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How can a manufacturing company stay competitive in a changing market?

Exploring customer needs and future offerings in a B2B context

Master's thesis in Quality and Operations Management

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Cover:
Picture showing two of Emerson’s radar measurement instruments and a process plant.

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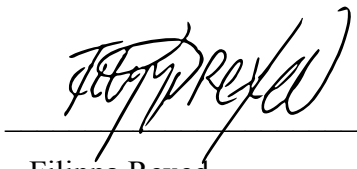

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SUMMARY
Emerson is a manufacturer of measurement instruments and is the leading manufacturer in several large industries. Now, Emerson wants to grow in new customer segments, where the Chemical segment has been identified as attractive. To grow in this segment, Emerson must understand customer needs to differentiate their offering to fit a new type of customer. The aim of the study is thereby to identify customer needs where Emerson can differentiate their offering to Chemical customers and to understand what Emerson can do to take advantage of the market opportunity of growth with radar technology in the Chemical segment.

A case study of Emerson has been performed. Data was collected through four research methods, a literature review, interviews, observations and secondary data. The interviews were performed in two phases, the first one with employees at Emerson, aimed at creating an understanding of Emerson and the current situation. The second one was performed with companies operating in the Chemical segments, to create an understanding of their needs.

The data collection showed patterns in common problems and challenges present at the Chemical companies. The basic need of the customers was common amongst them, to maximise uptime and reduce stops in the production. Furthermore, the Chemical customers lacked knowledge regarding how to solve issues in complex applications. Moreover, it was perceived that all radar level measurement instruments had more or less equal performance in standard applications. Thereby, the analysis propose that Emerson should continue to be a differentiator and use the Chemical customers' needs to introduce new unique offerings to the market.

Several suggestions are presented in the study, such as self-diagnostic services and an extended customer support. Furthermore, the Chemical customer's needs have implications on Emerson's business model and the organisational structure, where changes are proposed for Emerson to be successful with the Chemical customers. Moreover, three suggestions are presented to target the customer needs; radical innovation, involving customers and cross-functionally integrating departments.

Keywords: Emerson, Rosemount, customer needs, product offering, differentiation, innovation

TABLE OF CONTENT

VOCABULARY

Operation	The production department of the company
Operator	The employees responsible for monitoring the production processes
Instrument technician	Employee responsible for day-to-day tasks related to the instruments and maintenance
Instrument engineer	Employee responsible for optimising the use of instruments and maintenance
Process	The department responsible for optimising the production processes
Process engineer	Engineers responsible for optimising the production processes
Accuracy	Refers to the closeness of a measured value to the actual value
Repeatability	Refers to the closeness of two or more measurements to each other
EPC	A contractor that builds new production facilities, and is responsible for all activities from engineering, procurement and construction until production start
HSE	Employees responsible for Health and Safety
EX area	Explosive Hazardous area

1 INTRODUCTION

This chapter aims to introduce the background to the problem investigated and thereby the aim, purpose and specific issue.

1.1 Background

Markets and technology development are changing fast. The global competition makes it important for companies to launch products that satisfy the customers at the first try (Wheelwright, & Clark, 1992). Furthermore, the increased competition makes it more difficult for companies to differentiate their products, and competitive advantage is becoming more difficult to sustain (Gebauer and Fleisch, 2007). Many companies who built their business on something successful and created a strong position in a market, sooner or later comes to a point where they need to find new opportunities for growth (Zenger, 2016).

As markets rapidly change, competitive advantage has become quite temporary (Chevalier-Roignant, Dixit and Trigeorgis, 2011). Furthermore, the company must show growth for investors, and the company must find new opportunities for competitive advantage (Zenger, 2016). Many examples of successful businesses have showed that this is difficult, even for companies that have succeeded very well in the past.

To stay competitive and profitable, it is important to know what the customers want and to launch products that fit their needs (Ulwick and Bettencourt, 2008). Many companies offer similar products and customers are becoming more demanding in wanting products to fit their specific needs (Slack and Lewis, 2017).

Emerson is a US based company with operations in two core areas – Automation Solutions and Commercial & Residential Solutions. Automation Solutions', in which this work will be done, focus is on improving customer's business performance by measurement support. Furthermore, the area of Automation Solutions consists of different brands. This thesis will be performed within the brand Rosemount, which provides radar measurement systems for a wide range of applications (Emerson, 2020). Rosemount operates in three primary markets: marine applications, tank gauging and process industry. This project will be executed in the process industry area.

The Rosemount measurement system was the first patented solution for radar measurements. The company grew large within the Oil & Gas industry and is today the leading company in the segment. Emerson's focus has been on products of high quality and high complexity, developed for tough conditions and with high precision. Now, Emerson wants to grow in other customer segments. A market analysis was performed, where the Chemical segment was identified as a growing segment with customer needs

related to the existing products Emerson offers. Furthermore, Emerson already has a small presence in the segment.

Traditionally, Emerson's competitors have covered markets where Emerson has not been present, the Chemical segment one of them. Emerson's products are developed for robust applications, and apart from providing high precision and high quality, the products are generally seen as expensive. To grow in the Chemical segment, Emerson must understand the needs of the Chemical customers, and by that how Emerson can differentiate their offering to be attractive to these customers. From now on, Rosemount and all activities linked will be referred to as Emerson in this report.

1.2 Aim

The aim of the report is to perform a qualitative study of a selection of Emerson's customers in the Chemical segment, in order to

- Identify customer needs where Emerson can differentiate their offering to Chemical customers
- Understand what Emerson can do to take advantage of the market opportunity of growth with radar technology in the Chemical segment

The aim for this, is to present recommendations that Emerson can use to grow their business.

1.3 Limitations

Since the aim of the project is to provide recommendations, no new product will be initiated, nor will any changes be implemented during the project. Moreover, the recommendations will not include how Emerson should perform the implementation, but what Emerson can do.

Furthermore, the qualitative study will be limited to Swedish plants, however the participating companies are all global companies with plants in several countries.

Also, the study focuses on radar technologies. There are other measurement technologies commonly used in the Chemical market. For reference information about them, see Appendix 1.

2 METHODOLOGY

This chapter will present this project's research strategy, which includes the plan and research design. Furthermore, the research methods that have been used during the project, will be presented. Afterwards, analysis of empirical data, ethics and a discussion of research quality will be discussed.

2.1 Research strategy

The research strategy is, according to Denscombe (2014), a plan that aims to describe the purpose of the project, and to answer the research questions. The following text aims to clarify why a case study with a qualitative approach and systematic combining were suitable for this project.

The aim of this project work is to understand how Emerson can differentiate their offering to Chemical customers. According to Denscombe (2014), the research strategy 'Case study' is an approach that is suitable when the project focuses on one or a few areas that are of interest. The case study gives the researchers the possibility to investigate a certain segment in detail in order to understand the relationships and the different dependencies within the case.

Case studies are characterised by the usage of numerous research methods (Denscombe, 2014). Furthermore, case studies are used when relationships and processes need to be explored and when the investigated case is studied in its natural setting. In order to accomplish the aim of this study, companies in the Chemical segment need to be explored, analysed and compared. Therefore, the case study strategy was chosen. Moreover, Yin (2014) claims that the case study strategy is suitable when the research questions are open-ended and answers 'how' and 'why', which is aligned with this project.

Denscombe (2014) states that the case study approach usually is associated with inductive theory, which means that the project generates new research. Deductive research, on the other hand, is, according to Bryman and Bell (2011), the most common view which aims to verify already existing research. However, this project has required both to produce new theories and to verify already existing research. Dubois and Gadde (2002), suggest a method called 'systematic combining' which is similar to abduction and integrates both inductive theory and deductive theory. Systematic combining allows, according to the authors, the project to move back and forth between theory and empirical data.

Both qualitative and quantitative research can be utilised during a case study (Denscombe, 2014). Qualitative research is used when the project investigates the nature of a certain area and is preferable when the researcher does not have much knowledge about the studied topic. The quantitative research is preferable when the aim of the study is to produce results that are of more general characteristics and applicable to more than just one case (Waller, Farquharson and Dempsey, 2016). Furthermore, quantitative research is more suitable when the researcher has some knowledge about the studied topic and want to test already existing theories.

In this project, qualitative research was chosen, as the nature of the companies in the Chemical segment, and their perspective of different areas needed to be understood. Moreover, Bryman and Bell (2011) suggest that the inductive theory historically was linked to qualitative research, which is another reason for choosing this approach.

2.2 Research design

The research design describes how the data is to be collected, and the steps needed to answer the research questions and fulfil the purpose of the project (Easterby-Smith, Thorpe and Jackson, 2015).

This project investigates two areas, the business area Process at Emerson and the Chemical industry. The first mentioned, is investigated to enable a current situation analysis, to gain knowledge about the business and to understand how the employees are working today. Since Emerson wants to gain market shares within the Chemical segment, the Chemical industry needs to be explored and understood as well. Another reason to investigate these areas is to be able to understand how Emerson's business model must change for Emerson to grow in the Chemical segment.

As explained in the previous paragraph, a case study was chosen as the strategy. In order to attain the deep level of detail that a case study requires, Denscombe (2014) states that multiple research methods are needed. Therefore, four research methods were chosen, literature review, interviews, observations and secondary data. All methods are further described in 2.3 Research methods.

As previously explained, moving back and forth between theory and empirical data can increase the research quality. Thereby, the systematic combining, suggested by Dubois and Gadde (2002), was used. The systematic combining contributes to an iterative approach that enables the researchers to develop knowledge from different research methods and gain new insights throughout the project. Furthermore, it refers to the direction and redirection, as suggested by Dubois and Gadde (2002), where for instance an observation can give new findings to be considered in the next observation or interview, that the researchers would not have thought of previously.

2.3 Research methods

This section will explain the research methods used during the project: literature review, interviews, observations and secondary data.

2.3.1 Literature review

The literature review was divided in two phases. The first phase was performed before the interviews with the customers in the Chemical segment. The second phase started when the Chemical customer interviews were performed.

2.3.1.1 The first literature review

During this phase, information thought to be relevant for the study was gathered from articles, journals and books. Search engines, such as Google, where used and also databases with online libraries, such as Google Scholar and Chalmers Library. Furthermore, old course literature in terms of books, articles and cases were studied. Topics/words that was searched for included for example: Design for Quality, QFD, revealing customer needs, Voice of Customer (VoC). The review also resulted in two appropriate tools to use when analysing Emerson's current situation, the Business Model Canvas and Porter's Five Forces.

Furthermore, books recommended by Emerson was used to understand the business areas at Emerson, as well as the different measurement technologies used in the industry. The supervisor at Emerson also taught several insights and knowledge from own experiences in the Chemical segment in order to ease the project group to comprehend the Chemical customers who would be interviewed.

2.3.1.2 Second literature review

Over time, some confusion and questions occurred when the theory structure was outlined for the second literature review. Therefore, researchers at the University of Gothenburg, at the Department of Economy and Society working with Entrepreneurship and Innovation, was contacted via mail. Other researchers at the University of Gothenburg, working at the institute for Innovation and Social Change were contacted as well. These persons were asked to give input on the literature and were asked about known researchers within the studied areas. This resulted in new areas to explore within the literature, for instance market segmentation and market entry strategy. Furthermore, additional literature was added after completing the data analysis in order to further support the findings.

2.3.2 Interviews

The interviews were conducted in two phases and have been an important part of the data collection. The first interview phase were interviews conducted with employees at Emerson in order to understand the current situation of the company, and more specifically the business area Process. In the second phase, nine of Emerson's customers were interviewed in order to gain knowledge about their needs.

Denscombe (2014), claims that there are three different types of interviews, the structured, the semi-structured and the unstructured. The structured interviews, according to Lantz (1993), imply pre-determined questions that is asked in a specific order. The answers are easy to analyse and compare due to the standardised nature of the questions. It is a fast method that can be used in both qualitative and quantitative settings. The semi-structured interview has both strict and open questions, which make it possible for the interviewee to speak freely to some extent, but the process is still controlled by the interviewer (Lantz, 1993).

The unstructured interview is open, the interviewer starts with a topic and then let the interviewee steer and develop the conversation based on his or her knowledge, without being interrupted or controlled by the interviewer (Lantz, 1993). The purpose is to let the interviewee develop his or her own thoughts without being biased by the interviewer's questions. According to Lantz (1993), this method is suitable when the researcher wants to examine individuals' subjective experiences.

2.3.2.1 Internal interviews

After the first literature review was completed, the first interview phase was initiated. As mentioned before, the purpose of this interview phase was to understand the current situation of Emerson. Therefore, employees at Emerson were interviewed. From the first literature study, the Business Model Canvas and Porter's Five Forces were concluded to be two appropriate tools to use when analysing a current situation at a company. Therefore, the interview questions were compiled and divided into categories based on each building block in the Business Model Canvas and the forces of Porter's Five Forces.

The sampling strategy will affect the results and should be appropriate regarding location and participants (Waller et al., 2016). Henceforth, the employees at Emerson that participated in this interview phase were located in Gothenburg and had relevant roles and experiences that enabled them to answer the questions.

The interviews were semi-structured with compiled questions, described earlier. Each interviewee had the opportunity to tell about their experiences and talk freely about what they thought was important. The aim of the interviews was to gain knowledge based on the interviewees' experiences and their roles within Emerson, which according to Lantz (1993) is aligned with the use of semi-structured interviews.

Moreover, according to Waller et al. (2016), the more exploratory the study is the less structure is needed, which is another reason the semi-structured approach was chosen.

In total, six interviews were conducted, each with different focus; value proposition, customers, cost and revenue, suppliers, business development and products. Each interview took 1-1.5 hours and were made face-to-face at Emerson's facilities. The face-to-face interviews give, according to Waller et al. (2016), another dimension of the interview since the body language can be observed and trust is gained to a greater extent than performing for example phone interviews. These interviews were not recorded, instead both the project workers took notes during the interview.

2.3.2.2 Interviews with Chemical customers

For the second interview phase, the purpose of the interviews was to understand needs of Chemical companies in order to give Emerson recommendations about future offerings. Therefore, customers in the Chemical segment were interviewed. The different perspectives and thoughts of the interviewees needed to be analysed and compared, which according to Lantz (1993), would imply a more structured interview. However, each company also needed to be understood, and the interviewees needed to be able to elaborate on their own experiences. Consequently, the semi-structured interview was chosen.

