanical and plant engineering sector in 2025 will be about 30 % higher than in 2013 (Bauer et al., cited in Bartodziej 2017). Kauermann et al. (cited in Bartodziej 2017) identify eight changes that are likely to be introduced with the rise of Industry 4.0:

- customer customization
- flexibility
- optimization of decision-taking
- increased productivity and efficiency of resources
- emergence of value opportunities through new services

- demographic changes in the workplace
- increased importance of Work-Life-Balance
- the development towards a high-wage economy that is still competitive

These changes are positively correlated to cost savings, and will potentially have huge impacts on labor costs, energy costs, and capital costs (Bartodziej 2017).

3.1.2 Predictive maintenance

Industry 4.0 will also bring on the possibility of predictive maintenance, which aims at reducing the downtime of equipment by predicting and planning for maintenance before breakdowns occur. Equipment breakdowns are costly for the company. For example, when new maintenance practices were introduced at a global steel manufacturer, they managed to reduce their equipment downtime with 13 %, saving them $5M per year (McCarthy et al. 2013). The introduction of sensors and the analysis of Big Data in Industry 4.0 will improve the possibilities of predictive maintenance (Huxtable & Schafer 2016, de Senzi Zancul et al. 2016), thus indicating huge cost savings and efficiency gains for the customers of an OEM.

3.1.3 Increased revenue

The new technologies also bring potential for increased revenue for the customer. The transportation company Alstom managed to increase the number of passengers drastically largely thanks to the adoption of data-driven services (Baines & Shi 2015). The increased uptime resulting from less downtime with predictive maintenance also gives overall more effective operations, higher output and therefore potentially increased sales (Markeset & Kumar 2005). In a survey of 33 companies in the UK by Baines & Shi (2015) they clearly showed revenue growth potential, with examples of 5-10 % growth potential per year.

3.1.4 Environmental benefits

PSS is often mentioned as a way of aligning incentives of the supplier and the customer in such a way that life-cycle environmental impact of the product can be minimized (Tukker & Tischner 2006). There are a number of examples within B2B relationships where this potential has been confirmed (Mont & Plepys 2003). One example is MAN Truck and Bus UK who implemented new technology when adopting a more servitization-oriented business model, thereby managing to decrease their fuel consumption by more than 10 % and their emissions of CO_2 by 10-15 % (Baines & Shi 2015).

3.1.5 Improved risk management

Decreasing risks for the customer is important for companies trying to develop data-driven service offerings. Companies in mature industries report that their customers demand reduced risks and liabilities in connection with service-oriented solutions (Mont 2002b), which means improving the risk management for the customer is a necessity when offering data-driven services. PSS is often brought up as a way for the customer to decrease risk (Neely 2008; Datta & Roy 2011). The decreased risk stems from e.g. higher equipment uptime and transferring of fixed costs into more predictable variable costs (Baines & Shi 2015). Baines & Shi (2015) have also noticed improved safety as one of the potential gains with the new technology, as well as improved asset reliability and asset security.

3.2 Factors affecting adoption of data-driven services

This subchapter provides a basis for answering research question 2 by summarizing factors that could affect whether or not a customer adopts data-driven services. The summarized factors have previously been mentioned in literature in connection with PSS, servitization and Industry 4.0. The benefits from chapter 3.1 also affect customer adoption, but the factors presented here are those that affect customer adoption without being directly connected to what is being realized by a data-driven service offering. Both factors that could enable the adoption and factors that could inhibit the adoption are summarized here. The factors in this subchapter will later be used to construct the Receptiveness score in the hypothetical model presented in chapter 4. The headings in this subchapter are meant to facilitate the reading and are not directly related to the hypothetical model in chapter 4.

3.2.1 Relationship

In the context of setting up a successful PSS, several authors stress the importance of the relationship between the OEM and the customer. Kumar and Kumar (2004) argue that the delivery of the required product along with the flow of functionality and the associated services is easier achieved if the parties have been involved with each other before. The relationship also becomes of importance when defining the required activities within the PSS from the perspective of the customer (Ng & Nudurupati 2010). The increased ability to customize the service offering to the customer that comes from a close relationship also affects the perceived value of the offering for the customer (Goedkoop et al. 1999).

As servitized business models include not only a transactional element but also a relationship element (Baines & Lightfoot 2009), an important factor in answering whether or not a customer is willing to adopt data-driven services is whether the customer is willing to accept a closer relationship with the OEM (Goedkoop et al. 1999). Trust in the service provider enables customer adoption of servitization and is also the basis for successful sales of PSS (Goedkoop et al. 1999).

How the customer views the relationship with the OEM is also relevant. In literature on purchasing strategy it is often suggested that supplier relationships should be managed differently depending on the strategic importance of the supplier. The relationships with strategically important suppliers are more collaborative and could include elements such as setting joint operational improvement targets and sharing cost structures. (v. Weele 2014)

3.2.2 Value understanding

An important factor when looking at customers buying any kind of service or product is whether or not the customer understands the value of the offering. This can be regarded as a problem from the producer's side, meaning it's up to them to be able to communicate the benefits with their product or service (Mohr et al. 2010). When it comes to a more complex service or product however, the customer's ability to understand the value might be hindering, regardless of the ability from the seller to communicate the benefits of the product or service. As identified by Erkoyuncu et al. (2011), understanding service uncertainties and estimating costs based on them is a complex and difficult process. Therefore, if the customer is unable to understand all the current and future costs, and benefits of their service, they might be unable to understand the value added in new offerings, thus becoming uninterested in them. What is also important for value understanding is that the customer has a long-term perspective on their service costs and thinks more in the terms of the life cycle costs for the equipment. Customers lacking such understanding might find the cost of data-driven service offerings prohibitively high (Mont 2002b).

Furthermore, many customers might have the ability to theoretically understand the value of an offering, but might not be convinced if the OEM can't demonstrate the value to them on a satisfactory level (Baines & Shi 2015). There are different ways of demonstrating the value to customers, where one of the most common and traditional ones is the use of a validated reference case (Brunelli et al. 2017). The use of reference cases when selling Industry 4.0 solutions is viable and effective (Brunelli et al. 2017), but requires pilot tests to be run by the OEM.

3.2.3 Organization

Baines & Shi (2015) note that customers can adopt new data-driven services only when they are confident that the new services will fit within the organization. Thus, the organizational structure of the customer plays an important role. In companies surveyed by Baines & Shi (2015), the importance of process compliance and compatibility of existing systems were stressed as facilitating factors when adopting data-driven services. This means that lack of process compliance can negatively influence the customer's decision of whether or not to adopt data-driven services. Regarding existing systems, the current level of digitization also factors in as a facilitating aspect when adopting new technologies (Raut 2017). In addition to the systems and IT infrastructure, the organizational infrastructure also plays a role in whether or not a customer is able to transition to buying data-driven services (Mont 2002a).

It is also a facilitating factor if the customer has a purchasing strategy for its services. The existence and nature of such a strategy will determine the perceived importance of, and time devoted to, the purchasing of services (Weele v. 2014). Brunelli et al. (2017) note that the degree of centralization also plays a role when adopting new technology, as would be the case with data-driven services. The authors argue that a balance needs to be found between central and local control, where the former is needed for standardization and cost control, and the latter is important for encouraging innovation and creating commitment.

Furthermore, the role and the internal political power of the OEM's point of contact at the customer will affect whether or not a shift towards buying data-driven services will be initiated. Where the point of contact is in the organizational hierarchy in relation to where that kind of decision is made also affects the potential transition towards buying data-driven services.

Finally, the customer needs a budget for the new services. Even though one of the major advantages of the transition to new technology and data-driven services is cost savings, there are costs associated with switching from the old way of buying service to the new way. This requires a flexible enough budget for the customer to be able to perform the transition (Baines & Shi 2015). It can also require that the customer makes changes in its accounting systems, as current systems might be based on traditional charts of accounts not adapted for data-driven services.

3.2.4 Culture

The ability to integrate new and existing capabilities is identified as a key component in the adoption of Industry 4.0. In order to succeed managers have to change their mindset and be more receptive to new technology and innovations (Brunelli et al. 2017). Furthermore, in a review of existing literature on organizational innovation adoption, Frambach & Schillewaert (2002) identify the organization's innovativeness as an important factor affecting their adoption decision. Their research shows that a higher organizational innovativeness has a positive effect on the probability of innovation adoption.

Another important cultural aspect that has been brought up by Hypko et al. (2010) is risk aversion. A company that is risk avert is a company that every time they stand before a choice where the alternatives have the same expected return but different risks always will choose the less risky alternative. To exemplify, given the choice between a 50/50 gamble paying $200 or $0 and receiving $100 for certain, they would always choose the latter alternative (O'Neill 2001). Hypko et al. (2010) argue that the more risk avert the customer is, the more interested the customer is in a performance-based contract that transfers part of the risk to the OEM.

Among the drivers for servitization is a focus on core competencies. A consequence of this is that institutional unwillingness to outsource and a fear of being too dependent on a single supplier are factors that inhibit customers' service adoption (Baines & Shi 2015). Loss of perceived control by the customer has also been confirmed ex-post in performance-based contracts. Ng & Nudurupati (2010) examined two performance-based contracts delivering aircraft flying hours and missile system availability in the UK. During interviews with people in the customer's organization they brought up the loss of perceived control as one of the challenges with the new contract model. The shift in responsibility from the customer to the supplier regarding performance and uptime of the equipment caused discomfort with the customer as they tried to accept their new role.

3.2.5 Industry environment

The environment in which the customer is active also plays an important role for the potential interest in data-driven services. Bartodziej (2017) identifies changing market demands as one of the drivers behind Industry 4.0. Among these changing demands Bartodziej counts volatility. Volatility can arise from different sources, e.g. seasonal fluctuations, company-specific situations, local variations and product life cycle stage changes. Regardless, volatile markets set higher requirements on flexibility and adaptability, which can be acquired through data-driven services (Bartodziej 2017).

Furthermore, the competitive situation of the company will also affect its tendency to seek new and yet unproven solutions. If a company has a fierce competitive environment, competitive advantages are likely to be temporary. In such a situation, the importance of finding these temporary advantages are vital in order to perform on a high level. Following what the competitors are doing, thus removing their competitive advantages, is equally important (Chen et al. 2010).

3.3 Prioritization

This subchapter provides a basis for answering research question 3 by describing theory relevant for the customer prioritization.

It is widely acknowledged that setting priorities between customers and creating relationships with the most profitable ones is important for a company to maximize their profitability (Homburg et al. 2008, Mathur & Kumar 2013). It is not uncommon for companies to create customer loyalty programs with different tiers, where different customers are given different service levels. What these tiers are based on is usually purchasing volumes; customers can essentially climb tiers by purchasing more from the company (Lacey et al. 2007). In a study by Homburg et al. (2008) investigating whether or not companies should prioritize between customers at all, a model where the prioritization was based on both past profitability and expected future profitability for the customers was used. Their findings show that there is a positive correlation between customer prioritization based on these two variables and profitability from the prioritized customers.

For the prioritization that is to be made in this thesis however, this kind of customer prioritization does not take into account enough aspects for it to be deemed usable. Since the customer adoption is in question because of the customer unfamiliarity with and complexity in data-driven service offerings, historical sales volumes and customer profitability are not by themselves reliable for identifying which customers are most likely to buy the new kind of service. Expected future profitability was used for the customer prioritization in the study by Homburg et al. (2008) and could include more aspects related to customer adoption, but this concept was not strictly defined and differed between the companies studied. Furthermore, to strengthen the focus on the likelihood of the customer adopting the new service offering, the value can be discussed from the customer's perspective instead of the provider's perspective. Thus, existing customer prioritization models are not sufficient for the prioritization of customers when implementing a data-driven service offering in a conservative industry.

In order to tackle research question 3, a different approach for analyzing it and coming up with a prioritization was needed. There are many general problem-solving approaches described in academic literature. A notable example is the use of a 2x2 matrix, which has been identified by Lowy & Hood (cited in Brown 2004) as a great problem-solving tool that provides a good structure and encourages to see both sides of an issue. A 2x2 matrix helps attack the problem on a higher level of logic and provides a model that is very easy to apply and communicate. At the same time, it does not sacrifice in potential complexity, proved in models such as the Kraljic matrix (Kraljic, 1983), the BCG matrix (Henderson 1970) and the Ansoff matrix (Ansoff, 1957). It is however important that there is that there is some opposition between the axes in the matrix. Furthermore, the axes need to be relevant and cover a large part of the issue the matrix is meant to help solve. Thus, the axes need not cover only one aspect, and they need to be constructed with care (Lowy & Hood, cited in Brown 2004).

When constructing a matrix like this, it is important to start with the end state in mind. This helps guide the process and sets the bar for what is considered a successful model. Then one needs to find all potentially important aspects that influence the problem at hand. These are then used to find larger areas or themes. Finally, after a prioritization of the themes these are used to design the actual matrix by setting them on the axes. The matrix then of course needs to be questioned to see if it actually covers the most important aspects of the problem or if there is something missing. (Lowy & Hood, cited in Brown 2004)

3.4 Cases

In this subchapter a few examples of OEMs that have developed and deployed data-driven services, along with what they have been able to realize for their customers, are given. The subchapter is written from the perspectives of the OEMs since that is how most literature has chosen to approach the cases.

3.4.1 Xerox

An industry that has been one of the pioneers in the field of servitization is the photocopier industry. They adopted pay-per-use revenue models long before many other industries. The first servitized offering in the industry came in the end of the 1950s, when Xerox started renting out instead of just one-off selling their Xerox 914 model. This shift in business model came about because of the high manufacturing cost for the model, since it used a different, newly developed technology. A monthly cost for leasing the equipment that included all costs for service and the first 2 000 copies was used, which became very successful. (Visintin 2014)

Xerox has since continuously developed their servitized offering and today, they offer what they call *document management services*, which is supposed to optimize the customer's document-related processes and infrastructure (Visintin 2014), including managing the contact with external parties such as the postal service (Baines & Shi 2015). As a result of adopting the servitized offering from Xerox, British

Airways, Islington Borough Council, and Sandwell Borough Council all managed to save around 30 % in printing and reprographic costs (Baines & Shi 2015).

3.4.2 Rolls-Royce

In the beginning of the 21st century Rolls-Royce faced a decline in the demand for spare parts following the advances in technology. Since this was their most profitable income, it sparked a strategic change in the company, from being product-centric to customer-centric (Smith 2013). This in turn sparked a change in their offering, from selling jet engines to selling a service where the customer pays for each hour that the engines are in the air. Their first customer for this offering was the US navy. In the contract Rolls-Royce assumed all responsibility for the maintenance in exchange for being the only provider of engines and engine maintenance. The contract also included a guarantee of a certain performance, which was measured in engine availability, where Rolls-Royce guaranteed a rate of 80 % where the average at the time being was 70 % (Smith 2013).

The three main benefits for the US navy with this contract as identified by Smith (2013) was firstly that they could avoid the uncertainty inherent from the unpredictability of machine breakdowns. Secondly, they would get an improved service level and a guaranteed higher engine availability. Third, this contract would in total cost them less than the previous way of buying engines and maintenance. The contract proved to be a big success, with Rolls-Royce being able to meet and even exceed the expectations and guarantees. The US Navy even ended up saving in total $38M in the first three years of the contract (Smith 2013).

Today Rolls-Royce have developed this offering to provide after-sales services to both the defence sector and the civil airline sector. They offer different care packages, including services like logistics management, engine health monitoring, spare engines services, efficiency management, engine & parts trading, etc (Rolls-Royce, n.d.). The transition to the new strategy has helped them significantly increase their revenue and provide more value to their customers (Smith 2013).

3.4.3 Alstom Group

The Alstom group is one of the biggest energy and transportation infrastructure manufacturers in the world. Their transport division has since the middle of the 1990s changed their business model towards becoming a system and service provider, instead of just selling goods. This transition was sparked by changes in the UK railway market. When British Rail broke up in 1993, the market demand for maintenance contracts increased dramatically. Alstom saw this opportunity and decided to create a service business that offers services that were previously performed by national railway monopolies. (Davies 2004)

One of the main reasons the opportunity presented itself to Alstom was that when the railway in the UK was privatized, the companies operating the railways had different financial stakeholders to answer to, i.e. banks and finance companies. They had higher demands on making sure that the railway was in good condition with a low risk of failing in order to grant the operating companies loans. Therefore, the operators wanted to involve the OEM, i.e. Alstom, who had the most knowledge about the asset. Alstom Transport has, as an example, since managed to increase the passenger numbers from 13 million per year to 32 million per year on a certain line, an increase which they to a large extent attribute to the adoption of data-driven services (Baines & Shi 2015)

Another branch of the Alstom group, namely Alstom Power, has mentioned that one of the reasons they decided to servitize their offering was to defend their ground on the market. Their reasoning was that if a competitor secured a contract on one of their machines, they could possibly do so for more machines all around the world. Their servitization strategy prevents this by securing a contract with the customer so that Alstom is the sole provider of service. (Baines & Shi 2015)

3.4.4 Thales Training & Simulation

Thales Training & Simulation is a company that traditionally has sold flight simulators to both the defence and civil market. In the beginning of the 21st century, they too adopted a new business model that focuses more on selling flight training services instead of just selling simulators. The Vice Chairman of the company himself commented: 'Whereas a few years ago you could sell a unit and walk away, generating a profit now depends more on selling services, selling hours on simulator services' (Mulholland 2000, cited in Davies 2004). The main reason for the shift in business model is to enable Thales to gain additional revenue from the aftermarket service offering, compared to only having one-off sales (Davies 2004).