According to Lantz (1993), one must ensure that the interviewees are trustworthy since the information gathered during interviews will be analysed and then used as results. Emerson specified which customers in the Chemical segment that should be interviewed and provided their contact information. The interview questions were compiled and brainstormed through literature based on customer needs and interview techniques. The Chemical customers identified by Emerson were mainly manufacturing companies that had more than one production plant. However, there was one company that provided proprietary technologies to the Chemical segment. Taking this in consideration, the interview questions were compiled in two different ways, where some questions differed in the interview with the company last mentioned.

Eight interviews were conducted with companies within Chemical, and one interview was performed with a company in the Pulp and Paper industry. However, the last mentioned had a process manufacturing site very similar to the Chemical segment, which means that the information gathered was concluded to be relevant. Traditionally, European plants have served as role models when building new plants in other parts of the world. Furthermore, these nine organisations are global and have plants world-wide. Thereby, information gathered during the interviews was considered to be relevant for companies located worldwide.

All interviews were planned to be face-to-face, but due to the unforeseen virus Covid-19, five interviews were cancelled and rescheduled to phone-interviews. However, Denscombe (2014) claims that there are some advantages with phone-interviews as it

reduces the risk that the interviewees have preconceived opinions that occurs when meeting face-to-face. But it was also mentioned that phone interviews are risky since it becomes harder to verify the trustworthiness of the information the interviewee is telling.

The face-to-face interviews took 1-1.5 hours and took place at each company's office. The phone-interviews took 1-1.5 hours and was performed via Microsoft Teams. All interviews were recorded and, as Denscombe (2014) recommends, notes were taken as a complement to the audio tape. Denscombe (2014) further claims that such notes can capture other aspects, that recordings cannot, as body language, environment or climate.

2.3.3 **Observations**

During the second interview phase with the Chemical customers, a plant tour was planned at each company. The observation consisted of a guided tour where one or several employees presented sections of the plant and showed where measurement instruments were located. However, due to the consequences of Covid-19 that caused five cancellations, only four interviews and four observations took place face-to-face.

According to Waller et al. (2016), observations provide a different type of data compared to interviews. Combining these two methods can be advantageous when analysing the results, since the observation can either verify or disprove what the interviewee said during the interview.

Denscombe (2014) claims that there is a risk of having variations in the gathered data during observations, since the data quality depends a lot on the person observing and their previous experience and/or knowledge of the studied area. In order to minimise the risk, the systematic observation method can be used, which means that a checklist of things to look for is used. Therefore, prior to the first observation, a checklist was composed together with a person that had a long experience at Chemical process plants.

Prior to each observation, the contact person was asked via email if a plant tour was possible. The observations were non-participatory, which according to Waller et al. (2016), means that the researchers only observe and do not interact or perform any work tasks. Denscombe (2014) further states that avoiding interaction has advantages in terms of keeping the settings as natural as possible.

Each observation took 1,5 - 2 hours. Mobile phones or note pads were not allowed in the plants, mainly due to safety reasons. Therefore, the checklist explained earlier could not be brought. Instead insights and thoughts were written down after each observation, as a supplement to recording.

2.3.4 Secondary data

According to Easterby-Smith et al. (2015), the secondary data is information that can complete gaps in the primary data. Moreover, secondary data can include reports from companies, newspaper articles or blogs.

The secondary data used in this project was in the form of market analyses. Through Chalmers Library, market analyses of the Chemical segment were accessed. Furthermore, market analyses of the level measurement instrument industry have been used, purchased by Emerson.

2.4 Analysis of empirical data

During the interviews with the Chemical customers, notes were taken as a complement to the recording. During the interviews with the employees at Emerson, no recordings were made, but notes was taken. Therefore, full transcription of the data was not needed for data analysis in any of the interview phases. Furthermore, after each interview, insights and thoughts were written down, hence, the analysis phase started after the first interview.

As mentioned by Waller et al. (2016), the first step of the analysis phase is often something called 'open coding'. Open coding means that the data is read thoroughly, and when reading, comments and thoughts are noted. Every interview during this project was reviewed, and significant insights were written down at post-its. Each of the post-its was subsequently clustered in different categories in an iterative way. During this session, the notes that were taken during the interviews were read out loud. Whenever something was unclear, the recordings were used as a complement to the notes. When all categories were done, these became the main categories of the analysis.

2.5 Ethics

This section will explain ethical considerations taken during the interviews and observations. Ethical aspects in research projects need to be considered and is highly important in order not to harm human beings (Pruzan, 2016).

2.5.1 Interviews

First of all, it is important to make the interviewees aware of the purpose of the participation in order to reach informed consent. Moreover, the interviewer is responsible for showing respect towards the interviewee regarding gender, class and background (Waller et al., 2016). It is also important to protect the interviewee, and the interviewees must be anonymous if s/he asks for it (Carlsson, 1997). Before each interview, the interviewees were informed of the purpose of the project and of their

contribution. Furthermore, the interviewees were informed that they could choose not to answer specific questions and end the interview at any time.

According to Carlsson (1997), the interviewer is responsible for protecting sensitive information that the interviewee discusses. However, Dempsey, Dowling, Larking and Murphy (2016) state that the interviewee should be aware that anonymity does not imply that no one can take part of the study, since it in most cases will be published. But, the confidentiality means that the study should be presented in a way that makes it impossible to connect specific persons to the results. The raw material from the interviews was only reviewed by project team. Moreover, the interviewees were informed that the result and analysis of the study will be shared with relevant persons at Emerson and Chalmers, as well as published at Chalmers. Furthermore, the data have been compiled and presented in order to not make it possible to connect the result to a specific interview.

Waller et. al (2016) discuss the importance of conducting the interviews in a location where the interviewee can speak without being overheard. This was considered since the interviews were held within closed doors.

Regarding the recording, it is important to ask the interviewee if it is possible to record the interview (Denscombe, 2014). All participants in this study were asked before the start of the interview. Furthermore, it is the researcher's responsibility to ensure that the data from the recordings are saved on a safe platform. Creswell (2014) claims that the data gathered, both recordings and notes, can be stored up to five years before being discarded.

2.5.2 **Observations**

Ethical considerations of observations are similar to interviews, it is important with consent, respect and to clarify the purpose (Waller et al., 2016). There are some disagreements between researchers regarding consent of observations. According to Waller et al. (2016), the observer should always ask if it is possible to conduct the observations before they are performed. However, Denscombe (2014) says that if the observed people cannot be harmed, and thereby not exposed in a published research, ethical considerations have been considered. During this project, the contact person at each company was asked by email if an observation of their production was possible. This, in order to let them prepare other people at the company that may be affected.

Moreover, anonymity must be considered during the observations. Field notes taken or other notes related to the observation have been ensured not to connect any individuals to specific results. As insights were written after each observation, no names or other information that could connect individuals to different events were included.

2.6 Research quality

This section discusses the quality of the research, divided into three categories: validity, reliability and generalisability.

2.6.1 Validity

The validity relates to the accuracy of the findings in the research, and can be ensured through several procedures (Creswell, 2014). According to Pruzan (2016), the term is connected to the trustworthiness of the research. One way to ensure validity of the study is to triangulate, which means that the researcher uses more than one method. This study includes four different methods; literature review, interviews, observations and secondary data. These four methods made it possible to cross-check findings, which, according to Bryman and Bell (2011), is included in triangulation.

According to Denscombe (2014), qualitative research is based on grounded theory, which means that the findings are based on empirical data. This increases the validity of the research. Since the study is based on empirical data of different methods, the validity is increased. However, the result of the interviews is based on what people say and not what they do, which implies a risk in lacked trustworthiness (Denscombe, 2014). But, since observations were done as a complement to the interviews, the validity of the project increases. Moreover, Bryman and Bell (2011) state that recording the interviews also increase the validity, as it helps to avoid misunderstandings.

The interviews with Chemical customers were recorded, but not with the employees at Emerson. However, since the employees were located at the same place where the project was written, there was no problem to double-check statements that were uncertain. In order to enhance the validity, more interviews and observations could have been conducted. However, time limitations and the appearance of Covid-19 restricted this.

Furthermore, the majority of the interviews were conducted by phone, which according to Denscombe (2014) can decrease the trustworthiness of the information the interviewee is telling. However, performing the interviews face-to-face was not possible due to Covid-19. Moreover, the interview questions as well as the analysis were based on literature and relevant models which increase the validity to some extent.

2.6.2 Reliability

According to Denscombe (2014), reliability in research implicates the extent to which another researcher would find the same results if the study would be replicated. Moreover, the author mentions that reliability is hard to achieve in qualitative research since it is based on a social setting.

Bryman and Bell (2011) state that reliability in qualitative research is hard to evaluate, however it can be increased through explaining the procedure, including the different steps, in detail. It is hard to say if the result would be the same if a replication of this study was to be done, however the method-chapter in this project tries to explain in detail what was done in order to increase the reliability. But, the results from the interviews and the observations is hard to replicate in this project since it is based on specific people's opinions and experiences.

However, all interview questions were the same for every interviewee which made it easier to interpret dependencies and significant factors. This would somehow contribute to the reliability.

2.6.3 **Generalisability**

According to Bryman and Bell (2011), generalisability refers to how applicable a research study is for other cases. Gary (2015) mentions that researchers disagree regarding how well a case study can achieve generalisability since the case study's main focus is on one, or a few cases. However, the author claims that is it possible to make general conclusions since the case study investigates more than one dimension of the studied area. Analysing, digging deep and exploring different perspectives of a topic can increase the understanding of complex relationships, dependencies and therefore answer questions as why and how. Therefore, as this project is a case study, the generalisability is increased to some extent. Dubois and Gadde (2002) state that a method called systematic combining can contribute to achieve generalisability in case studies, which has also been used during the project.

The interviews have mainly been conducted with instrument technicians. This can both be seen as positive and negative, since the result gives an in-depth understanding of the instrument technicians' perspective. However, it makes the study less generalisable to other profession's perspectives.

As mentioned earlier, all the Chemical customers are global and have plants worldwide. Traditionally, European plants have, according to Emerson, served as role models when building new plants in the world. This means that the result can be applied to other plants in other parts of the world, which means that the generalisability is further increased.

3 EMERSON

This section will describe Emerson, the focus company of the case study.

Emerson Electric Co. is a technology company that offers products and services within process management, industrial automation and engineering. Emerson is headquartered in Missouri in the US and is a multinational organisation that operates in Asia-Pacific, Europe Middle East and Africa, and the Americas. The turnover in 2019 was 18,4 billion USD (MarketLine, 2020). The company have a trend of long-term growth, where shareholder profits have been distributed for the past 60 years.

Rosemount Tank Radar AB is a subsidiary company headquartered in Mölnlycke, Sweden, that manufactures radar instruments for level measurements, suitable in a large variety of industries. The organisation operates in Asia-Pacific, Europe Middle East and Africa, and the Americas. In 2019 the organisation had a turnover of 143 725 USD (Business Retriever., n.d).

Rosemount Tank Radar AB operates within three primary markets: Marine applications, Tank Gauging and Process Radar. Process Radar, in which this project is executed, is focused on general gauging in process industries for both liquid and solid applications.

Rosemount Tank Radar AB originates from Saab. A new business unit was started at Saab in 1976, where Saab became the first company to use radar technology for tank level measurement, mainly in the marine sector. In the 1990's, Saab's radar technology became the world leader of level measurement instruments within the oil industry. The Rosemount measurement system was the first patented solution for radar level measurements. The company grew large within the Oil & Gas industry and is today the leading company in the segment. In 2003, Saab's radar business was acquired by Emerson. From now on, Rosemount and all subsidiary activities will be referred to as Emerson. Emerson's focus has been on products of high quality and high complexity, developed for tough conditions and with high precision.

When the patent expired, competition started to grow. The competitors mainly focused on markets and product segments where Emerson was not as present. They succeeded in capturing the needs of customers present in other markets than Oil & Gas and have developed a stronger product offering in lower price segments. However, Emerson at large has a strong market position and is recognised as a leader in the radar level measurement industry. Especially within the Oil & Gas segment where Emerson holds 40% of the entire market which corresponds to 100 million USD, see figure 1.

Now, Emerson wants to grow in markets where their competitors are stronger. This project investigates the Chemical segment where Emerson holds 8% of the market, which corresponds to approximately 30 million USD. Traditionally, Emerson's

products have been developed for robust applications, and apart from providing high precision and high quality, the products are generally in a higher price segment and considered expensive for applications outside Oil & Gas.

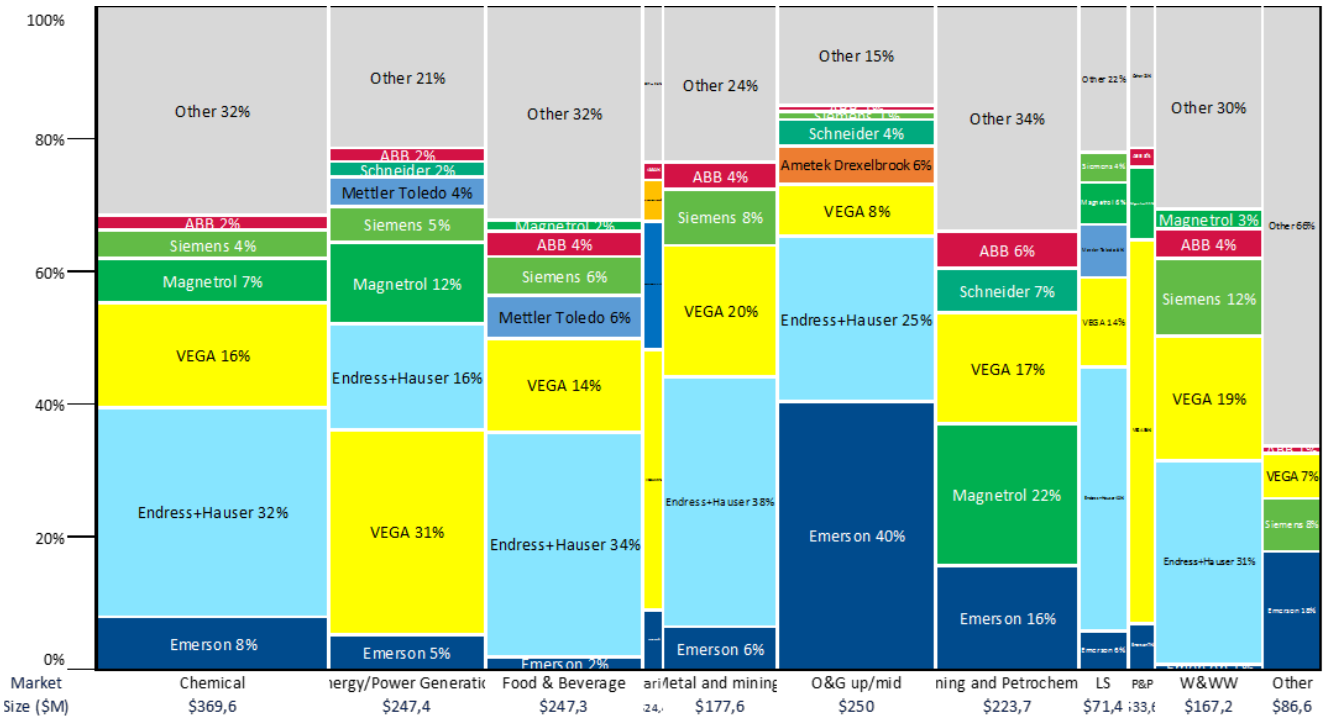

Figure 1. *Distribution of radar instruments' market share in different customer segment, for Marine applications, Tank Gauging and Process Industries.* Figure by Emerson based on a market report from VDC.