3.4.5 Krones

Another example of a customer who has developed advanced data-driven services for their customers is Krones, a manufacturer of packaging and bottling equipment. At the drinktec 2017 fair they presented a new offering based on digitalization solutions that they will begin to offer their customers (Canadian Packaging 2017). With the help of data collected from the equipment, they offer help to their customers with maximizing their efficiency in production. The data collected from the equipment is collected in one platform so that all information about the plant is available in one place. Analyses of the large amounts of data help them draw conclusions about the site's performance and suggest improvements. Their offering also includes condition monitoring of equipment, real time event tracking, and predictive maintenance. (Krones n.d.)

4 THEORY - HYPOTHETICAL MODEL

This chapter constitutes the hypothetical modeling of the model design phase, visualized in Figure 3. It compiles and arranges the established theoretical basis from chapters 3.1-3.3 along with what has been seen in cases in chapter 3.4 into a hypothetical model for customer prioritization model according to the purpose of the thesis. The chapter starts with a summary of the model. Then a description of how the model was constructed follows. Next, the parts of the model are described in more detail. Finally, the authors' intention of how to use the model is presented.

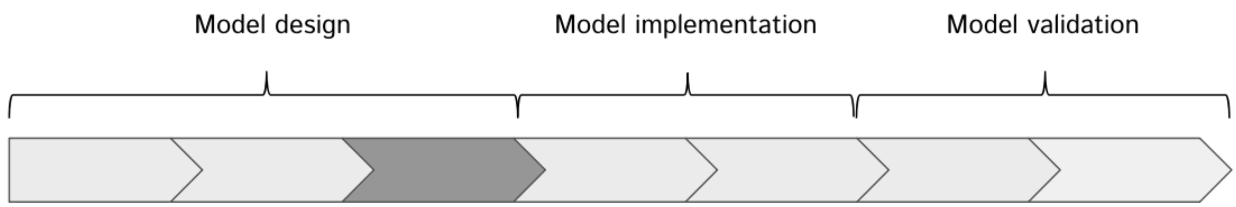

Figure 3. Position of chapter 4 in the work process

4.1 Summary of model

This model is intended to be general and applicable to OEMs in different industries. The abstraction level of the model as presented here is therefore intentionally quite high.

The basic idea behind the model is to score each customer on:

1. to what extent the benefits of data-driven services from chapter 3.1 have the potential to be realized for that customer if it would adopt data-driven services
2. to what extent the factors from chapter 3.2 are present within that customer and/or its environment

Hereafter, 1 will be referred to as the customer's *Potential* and 2 will be referred to as the customer's *Receptiveness*. The Potential and Receptiveness of a customer are obtained by scoring that customer in a number of areas and then weigh these area scores together into Potential and Receptiveness scores respectively.

The logic behind the Potential score is that customers with higher potential for realized benefits with data-driven services will be more prone to adopt these offerings. However, the existence of a potential for realized benefits might not be enough to be able to sell data-driven services to the customer. There are several other factors that could make the customer decide to not implement the offering. These factors are instead supposed to be reflected in the Receptiveness score. The areas that make up the Receptiveness score are to anticipate the way that the customer will value the business case presented by the OEM, as well as how ready the customer is to transform their business to utilize the new service offering. These areas are more dependent on the customer's surrounding and overall business strategy than the areas within the Potential score.

From the Potential and Receptiveness scores a discussion basis for prioritization among an OEM's customers can be obtained by visualizing the customers in a matrix where the Potential score represents the Y axis and the Receptiveness score represents the X axis. There are several ways in which the information from the matrix can be used. An example would be to draw threshold lines to segment the customers. These can be drawn in different ways depending on how the user of the model wants to set the lower thresholds for the prioritization segments. An example of such lines and segments can be seen in Figure 4, where parabolic lines have been used to create two prioritization areas, where customers in the darker area are the most prioritized, the customers in the lighter area are 2nd in prioritization and remaining customers are not prioritized.

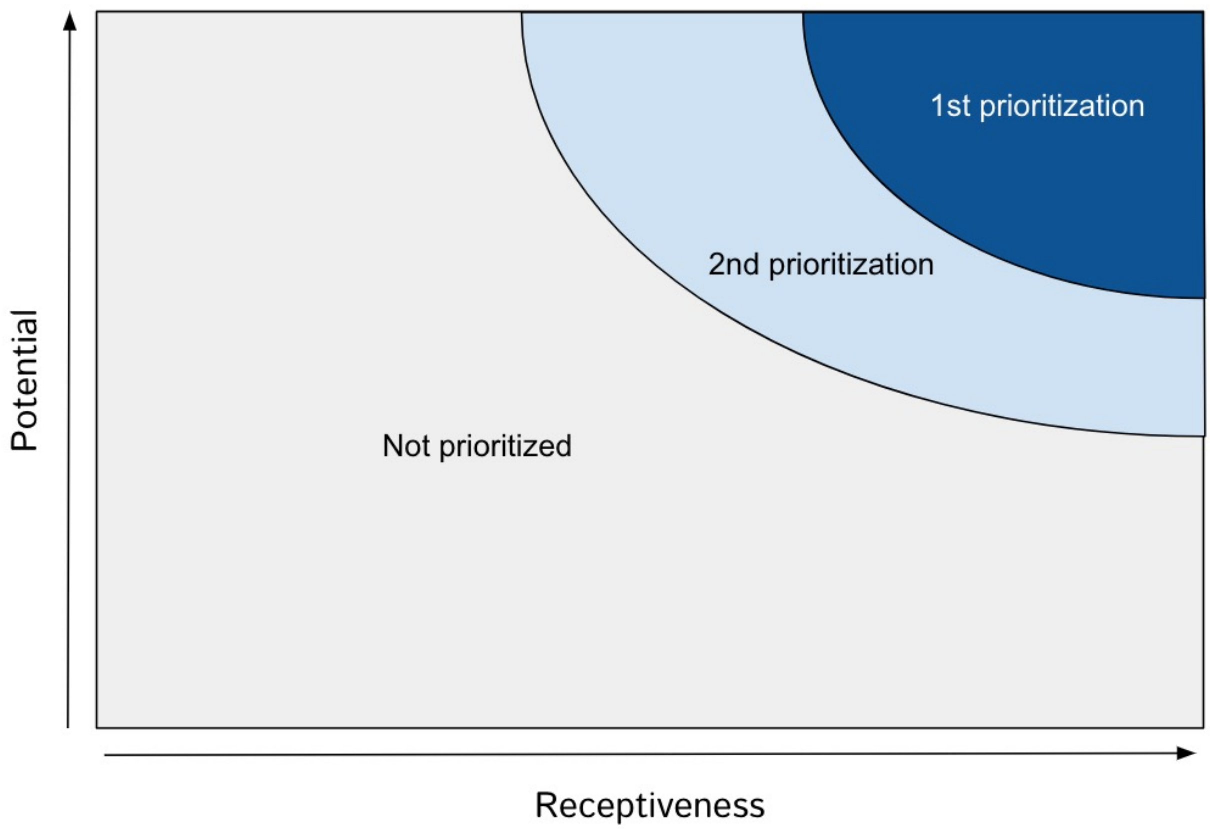

Figure 4. Example of matrix with prioritization areas

4.2 Construction of model

A hypothesis behind the construction of the model, also reflected in research question 3, is that a customer's current likelihood of adopting data-driven services can be described partly by the benefits that can be realized for that customer (chapter 3.1) and partly by other factors that influence customer adoption (chapter 3.2). In order to put this together into a model the theory on prioritization from chapter 3.3 was used.

The choice of using the matrix concept described in chapter 3.3 was made for several reasons. First, this model is meant to be general and applicable to different OEMs, meaning that it needs to describe the problem on a rather high level. Second, it is meant to provide a discussion basis for prioritization among customers, meaning that is is advantageous if the model is easy to communicate. Third, the findings from literature in connection with research question 1 and 2 (i.e. what is here called Potential and Receptiveness) were deemed to explain a large part of a customer's likelihood of adopting data-driven services, meaning that these would be a good fit for axes in a matrix. Furthermore, Potential and Receptiveness were hypothesized to be opposing to each other to a high degree, which strengthens the reasoning behind using them as axes in a matrix.

When constructing the matrix the guidelines presented in the end of chapter 3.3 was roughly followed. The aspects identified to influence the problem were the answers to research question 1 and 2. The first step was therefore to make a long list with these answers. From this list, larger areas were then formed. This was done in an iterative manner with feedback from the supervisors at LTH and the case company influencing each iteration. Given the delimation on internal use, one important guideline for the process of forming larger areas was that it should be possible to score a customer in each area with information available within the OEM's organization.

There were two main differences in the construction process compared to the guidelines in the end of chapter 3.3. The first one was that the gathering of potential aspects influencing the problem was done prior to deciding that a matrix was to be constructed. This was a consequence of how the research questions of the thesis were formulated, where research question 1 and 2 were investigated before research question 3. The second one was that the strict 2x2 matrix concept where each quadrant is labelled was not used. The reason for this decision was that the aim of the model is to prioritize customers rather than segmenting them. It is therefore the customers' relative placement in the matrix that is the most important aspect of the model output, not their absolute placement.

4.3 Potential

The Y axis of the model is called Potential and describes to what extent the benefits from chapter 3.1 have the potential to be realized for a customer if it would adopt data-driven services. A customer's Potential is obtained by scoring the customer in areas presented in this subchapter and then weight and summarize these area scores into a Potential score. How to do this should be adapted to each application of the model, and will depend on the OEM's equipment offering and industry. For example, a high score in one area and a low score in another should not necessarily indicate a medium score on the axis, depending on what the OEM equipment offering looks like.

In summary, the areas on the Potential axis are:

- Potential of installed base
- Above average maintenance costs
- Cost of standstill

- Equipment uptime
- Environmental benefits
- Amount of accidents

Below follows a presentation of the areas on the Potential axis, along with the reasoning behind them and an indication of what is sought in each area.

4.3.1 Potential of installed base

Cost savings is one of the main potential benefits with data-driven services and has also been observed in several of the cases investigated, e.g. for Rolls-Royce's customers. Therefore, the first area on the Potential axis is the potential of the installed base at the customer. What would render a high score here is a large installed base at the customer site, with equipment that in general is expensive to repair and maintain. The logic is that the more equipment the customer has, the more equipment the new technology can be implemented on, and the higher the potential of adopting a data-driven service offering is. However, exactly how to score the customer in this area and what size should give what score is up to the OEM applying the model.

When setting the score for the installed base, there are several considerations that should be made. First of all, what equipment is to be looked at should be decided upon. For example, if an OEM sells several machines that vary in size and cost to maintain, these shouldn't be valued equally. The score of the size has to be comparative as well, meaning that what is considered a "large" installed base will have to be based on some kind of average among the OEM's customers. Beyond these, there might be OEM-specific considerations to be made when deciding upon the criterias for the scoring.

4.3.2 Above average maintenance costs

The second area is the average maintenance costs for the installed base at the customer site, which also directly relates to cost savings. What would render a high score here is higher than average maintenance costs for the customer's equipment, especially for equipment with a relatively high maintenance costs from the outset (if those vary). The logic behind this area is that it, together with the installed base, will give a good idea of the potential cost savings that can be achieved at the customer. Again, what constitutes high maintenance costs must be decided upon by the OEM applying the model.

When setting the score for the maintenance costs the OEM needs to take many things into consideration and decide upon criterias for the scoring. As an example, one consideration could be whether the costs should be counted as a percentage above the average or as an absolute value which both have their advantages. In any case the OEM needs to consider that a customer that has maintenance costs just above average on equipment that is expensive to repair might have a higher potential than a customer with costs high above average on equipment that is cheap to repair. Ideally the score in this area is set in relation to what the OEM calculates it can reduce the maintenance costs to with a data-driven service offering.

4.3.3 Cost of standstill

Another benefit identified in literature is the potential for predictive maintenance and increased revenue. The third area on the Potential axis relates to these benefits and is called the Cost of standstill, defined as the alternative cost for the customer of not being able to produce because of equipment standstills. This cost mainly consists of lost revenue from lost orders because of the lowered output, but can include more factors. The higher the cost of standstill is for the customer, the higher the score will be for the customer in this area. The reasoning behind this is simply that if the customer will face high costs if the equipment breaks down, they are more likely to be interested in an offering that lowers their risk of standstills by enabling predictive maintenance.

Again, the OEM applying the model will have to decide upon criterias for the scoring in this area. What is considered a high cost of standstill will depend on the industry of the OEM and the customer, but should tentatively be based on some kind of average among the OEM's customers.

4.3.4 Equipment uptime

The fourth area on the Potential axis is Equipment uptime, defined as the total amount of actual running hours divided by the total amount of planned running hours over a period of time. The lower the equipment uptime is, the higher the score in this area should be. The reasoning behind this is that a low equipment uptime indicates frequent or long production stops due to equipment breakdowns.

This score together with the Cost of standstill will give an indication of what the customer's total costs associated with equipment standstill are. The uptime indicates how often the customer's equipment breaks down and the Cost of standstill how much it costs each time, which combined gives the total cost for the customer. Thus, this area as well relates to the predictive maintenance and increased revenue benefits form data-driven services identified in chapter 3.1.

4.3.5 Environmental benefits

Environmental benefits were also identified in literature and cases as a benefit with data-driven service offerings. Therefore, this is the fifth area of the Potential axis. The environmental benefits with the new service offering should be high in order to render a high score. The kind of environmental benefits that are relevant can differ depending on the industry that the customer is in, but examples could be reduced greenhouse gas emissions, less waste and lower usage of hazardous materials. Which kind of benefits are relevant will also affect how the scoring criterias are set by the OEM.

It should be noted that this area has not seemed to always be a decisive factor driving industries to implement a data-driven service offering. It is often identified as a very positive benefit, and should definitely be included in a business case presentation to the customer, but when prioritizing between customers and measuring their likelihood of adoption, this factor should in some industries maybe not be included in the score on the Potential axis, as it is not what will sway the customer into adopting a data-driven service offering.

4.3.6 Amount of accidents

Finally, risk management has been identified as a benefit in chapter 3.1. This of course relates to some of the other areas as well to some extent, but is directly related to the last area on the Potential axis: the Amount of accidents. The higher the amount of accidents at the customer's production facilities are, the higher the score in this area should be. The reasoning behind this is that fewer machine breakdowns and higher equipment reliability could reduce the amount of accidents the customer will suffer, thus helping the risk management at the customer site. The criterias for this score has to be set by the OEM based on the averages for their customers and calculations on how much the OEM can improve the reliability of their equipment.

Just as with the Environmental benefits area, the reduction of the amount of accidents has not been seen as decisive in the cases studied. It has however been identified in literature as one of the benefits with a data-driven service offering. Therefore, it has been included here as one of the areas on the Potential axis, but it is deemed to be relevant only in some industries. Thus, this area should not be incorporated in an application of the model if it is not relevant in the context of the OEM applying the model.

4.4 Receptiveness

The X axis of the model is called Receptiveness and describes to what extent the factors from chapter 3.2 are present within a customer's organization and/or its environment. A customer's Receptiveness is obtained by scoring the customer in the areas presented in this subchapter and then weight and summarize these area scores into a Receptiveness score. Again, how to do this should be adapted to each application of the model, and will depend on the OEM's equipment offering and industry. The Receptiveness axis contains areas that in most situations have to be judged more subjectively than those on the Potential axis. It is therefore important to try to create a common understanding of the scales and criterias to use when scoring.

The areas supposed to reflect the customer's Receptiveness are:

- Relationship
- Maturity level
- Risk aversion
- Innovative culture
- Competitive situation

Below follows a presentation of the areas on the Receptiveness axis, along with the reasoning behind them and an indication of what is sought in each area.

4.4.1 Relationship

One of the most important factors affecting whether or not a customer adopts a data-driven service offering identified in chapter 3.2 is the relationship the customer has with the OEM. Therefore, the first area on the Receptiveness axis is a score of the relationship with the OEM that the customer has. What is sought here is a close relationship, which renders a high score in this area. The reasoning behind this area is that the customer most likely would be more interested in a data-driven service offering if the customer already has a close relationship with the OEM.