4 THE CHEMICAL INDUSTRY

This section will the describe the Chemical industry, the focus segment of this study.

The European Chemical market has grown during the past years, in 2019 the market value reached 857,2 USD (MarketLine, 2019). The market is expected to grow further during the coming years (VDC Research, 2019a; VDC Research 2019b).

The Chemical market consists of a wide variety of fields: specialty Chemicals, PetroChemicals, commodity Chemicals, agricultural Chemicals and other Chemicals (for example pharmaceutical Chemicals). The European Chemical market was, during 2018, the second largest of the world markets. Commodity Chemical is the largest segment, specialty Chemicals the second largest. Germany accounts for the largest share of the European market. (MarketLine, 2019)

The main buyers to the Chemical companies are manufacturers of products that require Chemicals, such as plastic products and pharma companies and the key suppliers are companies such as Oil & Gas and utility companies. The competition in Chemical is strong as large capital-intensive manufacturing companies dominate the market, and rivalry between these incumbents is high. Single-use plastics will be forbidden in the EU; this puts high pressure on the companies' R&D which make them come up with new products. (MarketLine, 2019)

4.1 Level measurements

Level measurement is used to gain information about the surface position in a vessel and are commonly used in the Chemical segment. The surface can be solid, liquid or an interface of two liquids with different properties.

Being aware of the level of tanks and vessels is important in order to control the safety and profitability of the company's processes. Different applications demand different accuracy; however, the accuracy varies between different measurement methods and applications. This section will describe the reasons why level measurement is done, and the most common reasons of doing so. (Emerson, 2019)

4.1.1 Why measure level?

Reliable and precise level measurements are crucial in securing safe and effective processes (Emerson, 2019). Most of the purposes with level measurements will be introduced in the following segment.

4.1.1.1 Inventory

Keeping track of inventory levels is the most common reason for level measurements, either in terms of volume or in weight (Lewis, 2012). Inventory control has become more and more important over the years and more people are interested in it. In the past, inventory was most important for the operators responsible to monitor the processes. However, the increased focus on safety, cost of ownership and value of stored products has led to include other parts of the company such as management and accounting (Emerson, 2019).

4.1.1.2 Custody transfer

Custody transfer, meaning the amount of material that is bought and sold, is often based on level measurement that is converted into volume or weight. In this usage area, the precision of the measurement is often important as very small errors can result in incorrect payments, both when buying and selling the product. There are guidelines and recommendations for custody transfers using level measurement in international standards as well as possible national approvals that must be followed. (Emerson, 2019)

4.1.1.3 Process efficiency

Ensuring accurate level measurements increases the efficiency of a company's processes as it makes sure that there is enough material to run the process on full capacity (Lewis, 2012). For example, if tank measurements are not correct, the process might run on smaller batches than is needed, or if the variation in the measurements forces the company to run on lower capacity than needed. (Emerson, 2019)

4.1.1.4 Safety

Safety is an important aspect of level measurement and over the years the focus on safety has increased in order to gain more control. Level measurements impact safety as it provides control over overflowing in vessels. Vessels containing flammable, hot, caustic or reactive materials need safety systems to keep them from overflowing as overflow can lead to for instance severe incidents and environmental impacts. (Emerson, 2019).

4.1.2 Level measurement technologies

The study focuses on radar measurement technologies; therefore, the following section will describe the two types of radars provided by Emerson: guided wave radar and non-contacting radar. Furthermore, there are substitute technologies used in the Chemical industry, see Appendix 1.

4.1.2.1 Guided wave radar

The Guided wave radar (GWR) is mounted on top of the tank or vessel and is connected to a probe that reaches into the tank or is mounted on the side of the tank (Emerson, 2019). An energy pulse of microwaves is sent down the probe, and as the signal reaches the surface of the liquid, some of it reflects up the probe to the transmitter (Melwin and Sheer, 2014). The transmitter measures the time delay between the transmitted and the reflected signals and calculates the distance to the surface (Emerson, 2019).

As only a part of the transmitted signal bounces back, and the rest continues through the fluid, GWR is a good method when measuring liquid interfaces, such as oil and water, and measuring through foams. In these cases, the transmitter will receive a second reflection of the liquid and will be able to calculate the height of both fluids. (Emerson, 2019)

GWR can be used in tanks of all sizes, in chambers and tanks with little space. It works well in cases with turbulence, with low dielectric applications and since it does not depend on reflecting from a flat surface, GWR can measure tanks with powder and grains as well as liquids (Emerson, 2019). The measurements are accurate and reliable, both for the level and the interface, and applicable in many different situations. As radar is the basic principle of the method, no calibration is needed for changes in density, dielectric or conductivity of the fluid, and changes in temperature or pressure does not impact the accuracy (Melwin and Sheer, 2014). As there are no moving parts in the product, little maintenance is needed. Furthermore, GWR is easy to install and can replace other technologies even if there is still liquid in the tank (Emerson, 2019).

Even though GWR works in many different conditions, the conditions in the tank impact the type of probe that should be used. The choice of probe style depends on the application, length of vessel and mounting restrictions. Furthermore, direct contact with metallics requires a special type of probe. If the fluid is sticky or coats, problems with build-up can occur and special probes should be used to minimise the impact. Some GWRs have a self-diagnostic feature that can detect build-up on the probe and notify the maintenance system. (Emerson, 2019)

4.1.2.2 Non-contacting radar

Non-contacting radar can run on two techniques, pulse radar or Frequency Modulated Continuous Wave (FMCW). The pulse radar sends a pulse signal that reflects on the product surface and returns to the gauge which measures the time delay and calculates the distance. (Emerson, 2019)

The FMCW-radar sends a continuous microwave signal with varying frequency. The signal reflects on the surface and returns to the transmitter where the frequency of the reflected signal is compared to the frequency of the signal transmitted at the time of the

return. The difference in frequency is directly proportional to the distance to the liquid, and the precision of the measurement is high. (Emerson, 2019)

As the radar does not meet the content in the tank, the risk of corrosion is low, and sticky and abrasive fluids are not a problem. Furthermore, the frequency of the radar signal can be adjusted to fit the application of the tank where lower frequencies reduce sensitivity to vapor and foam. Moreover, higher frequencies keep the radar beam narrow which makes it less sensitive to disturbances from nozzles, walls and other signal disturbing objects. (Emerson, 2019)

Radar measurements do not require any compensations for changes in density, dielectric constant or temperature in the liquid. The measurements are not affected by pressure, temperature or by most vapor space conditions, hence the measurement is reliable and not sensitive to changes in the surrounding environments. As there are no moving parts, maintenance is minimal. The technique can be used for liquids, and some solids. As it does not touch the medium, it is suited in applications that are dirty or corrosive. (Emerson, 2019)

In non-contacting radar, the installation is very important for correct measurements. The gauge must be placed so the view of the surface is clear as blockage in the tank, such as pipes and stirring devices, can cause false reflections. The non-contacting radar can handle stirring; however, it depends on the fluid properties and the level of turbulence. The dielectric constant and the condition of the surface impacts the reflection of the radar signal, and therefore the measurement. It also makes the measurement more sensitive to foam. If the surface is turbulent and the dielectric constant is low, the reflected signal to the gauge becomes very low and makes the measurement less correct. (Emerson, 2019)

5 THEORETICAL FRAMEWORK

This chapter will give insight in the theory and frameworks that have been the base of the study. First, the Business Model Canvas framework will be explained, then, as related to the aim, it will continue in ‘creating competitive advantage’ and then cover ‘customer needs’, ‘customer relationships’, ‘innovation’, ‘customer involvement’ and ‘cross-functional integration’.

5.1 Business Model Canvas

The Business Model Canvas (BMC) is a tool used to understand the business model of an organisation, how to position the company in a competitive landscape and to shape the future design of the business model. The first aim of the tool is to create a shared understanding of the business model that provides the basis for the creation of new strategic alternatives (Osterwalder and Pigneur, 2010). The BMC has its starting point in nine building blocks which aim to provide a clear picture of how a company intends to earn profit. The building blocks are customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure, see figure 2.

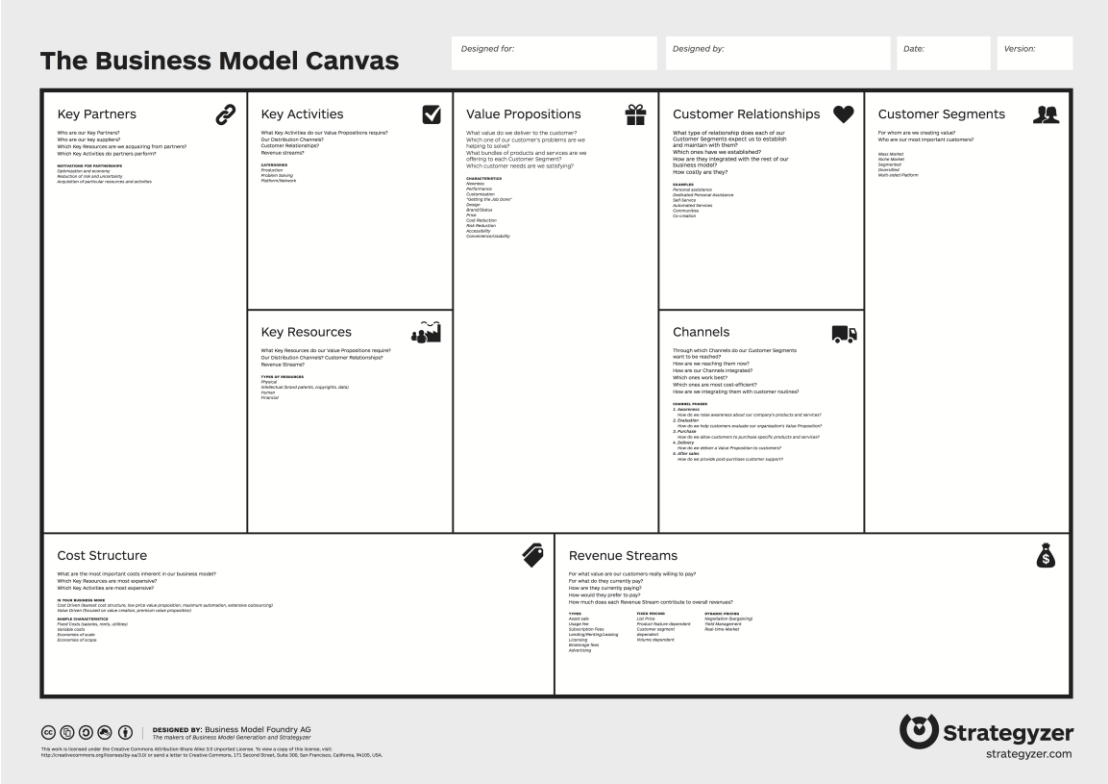

Figure 2. Business Model Canvas Poster (Wikipedia, 2020). CC-BY

5.1.1 Customer segments

This building block aims to define the groups of potential customers an organisation wants to target. The customer segments provide the foundation of the business as it is not possible for a company to survive without profitable customers. An active decision must be taken regarding which segments to target and which segments that are to be disregarded. When finished, it should be clear for whom the company wants to create value, and who the most important customers are. (Osterwalder and Pigneur, 2010)

5.1.2 Value proposition

The value proposition building block describes the product/service offering designed to create value for the specific customer segment. It constitutes the reason to why a customer would choose the focal company over a competitor and aims to solve a problem or target a need the customer has. A company can have several value propositions containing different bundles of products and/or services that target the needs or problems of a specific customer segment. When finished with this block, the following things should be defined: which value that are to be delivered to the customer, which of the customer's problem the company aims to solve, which customer needs that are to be satisfied and the design of the product/service offering to each customer segment. (Osterwalder and Pigneur, 2010)

When defining the value proposition, the following eleven values can be used as a grounding point: Newness, Performance, Customisation, "Getting the job done", Design, Brand/Status, Price, Cost reduction, Risk reduction, Accessibility, Convenience/Usability. (Osterwalder and Pigneur, 2010)

5.1.3 Channels

The channel building block aims to define the channels through which the company communicates with their customer segments. Communication, distribution and sales channels are the interface a company has towards its customers, which means that they have several purposes. The channels should aim to make customers aware of the company's products and services, provide after-sales support, to deliver and help the customers evaluate the value proposition and, lastly, to allow customers to purchase the products or services of the company. (Osterwalder and Pigneur, 2010)

The channels should take their starting point in how the customer segments want to be reached, combined and integrated to successfully deliver the company's value proposition. Furthermore, the organisation must choose between using their own channels, partner channels or a combination of the two. Own channels can be both indirect and direct, where indirect channels can be a retail store operated by the company, and direct channel is for instance websites or the sales force. Partner channels

are always indirect and include a wide range of options of different distribution, such as wholesale, retail or partner-owned websites. (Osterwalder and Pigneur, 2010)

5.1.4 Customer relationships

The customer relationship building block aims to define the type of relationship the company want to establish with the customer segments. It should be clear which types of relationships the company wants to have with each customer segments, and the relationships can range in how personal or automated they are. Which customer relationships are chosen heavily impact the overall customer experience. There are several categories of customer relationships and they may co-exist in a relationship with a customer segment. (Osterwalder and Pigneur, 2010)

The categories are: Personal assistance, Dedicated personal assistance, Self-service, Automated services, Communities, Co-creation.

5.1.5 Revenue streams

This block aims to define how the company generates cash from their customer segments. The company must know what the customers are willing to pay for regarding products and services, and the different revenue streams can have different pricing mechanisms. Furthermore, the company should be aware of how the customers want to pay, and how and what for they are paying today.

There are two main types of revenue streams, the one-time customer payment and the ongoing payments (for example in form of a customer support subscription). Within those, there are different ways of generating revenue streams. The categories are: Asset sale, Usage fee, Subscription fee, Lending/renting/leasing, Licensing, Brokerage fees, Advertising. (Osterwalder and Pigneur, 2010)

5.1.6 Key Resources

This building block aims to identify which assets are the most important in delivering the value propositions, and in turn make the business model work. The resources make it possible for the organisation to create and deliver the value proposition, to reach their customer segments, maintain relationships with the customer segments and collect revenue. There are different types of key resources depending on what the business goal is. The resources can be physical, financial, intellectual or human. They can be owned by the focal company or leased or acquired from key partners. The four main types of resources are: physical, intellectual, human, financial. (Osterwalder and Pigneur, 2010)

5.1.7 Key activities

All business models need a number of key activities which describe the most important things a company must do. The key activities are actions that must be undertaken for successful operations. These are linked to the value propositions, the reaching of markets, maintaining of customer relationships and earning of revenue as they set the possibilities to do so. The key activities differ depending on the industry, software companies will have a different set of key activities from manufacturing companies. There are three categories of key activities: Production, Problem solving, Platform/network. (Osterwalder and Pigneur, 2010)

5.1.8 Key partnerships

This block outlines the network of suppliers and partners that are needed for the company to operate. There are many reasons for a company to create partnerships, and many partnerships become important in the business model as they can help enhance the business model, reduce risks or give access to resources. There are four main types of partnerships: strategic alliances between non-competitors, coopetition's (strategic partnerships between competitors), joint ventures and buyer-supplier relationships. (Osterwalder and Pigneur, 2010)

5.1.9 Cost structure

This building block identifies the most important costs connected to the operations of the business. All previous building blocks generate costs, and those costs can be identified quite easily after defining the other blocks. Organisations differ in how cost-driven they are, and some businesses are entirely built around low cost structures, for example in low cost airlines. All businesses aim to minimise their costs, but as mentioned some companies are more focused on building low-cost structures. Therefore, two business model cost structures are distinguished: the cost-driven and the value-driven. The cost-driven business models work to minimise costs and to offer a very lean cost structure by offering low price value proposition. Value-driven companies focus on more premium value proposition and with more personalised service features. (Osterwalder and Pigneur, 2010)

To create a strong business model, it is important to identify these steps to understand customer needs and create competitive advantage (Osterwalder and Pigneur, 2010).

5.2 Creating competitive advantage

Satisfying customer needs is essential to become profitable (Porter, 1985). Furthermore, when entering new markets, it is important to identify how to do business in the new market to create competitive advantage (Roberts and Berry, 1984). The choice of how to create competitive advantage relates to a company's business model (Osterwalder and Pigneur, 2010). The business model provides a structure of how the firm interacts with actors in the business network and the markets it wishes to target (Zott and Amit, 2008). Firms can address the same customer needs in a market, but still have different business models. It is the firm that creates the most value that gets the advantage.

There are two main ways of creating competitive advantage, by offering a premium price product to differentiate in the market, or by offering a similar product at a lower price, thereby creating a price advantage (Van der Stede and Bruggeman, 1993). To create competitive advantage, firms must make a choice in which type of competitive advantage it aims to secure, as trying to please everyone's wants often leads to strategic mediocrity and low performance (Porter, 1985).

Competitive advantage stems from all the activities a firm executes to design, produce, market, deliver and support the offering (Porter, 1985). The set of activities creates the position the company is in, either the cost leadership or the differentiation. An organisation built on low cost involves low-cost activities such as cheaper distribution systems and high resource utilisation, while an organisation built on differentiation involves other types of activities, such as purchasing of high-quality materials and superior designs (Porter, 1985). Competitive advantage is gained by performing these activities either at a lower cost, or better, than the firm's competitors.

5.2.1 Cost leadership

The cost leadership strategy implies that the firm sets out to sell their products at a cheaper price than its competitors (Porter, 1985). Low-cost firms often sell a standard product to many different industry segments, trying to reap benefits from economies of scale (Banker, Mashruwala, and Tripathy, 2014). A firm that achieves and sustains cost leadership will be high performing in its industry. However, cost leaders cannot ignore differentiation completely. Customers must perceive the product sold as equivalent to what competitors are offering, otherwise the cost leadership firm will be forced to sell products well below competitor prices (Porter, 1985).

In industries where several firms aim to become the cost leader, rivalry between the firms might become fierce as all growth in market share becomes important. The situation can become harmful unless none of the firms gain the cost lead, hence the cost leadership strategy is notably dependent on pre-emption (Porter, 1985).

5.2.2 **Differentiation**

The differentiation strategy implies that the firm tries to be unique in its industry, by offering features that give extra value to buyers. The firms identify attributes that customers in the segment value and set out to meet those needs. The reward for doing this is that the firm is able to sell at a premium price (Boehe and Cruz, 2010). Furthermore, other benefits such as customer loyalty can be gained (Porter, 1985). The differentiation delivered can be attractive in a broad group of customers or provide extra value to a smaller set of customers with special needs.

There are many ways of differentiating in a market, where differentiation can be based on for example the product, the way of delivery, the marketing approach or something else (Banker, Mashruwala, and Tripathy, 2014). A firm that sustains and achieves differentiation will be high performing in its industry. However, differentiators must constantly work to find out how to create a price premium that exceeds the extra costs of providing the differentiation (Porter, 1985). Furthermore, the differentiator cannot ignore cost completely as premium prices set too high will be unattractive to buyers relative to offerings from cost leadership competitors. Therefore, differentiators aim to reduce costs in areas which do not impact the differentiation (Boehe and Cruz, 2010).

To succeed with the differentiation strategy, the firm must find unique attributes that are different from its rivals (Boehe and Cruz, 2010). For customers to pay a premium price, the offering must be truly unique and valued by the buyers, it is not enough just to be different. The differentiation can be connected to the product, and the activities around it, however many successful differentiators creates unique values through other sets of activities (Porter, 1985). Technology development activities can create products with unique performance. The logistical system can create fast and reliable deliveries and sales forces can increase differentiation by providing unique expertise and support. Furthermore, differentiation can emerge from how the company interacts with its customers - how they make use of the customer relationships and how they interact with their customers (Ford et. al., 1998).

Another way of differentiating is to offer a large sized portfolio of products and services. A broad scope can provide value for customers by serving a large set of their needs: help simplify maintenance by reducing the number of spare parts and designs needed, a single point contact for purchase and customer service and larger compatibility in products (Porter, 1985). Furthermore, many differentiators rely on customisation of products, which builds relationships with the customers and makes the customers expect customised products form differentiators (Banker, Mashruwala and Tripathy, 2014).

Technology impacts the competitive advantage if it impacts the firm’s cost position or differentiation (Porter, 1985). With regards to differentiation, technology development can increase value for customers if it provides unique and needed features. If a company

can find technology that better, than competitors, perform a task the firm will gain competitive advantage (Porter, 1985).

5.2.2.1 Creating value for the buyer

There are two ways of creating value for a customer, either by lowering the customer's costs or by increasing the customer's performance. If a customer can lower its costs or increase its performance, the customer will be inclined to pay a higher price. Furthermore, other customer goals, that are additions to goals on profitability, might impact the buyer value, for example in providing satisfaction or prestige for employees (Porter, 1985). To provide the customer's value, the firm must understand the set of activities performed by the customer as the differentiation offered impacts the customer's activities (Ford et. al., 1998). Looking into a set of customers might provide insights in what is perceived as value (Porter, 1985) The customer relationships are important in understanding the customers (Ford et. al., 1998). If companies ignore the customer relationships when trying to find what is valued, the company is likely to focus on the wrong things.

5.2.2.1.1 Lowering buyer costs

Finding ways of reducing the customer's cost is one way of differentiating. It demands that the firm have a thorough understanding of how the customers use the product and how the customer's activities impact costs. Some ways of lowering customer costs are: lowering delivery or installation costs, lower the cost of using the product in for instance reduced need of maintenance and labour, lower the indirect costs of using the product, for example the impact the product has on the production and lowering the risk that the product fails which reduces the customer's cost of failure. (Porter, 1985). Short lead times for spare parts are, for example, a way of reducing downtime. Furthermore, firms can offer their customers technical support and advice to reduce costs.

Regardless of which value provided to the customer, it is difficult for the customer to assess how the product will create value for them in advance. In many cases, customers cannot know how it will impact the costs or performance before purchasing and using the product. Therefore, customers often do not know what to look for in a supplier, and firms trying to differentiate must create signals of value to send the customers. These signals relate both to things that the firm can control, such as the ongoing expenditure and reputation, and things the firm cannot control, such as word of mouth (Porter, 1985). In line with this, Cooper and Kleinschmidt (1993), noticed that in order to increase customers' willingness to try a new product in the Chemical segment, a trial period was crucial.

Furthermore, when purchasing a product, the person who makes the purchase decision will be a large impact in the product's value. The decision maker can be separated from the users and the ones paying for the product, and the different needs and wants might not be the same. For example, purchasers might value cost more whilst plant managers

value reliability. Often, there are also individuals that influence the one making the decisions even though they are not directly part of the decision. These individuals might veto suppliers, even though they do not have the power to decide. (Porter, 1985)

5.3 Understanding customer needs

To create competitive advantage, it is crucial to understand the customer needs (Porter, 1985). Organisations must make well informed decisions about which customers to serve and which to ignore, and from that create a business model adapted around a comprehensive understanding of their targeted customer's needs (Osterwalder and Pigneur, 2010). In many cases, there is an agreement within the company that the understanding of customer needs is key to innovation, however different instances of the company often disagree on what a customer need is (Ulwick and Bettencourt, 2008). In many cases, companies do not have a standard of what a need is; how it is structured, the format of it and its purpose. Furthermore, Ulwick and Bettencourt (2008) argue that most companies fail to make the customer input useful and that the input should be used to give complete and accurate data.

Swaddling and Zobel (1996) also discuss how the understanding of customer needs are crucial in order to develop successful products, but that most companies fail in the understanding. Additionally, the authors argue that understanding customer needs leads to better decision-making and identification of market opportunities. Often, companies define their business to narrow, which can cause the risk of missing opportunities. Instead, companies must understand the underlying need they are working to fulfil. Ulwick and Bettencourt (2008) state a number of characteristics that the basic customer need statements should fulfil to deliver.

The authors argue that the statement must be written from the customer's perception of value and be defined on how the customer measures value, thus not on what the focal company believes the customer values. Furthermore, the statement must be commonly accepted and relevant to all the company's customers, regardless of segment. Neither can a basic customer need change over time, which means that the basic customer need must be relevant regardless of how much time that passes. The statement should be clearly defined, and words that can be interpreted differently by people should not be used. Lastly, the statement should not suggest how the different statements are prioritised. (Ulwick and Bettencourt, 2008)

Furthermore, Ulwick and Bettencourt (2008) suggest that the customer need statements should focus on the job the customer is trying to get done. This, since customers generally can articulate demands on how they want the job to be carried out in an easier way, and other jobs related to it, even in situations where there are no existing products.

5.4 Customer relationships

Close relationships are crucial for a company's survival (Peppers and Rogers, 2016). Ford et. al. (1998) describe the customer relationships as one of the most important assets in a company. In business-to-business (B2B) contexts, a sale is rarely a one-off transaction, it is a chain of events that might go on for several years (Storbacka, Strandvik and Grönroos, 1994). The delivery might go on for months or years, and after-sales support and follow-up is often a long-going process (Ford et. al., 1998). The first sale is, in many cases, the start of a relationship with many purchases over several years. Therefore, managing the sales relationships is a complex and important task. Furthermore, obtaining new customers is often more costly than maintaining existing customer relationships, which is the basic argument for managing the customer relationships (Storbacka et al., 1994).

Having strong customer relationships can create lock-in effects where it becomes more difficult for the customer to switch to a competitor supplier (Storbacka et al., 1994). Additionally, Belu and Caragin (2008), describe physical distance as an important factor that impacts the risk when entering new territories. Ford et. al. (1998) also mentions how physical, social and cultural distance can impact the relationship and that it is important to try to reduce the distance to create stronger relationships.

Customer relationships are likely to involve a lot of resources, both in sales, administration, production, logistics etc. (Ford et. al., 1998). Thus, customer relationships demand for resource allocation between the different customers and activities. The customer portfolio requires as much resources as the product or service portfolio. This implies that it is important to gain and develop customers into becoming profitable, but also to eliminate customers who are not profitable (Peppers and Rogers, 2016).

The sales force that performs the personal selling is at the heart of coordinating effective customer relationships. The sales force is directly involved in the relationship; however, they also coordinate the interaction of other people within the company. If this coordination does not exist, the resource usage can increase, and the relationship can develop in an unwanted direction. The sales force makes sure that the scope of the customer offering is expressed in a consistent way in all different channels. (Ford et. al., 1998).