What has been identified as important in the literature is the strategic importance of the relationship for the customer, as well as how much the customer trusts the OEM. Therefore, at least those two factors should be considered when setting a score on the relationship with the OEM. Other factors can be considered as well, depending on the OEM's situation and industry.

4.4.2 Maturity level

The second area on the Receptiveness axis is the customer's maturity level in regards to maintenance and manufacturing strategy and processes. A high maturity level will render a high score in this area. The logic behind this area is derived from the value understanding and organization factors identified in chapter 3.2. If the customer is more mature, they are more likely to understand the value of the offering and have an organization capable of implementing it.

The literature suggests that possible factors to look at when determining the customer's maturity level are process compliance at the customer sites, whether or not the customer has a mature purchasing strategy, if the customer properly understands the value of the offering, and if they have a long term perspective on the service value. How these should be measured and judged must be decided upon by the OEM applying the model.

4.4.3 Risk aversion

The third area on the Receptiveness axis is the customer's risk aversion, which was identified as a factor in the customer culture in chapter 3.2. The more risk averse the customer is, the higher their score in this area should be. The reasoning behind this is that the data-driven service offering is meant to reduce the risk of breakdowns at a slightly higher cost. If the customer is more risk avert, the likelihood of them being willing to pay a premium for a new service offering lowering their risk should be higher.

The risk aversion will most likely be a relative measure among the OEM's customers. It can be difficult to measure, and will probably have to be based on how the customer's attitude towards risk-reducing maintenance and upgrades has been in the past.

4.4.4 Innovative culture

As mentioned, the customer's culture and innovativeness is a factor affecting customer adoption of data-driven services. Thus, the fourth area on the Receptiveness axis is a score on to what extent the culture of the customer encourages innovation. An innovative culture renders a high score. The logic behind this is that a more innovative culture probably brings a more positive attitude towards new and technology-based offerings, thus potentially increasing the interest for a data-driven service offering from the OEM.

The Innovative culture area will have to be judged subjectively on the basis of e.g. whether or not the customer keeps its equipment updated and upgraded. Whether or not the customer itself tries to stay innovative by developing new products and solutions can also give input to how progressive and innovative the customer culture is.

4.4.5 Competitive situation

Finally, the industry environment was also identified in literature as a factor for customer adoption. Since the tool is supposed to be used to prioritize between customers, factors affecting the whole industry and all customers in the same way were deemed less interesting than those that vary more between customers. Therefore, the last area on the Receptiveness axis was instead set to a score supposed to reflect the competitive situation for the customer. A fierce competitive situation should give the customer a high score. The reasoning behind this is that if the customer is in a very competitive industry, they probably are more interested in both cost savings and reduced downtime, since they otherwise might become too pressured on margins or delivery performance.

What kind of producer the customer is can give input on how to score them in this area. If the customer is a label producer that has to fight for contracts and work short-term the competitive situation is very different from an original producer that has a very stable market demand and can plan long-term.

4.5 Intended use

In this subchapter the authors' idea of how and in which contexts the model is intended to be used is presented. This does not however exclude the possibilities of using the model in other situations and in other ways than presented in here. All such decisions are up to the user and should be decided upon with each use case of the model.

Before applying the model, it has to be operationalized and adapted to the specific situation. In this process there are a few considerations to be made. It has to be decided which customers the model should be applied to and who in the organization should score the customers, since this will likely affect later decisions in the operationalization process. All of the scoring areas presented previously in this chapter might not be relevant or even possible to score in all applications, so a decision has to be made about which areas to incorporate. How to set the scores also needs to be decided upon.

These decisions include e.g. what scale to use, which criterias to base the scoring on and how the scoring areas should be weighted to summarize the Potential and Receptiveness scores.

The model is intended to be applied to customers belonging to the same customer segment. What constitutes a customer segment varies from one OEM to another so this is something that has to be decided upon before applying the model. The logic behind not applying the model to several customer segments simultaneously is because of the risk that scoring criterias can become too generic when they should be applicable to customers belonging to different segments. Customer attributes such as what type of equipment a customer has can be dependent on what customer segment it belongs to, meaning that customers within the same segment can get very similar scores when the scoring criterias are based on customers from more than one segment. This can lead to clusterings in the matrix of customers belonging to the same segment, which might cause difficulties when prioritizing between the customers. An alternative use of the tool would be to use this clustering to prioritize between different customer segments, but this possible use of the model is not something that is going to be investigated further in this thesis.

Furthermore, the model is intended to be applied to individual customer sites rather than a group of sites belonging to the same customer. The reason is that some of the areas that are to be scored in the model can potentially vary dramatically between different sites belonging to the same customer, meaning that scoring them for the customer as a whole would be rather insipid. Having a prioritization on site level also enables taking the information one step further and look at which customer groups have many sites that should be prioritized when deploying data-driven services.

5. CASE STUDY

This chapter describes the model implementation phase of the thesis, visualized in Figure 5. The chapter starts with introducing the case company and motivating why this particular company was chosen for the case study. That is followed by a description of the operationalization of the model, including how the areas were adapted, the scoring criterias for them, and the tool that the operationalization rendered. Finally, the model application is described and the results from the application are presented.

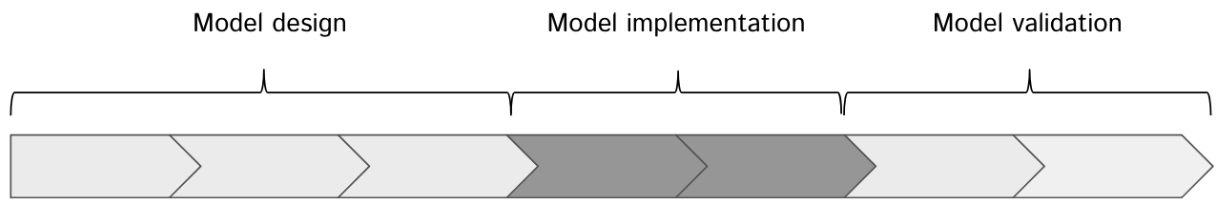

Figure 5. Position of chapter 5 in the work process

5.1 The case company

5.1.1 Tetra Pak Processing Systems AB

The case company chosen for the case study in this thesis is Tetra Pak. Tetra Pak is divided into two main entities: Tetra Pak Packaging Solutions and Tetra Pak Processing Systems (TPPS). The former produces equipment for packaging different kinds of drinks and foods in cartons, e.g. dairy products, juices, and beans (Tetra Pak n.d.a). The latter produces equipment for food processing, e.g. homogenizers, spray dryers, and cheese block forming equipment (Tetra Pak n.d.b). The case study in this thesis has been carried out at the Tetra Pak Services department within TPPS. Tetra Pak Services handles all the after-market sales for the Processing equipment and is divided into nine service areas: maintenance, spare parts, consumables, upgrades, training, plant components, installation services, expert services, and automation services (Tetra Pak n.d.c).

The service organization has a global reach with a central department located in Lund. The sales to customers are handled through local sales managers all around the world that are responsible for customer accounts. They sell the services which are then performed by TPPS service engineers. It is also possible for the customers to either perform their own service of the equipment or hire a third party. TPPS also offers service contracts to their customers, where they can get maintenance solutions or spare parts at agreed upon rates. Within the maintenance service contracts, they offer different services, e.g. maintenance management, where TPPS will take responsibility for planning, coordinating and executing the maintenance activities at the customer site. They also offer planning and execution of preventive maintenance, meaning maintenance with regular intervals aimed at preventing equipment breakdown. Another offering is called corrective maintenance, where all equipment breakdowns will be fixed and the costs are covered by TPPS. Another offering is the possibility of having a TPPS engineer available on-site according to a predetermined schedule. The spare parts service contracts are designed to give the customer certain rates for spare parts in exchange for a guarantee that they will order a certain amount of them.

TPPS's customers are divided into customer groups and customer sites. The customer sites are the actual production plants where the equipment is located. The customer group is the company that owns and operates the site. Usually, a customer group owns more than one site, and sites from all over the world can belong to the same customer group. (F. Sagerstedt, personal communication, January 25, 2018)

Currently, TPPS has not yet developed the sensors and the analytical capabilities needed for a data-driven service offering. They have however recently started a digitalization project for developing these capabilities. In order to decrease the amount of iterations that will be needed to create a suitable and viable offering, TPPS wants to start with the end state in mind. This means that before developing the offering, they want to look at which customers to start with when deploying the offering and what would make them interested in it. This information is then to be used in the development process (F. Sagerstedt, personal communication, January 25, 2018)

As mentioned, TPPS is a global organization and is divided into market areas that are responsible for the customers in their respective geographic area. Since there are differences in the maturity between different market areas, it was decided after discussions with TPPS that the tool that will be developed for the case study in this thesis is supposed to be used separately within each market area. (F. Sagerstedt, personal communication, January 25, 2018)

5.1.2 Choice of company

The case company has been chosen as it has been deemed to represent a company facing the challenges identified in the background of this thesis. TPPS operates within the process industry, which is an industry that is lagging when it comes to digitization and data analytics. In a study by PriceWaterhouse Coopers on Industry 4.0, the process industry was the only one out of five industries surveyed where the respondents did not expect that they will have achieved a high degree of digitization within five years. In the same survey the process industry was determined to lag behind the other sectors when it comes to planned investments in IoT (Geissbauer et al., 2014). Therefore, TPPS is in a situation where they should be able to leverage a data-driven service offering to their customers.

Furthermore, TPPS's products are very suitable for a data-driven service offering. As already mentioned, TPPS are currently not collecting much data, but there are many possible measuring points (F. Sagerstedt, personal communication, January 25, 2018). This means that they would likely be able to create a new offering that could bring added value to their customers. The equipment is also capital intensive and produces high volumes per unit, thus indicating that the potential in offering more advanced services and the potential losses from non-functioning equipment are high. (F. Sagerstedt, personal communication, January 25, 2018)

Finally, TPPS has a lot of customers from all around the world. This provides an excellent basis for being able to find a good selection of customers that could be used in the initial testing of the model, thus lowering the risk of the customer selection affecting the reliability of the results or the usability of the model.

5.2 Operationalization

This subchapter describes the decisions made when operationalizing the model into a tool that could be used within TPPS. First, considerations regarding what customers the tool should be applied to and who should set the scores are presented. Then, changes in and adaptations of the scoring areas are described. Finally, decisions on what to base the score on for each scoring area are described.

5.2.1 Choice of customers to score and people to set scores

Although some of the parameters (such as Maintenance potential) can be scored based on data from TPPS's CRM system, other parameters (such as Relationship) requires specific knowledge about the customer. Therefore, it was decided that the sales managers responsible for the chosen customers should set the score. Several sales managers were contacted and a total of five agreed to participate in the model application. These have been anonymized in this report and are hereafter called Sales manager A, B, C, D, and E. One more sales manager helped in developing the scoring criterias but did not participate in the scoring. This sales manager is hereafter called Sales manager F. These worked in five different geographical areas, namely the USA (Sales manager A), New Zealand (Sales manager B), the Nordics[2] (Sales manager C), Benelux[3] (Sales manager D) and Russia (Sales manager E). They were all responsible for customers within TPPS's dairy customer segment. The customers in this segment all sell dairy products, however excluding cheese and powdered products. Each sales manager were asked to set scores for as many customers as they had time for. They were also asked to choose customers that they thought would score differently in the tool, in an effort to increase the likelihood of applying the tool on customers in different prioritization segments.

As mentioned in chapter 5.1.1, the tool is supposed to be used within each market area and not primarily for comparison between customers in different market areas. The reason for contacting and using sales managers from different countries in this case study despite this is that the digitalization project at TPPS is till in a very early phase. Therefore, it was difficult to demand that the sales managers devote enough time to get a sufficient amount of scored customers in any one market area. To reach a certain number of scored customers was however still important for evaluating the validity of the model. Therefore, the solution chosen in the case study in this thesis was to score customers from several market areas and use this aggregated data set for analysis.

[2] Sweden, Denmark, Norway, Finland and Iceland
[3] Belgium, Netherlands and Luxembourg

5.2.2 Changes and adaptations in scoring areas

Some customer groups purchase maintenance services via a central purchasing organization. In these cases the invoice is sent to this central organization meaning that it is difficult to find correct data on customer's maintenance costs on site level (F. Sagerstedt, personal communication, March 16, 2018). An alternative to the scoring area Above average maintenance costs was therefore sought, and the solution found was to merge the two scoring areas Potential of installed base and Above average maintenance costs into one scoring area called Maintenance potential. Doing so meant that there was no need for data on actual maintenance costs. Instead, data from TPPS's CRM system containing estimated future maintenance costs could be used to gauge the total potential per customer site.

Quantitative data on the customers' Equipment uptime is not available within TPPS. Generally this is not something sales managers have a rough idea of either. One situation where a sales manager would have knowledge about a customer's Equipment uptime is when there is a guaranteed uptime in the service agreement with the customer. However, there are currently few service agreements containing uptime guarantees since TPPS in most cases don't yet know what level of uptime they are able to give as a guarantee the customer (Sales manager D, personal communication, March 26, 2018). Given the lacking information about equipment uptime the decision was made to take this scoring area out of the model in this application.

Just as for Equipment uptime, there is no quantitative data available on the customer's Cost of standstill. It is also very difficult to subjectively assess a specific customer's Cost of standstill by putting it in relation to other customers since there are many factors affecting this cost, e.g. cost of missed deliveries, risk of losing customer contracts. According to a sales manager (Sales manager D, personal communication, March 7, 2018), another metric that is closely related to Cost of standstill is the customer's capacity utilization rate, i.e. the number of planned running hours divided by the number of hours corresponding to maximum capacity. This will give a hint about the Cost of standstill. Equipment running at maximum capacity will cost more when standing still than equipment running at half capacity, since the production lost from them most likely is greater. Furthermore, equipment running at maximum capacity is more likely to affect production further down in the production line as well when standing still. Consequently, a decision was made to adapt Cost of standstill into Capacity utilization rate. Another reason for doing so was that data on the customers' running hours for their equipment is available in TPPS's CRM system.

The scoring areas Environmental benefits and Amount of accidents were after a discussion deemed to be relevant but not a decisive factor for TPPS's customers when purchasing data-driven services (F. Sagerstedt, personal communication, March 13, 2018). These factors were therefore taken out of the model in this application.

One of TPPS's expectations with implementing a data-driven service offering is that it would then be possible for them to benchmark different customers against each other and advice lagging customers on how to increase the efficiency of their operations (F. Sagerstedt, personal communication, January 25, 2018). An example of this would be to analyze and improve the production planning at the customer sites. These kind of initiatives would be more relevant for customers that have lower efficiency, which shows that it is desirable to include an area scoring the customer's current efficiency in their operations. The decision was therefore made to add the area Efficiency of operations in this application of the model.

For the scoring area Innovative culture it was found difficult to tell anything about customer's innovativity beyond what can be observed in their relationship with TPPS. Sales managers within TPPS will generally not have enough knowledge about the customers' product development and R&D processes in order to base a score on it. The decision to adapt Innovative culture into Innovation adoption was therefore made, meaning that the focus was instead put on the customer's ability to adopt new products, services and technologies from TPPS in the past.

The scoring areas Relationship, Maturity level, Risk aversion and Competitive situation were judged to fit well with the application at TPPS (Sales manager D, personal communication, March 26, 2018; F. Sagerstedt, personal communication, April 4, 2018) and were therefore not changed or adapted. The resulting model after the changes and adaptations mentioned in this subchapter can be seen in Figure 6.