In most cases, customer relationships involve many different people in the customer organisation (Ford et. al., 1998). The personal contacts are important as they can help the company understand the customer's problems and uncertainties, and by that reduce its own uncertainties. The intensiveness of personal contacts changes depending on which state the relationship is in. For example, the intensity is probably higher in the beginning of a joint project of changes in product design, and lower once the product

design is done and the customer is buying the product, and everything works. (Ford et. al., 1998)

Traditionally, strategic management literature has advised companies to refrain from entering into close partnerships as it was argued to create unwanted dependence and give power to threaten or exploit the dependent organisation (Ford et. al., 1998). However, during the past years it has been clear that companies willingly create dependent relationships to harvest the benefits close relationships give, for example in joint product development and supply chain management.

Furthermore, the authors argue that, although several things must be formalised and based on legal criteria, mutual trust and commitment are crucial factors in relationships, which are created through interactions and social exchange (Gadde, Huemer and Håkansson, 2003). Furthermore, it is mentioned that trust increases when customers get help to resolve issues they have not been able to manage themselves.

Gadde et al. (2003) further argue that coordination of activities enhances the efficiency. Thus, it is important for firms to connect their activities, improve performance and further to develop the relationships in a systematic way as the high involvement can give large benefits. Ford et. al. (1998) also describe how companies gradually focus more on restructuring their supply chains to include fewer suppliers. This includes an increased tendency of using suppliers for a wider scope, letting them perform activities previously performed by the company.

Furthermore, it is important to be aware that the customer might not have the same intentions for the relationship as the supplier (Ford et. al., 1998). In some cases, the supplier might see potential in increasing its sales to a customer and are therefore willing to invest time and other resources in it. The customer, however, might only be interested in buying one component of the supplier and wants to contact the supplier only at the time of purchase.

Furthermore, the sold products might not be very important in the customer's operations, even though the products can be of high value. The more important the sold components are, the more eager the customer will be to have a close relationship. Therefore, it is important for companies to manage their relationships in the current state, but also when trying to steer the progression of the relationship in a direction that meets the company's interests (Ford et. al., 1998).

How well the company interacts and manages its customers, how well the customer related activities are managed and how well the different individuals involved in the customer relationships are managed is a directly linked to the company's competitive advantage (Ford et. al., 1998). Understanding the customer gives insight in what the customer needs are, and how the company's products impacts the customer's operations (Peppers and Rogers, 2016).

5.4.1 Customer support

Customer support has been progressively important for companies offering more technical products and services. Traditionally, customer support has been seen as a cost in the organisation and not a profit-making function (Davenport and Klahr, 1998). Because of that, there have been much pressure in keeping costs down, but still try to satisfy the customers. Simultaneously, many companies are selling similar commodity products which increases the demand for differentiation (Porter, 1985). Thus, companies have realised that customer support is a mean of differentiation (Davenport and Klahr, 1998). Improved customer support quality has shown to improve customer satisfaction, leading to higher customer loyalty and additional sales.

5.4.1.1 Servitization

Expanding the offering with services, such as customer support, have for the past years been known to increase the value delivered, and thereby contribute to competitive advantage (Baines, Lightfoot, Benedettini and Kay, 2009). Considering this, most management literature suggest traditional product companies to incorporate service sales in their offering (Oliva and Kallenberg, 2003).

The authors extend the argument for doing this outside of the competitive advantages to also include profits - customers are generally willing to pay for services, resulting in higher margins, and service sales are less sensitive to the economic cycles. In addition, there is a trend in downsizing to narrow the company scope and focus more on core competences, thereby trusting third parties with tasks that do not belong to the core business.

Much of the arguments of incorporating services in the offering lie in financial drivers, in higher profit margin and in stability of income (Baines et. al., 2009). Sawhney, Balasubramanian and Krishnan (2004) mention several examples where service sales have become twice as large as product sales and generated stable revenues, even in times with lowered sales. The stabilised sales stem from the fact that product-service sales seem to be counter-cyclical and more resistant to economic cycles that impact product sales (Baines et. al., 2009).

The competitive advantage given by services mainly derives from being able to differentiate the product from competitors (Baines et. al., 2009). In many cases, the competitive advantage created by services is more sustainable since it is much harder to copy (Oliva and Kallenberg, 2003). Furthermore, Gebauer and Fleisch (2007) also argue that it is becoming more difficult to gain competitive advantage based on product innovation and technological superiority. Services can also make the customer feel that the physical product is customised, which increases barriers to competitors (Baines et. al., 2009). Therefore, more and more value propositions include services as fundamental parts in delivering value, reducing the product from the main value to be a part of the offering.

Customers are also starting to demand sales of services, as many are pressured to narrow the core competences, be more flexible and have higher technological complexity (Slack, 2005). This often leads to increased pressure to outsource services. Furthermore, services have shown to contribute to customer loyalty and thereby make customers dependent on the supplier (Baines et. al., 2009).

However, the transitioning from product to service orientation is difficult and many firms fail, mainly because the business model must go from transactional-based to relationship-based (Oliva and Kallenberg, 2003). Therefore, it is suggested to take smaller steps and to start by offering certain services, not entire solutions straight away. Gebauer and Fleisch (2007) mention how offering customer support can be the start of making the transition from product manufacturer to solution provider. Furthermore, to incorporate service sales, a strong customer orientation is needed (Baines et. al., 2009). However, offering services gives companies insights on customer needs which can help develop more attractive offerings (Baines et. al., 2009; Gebauer and Fleisch, 2007).

5.4.1.1.1 After-sales support

After sales support has shown to be significant in improving the customer satisfaction and plays an important role in building customer relationships (Ford et. al., 1998). A study performed by Sigala, Rigopoulou, Chaniotakis, Lymperopoulos and Siomkos (2008) clearly showed that after-sales services improved the value perceived by the customers and in turn the quality of the relationship. Thus, the after-sales service provided value-adding attributes to the offering, making it into a strategic question. Cooper and Kleinschmidt (1993) found in their study of the Chemical segment that customer support and technical support were crucial in the launch of new products. Furthermore, the quality of the sales force was perceived to be important for success.

Gebauer and Fleisch (2007) state that manufacturing companies must innovate in creating customer support services that relates to, for example, process-oriented engineering, spare part management and management of customer maintenance. Maintenance is a cost for companies and performing preventative maintenance can help reduce costs and increase performance in processes (Bergman and Klefsjö, 2010).

Mathieu (2001b) argues that customer support should include services that help maximise the customer's processes and strategies related to the focal company's product. Furthermore, the customer support can change the focus of the customer's value proposition from efficacy to efficiency and effectiveness in all the customer's processes. Gebauer and Fleisch (2007) further mention how including the customers in the innovation process is crucial for successful launches, where the customer should take part in the whole development process.

5.5 Innovation

To continuously renew and innovate the offering of a firm is the base of creating customer value (Ford et. al., 1998). This means that the supplier must constantly look for new improvements in the offering and interaction with its customers. According to Toner (2011), an innovation is to create a new product or service or improve some features within an existing offering that develop technical requirements, the software or the ease of use.

The author also states that innovation can be based on new technologies or make use of already existing research and technologies. Furthermore, Hauser, Tellis and Griffin (2006) emphasise on the significance of the customer's perspective in innovation. This is related to the importance of understanding customer needs, and in turn develop innovative products and services that fulfil these needs.

Gaubinger, Rabl, Swan and Werani (2009) mention that when a product reaches a certain maturity, most of the products sold are similar and provides little differentiation. Moreover, the authors state that being the first organisation to launch an innovative product creates an advantage of an early start in terms of pricing. Furthermore, Porter (1985) states that there are many other advantages of being the first mover, for example sustained reputation, higher switching costs and image benefits. Roper, Dub and Love (2008) found that innovation is a significant factor of business growth, which means that organisations that are engaged in innovation grow faster than organisation that do not.

The process of managing a successful product innovation, according to Toner (2011), includes design, research and development, and procurement of licenses and patents. Moreover, Toner (2011) emphasises on the importance of having employees that are experienced and skilled in order to succeed the product innovation. Furthermore, Doran and Ryan (2014) state that the outcome of a successful product innovation increase the organisation's performance and productivity.

According to Gaubinger et al. (2009), innovation can be classified in four dimensions, based on the innovation's novelty; technology, market, organisation and innovation environment. The technology dimension refers to the usage of technical knowledge, where the less technical knowledge required gives a degree of the innovation. The market dimension includes innovation related to customer needs that have not been fulfilled or are new. A higher degree within this dimension, implies a greater radical innovation.

The organisational dimension is evaluated based on whether the innovation leads to a change within the organisation, where big organisational changes indicates more radical innovation. Lastly, the dimension of innovation environment implies that the more an innovation contribute to the innovative environment, it results in a higher

degree of radical innovation. In general, a high degree of each dimension indicates a radical innovation, while a low degree demonstrates an incremental innovation.

Moreover, Gaubinger et al. (2009) emphasise on uncertainty related to innovation. This, because innovation is about creating something new that has not been discovered before. The incremental innovation is based on already existing research and knowledge which indicates a lower degree of uncertainty, while the radical innovation is related to a high degree of uncertainty. Innovation can be divided into radical and incremental innovation, relying on the achievements gained and how the activities are used within each classification (Toner, 2011).

5.5.1 Radical innovation

Radical innovation is disruptive, which means that the radical innovation causes a disruption of the market, and that it eventually will force existing market leaders away (Toner, 2011). According to Leifer, O'Connor and Rice (2001), the radical innovation often results in new products and the existing products become dominated by the new products and therefore less preferred in the market.

As mentioned previously, the uncertainty within radical innovation is high, which according to Leifer et al. (2001) is connected to the technology, the market, the organisation and the resources. These four factors imply respectively the uncertainty of not having the technical knowledge or expertise, not understanding customer needs, not having the right competences within the organisation and lastly financial concerns. The authors also claim that large organisations can encounter obstacles when trying to create a radical innovation due to the uncertainty and complexity entailed.

Hauser et al. (2006) also states that radical innovation causes a lot of uncertainty, and in turn imply high risks. Radical innovation can contribute to long-term profits and also create an exceptional value to the customers. In general, the radical innovation starts from a technical perspective, rather than listening to the market (Hauser et. al., 2006). However, it is further argued that it is crucial to investigate customers and markets first in order to succeed with the radical innovation.

Moreover, there is a need to find ways to involve the customers by asking about experiences and technical concerns. Slater, Mohr and Sengupta (2014) also state that there are risks and uncertainties related to radical innovation, but if the organisation succeed, it creates a competitive advantage. More specifically, when an organisation manages to create a radical innovation, including the increase of knowledge, competences and creating processes, competitors will have a hard time to imitate.

To conclude, Doran and Ryan (2014) suggest that radical innovation require the organisation to develop competencies in order to tackle the uncertainties, especially related to the employees and their experience. This also relates to the organisational dimension mentioned earlier where a structure is set within the organisation, to

overcome changes brought by the radical innovation. Furthermore, an organisation with financial stability have an advantage when developing radical innovation, since it often requires costly experiments and projects (Doran and Ryan, 2014). The authors also highlight the importance of design and development in the organisation.

5.5.2 Incremental innovation

The incremental innovation, on the other hand, implies small changes and improvement of the existing products over time Toner (2011). Moreover, Gaubinger et al. (2009) state that incremental innovations can include both improvements and small changes, but also products that are similar to competitors, called “me too” products. As mentioned earlier, incremental innovation builds on already existing technology and research which involves less uncertainty regarding technology, market and organisation (Toner, 2011). Hauser et al. (2006) claim that large and traditional organisations with a complex structure mainly use incremental innovation. Furthermore, Toner (2011) mentions that incremental innovation can be suitable both for smaller and larger organisations since it does not require the same financial investments.

In order to succeed with incremental innovation, an organisation must put effort into market research and management (Doran and Ryan, 2014). Toner (2011) states that incremental innovation is built upon learning by doing, and that it is commonly used in production processes where one improvement is based on previously enhanced experiences. Moreover, the author mentions that it is common to involve customers in such improvements.

Khosla (2018) demonstrates numerous cases in which successful management of small improvements have led to improved profits. It is also mentioned that large innovation projects, aiming to create a radical innovation, risks to end up without results. However, in the study by Slater et al. (2014), it was found that the outcome of radical innovation both can be more beneficial and consistent in the long run. Lastly, Doran and Ryan (2014) say that each organisation must develop skills that suit the organisation’s innovation the best.

5.5.3 Introducing the innovation to the market

Timsit, Castiaux, Truong, Athaide and Klink (2015) describe two ways of entering a market, the market-pull (MP) and the resource push (RP). The MP approach takes on an outside-in firm perspective where market needs are investigated and translated into the firm, whilst the RP approach takes on an inside-out perspective where the firm's existing knowledge and resources determine the way to enter the market.

The MP approach measures performance in how well the firm succeeds in delivering superior value to customers and the RP approach aims to use the firm's existing capabilities in an optimal way to generate performance. Bergman and Klefsjö (2010)

state that the creative combination of both approaches is, most often, the way to success. Furthermore, Bond and Houston (2003) describe a market opportunity as the intersection between a market need and a firm capability. Once the technology is connected to the market opportunity, competitive advantage can be created.

Bond and Houston (2003) also state that market opportunities involve high levels of market and technology uncertainty. Therefore, the firm should set aside significant resources to benchmark the technical and market feasibility, thereby systematically collecting data about technological possibilities, customer needs and market feasibility. To do this successfully, close cooperation between engineers and market specialists is needed, both to collect and interpret the data (Bond and Houston, 2003). This is also critical to maximise the source of competitive advantage stemming from the technology as it must be linked both to the company's resources and the strategic market plan.

There are two main types of firms when entering markets, *de alio* and *de novo* (Timsit et. al., 2015). *De alio* firms are firms that enter a new market from another industry, while *de novo* firms are new firms assembled to enter the new market (entrepreneurial firms). In most cases, the *de alio* firms have large initial resources and capital. They can use the capabilities inherent in the parent organisation; the core competence, the (in many cases) larger offering portfolio and they have more room for errors and time to recover from them.

De novo firms fail more often, most commonly due to the lack of resources. However, *de novo* firms are more flexible and can make faster decisions and possesses a competitive advantage in rapidly changing environments. The more resources a firm have, the better the performance and the larger the chance of survival.

5.6 Involving customers in product and service development

As emphasised previously, understanding customer needs is important in order to gain long-term success. According to Bergman and Klefsjö (2010) it is also essential to focus on future customer needs, since these change over time. How well the organisation succeeds in becoming competitive, successful and grow, depends on how the organisation manage to create new products (Lagrosen, 2005).