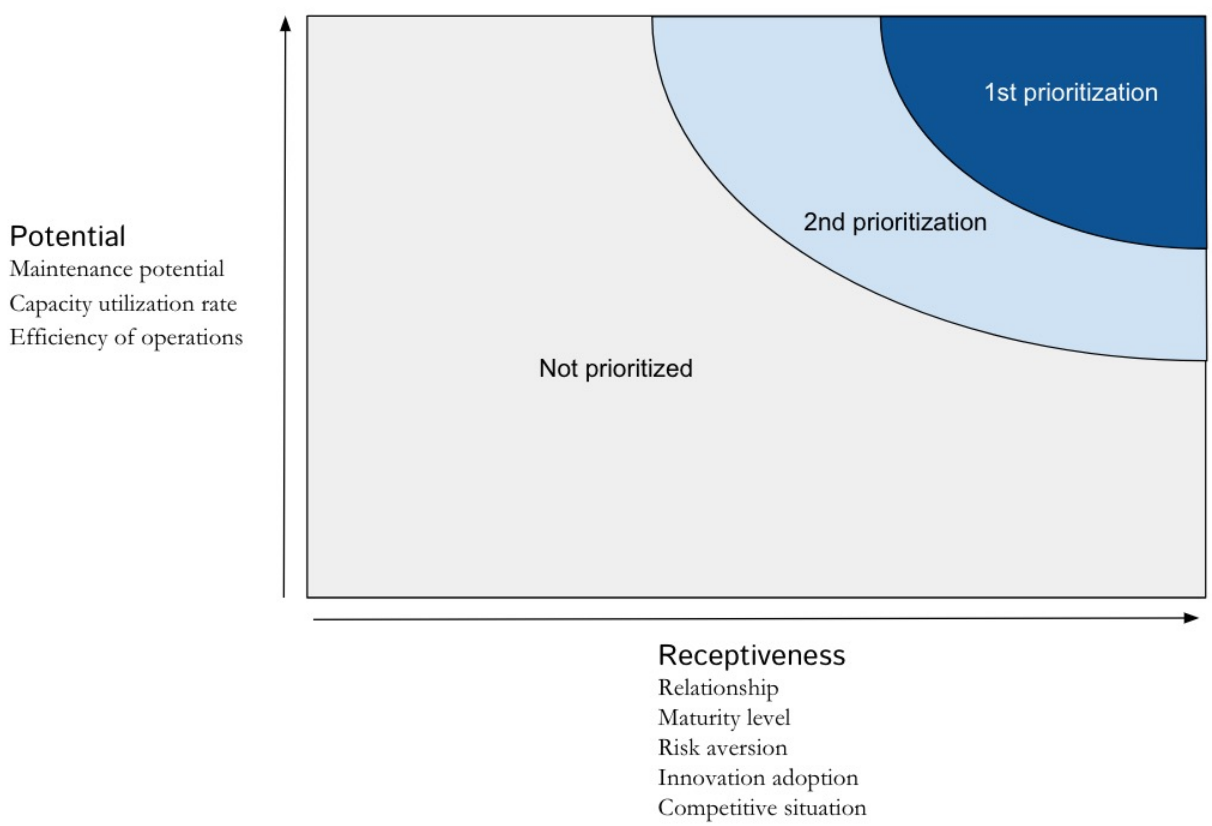

Figure 6. Prioritization matrix for hypothetical model

Out of the areas that were chosen for the model application, the Maintenance potential and the Capacity utilization rate were the only areas where data was available that could be used for the scoring. The rest of the areas needed a subjective score to be set by a sales manager.

5.2.3 Scoring instructions

All areas were chosen to be scored on a scale from 1 to 5. By using an odd number of scale steps the middle value can represent a neutral score (Lekvall & Wahlbin 2001). Furthermore, the decision to use 5 scale steps was a trade-off between getting a high enough granularity in the model output and making the scoring process easy enough for the people setting the scores.

Given the situation where 6 out of 8 areas had to be scored without support from quantitative data there was an apparent risk that the scores in these 6 areas would be dependent on the person setting them. In order to minimize the risk of different sales managers interpreting the areas differently or interpreting the scales differently, scoring instructions were decided upon that were used by the sales managers when scoring the customers. Hence, the purpose of the scoring instructions was to provide a clear basis for how the score in each area should be set. The instructions for each area consisted of five parts:

- **Aim of the area:** The basic idea behind the area in question, i.e. which customer traits the area is trying to capture.
- **Score basis question:** The basis upon which the area score should be set, formulated in a question. The answer to this question should give the score, when considering the scale for the area.
- **Scoring criterias:** A few factors that should be considered as a support when answering the score basis question.
- **Scale:** A visualization of the numerical scale with (in some cases) its associated names of scale steps.
- **Exemplification of scale steps:** To further concretize what different scale steps mean, descriptions of hypothetical customers and what scale step they belong to are provided here.

The rest of this subchapter describes how the instructions for each scoring area were arrived at. The full scoring instructions that finally were decided upon, and that the sales managers looked at when scoring their customers are presented in Appendix A.

5.2.3.1 Maintenance potential

An estimation of the customer's maintenance and spare parts costs was available in TPPS's CRM system. The cost of maintenance and spare parts among TPPS's customers vary dramatically. For example, within the dairy customer segment the customers' annual maintenance and spare parts costs vary between almost zero and over €1M (Tetra Pak 2018). The large difference is partly due to varying sizes of the installed base, but even for customers with the same size of the installed base the costs vary a lot, since the cost per unit can vary depending on what kind of equipment it is. For customers within the dairy business unit with 25 pieces of equipment installed (a rather typical number) the maintenance and spare parts costs range between €30,000 and €216,000 annually (Tetra Pak 2018). This information was used when setting the scoring thresholds for this area. After discussion with TPPS, the decision was made to use relative scoring thresholds based on the customer sites that were imported in the tool with each use of it. The relative scoring was not set so that a certain percentage of the sites were given a certain score (e.g. 20 % got a 1, 20 % got a 2, etc.). Instead, the score is based on a site's contribution to the total maintenance and spare parts costs of all the sites in the import. All sites that together contribute up to a certain percentage gets a 1, from that percentage to another level gets a 2, and so on (see Appendix A for details). This ensured a relative score, but minimized the risk of sites being very far from each other in maintenance and spare parts cost, but still getting the same score because they ended up in the same bracket.

5.2.3.2 Capacity utilization rate

The number of planned running hours per year for each piece of equipment could also be found in the CRM system. The number of planned running hours for TPPS's equipment can vary between a few hundred hours to over 8,000 hours per year, where the last figure represents a capacity utilization rate of more or less 100 %, so the scores were set in relation to this. Then an average utilization rate for the whole plant was calculated. Again, the decision was made to set the score relative to other customers instead of using absolute levels. The score was set up so that the lowest and highest utilization rates were found among the customer sites that the tool was applied to. The interval between these were then divided into 5 equally large pieces and scores were set based on which interval the sites were in. The higher the utilization rate was, the higher score the site got (see Appendix A for details).

5.2.3.3 Efficiency of operations

The Efficiency of operations area was as mentioned added in the operationalization of the model at TPPS. The criterias that were used in the scoring was how much resources the customer needed for their operations, including electricity, water, steam, waste, and how skilled their staff was. The higher the waste and the lower the skill level, the higher the score would be for the site. No data on the customers' resource usage or staff skill level was available, so this area needed to be scored subjectively. However, according to a sales manager (Sales manager D, personal communication, March 26, 2018) it should be possible to assess the above based on a sales manager's knowledge of the customer and score them in comparison to other sites. It was however noted that he thought this might be one of the hardest aspects to score.

5.2.3.4 Relationship

The relationship between TPPS and their customers vary quite a bit from customer to customer. It ranges from customers that maintain their equipment by themselves or buy the service from another provider than TPPS, to customers that have on-site engineers from TPPS that are at the customer site according to an agreed upon schedule to perform maintenance activities. Customers that buy services from TPPS on a frequent basis tend to have a service agreement in place where they pay a fixed monthly price for the activities covered under the agreement.

Thus, when first exploring the scoring areas with a sales manager (Sales manager D, personal communication, March 26, 2018) this was an area that felt familiar and easy to score for a sales manager. The only data available in this area was service agreement levels. Since the area covers a bit more than that, the decision was made to make the area a subjective score where the sales managers were supposed to take a few more aspects into account.

5.2.3.5 Maturity level

The Maturity level score was more or less adopted straight from the hypothetical model. One aspect that TPPS themselves had looked at when judging the customers' service strategies was if they were running their equipment to failure and then repairing it or if they were more actively managing it (F. Sagerstedt, personal communication, March 13, 2018). Thus, the decision was made to include the degree of reactive behaviour when buying services in the criterias. Otherwise, the criterias used were the ones identified in the literature and cases studied. No data was available on these criterias, meaning that the area needed to be scored subjectively.

5.2.3.6 Risk aversion

The Risk aversion scoring area was not altered at all when operationalized in the TPPS application of the hypothetical model. In order to clarify the concept, the scenario described to define risk aversion in chapter 3.2.4 was adapted to reflect a situation more relevant for the service organization at TPPS. This made the concept seem clear and judgeable to both the supervisor at TPPS and the sales managers contacted (F. Sagerstedt, personal communication, March 13, 2018, Sales manager D, personal communication, March 26, 2018, Sales manager A, personal communication, April 6, 2018, Sales manager B, personal communication, April 10, 2018). Again, no data was available in this area, so the score had to be set subjectively.

5.2.3.7 Innovation adoption

The scoring for this area was mostly based on the first part of the Innovative culture criterias mentioned in chapter 3.2.4, namely whether or not the customer keeps its equipment upgraded and updated. Since the original idea of the Innovative culture area was not usable, it was reworked by adding how interested the customer usually is when new equipment and features are released. Thus, the sales managers experience from communicating with the customer was incorporated as well, and not just the hard fact of whether or not the customer upgrades and updates. No data was available in this aspect, so the scores were set subjectively by the sales managers.

5.2.3.8 Competitive situation

It was decided that the scoring for the area Competitive situation was to be based on the customer's profit margin, since this is typically a good indication of the intensity of competition (F. Sagerstedt, personal communication, March 16, 2018). Quantitative data on the profit margin is not available within TPPS, so if quantitative data were to be used it had to be collected externally. In the option between doing so and base the score on a subjective assessment of the profit margin the latter was chosen in order to not make the scoring process too tedious for the person going through it. Just as is the case with many OEMs, some of TPPS's customers produce for their own brand whereas others are contract producers. This was used as a scoring criteria since producing for one's own brand typically means higher margins (Sales manager D, personal communication, March 7, 2018). Which segment the customer's products belong to was also added as a criteria. Having many products in the high-end segment typically means higher margins (Sales manager D, personal communication, March 26, 2018).

5.3 Application

5.3.1 Process

An Excel tool where customer sites could be imported and then scored was created to be used by the sales managers in the scoring process. This tool used information from TPPS's CRM system to calculate the Maintenance potential and Capacity utilization rate. It then contained fields for the sales managers to input the rest of the scores. Finally, the tool calculated the Potential and Receptiveness scores for the customers and visualized them in a matrix.

In order to make sure that the sales managers all would be able to use the tool as intended, they all got an individual introduction to it and the project. This introduction contained a general background and introduction to the subject of this thesis and how it relates to the digitalization initiative at TPPS. A description of the tool and the scoring areas followed. In order to ensure a correct usage of the tool, the sales managers got to pick a customer that was scored as an example when going through all the scoring areas. Another important question to be answered with the case study was how hard it would be for the sales managers to use the operationalized tool. Therefore, notes were taken in each meeting with the sales managers on whether or not they easily grasped the concept. They were also asked to give feedback on the process and how easy and intuitive the tool was to use. Finally, the sales managers got a chance to ask any questions they might have. When the introduction was finished, the sales managers were also asked to score a few more customers and send the results back.

To give the sales managers something to fall back on in case they forgot what was said during the introduction, a document containing detailed scoring instructions was sent out to them along with the tool. The full scoring instructions that were sent out can be found in Appendix A.

5.3.2 Results

In total, the 5 participating sales managers scored 39 customer sites belonging to their respective market areas. The results are visualized in one prioritization matrix for each market area in Figures 7 to 11, where only the customers' Receptiveness and Potential scores are showed. When calculating the Receptiveness and Potential scores, an even weighting between the areas was used. For the full scoresheet showing all customers, see Appendix B. The labelling of customers in Figures 7 to 11 and Appendix B correspond to each other.

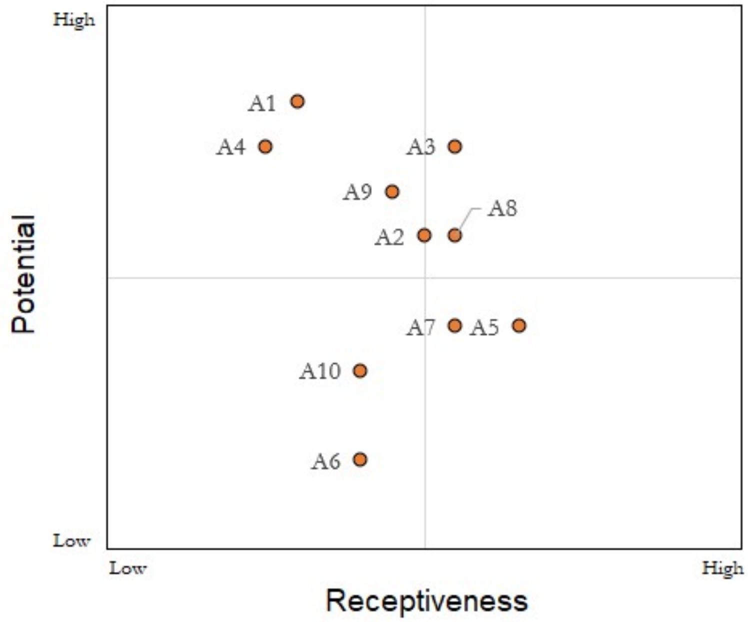

Figure 7. Scores for customers in the USA

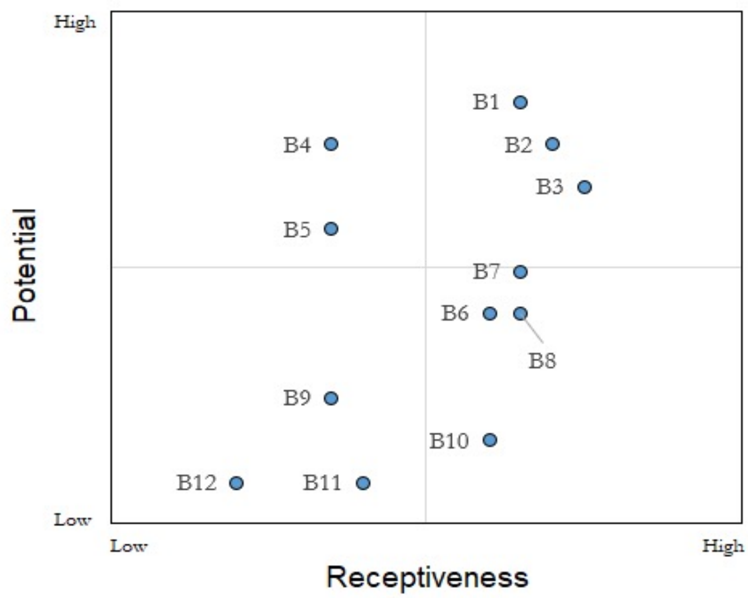

Figure 8. Scores for customers in New Zealand

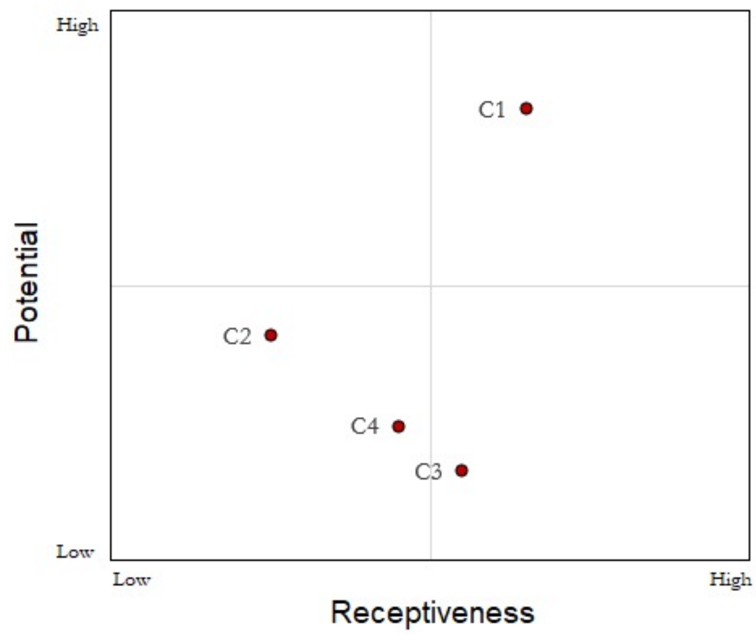

Figure 9. Scores for customers in the Nordics

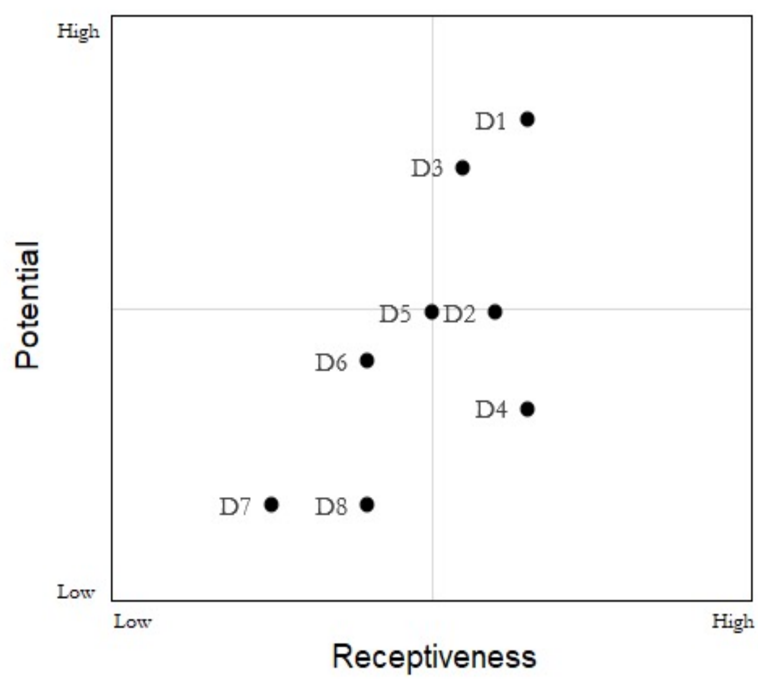

Figure 10. Scores for customers in Benelux

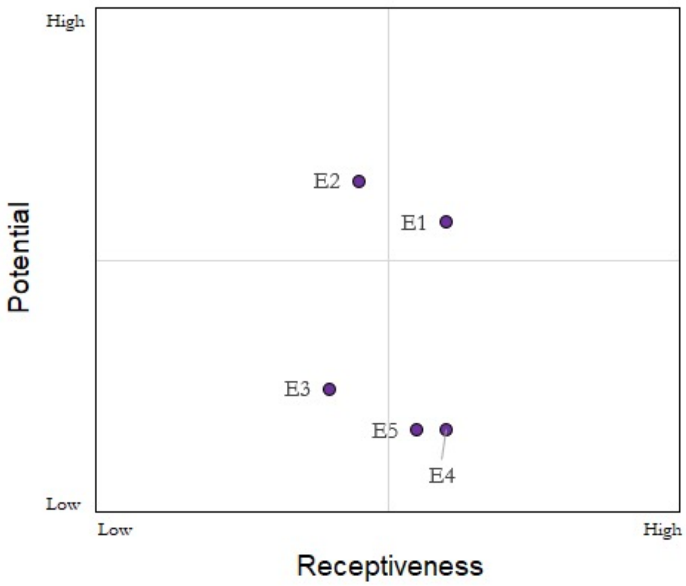

Figure 11. Scores for customers in Russia

In addition to being asked to score the customers, the sales managers were asked afterwards what they thought the results would look like to see if the model seemed to output reasonable prioritizations. None of the sales managers were surprised with the resulting output.

When it comes to the usability of the tool, all sales managers that were involved in the application found the tool easy enough to use. With the knowledge they had on their customers, they were all able to score them in every area of the tool. While walking them through the tool with an example customer, barely any questions were raised on how to think and when the sales managers scored customers on their own, no questions at all were asked regarding how to score the customers. It was however noted that some sales managers wanted to set scores in between the scale steps. It was also noted that the scale for Efficiency of operations was a little bit confusing since a high efficiency is supposed to give a low score and vice versa. The same was true also for Competitive situation, although to a smaller extent. A few questions on the functionality of the Excel file was raised, but in general the sales managers didn't have any feedback on how the usability of the tool could be improved.

6. ANALYSIS

This chapter constitutes the analysis of the model validation phase, visualized in Figure 12. The chapter starts with a presentation of the structure of the analysis and what questions are to be answered. The questions are then answered one by one with the help of analyses of the data gathered in the model application.

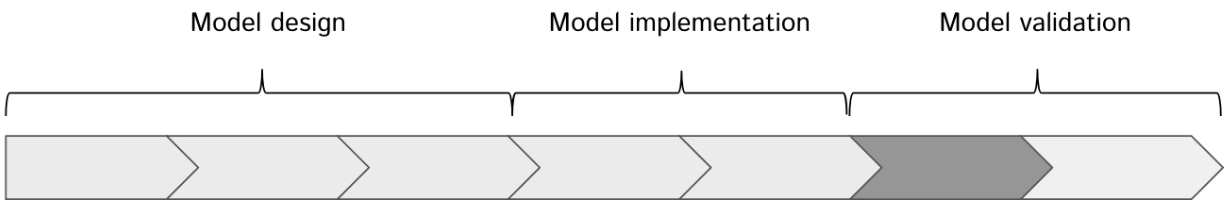

Figure 12. Position of chapter 6 in the work process

6.1 Analysis structure

As stated in chapter 2.4.1, the aim of the analysis was to provide a basis for answering the following questions that are all directly related to research question 3:

a. Can the model be used as a basis for customer prioritization?
b. How valid is the design of the model?
c. How reliable is the model output?

In order to answer question a, the distribution of the answers from the sales managers were analyzed. The idea was that in order for a prioritization to be made, there need to be distinguishable differences between the customers, meaning that all customers must not get the same score in each area. If the distribution of scores is good in all scoring areas, this indicates that the customers differ from each other enough for a prioritization to be made. Finally, a visual inspection of the matrix with the results in chapter 5.3.2 was made to see if that could be used as a basis for customer prioritization.

To answer question b, correlations between the axes and the separate areas in the model were studied. As mentioned in chapter 3.3, when creating a 2x2 matrix model it is important that the axes used are not two sides of the same coin, meaning it is possible to get different scores on the two axes. If the axes are correlated to a high degree, it means that the customers tend to get the same score on both axes. In such a case, there is not enough difference between the axes for the design of the model to be valid. A similar argument is true for the scoring areas. If two areas correlate to a large extent, it means that they are basically scoring the same thing and including both of them could give skewed results. Furthermore, a simpler model could be obtained by just including one of the areas.

Finally, for answering question c, the sales managers' individual scorings were studied. This was done through a comparison between the sales managers in how they were using the scoring scale for each area. For example, if all sales managers used all scale steps, it indicates that they have understood the scale to be used, thus increasing the reliability of the output. Furthermore, if their distributions of scores within the scoring areas were similar, it might indicate that they have understood the scales in the same way.

Below follows the analysis on each of the questions above, divided into one subchapter for each analysis question.

6.2 The output as a basis for prioritization

Analyzing the answers, it can be seen that the scores within each area are differing between the customers, with a bulk of the scores in most areas being between 2-4 (see Figures 13 to 20). As the scores 1 and 5 more or less represent extreme cases, it was expected that they would have fewer occurrences. However, the existence of these cases indicates that the sales managers were able and confident to set different scores and use the full scale available to them.

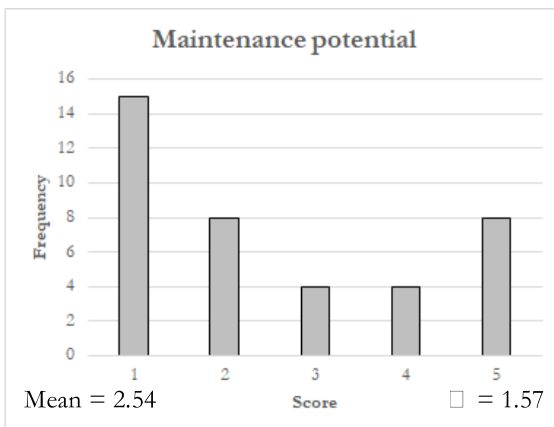

Figure 13. Distribution of Maintenance potential scores

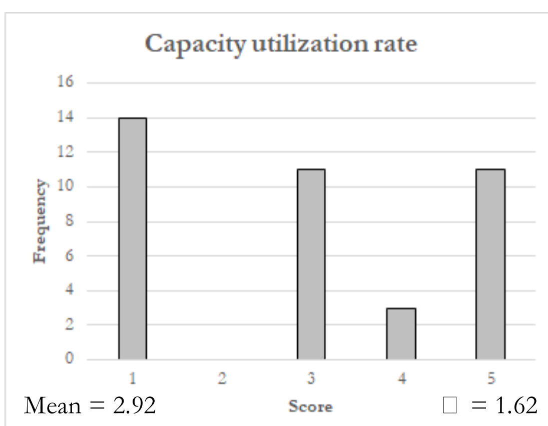

Figure 14. Distribution of Capacity utilization rate scores

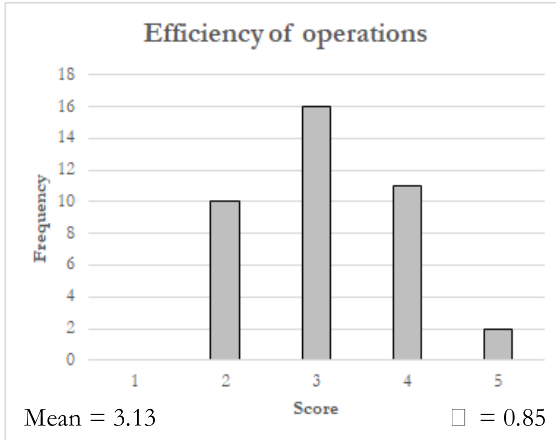

Figure 15. Distribution of Efficiency of operations scores

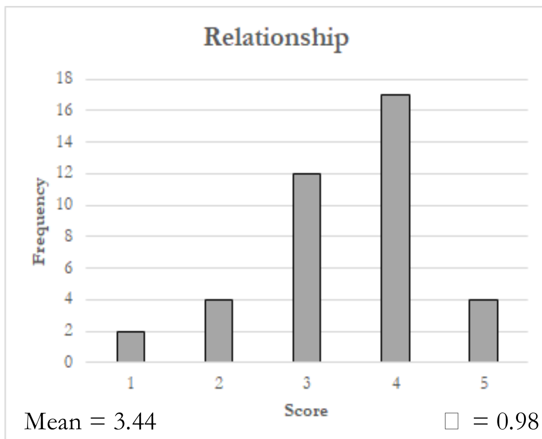

Figure 16. Distribution of Relationship scores

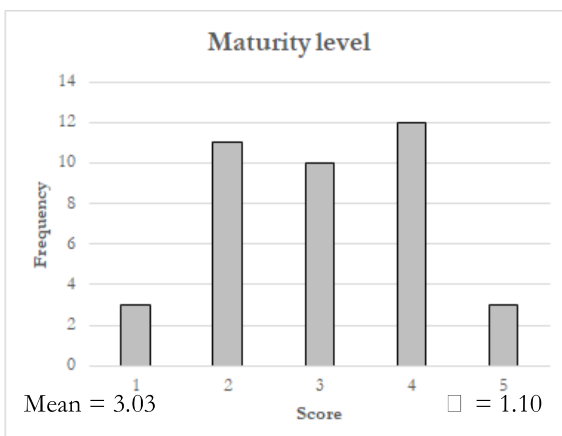

Figure 17. Distribution of Maturity leve scores

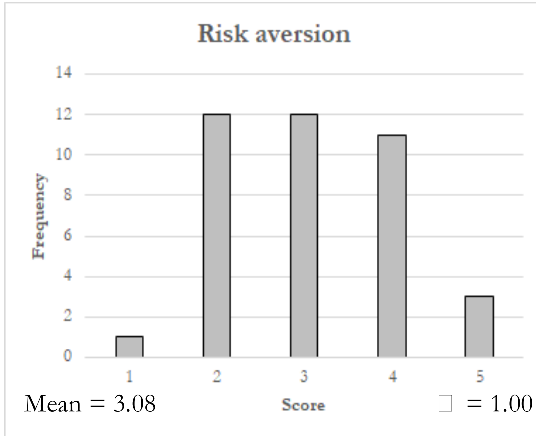

Figure 18. Distribution of Risk aversion scores

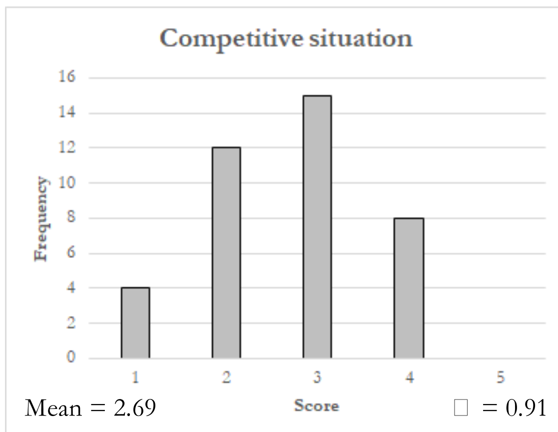

Figure 19. Distribution of Competitive situation scores

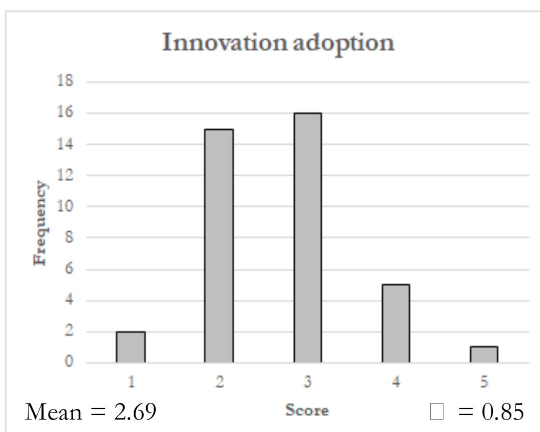

Figure 20. Distribution of Innovation adoption scores

The areas that have the most dispersed scores over the scale, measured by their standard deviation, were the Maintenance potential and Capacity utilization rates, as can be seen in Figures 13 and 14. These were the automatically generated scores based on quantitative data, thus guaranteeing a dispersal of them. This implies that in order to get a better dispersal of customers in the matrix, a good idea is to generate as many scores as possible from quantitative data and forcing a dispersal of the scores. However, improvements could still be made to the algorithm behind the automatically generated scores to ensure a dispersal that works for prioritizing the customers.

Furthermore, when looking at the Capacity utilization rate it is worth noting that there were no scores of 2 and only three scores of 4. This can in part be explained by there being quite few customers in each run of the tool, since each market area was run separately. Thus, the algorithm did not function very well, as it is basing the scores on the customers that are imported into the tool. If more customers were to be imported, the score might be more dispersed than in this application. Still, the algorithm leaves room for improvement.

As mentioned in chapter 5.2.1, the data points in any one market area are not enough to give a reasonable output that can be used for prioritization. However, if the data points are aggregated into one matrix and studied visually, it can be seen that the customer sites are rather scattered and a prioritization line can be drawn, as in Figure 21. In this example, 5 customers (C1, B1, D1, B2 and B3) are suggested to be prioritized higher than the rest of the customers. This coupled with the fact that the scores were pretty well distributed in all scoring areas concludes that the answer to the question whether or not this model can be used for customer prioritization is yes.

Below an example of a basis for customer prioritization is presented in Figure 21. The color coding used for the customer sites can be found in Table 1.

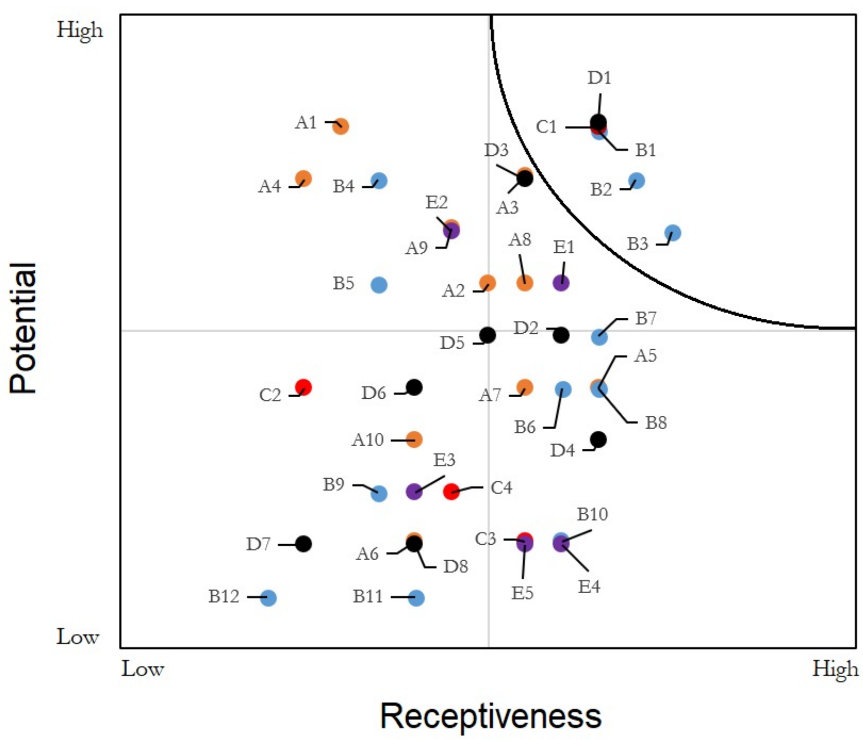

Figure 21. Aggregated customer scores with prioritization line

Table 1. Letter and color coding for customer sites

Letter	Area	Color
A	USA	Orange
B	New Zealand	Blue
C	Nordics	Red
D	Benelux	Black
E	Russia	Purple

6.3 Design validity

As already mentioned, when creating the hypothetical model it was important that the Potential and Receptiveness scores would not be correlated to a large extent, otherwise they would not be a good fit for the axes in the matrix. The result from the case study showed a correlation of 0,27 which is closer to no correlation (0) than perfect correlation (1). It is difficult to mathematically interpret the correlation any closer than this, but when looking at how the customers from the case study place in the matrix (Figure 21) they do not seem to show a linear relationship. This at least shows that the correlation between the Potential and Receptiveness scores is low enough for it to make sense that they form axes in a matrix.