In many markets, the competitors offer similar products and small advantages in product specifications can make much difference. Customers are becoming more demanding in wanting products that fits their specific needs. Markets are more fragmented which means that companies must make products that can be adapted to different markets, which increases the pressure on the development processes (Slack and Lewis, 2017).

5.6.1 The product development process

The development of an idea occurs during the product development process. One model, explained by Bergman and Klefsjö (2010), demonstrate three steps in the product development process, namely, requirements, concepts and improvement. The first step includes identifying, understanding and evaluating customer needs. During the second step, a number of different prototypes is developed, aiming to satisfy future customers. The last step is to make sure that the product will be robust, and to ensure improvements. The process is iterative, meaning that it is possible to go back and forth between steps and continuously create and improve the idea. Moreover, Lagrosen (2005) emphasises on cross-functionality in new product development where marketing, design and production are working together. The author states that effective cross-functional teams can decrease the costs and at the same time maintain high quality of the product.

In the past, most organisations tried to involve customers in the product development process in order to gain knowledge about requirements and other valuable information (Fang, Palmatier and Evans, 2008). This is still something companies do, but during the last years the attitude among customers has changed and they have become more interested of being a part of the product development process. This, because the customers have become aware of positive effects that the involvement brings, as it reduces their costs and increase their performance.

However, organisations sometimes fail when involving the customer since there is a tendency to discuss solutions instead of what the customer actually needs. This is further emphasised by Thomke and Hippel (2002), who mention that even if the customers are aware of what they need, they sometimes have a hard time to pinpoint it and to make it clear to the supplier.

5.6.2 Customer involvement

Customer involvement can be classified in different ways. One way of classifying is to divide the involvement based on unsolicited and solicited cooperation (Brockhoff, 2003). The unsolicited cooperation means that the customers give the company feedback, either in terms of complaints or suggestions. The solicited cooperation is when customers are invited to contribute to, or to be active in the development process. In the solicited cooperation, different tools can be used to manage the involvement of customers. According to Bergman and Klefsjö (2010), a methodology that can be useful is Quality for Deployment (QFD).

QFD enables companies to identify customer needs, but also to translate the needs into product characteristics. Furthermore, QFD contributes to improved communication and participation within the organisation (Bergman and Klefsjö, 2010).There are four steps in QFD; perform a market analysis of customer needs, examine competitors, identify

key factors of the organisation's products, and translating the factors into product characteristics through the 'Quality House'.

5.6.2.1 Closeness of relationship

According to Ford et. al. (1998) there are three different categories of closeness between the customer and the supplier: Transactional relationships, Facilitative relationships and Integrative relationships. The first mentioned means no integration between the supplier and the customer, or that the links between them are limited. This originates when customers see no purpose of having a relationship for various reasons, for instance when the customer's only focus is on reducing the purchasing price.

The Facilitative relationships implies customers that are cost driven as well, but the relationship between the supplier and the customer is more linked and tightened together. The Facilitative relationship is created to increase the cost benefits of the relationship for both sides. The relationship is somewhere in between transactional relationship and integrative relationship. (Ford et al., 1998)

The Integrative relationship start from a mutual need, where both the customer and the supplier want to interact. It proceeds through the development and adaptation to each other's processes and requirements. Ford et al. (1998) also describe that both the supplier and the customer can benefit through integrative relationships by learning from each other, and through transferring technology. Neale and Corkindale (1998) discuss co-development, which means having an in-depth relationship with the customer which relates to an integrative relationship. Having integrated projects can contribute to new knowledge and expertise to both the supplier and the customer.

5.6.2.2 Effects of customer integration

An increased integration between the supplier and the customer increase the information sharing and coordination effectiveness (Fang, Palmatier and Evans, 2008). It will therefore, in the long run, contribute to avoiding unnecessary costs and to be able to optimise products. Moreover, Gruner and Homburg (2000) claim that the collaboration with customers can be seen as a bridging strategy to ensure that the customer needs are captured, which in turn can increase the organisational effectiveness and performance. Brockhoff (2003) further says that involving customers in the product and service development process means that the supplier has the opportunity to show that the customer's opinion is important, which increases trust.

However, the increased degree of integration between the customer and the supplier can lead to increased costs (Thomke and Hippel, 2002). However, if the supplier outsources the process of improvements and feature testing to the customers, the cost can be reduced. It is further mentioned that the supplier would support the customer in such circumstances, but it should be seen as a win-win situation where the supplier

increases their understanding of the customers, and the customers can decrease costs and increase performance.

The positive effects of involving the customer are further confirmed by Wang, Jin, Zhou, Li and Yin (2020), however the authors also claim that there are risks of involving the customers. A customer and an organisation usually differ with regards to culture, goals and capabilities which can make it difficult to understand each other. The authors also emphasise the fact that there are a lot of studies showing that customer involvement has positive effects.

Ford et al. (1998) state that every relationship will have different outcomes, some will be very productive while others will be inefficient and/or consist of conflicts. Furthermore, trust and commitment between suppliers and customers are crucial. However, in some cases it is not possible to achieve genuine relations and interactions, but suppliers should strive to do so in order to create a win-win situation.

To conclude, Ford et. al. (1998) mention that organisations usually have a mix of the categories of closeness. When moving towards a higher degree of integration between the customer and supplier, the authors state that the aim should be to minimise relationship cost and maximise revenue benefits. Furthermore, the firm should aim to prioritise the costs and to make the customer fill gaps that the organisation lack, and vice versa.

5.7 Cross-functional integration

In order to develop successful ideas, it is important for marketing, R&D, engineering and manufacturing to share information regarding customers, technical specifications, strategies and pricing with each other (Griffin and Hauser, 1992).

Yoon and Jetter (2015) describe a recurrent issue seen in organisations: engineers in the core of developing new products are at the same time far away from the customers which creates a gap. In today's society, engineers must understand customer needs on a deep level and must be familiar with the customer's experiences. Moreover, the authors state that it is usually marketing, including sales, who interact with the customers and in turn talk to engineering. Because of this, it is important that marketing and engineering have good ways of communicating and a shared understanding of each other's goals and endeavours.

5.7.1 Communication between departments

Poor communication and can cause misunderstandings, conflicts and delays in the development process. Marketers generally do not have a technical background, which makes it difficult for them explain and understand complex technical issues described by customers (Yoon and Jetter, 2015). Griffin and Hauser (1992) also argue that it is crucial that engineering and R&D understand customer needs, and that marketing has

an insight in technical capabilities. Moreover, customers have, in general, a hard time to express their knowledge, but find it easier to talk about problems and needs (Riquelme, 2001). This makes it even more important to make sure that engineers get well communicated information presented by the customers.

The collaboration between R&D and marketing is a common issue in many organisations. Sherman, Berkowitz and Souder (2005) state that employees working within the different departments have different backgrounds and, in general, different goals. R&D is usually more focused on technical requirements and radical innovations, while marketing is closer to customers and tries to listen to the customers and focus more on incremental innovations. A solution to this issue is to cross-functionally integrate the departments (Sherman et al., 2005). The integration can contribute to more successful prototype development, increased effectiveness and successful product and service launches.

Furthermore, a consequence of poor cross-functional integration is, according to Wheelwright and Clark (1992), that the manufacturing and engineering departments often work in parallel without collaboration, which leads to solutions with features that do not match each other. This causes re-work that will demand resources and take time, which in the end can delay the time-to-market. Departments which do not collaborate or communicate will affect the organisation's efficiency in a negative way, which will lead to increased costs and delayed product and service development processes.

5.7.2 **Integrating departments**

There are several solutions to ease the process of knowledge and information sharing. Griffin and Hauser (1992), suggests Quality Function Deployment (QFD) since it enables cross-functional teams and enhance the communication between departments. However, according to the Wheelwright and Clark (1992) organisations will not always benefit from cross-functional teams, for instance if the coordination between the departments works well, customer needs are clear, and lifecycles and lead times are long. But, if the market is dynamic and there is a need to develop products effectively, cross-functional integration is valuable.

Wheelwright and Clark (1992) also emphasise the importance of creating trust between the different departments through sharing information and knowledge. This is essential in order to manage the integration of different departments, according to the authors. The positive effects of cross-functional teams are reduced costs, shortened process development process and increased performance and profitability. Moreover, Su, Chen & Wang (2017) claim that cross-functional integration can increase both creativity and innovation within an organisation. Carucci (2018) says that the integration will, in the end, create an understanding of different department's purpose, hence contribute to both trust and respect among each other.

On the contrary, Brettel, Heinemann, Engelen & Neubauer (2011) stress that cross-functional integration can imply costs due to an increased number of meetings and time that is put on transferring knowledge between departments. Moreover, since people who have different backgrounds and perspectives will collaborate, discussions and conflicts about, for example, prioritisations can occur. However, Carucci (2018) states that these discussions occur because of the organisation's structure, which accepts such behaviours.

Furthermore, this may happen because departments do not know what others are doing or trying to achieve. Therefore, the author suggests that managers should ask the departments to find values created together, in order to increase the awareness which can contribute to increased performance. Another suggestion is to emphasise on training or education which can increase the knowledge and understanding of the different departments (Shaw & Shaw, 1998).

6 EMPIRICAL FINDINGS

The following chapter will present the empirical findings of the interview phases. The internal interviews are presented first, where the interviewees are employees at Emerson. The interviews with Chemical customers are presented second, where interviewees are customers who operates in the Chemical segment.

6.1 Internal interviews

The first interview phase was conducted with employees at Emerson. The aim was to create an understanding of Emerson's current situation.

6.1.1 Customer segments

The majority of the interviewees explained that Oil & gas, Refining and PetroChemical were the biggest customer segments. Other smaller segments that were mentioned during the interviews, were Chemical, Pulp and Paper, Food and Beverages, Life Science and Metal Mining.

Furthermore, the interviewees reasoned around the most important personas targeted in the mentioned segments. All interviewees agreed that the important personas in the segments are EPC's, operations (production), maintenance and HSE (Health, Safety and Environment).

This resulted in that the Customer segment consists of Oil & gas, Refining and PetroChemical. Moreover, the personas identified were EPC, Production, Maintenance and HSE.

6.1.2 Value proposition

All the interviewees described that Emerson has different value propositions for different personas. Regarding the instrument technicians and instrument engineers (whom belongs to maintenance), Emerson wants to deliver reliable instruments and long instrument lifetimes. The instrument technicians were described to have the most knowledge about the instruments, the problems and the root cause of the issues. Regarding the employees in operations, Emerson wants to contribute to maximise up-time and increase the efficiency in the processes.

The operators were described to notify the instrument technicians about measurement errors when these where discovered. However, it was mentioned that the operators do not have the knowledge of why the problems occur. Furthermore, the instrument technicians and instrument engineers were stated to be influencers as none of the

mentioned occupational groups are purchasers of large volumes. However, the instrument engineers and technicians influence the purchasers regarding the volume in which instruments to buy.

The employees working in safety were described to have other wishes regarding the instruments. The interviewees agreed that the safety staff influences the purchasing of instruments as they are responsible for following standards and safety rule sets. The project department were also mentioned as a persona, as projects were stated to be more concerned about price. Therefore, the interviewees described that other messages were needed for buyers in project organisations.

When asked about why the customers choose to purchase measurement instruments from Emerson, the interviewees all stated that the Emerson brand is crucial as it stands for premium, robustness and high quality. Furthermore, Emerson was stated to be known as a large and reliable organisation that can help to solve problems. Regarding the high-quality aspect, the interviewees also mentioned that the brand is associated with a higher price point than its competitors.

According to the interviewees, Emerson wants to deliver safe, reliable, user-friendly instruments which the customers do not have to care much about. The instruments should be simple to install, be maintenance free, reliable and manage all types of processes, from simple to complex ones. Furthermore, Emerson also wants to deliver measurement instruments that help the customers reduce the operating costs by helping to control the processes and by that reduce the OPEX. Additionally, in one interview the size of the product portfolio was mentioned as a strength, as well as the service organisation including the technical support.

Also, Emerson offers customised solutions for special needs where one of the interviewees described this as a strength of Emerson. Both since it is offered, but also that Emerson has the financial means and knowledge to launch products in special applications. One of the interviewees said:

"The products are supposed to work in extreme environments. That creates complexity in the products and excludes smaller vendors who are unable to invest and comply with the requirements. Emerson have been operating in these segments for a long time and built an organization able to mitigate these challenges, and therefore do not face the same barriers of entry to these markets. In addition, we have the financial means to keep up, and the knowledge to produce and develop products compliant with these specific requirements or certifications. New or smaller players on the other hand may not have that to the same extent, which means that they are less likely to succeed or even want to pursue these types of industries."

The interviewees said that Emerson wants the customers to tell about their problems, however, the salesperson stated that it is difficult to get the customers to reveal problems faced in the processes.

To conclude, the interviewees mentioned values delivered from Emerson within the following value categories in the Business Model Canvas framework: Performance, Customisation, Brand/Status, Cost reduction and Usability.

6.1.3 Channels

During the interviews, the sales channel was agreed upon to be the biggest and most important channel to reach the customers. The sales channel is owned by Emerson and managed by a sales organisation. Furthermore, it was explained that Emerson also has an indirect sales force in local business partners that distribute Emerson's products in areas where Emerson has less presence. Other channels the interviewees explained to make customers aware of Emerson were social media, the Emerson website, business publications, exhibitions and advertisements.

Some of the interviewees mentioned that educations for the customers are provided by Emerson that demonstrates new products and updates of the products. This was seen as important in the process of reaching the customers.

When a customer wants to purchase products from Emerson, it was described to be most common to contact a salesperson, belonging to the sales organisation, by mail or phone. One of the interviewees explained that the customer and the salesperson together try to come up with a solution. However, in some cases the process required a lot of work and time, since the salesperson is involved a lot with the technical specifications.

The interviewees explained that customers contact Emerson when a problem is discovered. In these cases, with regards to the post-purchase customer support, Emerson reach out to the customers through service support which is both available through visits and by phone. Furthermore, surveys are sent out to the customers after support and visits to evaluate the customer satisfaction.