Both the Potential and the Receptiveness scores are calculated from the scores in their respective areas. To ensure that none of these areas correlate too much with each other, pairwise correlations between the areas within an axis were calculated. The result showed that the highest correlation between two areas belonging to the same axis was 0,42 (see Figures 22 and 23). Again, this is closer to no correlation (0) than perfect correlation (1) showing that there are at least no obvious areas that should be removed.

	Maintenance potential	Capacity utilization rate	Efficiency of operations
Maintenance potential	1.00		
Capacity utilization rate	0.38	1.00	
Efficiency of operations	0.03	0.16	1.00

Figure 22. Correlations between scoring areas on the Potential axis

	Relationship	Maturity level	Risk aversion	Innovation adoption	Competitive situation
Relationship	1.00				
Maturity level	0.39	1.00			
Risk aversion	0.25	0.40	1.00		
Innovation adoption	0.34	0.42	0.18	1.00	
Competitive situation	-0.19	-0.02	-0.06	-0.09	1.00

Figure 23. Correlations between scoring areas on the Potential axis

In conclusion, neither the axes or the individual scoring areas in the model show any major correlations, thus indicating that the design of the model is valid.

6.4 Output reliability

In order to investigate the output reliability, what would ideally have been analyzed is if all sales managers using the tool seemed to interpret both what is included in each scoring area, and where to set the thresholds for the scoring levels in the same way. One way to analyze this is to have several sales managers score the same customer and look at the difference between their scorings for that customer. Having each sales manager score many customers would also help give credibility to the conclusions of whether or not the output is reliable.

Because of time and resource limitations in the work process of this thesis, it has not been possible to create the above described ideal situation. No two sales managers scored the same customer, and the number of customers scored per sales manager vary from 4 to 12 customers. Because of this, no conclusions will be drawn based on the collected data in the case study when it comes to the sales managers' interpretations of the scoring areas and scale steps. Therefore, no comments are made on the output reliability either.

7. DISCUSSION

This chapter constitutes the discussion of the model validation phase, visualized in Figure 24. The chapter starts with a discussion of the analysis made in chapter 6. Then the further usability of the applied model for TPPS is discussed. Next follows a discussion of the usability of the general model, based on the model implementation at TPPS. Thereafter, the relevance of the areas in the model are discussed. The chapter is concluded with a discussion of the credibility of the thesis.

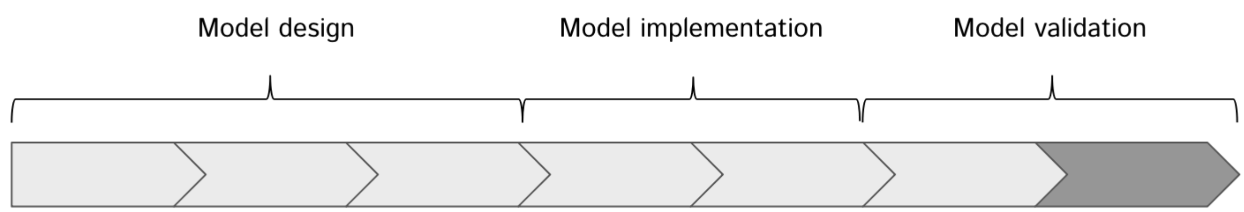

Figure 24. Position of chapter 7 in the work process

7.1 Analysis discussion

The first question in the analysis concerns whether or not the output from the model can be used as a basis for customer prioritization. The method chosen for analyzing the collected data in this regard is not the most mathematically rigid. There are several other methods that could be used, e.g. ones that could optimize the dispersal of the customers in the resulting matrix by adjusting the weights of the scoring areas. The problem with methods like that is that it would be hard to define what an optimal dispersal actually is. It could mean that the customers are dispersed as much as possible, making it easier to distinguish which customers should be prioritized. That might however skew the interpretation of the data in an unwanted way, e.g. by magnifying differences that in reality are rather subtle. Furthermore, the purpose of this thesis is not to create an optimal dispersal of the customer sites. The main focus is on the areas that are to be used for the prioritization and to suggest a way of using those. Therefore, the decision was made to use methods of analysis that do not attempt to optimize the dispersal of the customers.

Furthermore, regarding the data collected, it can be argued that the sample is quite small and therefore might not give valid results. This could have been improved upon if more time and organizational resources had been available, so that more customer sites could have been scored. In an attempt to mitigate this shortcoming, the scorings from all the sales managers were aggregated in order to get a large enough sample for answering the first analysis question. Even though this is not how the tool is intended to be used at TPPS, this was deemed the best alternative to having the sales managers score enough customers to use their data sets independently. Since there are differences between the different market areas, e.g. on what is used as a benchmark in the scoring areas, this could affect the conclusions made in the analysis. Therefore, the market areas were chosen so that all customers scored were from market areas that were relatively similar to each other when it comes to standard and maturity. The sales managers were also asked to pick customers that they thought would end up on different ends of the spectrum to decrease the risk of getting customer scores that were all similar.

The answer to the first analysis question was that it was possible to use the collected data as a basis for customer prioritization, even considering the above discussions. The answer in itself is deemed reasonable based on the data collected, but whether or not the answer is correct for the model in general could be questioned. Still, given the efforts made to mitigate the risks of analyzing the data in the wrong way, the answer to the first analysis question is stated with a relatively high degree of confidence.

The second analysis question was whether the design of the model was valid in regards to whether or not the axes and their scoring areas were a good fit for the matrix. Again, there might be more rigid mathematical analyses that could have been made to determine this, but because of the limitations in time for, and the main purpose of the thesis these were not investigated. The correlation analysis was still deemed to be enough for answering the second analysis question, and from the data and feedback collected the design of the model appears to be valid. Again, the argument that the sample is quite small in size could be made, but the aggregation of all the scores gives at least some ground for the statements made.

An attempt to analyze the reliability of the model output with regards to the sales managers' interpretations of the scoring areas and their scales was made in chapter 6.4 but it was not deemed possible to draw any conclusions about the reliability. This was rather a consequence of the sample of scored customers being too small than choosing the wrong method for analysis. The intended analysis method required both that the sales managers should have scored the same customers and that they should have scored a considerable amount of customers. Because of the fact that usually only one sales manager is assigned to each customer site, meaning that there are almost no customer sites where more than one sales manager has enough experience and knowledge to be able to score them, it was not possible to let several sales managers score the same customer. The sales managers did not even have time to score enough customers for their individual data to be used for drawing conclusions in this regard, with the number of customers scored per sales manager ranging from 4-12. Thus, the required data for answering the third analysis question was not possible to collect.

7.2 Further usability of applied model within TPPS

The feedback received from the sales managers during the application shows that the tool generally is easy to use, at least after getting an introduction of it and the subject. However, a couple of improvements could be considered in order to increase the usability of the tool before implementing it on a larger scale within TPPS.

The scales for Efficiency of operations and Competitive situation could be inverted in order to avoid confusion when scoring. The tool could then be programmed to invert them back when calculating the Potential and Receptiveness scores. Extending the scale to include more scale steps could also be considered since there were a few occurrences during the demonstrations of the tool where sales managers wanted to put a score in between scale steps, indicating that there were too few of them. On the other hand, more scale steps would increase the need for exemplification of the scale steps in order to clarify what each scale step means. It would also require more afterthought from the sales managers when scoring, potentially making the scoring process slower and more tedious. An alternative solution would be to let each sales manager choose the number of scale steps and then program the tool to normalize all scores to the same scale. That way sales managers that want to score with a higher granularity can do so without having to make the scoring process tedious for other sales managers.

The distribution of the Capacity utilization scores was quite uneven. Therefore, if TPPS is to implement the tool on a larger scale, the scoring algorithm for the Capacity utilization rate might have to be improved. On the other hand, since this score is generated from CRM data, it can be adjusted later on and does not hinder the tool from being used as-is. If a larger implementation is made where more sites are imported into the tool, it might even be possible to find a better segmentation of the customers and changing the algorithm after that.

Another aspect that should be considered before a large scale implementation is if a different weighting should be made between the areas when calculating the Receptiveness and Potential scores. As mentioned in chapter 5.3.2, the results presented in the matrix in Figure 21 are calculated with an even weighting on all areas. With this weighting it was, as already stated, possible to use the matrix as a basis for customer prioritization, but it can be argued that some areas are more important than others and therefore should carry a heavier weight. Thus, a discussion of what weights to be used should be held before using the Excel tool further.

The approach used for introducing the sales managers to the tool, with an oral introduction and demonstration, worked well but might be too time consuming if implementing the tool on a larger scale. Although the introduction of the tool is an important aspect to consider if a large scale implementation is to be successful, it is something that is not directly related to the tool in itself and it is therefore outside the scope of this thesis to discuss this any further.

For the managers that are to use the output of the tool as a discussion basis, it is important to remember the limitations of the model such as the relative scoring for the Maintenance potential and Capacity utilization rate and the subjective assessment of the other areas. It is therefore recommended to further investigate the customers that are to be prioritized before a final decision is made.

Finally, the Excel tool used in the application left some room for improvement when it comes to its usability and functions. This does not however affect the usability of the model as such, since other tools could potentially have been used instead.

7.3 Usability of general model

The usability of the general model can be described by how easy the general model was to operationalize into an applied model. During the operationalization phase in the case study several considerations were made in order to get a tool applicable for TPPS. Some of these are useful to have in mind for any operationalization and application of the model and will be discussed below.

7.3.1 Choice of customers to score

A consideration that should probably be among the first ones is which customers the tool should be applied to. This decision will probably affect later decisions in the operationalization, so it is important to think this through thoroughly. Applying the tool to more customers will give a better overview of the customers but it will also require more time and resources. In case the OEM has an initial idea of which customer region or customer segment is the most promising, an alternative could be to only include these customers when applying the model.

7.3.2 Choice of people to set scores

It was concluded early on in the case study that the people setting the scores would need good customer knowledge. For example, the areas Relationship, Risk aversion and Maturity level would be difficult to score without having dealt specifically with that customer. This is most likely true in other applications of the model as well. This means that the people most suitable for scoring will often have roles such as sales representatives, sales managers or account managers. However, where in the organization to find the right people will differ from one OEM to another.

All of the 5 people scoring customers in the case study were sales managers that were responsible for the customer sites they scored. As stated in chapter 5.3.2, they seemed able to score the customers after getting an introduction to the tool and its scoring areas. However, one thing that was noted was that when going through the scoring instructions some sales managers seemed unaccustomed to think of the customers in such a broad sense that is required for scoring some of the ares. Given this, it can be important to consider on what level within the organization the people setting the scores are. They need to have enough knowledge about each customer they are scoring, but at the same time they need to be able to assess the customers from a rather broad business perspective. The latter part will probably point in the direction towards more senior roles.

In case it is possible, an option is to let more than one person score the same customer. Then an average of these people's scores for that customer can be used. This will decrease the risk of skewness in the scores due to misinterpretation of the scoring instructions, since it is less likely that several persons misinterpret the scores in the same way. Furthermore, the scores will not be dependent on a single person's subjective assessments. Although this approach has many advantages it will require more time and resources, which will have to be considered before deciding to proceed with it. Furthermore, as was the case at TPPS, in many situations it can be difficult to find more than one person with enough knowledge about a particular customer.

7.3.3 Choice of scoring areas to incorporate

As can be seen from the operationalization process in the case study, what areas to incorporate in the applied model is a very important question to answer. Even though the scoring areas in the general model are intended to be usable in most applications, the model needs to be adapted for it to be usable. It is important to both look at the areas from the general model and decide whether or not they are to be incorporated, and think about what areas are important in that specific situation that might be missing from the general model. For example, in the operationalization of the model in this thesis, some areas were excluded, others were adapted and one area was even added to the applied model.

Another aspect not directly related to the applicability of the areas, but still affecting the decision of which areas to incorporate in the applied model is the information currently available within the organization. If too little information is available for an area to be scored a decision has to be made between gathering more information and excluding that area from the tool. This trade-off will come down to how much time and resources are available and how high demands there are on the reliability of the output from the applied model.

When the choice of which areas to incorporate has been made, their weight when calculating the total scores for the axes needs to be decided upon. It is difficult to generalize the results from the case study in this regard. There are several aspects that need to be considered when deciding upon the weights, e.g. the importance of the area and the reliability of the answers from the sales managers. Therefore, the weights need to be discussed in each situation where the model is to be used.

7.3.4 Choice of scoring method

Next, one has to decide on a method for scoring the areas. In the case study this was done via the scoring instructions presented in Appendix A. Another scoring method was attempted at first, but was abandoned, since it was deemed more difficult to communicate to the sales managers. Of course there are other possible methods for scoring the areas. However, since no other approaches than these two were actually tried, a discussion regarding how well they work would be based only on speculations. Therefore, no other approaches will be discussed here.

7.3.5 Choice of scoring basis

As previously mentioned, some adaptations and changes had to be made for the general model to be applicable in the case study. Some of these decisions were influenced by whether or not quantitative data was available to base the score on. One advantage with basing the scores on quantitative data compared to subjective assessments is that the scoring becomes consistent and not affected by who is setting the score, which can potentially increase the reliability of the model output. Another advantage is that scores based on quantitative data can be automatically generated, e.g. in Excel, which speeds up the scoring process. Of course these advantages are only relevant as long as the data is updated and of high quality, which therefore becomes a crucial factor. Incorporating subjective assessments in the scoring process enables information that is currently not captured with data to be used as input to the model. This can possibly improve the model output, which is why subjective assessments are worth considering despite the risks associated with them.

An example from the case study of a decision influenced by whether or not relevant quantitative data was available is the merging of the scoring areas Potential of installed base and Above average maintenance costs. For these areas there was available data that could be used in an aggregated Maintenance potential scoring area instead. Another example is the adaptation of Cost of standstill into Capacity utilization rate*,* which also was made because there was data available on the latter. The exclusion of Equipment uptime was brought on by the fact that quantitative data on that area was not available and the sales managers consulted did not have enough knowledge to make a subjective assessment of the score.

An alternative to the above decisions would be to incorporate more subjective assessments in the scoring of these areas to make up for the lack of quantitative data. Regardless of which alternative is chosen, it is important to understand that there is a trade-off when implementing the model in adapting it to fit the data available within the OEM versus making up for a lack of data with more subjective assessments. This is true also for the Receptiveness axis although these areas because of their nature are more difficult to find quantitative data on that could be used for the scoring.

7.3.6 Choice of scale for scoring

Another important question that needs to be decided upon is what scale to use for the scores. In the case study, a scale of 1-5 was used, which worked even though some sales managers asked for more scale steps. What scale to be used is however hard to draw general conclusions on, and needs to be discussed in each application of the model.

One of the more difficult decisions in the case study was to decide whether a customer's score should be set in relation to the other customers that the tool is applied to or in relation to a fixed benchmark. The former alternative was in chapter 5.2.3 referred to as relative scoring and means that the scores become dependent on which customers the tool is applied to. The latter alternative will hereafter be referred to as absolute scoring. Using relative scoring decreases the risk of customers in an application getting very similar scores so that the output from the model becomes difficult to use as a basis for customer prioritization. On the other hand, relative scoring increases the risk of magnifying differences between customers that are rather subtle when viewed from a larger perspective.

7.3.7 Considerations to mitigate the risk of low output reliability

As already stated in chapter 7.3.4, there is a trade-off between basing the scoring of the customers on quantitative data or subjective assessments. Given this discussion, a likely scenario for most applications of the model is that some areas will be scored based on quantitative data and some areas with subjective assessments. Regardless of how an area is scored it is important to consider the reliability of the model output.

For areas that are scored based on quantitative data, it is mainly the quality of the data that affects the reliability of the output. Measures that can be taken to decrease the risk of data quality is to check samples of the data to see if it seems updated or to corroborate the data with another independent source.

What affects the reliability of the model output for areas that are scored with subjective assessments is mainly whether or not the people setting the scores interpret the areas and use the scales as intended. One way to decrease the risk of misinterpretation is to have clear scoring instructions and criterias for the different scale steps. Also, having the people that are to set the scores discuss scoring instructions and criterias with each other could increase the likelihood that they at least interpret the areas and scales in the same way. Another option, that was also mentioned in chapter 7.3.1, is to have several people score the same customer and use an average of these scores.

The difficulties with analyzing the output reliability for areas scored with subjective assessments was mentioned in chapter 6.4. In case this analysis is possible to make it is of course desirable to do so. That way the risk of low output reliability can be assessed. In case an analysis shows that the different people scoring clearly use the scale differently, a normalization[4] of the scores can possibly be considered in order to increase the output reliability. How to do this and what should be considered is however outside of this thesis's scope to discuss.

7.4 Relevance

For the model to render an output that is usable and valid, it is important that the scoring areas used in the model are relevant and do give a good picture of the customers' interest in a data-driven service offering. Therefore, the relevance of the general model and its axes as well as the individual scoring areas are discussed in this subchapter.

7.4.1 General model

As can be seen from the research questions, the aim of this thesis has been to examine factors affecting what in this thesis is called the Potential and Receptiveness for a customer, and use this to suggest a model for customer prioritization. Research question 3 implies that a hypothesis behind the model presented in chapter 4 is that a customer's interest in data-driven services can be described by its Potential and Receptiveness. The aim of this thesis has not been to verify or reject this hypothesis. In fact, it is not possible to verify or reject it with the chosen methodology since the model output was never compared with any other known information about the customer's interest

[4] Here, normalization refers to a transformation of each person's scores such that the mean and standard deviation of the scores become the same for all persons.

in data-driven services. However, a discussion of the relevance of the model and its parts can still be held.

The fact that all of the parts in the model are derived from academic literature is in itself a rather strong argument for why the parts of the model are relevant. Still, it is important to take into consideration that some of the literature reviewed did not mention benefits and adoption of data-driven services as such, but rather looked at benefits and adoption of concepts with a close relation to data-driven services, namely PSS, servitization and Industry 4.0. An improvement in relevance could possibly have been achieved if only literature directly related to the benefits and adoption of data-driven services was reviewed. The main issue with this was that there is no consistent and clear definition of what in this thesis is referred to as data-driven service offerings in academic literature, making it difficult to search for and juxtapose previous studies on the subject.

Another argument for why the parts of the model are relevant is that prior to constructing the model the benefits from chapter 3.2 and the factors affecting whether or not a customer adopts a data-driven service offering from chapter 3.3 were discussed with the supervisors and sales managers D and F at TPPS. In these discussions the relevance of the findings were confirmed. An even better indication of relevance could possibly have been achieved if the findings had been discussed with people from more than one organization. However, the fact that people within an organization independently corroborated the findings from literature is in itself still a good indication of relevance.

7.4.2 Scoring areas of the Potential axis

As for the individual scoring areas of the hypothetical model, the Potential of the installed base and the Above average maintenance costs, which together give an indication of the customer's maintenance costs, were both found to be relevant. However, they had to be adapted to fit the situation in the case study. Since the benefit of lower maintenance costs therefore has been identified both in theory and in the case study, these areas are most likely relevant in the majority of the applications of the model. Furthermore, the situation encountered in the case study is probably not unique, and the merging of the two areas might even be considered for the general model as well.

The Cost of standstill and the Equipment uptime areas, that are to be used to give an idea of the customer's total costs associated with equipment standstills are, were also found to be relevant. However, the case study showed that it might be hard to find data on them. It also showed that there might be other indicators that can be used as a scoring basis and still capture the same fundamental idea. Therefore, the areas in themselves were deemed relevant and are most likely relevant in other applications as well.

Two of the areas from the general model were not used in the application at TPPS. The first one was Environmental benefits, which was deemed not important enough to be a determining selling point for the customer. The Environmental benefits area is, as stated in chapter 4.3.5, most likely an area that is more relevant in some industries than in others. In the case of TPPS it was not decisive, although not irrelevant. Therefore, it should still be kept in the general model for use in other applications.

The second area from the general model that was not used was Amount of accidents. This area was deemed irrelevant in the case study. This coupled with the fact that this benefit was identified in very few of the articles studied in the literature review indicates that this area should maybe be excluded from the general model for future applications.

As mentioned in chapter 5.2.2, one area that was added to the Potential axis in the operationalization of the model was Efficiency of operations. This area was concluded to be relevant and needed in the case of TPPS and absent from the hypothetical model presented in chapter 4, which is why it was added. Similar scoring areas were discussed in the creation of the hypothetical model as well, but were assumed to be too difficult to find usable scoring criterias for in an operationalization of the model. The case study showed that it was possible to set a score in such an area, at least to an extent where it should be included in the operationalization. This coupled with the fact that increased efficiency is one of the main benefits with a data-driven service offering implies that this scoring area should be included in the general model as well.

7.4.3 Scoring areas of the Receptiveness axis

The areas Relationship, Maturity level, Risk aversion and Competitive situation were all used in the case study without adaptations and were deemed relevant. They were also identified as important in academic literature. They should therefore be kept unchanged in the general model.

The Innovative culture scoring area had to be adapted for the case study, since the sales managers at TPPS in general couldn't say enough about the customer culture for it to be a useful scoring area. The change that was made, from Innovative culture to Innovation adoption, might be a useful one to incorporate in the general model as well, since it is fair to assume that a company is more likely to know what a customer's attitude towards new products has been in the past than they are to know how innovative the culture is in general in the customer organization.

7.4.4 Further considerations

Even though there are indications that the parts of the model are relevant, this does not mean that the model covers all relevant factors. There could still be factors that have been overseen in this thesis, or that are relevant for a unique situation not covered in literature. This illustrates the importance of adapting the model to each situation and remember to look further than the areas provided to ensure that the model can be used effectively.

Furthermore, the suggested model is not the only way of organizing these factors. For example, an alternative that was considered instead of using a matrix was to use a radar chart (Tague 2005) to visualize the scoring of the areas. The choice was made not to use a radar chart since it after discussions with the supervisor at TPPS was deemed to not give a clear and easy comparison between customer sites. All in all it is fully possible that there are, in some sense, better ways of using the Potential and Receptiveness to prioritize between customers. However, this thesis is not meant to provide the best model, it is meant to suggest a model.

7.5 Credibility

As mentioned in chapter 2.1, three areas of credibility, as identified by Höst et al. (2006), have been guiding principles throughout the work process of this thesis. These are, again, reliability (in the data collection with regards to natural variance), validity (if the correct systematic symptoms have been studied), and representativeness (that the conclusions are generalizable). Below follows detailed discussions of each of these areas in connection with the thesis.

7.5.1 Reliability

The reliability in this thesis is mainly influenced by the quality and quantity of the collected data and information, both from academic literature and from TPPS.

When it comes to the reliability of the academic literature reviewed, it has been deemed high. All information gathered has been critically evaluated. Furthermore, throughout the literature review several corroborating sources for all information found was always sought., and the search engine for publications provided by Lund University was mainly used for finding literature. There might be some issues in reliability because of the lack of definition of what in this thesis is called data-driven services, but many closely related concepts were found that could be used in conjunction to create a full picture of what was to be studied.

The data that is used to calculate the Maintenance potential and Capacity utilization rate scores in the Excel tool was gathered from TPPS's CRM system. This data was flawed in a couple of ways, which might affect the results from the output of the tool. Firstly, the data was for some equipment incomplete, meaning that the Maintenance potential and Capacity utilization rate might be scored lower than it should for some sites (as the incomplete information is treated as zeroes by the system). This could have been corrected by e.g. removing that equipment to improve the Capacity utilization rate scores. It would also be possible to divide the total maintenance and spare parts costs in the CRM data for each site by the number of equipment that had registered running hours on the site to improve the Maintenance potential scores. This idea was however discarded after discussions with the TPPS supervisor, as the total maintenance and spare parts costs for the site as a whole is more interesting than the average costs per running equipment at the site.

Secondly, the data from the CRM system was not necessarily up to date. According to TPPS processes, it should be, but the process compliance for this was identified as somewhat lacking. This could be remedied by either following up on all sales managers and making sure they updated their data, or by using actual maintenance costs for equipment in the past instead of calculated future maintenance and spare parts costs, which is the case with the data from the CRM system. The former of those two alternatives was as such viable, but not something deemed feasible within the timeframe of this thesis. The latter was discarded in agreement with the supervisor at TPPS, as the historic data was deemed less interesting, although it might be more reliable.

Despite the flaws in the data, it was still decided to be used as a scoring basis for the Maintenance potential and Capacity utilization rate since the alternative would have been to have a sales manager subjectively judge these scores, which was deemed even less reliable than using actual data. Furthermore, to make sure the output of the tool was not interpreted as an absolute truth, it was emphasized that the output was to be used as a basis for discussion, and not for strictly prioritizing customers.

Another consideration that could have increased the reliability of the data used was if more answers would have been collected from sales managers. A larger quantity of data that can be analysed gives a better grounds for the conclusions drawn. Unfortunately, the timeframe of this thesis and the availability of the sales managers limited the possibilities of collecting more data.

Furthermore, the reliability in the answers from the sales managers in the application of this tool is by its nature not the best. As 6 out of the 8 scoring areas were judged subjectively, the reliability becomes lower than if they could have been measured in a more exact way. Furthermore, as the sales managers are human beings, the interpretation of the scoring areas and what is considered industry average could as mentioned potentially vary a lot, making the answers even more unreliable. The decision to use subjective scores was still made, considering a balance between the ease of implementation of the tool and how reliable the output was. There is also the problem of finding the right measurement to represent the scoring area to the best extent, which might be very hard to do and can potentially make the data more unreliable than subjective scores if poorly chosen. What can be done to try to mitigate this problem is normalizing the scores from the sales managers, as mentioned in chapter 7.3.6.

7.5.2 Validity

Höst et al. (2006) recognize using what is called triangulation as a way to improve validity. Triangulation means using several methods to study the phenomenon, to make sure the right phenomenon is studied. In this study, both a literature review and a case study have been used in order to create and validate a model for customer prioritization. Throughout the whole study, the ambition has been to whenever possible seek several sources of corroborating information before concluding it to be relevant. These sources have for the literature review and hypothetical modeling mainly been academic literature, but various reports from e.g. consulting companies and information from within the case company was also used.

The chosen work process influences the validity of the thesis as well. For example, the choice of the case company (discussed in chapter 5.1.2) greatly affects the validity of the study. Also, the approach to the literature review and the method of analysis could also give a description of a different phenomenon than the intended if chosen wrongly.

It is difficult to judge the validity of the prioritization output from the model in the case study, since there was no known information about the customers' willingness to adopt data-driven services that the model output could be compared to. The sales managers involved were asked to compare the results with what they would have expected the prioritization to look like, and the fact that none of them were surprised by the model output is at least an indication that the results are valid. However, beyond that it is difficult to say more about the validity of the model output.

Finally, another way to increase the validity as identified by Höst et al. (2006) is to let someone else review parts of the process. In this thesis the supervisors from both LTH and TPPS have been closely involved in the process and have reviewed it along the way to ensure the validity of the project.

7.5.3 Representativeness

When performing a case study it is usually hard to generalize the results since the situation studied is just one isolated occurrence of the phenomenon and might not look like other occurrences. However, the closer the case study resembles the context that is to be generalized, the more representative the results are (Höst et al. 2006). Therefore, it becomes very important to carefully select the case to study. As mentioned (see chapter 5.1.2), the case company for this thesis was chosen so that it to a large degree would reflect the phenomenon and situation that was to be studied, to ensure the representativeness. It is also very important when presenting the results from the case study to include enough details on how it compares to other situations, so that the reader can make an assessment of how applicable the results are in other contexts. Therefore, a description of the case company and its situation was provided in chapter 5.1.1.

The generalizations from the case study have been made with quite a high degree of confidence since the case company is deemed to reflect a situation that other companies also might find themselves in. TPPS is in a very conservative industry with high demands on safety, which makes the customers reluctant towards offerings that change their operations too much. Such a reluctance probably in many other industries as well, even though the reasons for the reluctance might vary. However, the existence of a reluctance in and of itself means that there are other OEMs in a similar situation to TPPS's. In any case, applications of the model in other industries would be needed to ensure that the conclusions from this application are generalizable.

8. CONCLUSIONS

This chapter presents the conclusions of this thesis. First, the research questions posed in chapter 1.4 are answered. Then the academic contribution of the thesis is described. Finally, some directions for future research within the subject of this thesis are given.

8.1 Findings

In this subchapter answers to the research questions posed in chapter 1.4 are given.

1. What are the potential benefits with data-driven service offerings from the perspective of the customer?

The answer to the first research question was found in literature and case studies of companies that already have implemented similar service offerings. The main potential benefits for a customer from data-driven services have been found to be:

- Cost savings
- Increased uptime
- More efficient operations
- Improved risk management
- Fewer accidents
- Decreased environmental footprint

2. What other factors could affect whether or not a customer adopts data-driven service offerings?

As with the first research question, the answer to the second research question was found in literature and case studies. The main factors that could affect whether or not a customer adopts data-driven service offerings have been found to be:

- Whether or not the customer is able to understand the value of the offering
- The customer's attitude towards new innovations
- If the customer is risk avert or not
- Whether or not the customer is focusing on core competencies and tries to outsource all non-core functions
- The customer's organizational structure
- The customer's process compliance
- How close the relationship between the OEM and the customer is, and how much the customer trusts the OEM
- The volatility of the industry that the customer is in
- The competitive situation that the customer is in

3. How can the answers to 1 and 2 be used by OEMs to prioritize between customers when developing and deploying data-driven service offerings?

This question was answered by using literature on model creation, as existing literature on customer prioritization mostly has a different focus than this thesis. From the identified benefits and factors affecting whether or not a customer adopts a data-driven service offering, two larger groupings were formed and named Potential and Receptiveness. These consist of several areas, and the customers are to be scored in each of these areas. These scores are then weighted and summarized into a total Potential and Receptiveness score for each customer. Finally, the Potential and Receptiveness of the customers can be visualized in a matrix, thus creating a basis for discussing which customers are to be prioritized with the new data-driven service offering. The visualization along with the areas included in Potential and Receptiveness can be seen in Figure 25.

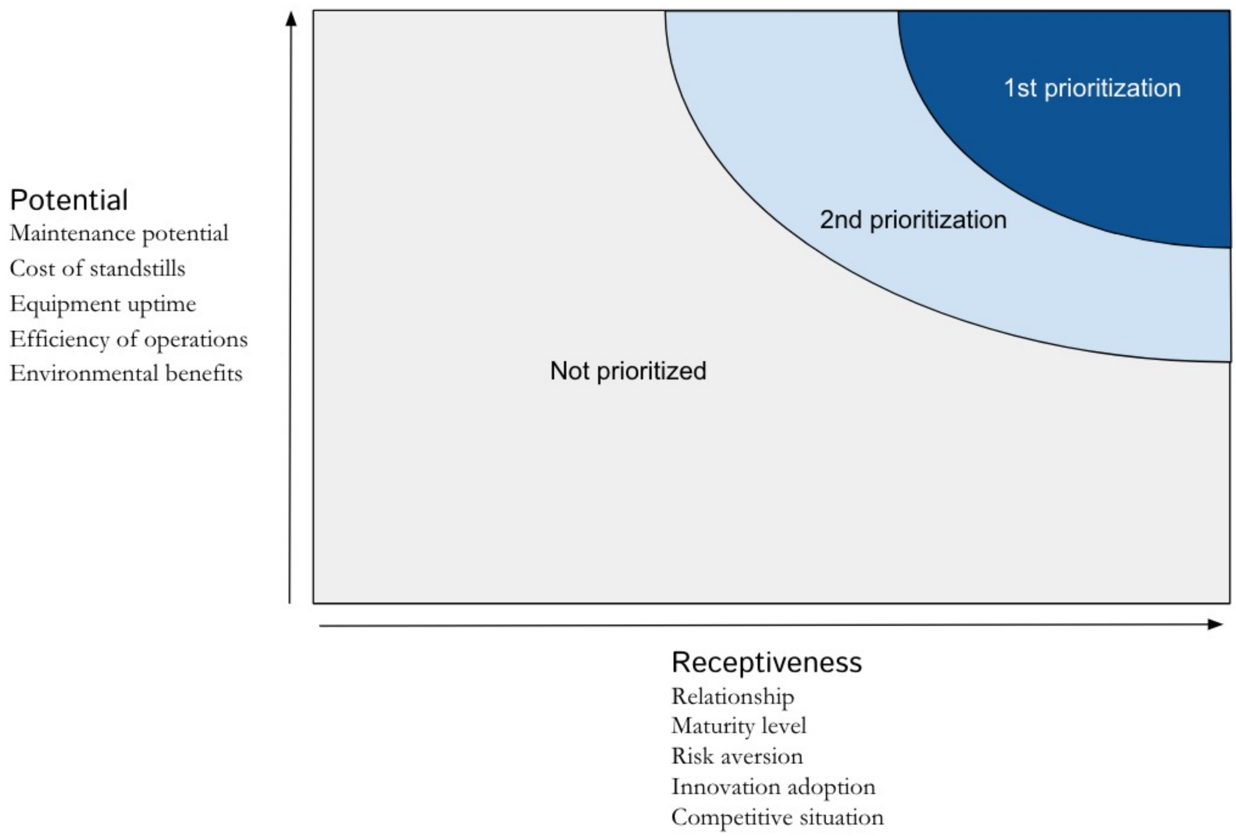

Figure 25. Prioritization matrix for suggested model

8.2 Purpose fulfillment

The purpose of this thesis was to suggest a model that can be used by OEMs to find out which of their customers would most likely adopt data-driven service offerings. The work process of the thesis has helped identify relevant benefits and factors that affect whether or not a customer adopts such services, and that have been aggregated to a model that has been applied in a case study. The findings were then incorporated into the initial hypothetical model, and the above described model was the result. This model is intended to be general and possible to use for any OEM. Thus, the purpose of this thesis has been fulfilled.