To conclude, the most important channel to reach customers is the sales channel. Moreover, other channels that are considered important to the interviewees are: social media, local business partners, website, business publications, exhibitions, advertisements.

6.1.4 Customer relationships

All interviewees mentioned that Emerson is seen as a consultative partner that supports and helps the customers with problems. As the customers often do not have all knowledge required to solve the problems, or to choose accurate measurement instruments in specific applications, Emerson helps to provide the missing knowledge. This is, in one interview, described as an important aspect in increasing the customer's trust in Emerson.

Furthermore, it was mentioned that the customers expect Emerson to be professional, to be honest and to sell high quality products. It was also stated that the customers

expect Emerson to be accessible and to reply quickly on inquiries. Also, Emerson is expected to sustain good customer service, a positive environment and to initiate interactions between the customer and Emerson. Moreover, it was mentioned that the customers rely on Emerson as a large organisation and perceive Emerson as safe. This, since there are several parts within Emerson that can save unexpected events in larger projects that might run over several years.

The interviewees also stated that the customers expect Emerson to be innovative. However, in one interview it was mentioned that Emerson has fallen behind the competitors and are not launching new features in the same rate. In another interview, the innovation was also mentioned as a significant factor in what the customers expect. However, the interviewee further explained a gap between the customers and Emerson as Emerson has a lot of innovation in-house, but a long time-to-market which causes the customers not to see the innovation at hand.

To conclude, the interviewees mentioned how Emerson builds customer relationships on personal assistance, and in some cases dedicated personal assistance according to the Business Model Canvas framework.

6.1.5 Revenue streams

Emerson's main income was stated to come from product sales and sales of technical support hours. Furthermore, some revenue is gained from software sales and licensing, however, product sales and sales of technical support hours are the main income. Regarding customer service, the customers pays per occasion, hence the number of hours used. Furthermore, the customer can buy a number of hours in advance and pay a proportion of the cost in advance. Emerson also sells educations to their customers.

To conclude, with regards to the Business Model Canvas framework, Emerson's revenue streams consist of one-time customer payments of asset sales with a fixed pricing mechanism.

6.1.6 Key resources

The key resources mentioned during the interviews have all been owned by Emerson. Regarding physical resources, Emerson's production facilities, with all equipment related to it, have been described as a main resource. Within intellectual resources, the Emerson brand along with other intellectual property, such as patents, have been stated to be crucial resources to the business model. Furthermore, the interviewees mentioned that Emerson has crucial partner relationships with some suppliers, as well as with customers. Emerson also has important resources in the human aspect, as the interviewees describe the importance of technical knowledge and support given to the customers. Lastly, Emerson has a lot of financial capital from being large and profitable for the last sixty years which gives power to the company.

6.1.7 Key activities

During the interviews, it was mentioned that Emerson's key activities are connected to production and manufacturing, engineering, distribution, service and support, marketing, procurement and HR.

6.1.8 Key partnerships

When discussing partnerships during the interviews, several of the participants mentioned that it is important to have close relationships with EPCs. This since the EPCs are designing and building new facilities, and there is a lot of profits to gain if the EPC uses Emerson products.

It was also mentioned that some of Emerson's suppliers are key partners. According to one interviewee, working with sourcing and logistics, Emerson has both small and big suppliers all over the world. However, the interviewee stated that it is important not be too dependent upon the supplier, or the other way around that the supplier is too dependent on Emerson as it is too much risk when Emerson's demand fluctuates.

Moreover, investors, companies within Emerson, the Local Business Partners and Strategic accounts are seen to be important key partners to the interviewees. In general, there is no collaboration with competitors and no technology is shared with one another except from some patents.

6.1.9 Cost structure

The interviewees mentioned that Emerson's focus is on delivering premium products and support, and that the purpose of the business is to create value to the customers. According to two of the interviewees, the most important key resource, which is people, is the biggest cost in the organisation. Moreover, it was mentioned that the key activity that costs the most, is the company's procurement costs. Furthermore, other large costs mentioned were costs for engineering, manufacturing, HR, sales and marketing.

6.1.10 Business Model Canvas

The result of the interviews was compiled into the Business Model Canvas framework, presented below.

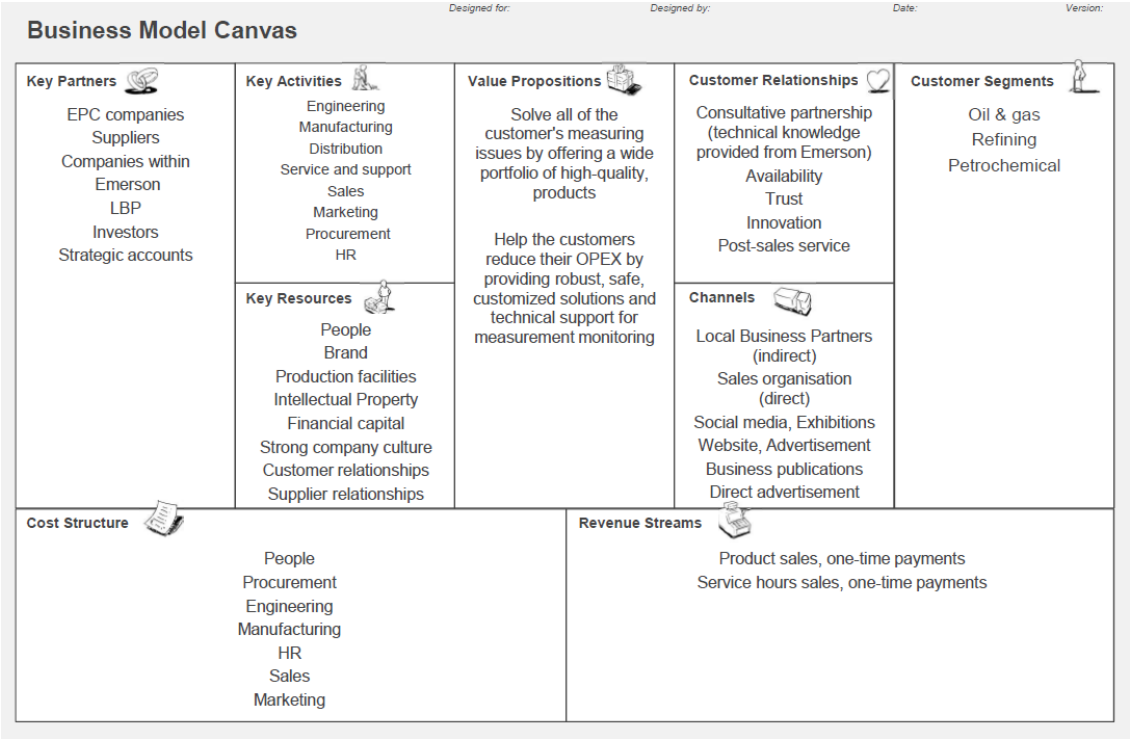

Figure 3. *Business Model Canvas Poster.* Wikipedia (2020). Adapted with permission.

6.2 Interviews with Chemical customers

The following chapter aims to present the data collected during the customer interviews. The second interview phase was conducted with current Emerson customers operating in the Chemical segment.

6.2.1 Expectations of suppliers

All interviewees stated that the relationship with the supplier is crucial when choosing which instrument to use. Furthermore, the salesperson is the most important link to build a relationship with the supplier. When discussing the relation to the salesperson, it was both appreciated that the salesperson calls and makes regular visits. This, since new knowledge is gained about products and it also enables to get to know the salesperson better. In general, there was a common view that the more visits a salesperson makes, the more products will be sold. In order to build a good relationship, some claimed that it was important that the salesperson stayed the same over time and was not replaced.

6.2.1.1 Innovation

All the participants said that innovation is important to them if it enables or contributes to fulfilling a function that is needed. However, it is not relevant to change the existing product to a newer one just for the reason of changing. It is only of interest to solve an existing problem that has not been solved before.

6.2.1.2 Customer support

All interviewees said that customer support is very important regarding the relationship with the supplier. Furthermore, it was one of the first things that was mentioned when asked about what high quality is in measurement instruments. It is helpful that a supplier can be reached fast if new problems occur. When a product stops to work, the problem is discussed with the supplier and if the supplier cannot help or solve the issue, the companies will try to find a new supplier to help. Moreover, it is important with fast replies and that the suppliers can support and provide the company with new knowledge are important.

Moreover, a majority talked about the importance of having experienced and skilful technicians that can show up quickly, hence are located nearby. It is the salespersons from the supplier that are visiting the companies most frequently. However, some said that between times the salespersons do not have enough technical knowledge to understand complex applications and solve existing problems. In general, all but one claimed that it is the supplier who has the best knowledge about the products and can propose the best solution to an issue.

6.2.1.3 Price and purchasing

Regarding the attitude towards the price of a product there are different standpoints in the companies. Everyone said that purchasing is concerned about price and wants to expose several suppliers to competition. Therefore, purchasing generally required more than one supplier. On the other hand, the instrument technicians and operators, who have been the majority of the interviewees, said that the function of the instruments are more important than the price. Furthermore, it was seen as important that the supplier can fulfil the technical specification and that the supplier could deliver products fast. But the instrument technicians and operators saw both advantages and disadvantages of only having one supplier. The advantages were; the comfortableness of having support from the same supplier, it reduces spare parts from the inventory and the time spent on relearning is eliminated.

However, a disadvantage with only one supplier is that the supplier can get too much power and try to put pressure on lowering prices. Moreover, some said that it is valuable to be able to change between different products provided from different suppliers to compare the products. However, in general purchasing is concerned about the price while the instrument technicians see it as less important. Purchasing has the last saying

regarding price and what units that should be purchased. However, the instrument technicians have the possibility to impact purchasing decisions as the technician proposes which products purchasing chooses between.

6.2.2 Factors affecting quality

The main purpose of having measurement instruments is to enable the production to operate on maximal capacity. This need has emerged recurrently in every interview. Regarding the quality of the instruments, the majority said that a variation in quality is needed depending on how important the application is. This, because the applications require different precision, which means that there is no need to have the same accuracy in applications that are less important.

6.2.2.1 Usability

Usability was one of the first things mentioned by the interviewees when asked about high quality in the instruments. It is very important that the instruments are easy to use. More specifically, there is a need for easy and fast installation and calibration of the instruments. It was perceived as annoying when the installation of the products is difficult. This, since a high workload where instruments that are difficult to use demands for extra work hours, for themselves and when teaching new people.

Moreover, some of the interviewees mentioned that Emerson's instruments are easy to use while others say that Emerson's instruments are more difficult to install and use than competitor instruments. It was also said that it is disturbing and takes a lot of extra time when the user interface is not user friendly. All interviewees that were engineers thought that Emerson's products were easy to use. However, the majority of the interviewees who were instrument technicians had a harder time to understand how to install the measurement instruments and some also thought that the manuals were not sufficient regarding the installation.

The radar measurements were in some cases hard to use. However, the majority stated that the radar instruments are easy to use, troubleshoot, install and teach to new employees. Furthermore, the instruments are expected to become easier to use in line with the technology development.

6.2.2.2 Retrieving information from the instruments

The information retrieved from the instruments are collected and interpreted in a control room, none of the interviewees stated that there are critical values retrieved from looking at the display on the instrument. Several companies choose not to include displays on the instruments, mainly because the displays are not used. This, since the price of the product is decreased when the display is excluded. In many cases, level instruments are described to be in places that make it hard for operators to see them, for instance at high heights. However, in some cases the displays can be useful for

instrument technicians as some information can be seen without connecting it to the HART calibrator.

6.2.2.3 Accuracy and repeatability

When questions were asked about high quality and expectations of a measurement instrument, factors as repeatability, availability and accuracy were mentioned. These factors were stated to be important, since the users of the instruments need to be able to trust the measurement and the values. However, some of the companies stated that most suppliers have the same high level of accuracy and that there is no apparent difference between the competitors' instruments.

It was also mentioned that instruments can get a bad reputation quickly if the instruments fail to function or have issues. Both technicians and operators said that when an instrument gets a bad reputation, it is hard to gain back trust in it.

6.2.2.4 Product portfolio size

A majority of the interviewees said that the size of a supplier's portfolio is not that significant. The main concern when choosing a supplier is whether the attributes of the products are relevant. Nonetheless, the portfolio size matters in some cases, for instance in new large projects.

Customised products were considered to be important in some cases, since some of the companies require solutions that are adapted to a specific problem. However, most of the companies generally try to avoid customised products due to longer lead time, increased costs and increase in the number of required spare parts.

6.2.3 Challenges

When asked about challenges that the companies interviewed are facing, the most common ones mentioned was keeping a high up-time in the production including a reduced number of stops, keeping costs down and running the processes close to maximum capacity. Two participants mentioned challenges in keeping a high level of safety and two other mentioned time restrictions and scarce resources.

6.2.3.1 Complex environments

Several of the interviewed companies are working in very problematic and complex applications with different factors impacting the level measurement. The factors impacting the level measurements in these environments were: low dielectric constant mediums, mediums that create build-up inside the vessels, stirring devices and other hardware in the tank, high temperatures and high pressures. As mentioned previously, the salesperson's technical knowledge was perceived to not always be enough. All the companies with complex applications were among the companies that mentioned that the technical process knowledge of the salesperson is not always enough.

Six of the interviewed companies told about major problems in the level measurements when there is foam in the vessels. This, since it was experienced that the measurements were incorrect as it measured the foam level and not the liquid level. Some of the companies have solved the issue by measuring in a pipe mounted on the side of the vessel, however, this was not sufficient in all cases. Furthermore, other issues were in measuring interfaces in between two liquids with different properties.

6.2.3.2 Vessels

Most of the interviewees described that there are high vessels in the company facilities that creates issues when choosing level measurement instruments. The most common issue was related to GWR as the probe becomes too long. Furthermore, some of the high vessels were described to be unpleasant to climb, especially during night-time. During one interview, issues related to vessels placed outside were described as the weather and temperature impacted the volume of liquids in the vessels. In this case, radar measurements were experienced to deal relatively well with this type of circumstances.

Another issue in vessels was vessels with tapered bottoms. The radar measurements worked poorly in these types of vessels as the tapered bottom interferes the signal and cause bounces on the walls of the vessel, resulting in faulty measurements. See figure 4.