8.3 Academic contribution

The suggested model described in chapter 8.1 is supposed to be used to find which of an OEMs customers would most likely adopt data-driven services. Quite a lot of research has already been conducted on customer benefits and adoption in the context of PSS, servitization and Industry 4.0. Although the suggested model to a large extent is based on the findings from such research this thesis still contributes to the academy, primarily for three reasons:

- it is a compilation and arranging of previous findings in such a way that they can be used by OEMs to improve decision making
- it suggests a multi-dimensional model for customer prioritization focusing not only on simple measures such as sales volume or profitability, as is often the case with customer segmentation and prioritization models
- contrary to most existing research within the field, this thesis focuses on the benefits for the customer rather than those for the OEM

8.4 Directions for future research

Since the model is created in this thesis and only applied at one case company, the model would benefit from further applications in order to ensure that the conclusions from this thesis are correct. Therefore, applications of the model at other case companies, preferrably in other industries than TPPS, are suggested. In such applications it would be interesting to increase the validity of the model by incorporating contact with the customers as well to see if the output of the model seems to reflect reality. One way of doing so would be to see if customers that are to be prioritized according to the model in e.g. interviews seem to be the most interested in data-driven service offerings. Furthermore, it would be interesting to investigate which of the areas in the model seem to be the most important, so that general directions could be given when it comes to the weighting of the areas when calculating the axis scores.

There are further potential applications of the model that were not the intended use described in this thesis. For example, the intended use in this thesis is that the model is to be used only on customers that are in the same customer segment. Therefore, another potential application is to use it on several customer segments to try to figure out which segment is the best to start with. That would require some rework since there would be considerations to be made in regards to the variances within and between the customers in the different segments. Even so, it is a potential use that could be relevant to pursue further in future research.

Another potential use of the model that was not intended in this thesis is for it to be used on customers from different geographical areas. As with the different segments, this would require rework of the model to fit the new purpose. If an even more general model is desired, both these aspects could be added to the model in a future rework of it. It could then be used either to find the most promising customers in the full customer portfolio, or to find the most promising customer segment or geographical market.

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APPENDICES

A. Scoring instructions

Maintenance potential
Aim of the parameter: To assess the customer's potential for lowering their cost of maintenance and spare parts related to equipment bought from Tetra Pak. This is done by looking at the customer's current costs. A higher cost indicates a higher potential for lowering the costs.

Score basis: How high are the customer's current costs for maintenance and spare parts compared to other customers within that business unit?

Scale: 5-degree scale from 1 to 5.

Criterias: The score is determined by calculating the annual maintenance and spare parts potential for each piece of equipment in TecBase that is currently running. These potentials are then aggregated for each customer and compared between customers such that the customers with the lowest potential gets a score of 1 and the customers with the highest potential gets a 5.

Note: This score is automatically generated in the Excel file by the following algorithm:

1. For each customer imported the total maintenance and spare parts costs for all their equipment is calculated
2. The customers are sorted from lowest to highest with respect to the result from step 1
3. The result from step 1 is summed for all customers to get the total maintenance and spare parts costs for all customers imported
4. For each customer, the result from step 1 is divided by the result from step 3 to get each customer's share of the total maintenance and spare parts costs
5. For each customer, starting with the first customer in the sorted list from step 2, the accumulated share of the total maintenance and spare parts costs are calculated (i.e. the next customer in the list gets the sum of all the previous customer's result from step 4)
6. For each customer, a score from 1-5 is obtained based on the result from step 5 according to the following criterias:
    a. If the result from step 5 is less than or equal to 0.2 the customer gets a score of 1
    b. Else if the result from step 5 is less than or equal to 0.4 the customer gets a score of 2
    c. Else if the result from step 5 is less than or equal to 0.6 the customer gets a score of 3
    d. Else if the result from step 5 is less than or equal to 0.8 the customer gets a score of 4
    e. Else the customer gets a score of 5

Capacity utilization rate
Aim of the parameter: To assess the importance of Tetra Pak equipment at the customer site thus indicating the cost implications of standstills.

Score basis: How important is Tetra Pak's equipment at the customer site?

Scale: 5-degree scale from 1 to 5.

Criterias: The score is determined by dividing the yearly running hours per equipment in TecBase with the running hours of a piece of equipment running at full capacity. The average of the equipment at the customer site then renders the score for the customer. A higher rate renders a higher score.

Note: This score is automatically generated in the Excel file by the following algorithm:

1. For each customer site and equipment, the capacity utilization rate is calculated by dividing the yearly running hours with the running hours corresponding to full capacity (8000 hours/year)
2. For each customer site, the average capacity utilization with respect to all its equipment is calculated using the results from step 1
3. The customer sites with the lowest and highest average capacity utilization rates are identified and the difference between them form an interval
4. The interval from step 4 is divided into 5 equally large pieces
5. For each customer, a score from 1-5 is obtained based on which piece of the interval from step 4 that customer's average capacity utilization rate belongs to. The piece of the interval with the lowest capacity utilization rates get a score of 1 and the piece with the highest capacity utilization rates get a score 5.

Efficiency of operations
Aim of the parameter: To assess the customer's potential for improving efficiency of their operations by looking at their current efficiency. A lower efficiency indicates a higher potential for improvement, thereby rendering a higher score.

Score basis: How efficient is the customer currently in their operations compared to the industry average?

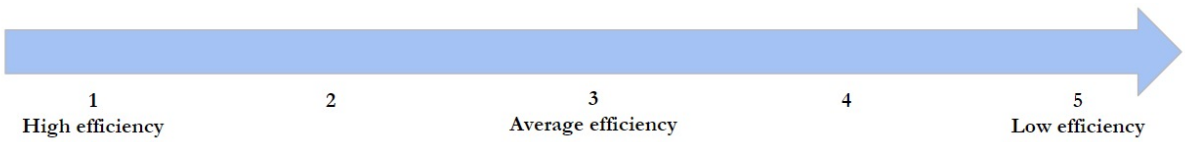
Criterias: The following should be taken into consideration when setting the score:

- Resources used per unit of production from the following categories:
  - Electricity consumption
  - Water consumption

    - Steam consumption
    - Other consumables
    - Waste (ingredients)
        - Rework
        - Dump

- Staff skill level for the following production roles (a higher staff skill level indicates a higher efficiency):
    - Operator
    - Technician

Scale: 5 degree scale from 1 to 5 as shown below.

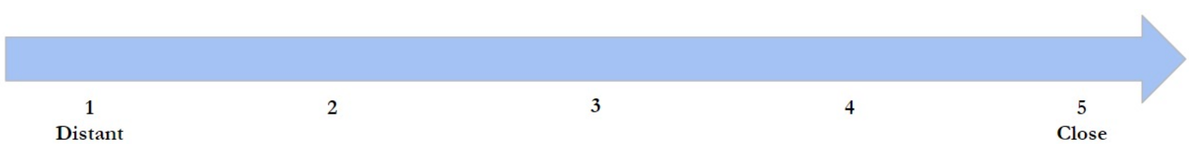


Relationship
Aim of the parameter: To assess how close Tetra Pak's relationship with the customer currently is, as well as the degree of trust in the relationship.

Score basis: How close is the relationship between Tetra Pak and the customer?

Criterias:
- Current service agreement
- Extent of information exchange
- Extent to which Tetra Pak tailors the solutions to the customer as opposed to using a more standardized service agreement
- Strategic importance of the relationship from the customer's perspective

Scale: 5 degree scale from 1 to 5 as shown below.



Exemplification of scale steps:
Distant

The customer has no service agreement with Tetra Pak. The customer maintains their Tetra Pak equipment by themselves and buy services/material from Tetra Pak only occasionally. Tetra Pak is of little or no strategic importance to the customer.

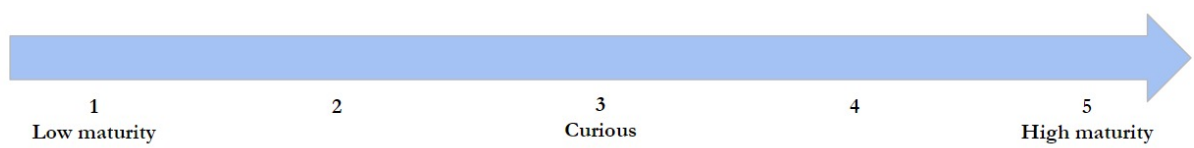
Close
The customer has an extensive service agreement including both corrective and preventive maintenance, covering materials/services such as: spare parts and maintenance units, upgrades/improvement kits and on-site engineers. Tetra Pak tailors the services to the customer's needs to a high extent and the customer is willing to share information with Tetra Pak to facilitate this. Tetra Pak is a supplier/partner of significant strategic importance to the customer.

Maturity level
Aim of the parameter: To assess the customer's maturity level in regards to maintenance and manufacturing strategy/processes.

Score basis: How mature is the customer with regards to maintenance and manufacturing strategy/processes?

Criterias:
- The customer's degree of reactive behavior when buying maintenance services
- Extent to which the customer has a well defined purchasing strategy for maintenance services
- Extent to which the customer assesses Tetra Pak's performance as a supplier
- Degree of process compliance

Scale: 5 degree scale from 1 to 5 as shown below.



Exemplification of scale steps:
Low maturity
The customer's behavior when buying maintenance services can be characterized as reactive, i.e. they run their equipment to failure and then repair it. The customer has no clear purchasing strategy for maintenance services and they do not assess Tetra Pak's performance as a supplier. They lack defined processes within their operations, which cause frequent errors and production stops.

High maturity
The customer's behavior when buying maintenance can be characterized as preventive, i.e. they buy maintenance services to avoid unplanned stops. The customer has a well defined purchasing strategy for maintenance services and they regularly assess and follow up Tetra Pak's performance as a supplier. Their operations run smoothly with a high degree of process compliance.

Risk aversion
Aim of the parameter: To assess the extent to which the customer is trying to avoid the risk of costs associated with equipment standstills.

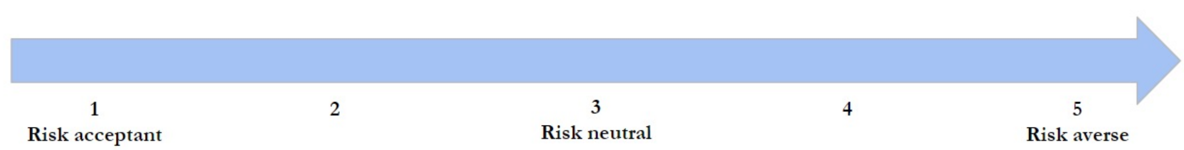
Score basis: How risk avert is the customer with regards to equipment standstills?

Criterias: The customer's decision preference in the following imaginary scenario should be used to determine the score:

The customer has the option of paying $20 for a routine maintenance (which will postpone breakdown) or leaving the machine be, exposing themselves to a 20 % risk of a breakdown that would cost them $100.

- If the customer would prefer leaving the machine be, the customer is *risk acceptant.*
- If the customer would be indifferent between the two options, the customer is *risk neutral.*
- If the customer would prefer buying the maintenance, the customer is *risk averse.*

Scale: 5 degree scale from 1 to 5 as shown below.

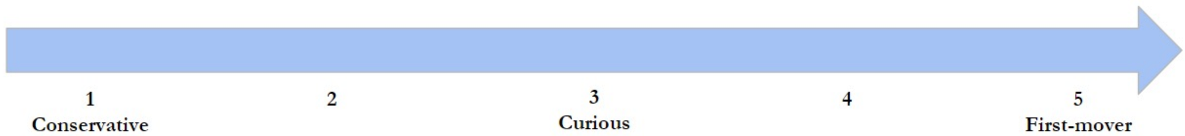


Innovation adoption
Aim of the parameter: To assess the customer's attitude towards new products, services and technology.

Score basis: What is the customer's attitude towards new products, services and technology?

Criterias:
- Extent to which the customer keeps its equipment updated and upgraded
- Extent to which the customer is interested in the latest equipment and features

Scale: 5 degree scale from 1 to 5 as shown below.



Exemplification of scale steps:

Conservative

The customer is rarely interested in the latest equipment. They only update and upgrade their equipment to a degree where they can keep up with the competition, which typically means they adopt to new products/services/technology later than their competitors.

Curious

The customer is sometimes interested in the latest equipment but require proof of concept to purchase or adopt to new solutions.

First-mover

The customer continuously updates and upgrades its equipment. They are often interested in the latest equipment and and are willing to try new solutions even if they are unproven. They generally adopt to new products/services/technology before their competitors.

Competitive situation

Aim of the parameter: To assess the customer's competitive situation. This is done by looking at their profit margin, since this reflects the competitive situation (fierce competition usually means lower margins).

Score basis: What is the customer's competitive situation, with regards to their profit margin?

Criterias:

- Whether the customer produces for their own brand or if they are a contract producer (own brand typically means higher margins)
- Whether or not the customer's products belong to the high-end segment of their respective product category (which typically indicates a higher profit margin)

Exemplification of scale steps

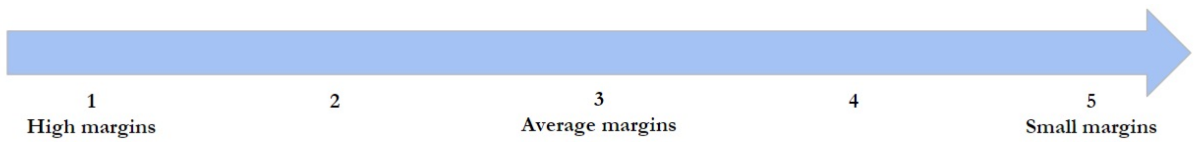
High margins

The customer owns the brand of the products they are producing. Many of the products belong to the high-end segment of their respective product category, giving the customer a high profit margin.

Average margins
Most of the customer's products belong to the standard sortiment of their respective product category, giving the customer an average profit margin.

Small margins
The customer produces on contracts from other brand owners, which typically gives the customer a low profit margin.

Scale: 5 degree scale from 1 to 5 as shown below.



B. Full scoresheet for customer sites

Name	Country	Potential			Receptiveness				
		MP	CUR	EoO	Rel	ML	RA	IA	CS
A1	USA	5	4	4	3	2	2	2	2
A2	USA	5	3	2	5	3	4	2	1
A3	USA	4	5	3	3	3	3	4	3
A4	USA	3	5	4	1	2	2	2	3
A5	USA	2	4	2	3	5	4	3	3
A6	USA	2	1	2	3	4	3	2	1
A7	USA	1	5	2	4	4	4	2	2
A8	USA	1	5	4	2	2	5	3	4
A9	USA	1	5	5	4	1	4	3	2
A10	USA	1	1	5	4	1	4	2	2
B1	NZ	5	5	3	4	4	3	5	2
B2	NZ	5	3	4	4	5	4	3	3
B3	NZ	5	3	3	5	5	5	4	1
B4	NZ	4	5	3	3	3	2	2	2
B5	NZ	3	3	4	2	2	3	2	3
B6	NZ	2	3	3	4	4	3	3	3
B7	NZ	2	3	4	4	4	4	3	3
B8	NZ	1	4	3	4	4	4	3	3
B9	NZ	1	3	2	2	3	2	1	4
B10	NZ	1	1	3	4	3	4	3	3
B11	NZ	1	1	2	4	2	2	3	2
B12	NZ	1	1	2	3	1	1	3	1

C1	Nordics	5	5	3	5	4	2	4	3
C2	Nordics	4	1	3	1	2	3	2	2
C3	Nordics	2	1	2	5	4	2	3	2
C4	Nordics	1	1	4	4	2	2	2	4
D1	Benelux	5	5	3	4	4	4	3	3
D2	Benelux	4	3	2	4	3	3	3	4
D3	Benelux	3	5	4	3	3	4	3	3
D4	Benelux	2	3	2	3	4	3	4	4
D5	Benelux	2	3	4	4	3	3	3	2
D6	Benelux	1	3	4	3	2	2	3	3
D7	Benelux	1	1	3	2	2	2	2	2
D8	Benelux	1	1	3	3	2	3	1	4
E1	Russia	5	1	4	3	4	3	4	3
E2	Russia	3	5	3	4	2	2	2	4
E3	Russia	2	1	3	3	3	2	2	3
E4	Russia	1	1	3	4	4	5	2	2
E5	Russia	1	1	3	4	3	3	2	4