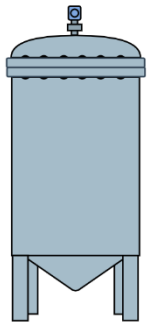

Figure 4. Tank with tapered bottom. Figure by the authors.

Four of the interviewees mentioned that the installation of level instruments was problematic as the placement of the radar is static and cannot be moved after the first installation. The companies had many different types of applications which required many different types of vessels. Furthermore, that the content in the tanks is sometimes changed, which can demand a replacement of the instrument to get better measurement accuracy.

Furthermore, some vessels come with predrilled holes, giving limited flexibility in placing the instrument, whilst other vessels are delivered without pre-decided placements. However, as a hole was drilled in the vessel, the level instrument will be placed there permanently since there is a need to avoid having unused holes. In cases where it is not possible to tamper the vessel walls, radioactive measurements are often used.

6.2.3.3 Lack of knowledge

Several interviewees stated that problems occur in troubleshooting the instruments when incorrect measurements are given. It is difficult to know the root cause of the errors and to know which actions that are required to solve them. It was also mentioned that it is difficult to use the level measurement instrument when there is a lack of documentation or knowledge within the company.

Furthermore, several of the companies find it difficult to find people to hire that have enough knowledge and experience. It is seen as a great challenge in the future, to find competent personnel. It was also described that people who are experienced are very competent, but that there are few of them.

6.2.4 Performing the measurements

During all the interviews the need for precise and accurate measurements were revealed as important factors. The information gathered from the instruments was, in all cases, used for important monitoring and control which demands for trustworthy measurements.

6.2.4.1 Maintenance

All the interviewees stated that the reason to perform maintenance on the measurement instruments is to make sure that the instruments work correctly and show correct values. None of the interviewees perform a thorough preventive maintenance on the measurement instruments, the maintenance is done when the instrument shows wrong values and/or if something urgent occurs. However, preventive maintenance was perceived to reduce the workload and help the instrument technicians.

Furthermore, instruments that are easy to maintain implies high quality according to the instrument technicians. There is a need to be able to maintain the product, including opening it up and switching parts, without breaking something else. Also, it was several participants who mentioned that an instrument's quality is perceived to be higher if it does not need maintenance at all.

The most common maintenance performed on radar instruments is to clean probes from sticky materials and to clean clogging from antennas. Aggressive mediums can increase the need for maintenance. Furthermore, it is important in the day-to-day work to have robust products that are adapted to complex environments. Robustness, low maintenance and long lifetime of the instruments were considered very important factors regarding high quality.

6.2.4.2 Faulty level measurements

All interviewees have described that faulty measurement instruments are discovered by operation, who notifies the instrument technicians. In most cases, the operators and the technicians communicate through a report system.

Level measurement is seldom changed, it only happens in cases where there are problems with the measurements. It is often operation that initiates the change and thereafter process engineers evaluate the need. After that, the instrument technicians and engineers are involved to evaluate how and which instrument that are to be used. Therefore, the decision of what and how the company measures is decided through a collaboration between operation, process and instrument.

Regarding the cooperation between operation and maintenance, several of the interviewees have described that the communication between the departments is inadequate. One interviewee described that changes in how the production is run, is not always communicated to the instrument technicians. This can cause instruments to break as the instruments are not made to manage the new circumstances. Furthermore, many of the interviewees could not answer the question of how the departments cooperate with each other. On the contrary, two interviewees said that the collaboration between maintenance and operation is great, and that this is crucial for effective production.

6.2.4.2.1 Consequences of faulty measurements

Faulty level measurements impact the production in a negative way, since it decreases the efficiency and the effectiveness in the processes. This mainly depends on that the level measurement influences the production planning and, in turn, is connected to the number of stops and whether the process can be operated at maximum capacity. Furthermore, faulty level measurements are, in a majority of the companies, connected to increased costs in terms of waste, raw material consumption, product quality and environmental factors.

The level measurement is used to plan the production by assessing which raw materials are in stock and therefore which products and which quantities can be produced.

Furthermore, the level measurements are connected to safety as the vessels can be overfilled. Several of the interviewed companies had EX areas, in some cases up to 90% of the area. Overfilling of vessels is dangerous as it can lead to unwanted incidents, in worst case scenario damage to persons. However, the safety aspect was not described to be connected to level measurements as there are other safety systems in place around the vessels.

6.2.5 New technology and future opportunities

Most of the companies have identified several opportunities in growing the business, which in most cases result in plans of building extensions to existing plants, or new production plants. One company, providing proprietary technologies, described opportunities related to the usage of new technology such as distance control and virtual connections. However, the rest of the companies saw limited possibilities when asked about new technology. Furthermore, none of the participants thought that the way level instrument is used will change in the future.

6.2.5.1 Switch to something new

The products are only switched when the old one is broken or if there are issues in the measurements. The participants also described that the same model is used until it can no longer be purchased, then a newer model is purchased. One of the interviewees mentioned:

"Some instruments have been there for so long that the supplier has closed down."

When answering the question about testing new types of measurement instruments, the interviewees all stated that new products were not tested for fun. It was only done in cases where there are issues that cannot be solved by existing instruments. Furthermore, it is preferable with products the employees are used to and that are known to work well in existing applications. Products that are known to work well are, in general, chosen in all similar applications.

If the companies decide to try something new, a trial period and/or a cost reduction are desired. Two companies described that testing new things are uncommon and not appreciated, whilst four of the companies appreciate to test new things and try new suppliers. However, these four mentioned that this is an opinion and that many others in the company were more resistant.

Regarding the testing of new products, it is relevant to test the product first and if the product is suitable, scale-up can be considered. Others said that it is both appreciated and that it happens that a supplier's unlaunched product is tested. These situations are suitable when the supplier has an idea of how to solve an issue that has not been managed before. When a problem occurs and there is a need to find a solution, the companies located closely are asked for advice, if a similar problem has been solved there previously.

Furthermore, if the current product does not work or cannot fulfil the need of a certain problem, then it may be appropriate to change the product. Moreover, it was also mentioned that changing a product can be relevant when another supplier can offer something better and if an issue is solved by changing the product, they are more intrigued to do so.

In these cases, a supplier usually comes and present new products and has the right timing or the interviewees went to exhibitions in order to get updated of the newest products and updates.

6.2.5.2 Wireless

When discussing wireless products, it was described that wireless solutions can be favourable as it reduces the cost of wiring and that it is more flexible, for instance in applications with temporary vessels (which some participants described as common). However, all interviewees described that the risk of cyber-attacks is too big and that wireless products are not safe enough to be used. Furthermore, one participant mentioned that the batteries in wireless instruments demand more maintenance.

6.2.5.3 Apps

All but one of the interviewees said that the production processes cannot, and never will be, controlled in apps. This because apps are perceived to be untrustworthy; easy

to hack that enables third parties to access and control the processes. However, the apps can be a complement to view information about what happens in the processes for instrument technicians and maintenance in general.

Furthermore, two of the companies described that EX areas prevent the usage of apps. The remaining companies did not perceive this as a problem and did not see that EX areas caused problems in general. These interviewees were also experienced in using explosion proof tablets and telephones.

6.2.5.4 Self-diagnostics

All the interviewees are aware of the self-diagnostic feature included in the newer models of radar, however none of them are using it. Furthermore, there is a need to use the self-diagnostic feature to gain more information, make maintenance easier and reduce costs. The reason to why it is not used is that the organisation cannot handle the data. This, since there is a lack of setups in the systems to receive, analyse and present the data in a useful way. Moreover, there is a lack of resources in setting up the required processes and ways of working as the technicians are very busy and mostly work with urgent matters. All the instrument technicians believed that the workload would decrease with an increased use of preventative maintenance, assisted by the self-diagnostic feature.

7 ANALYSIS

This section will combine the theoretical chapter with the empirical findings to present an analysis. The analysis will start by introducing a number of identified customer needs and continue to present suggestions on how to target those needs. The analysis will end with a discussion around the implications on Emerson's business model.

7.1 Creating competitive advantage

The aim of this study has been to identify how Emerson can differentiate their offering in the Chemical segment. During the course of the project, several customer needs have been identified as opportunities for Emerson.

Emerson has been identified as a firm that follows the differentiation strategy. According to Boede and Cruz (2010), differentiators are firms who identify attributes that targeted customer firms find valuable, and thereby are willing to pay a premium price for. According to the employees at Emerson, found in the first interview phase, Emerson's customers are willing to pay extra for Emerson's well-known brand that signals quality and reliability. Furthermore, their existing customers (mainly within Oil & Gas) were stated to see Emerson as a trustworthy supplier that helps to solve a large variety of problems.

Moreover, during this project, it appeared that some of Emerson's competitors follow the cost leadership strategy. Cost leadership firms set out, and thereby build their organisation around selling their products at a cheaper price than competitors (Porter, 1985). However, cost leadership firms are also stated not to be able to ignore differentiation, as their products must be perceived as equivalent to other products on the market. As the interviewed Chemical customers stated, all products are perceived as similar, which means that the cost leadership strategy is, as of now, the leading one in the Chemical segment. Furthermore, this can be seen in the market shares, where a cost leadership firm has the largest market share (see figure 1). Therefore, it is crucial for Emerson to identify features that create a unique offering that the customers in the Chemical segment find valuable.

During the customer interviews, the main reason for using measurement instruments was to control the processes to maximise the capacity usage. Swaddling and Zobel (1996) describe how companies often define their business too narrowly and that it is crucial that the underlying customer need is understood. An underlying need is, according to Ulwick and Bettencourt (2008), written from the customer's perception of value, and does not change over time. Thereby, the underlying customer need identified in the study is to maximise up-time in the customer's processes.

7.2 Understanding customer needs

Bond and Houston (2003) explain market opportunities as the intersection between customer needs and firm capabilities. Building on Emerson's capabilities, identified in the interviews with employees, the following areas introduce opportunities for Emerson to differentiate in the Chemical segment, based on an understanding of customer needs.

7.2.1 Accuracy and repeatability in complex applications

A firm that follows the differentiation strategy must create a thorough understanding of customer needs, since the firm must find truly unique features that are valued by the customers (Boede and Cruz, 2010). During the customer interviews, it became clear that the customers in the Chemical segment all value high accuracy and repeatability. However, all of them also stated that all competitor instruments are performing equally well in that area. High reliability and precision in standard applications are thereby not an opportunity for differentiation.

Furthermore, accuracy and repeatability were identified as two of the most important aspects in what is perceived as high quality. However, as previously mentioned, all customers say that the accuracy and repeatability are good enough in all radar measurement instruments. But, during the interviews, it became clear that many of the interviewed customers had complex environments in which the measurement instruments could not provide reliable and accurate measurements. These applications involved aggravating factors inherited in the production processes, such as foam, high pressure, high temperatures, stirring, interfaces, clogging, tapered vessel bottoms, low dielectric constant and corrosive mediums. Furthermore, the interviewees described how errors in the measurements in these applications were resource demanding, and thereby costly for the operations. Several of them could cause severe consequences, both in times of cost and in accidents.

Reducing customer's costs is a way of creating value for customers, thereby giving incentives for premium payments (Porter, 1985). Furthermore, increasing customer performance is also a way of creating value. Developing instruments that can provide accurate and repeatable measurements in these environments can both reduce customer's costs and increase the performance. Also, Porter (1985) describes how technology development can provide differentiation if it makes the product perform better than competitors. As none of the existing competitor's products can provide the desired accuracy in the complex applications, solving these issues gives Emerson a unique offering that none of the other competitors can provide.

To continue, Emerson has a tradition of being innovative in finding unique solutions to problems that have not before been solved. It is, according to the interviewees at Emerson, inherited in Emerson's legacy to come up with new ideas, and the company highly values the number of patents they have. Emerson has a strong engineering

department and an organisation with solid resources, both financial and other, to invest in solving difficult problems. Solving the issues is thereby aligned with Emerson's capabilities, making it a market opportunity according to Bond and Houston's (2003) definition.

7.2.2 Usability

During the Chemical customer interviews, the interviewees clearly stated that the usability of the products is crucial when choosing measurement instrument supplier. It is incredibly important for the customers that the instruments are easy to install, easy to use, easy to troubleshoot and easy to perform maintenance. Furthermore, all interviewees found it important with clear instructions, however, the opinions whether Emerson's products were easy to use differed. Lastly, the interviewees mentioned that the usability is expected to become better with future technology development.

All customer interviewees stated that the usability impacts the workload of the instrument technicians and instrument engineers. Furthermore, they said that apps can help the usability as it can be convenient to see information remotely. The interviewees reasoned the same way around wireless products, that it can increase usability as it is more convenient and more flexible to install when no permanent wiring is done.

Again, Porter (1985) describes how decreasing customer costs is a way of creating value for customers. As the usability impacts resource usage, improving it, is a way of creating value. Furthermore, the customers expect the usability to become better and value the usability very much, which makes it important for Emerson to further improve it. Especially as the customers face challenges in hiring new staff with enough competence, the usage of the instruments will be even more crucial. This, since anyone should have the opportunity to use, understand and troubleshoot the instruments despite little previous knowledge. Slater, Mohr and Sengupta (2014) argue that successful innovation gives competitive advantage, and that it should stem from knowledge about the customer's usage patterns.

7.2.3 Customer support services

During the customer interviews, it was revealed that the companies in the Chemical segment highly value customer support, including technical support, and that they are dependent on it. The interviewees mentioned that it is difficult to gain enough knowledge to know the root causes of all errors in the measurements, and that it is difficult to find and hire new personnel that have the right competences. Several of them mentioned this as a big challenge in the future. Furthermore, it was mentioned that the technical support is crucial when choosing supplier, and that instruments are often purchased from vendors that offer the best assistance. Moreover, it is important that the supplier is easy to reach and that they have local service personnel that can come to their site and help them fast.

According to Baines et. al. (1998), expanding the offering with services has for the past years been known to increase the value delivered to customers. Generally, customers are willing to pay for services, and there is a clear trend in downsizing companies into focusing more on core competence, thereby trusting third parties to manage tasks that do not belong to the core (Oliva and Kallenberg, 2003). Competitive advantage created from services has shown to be more sustainable as it is harder to copy. Gebauer and Fleisch (2007) argue that competitive advantage based on product innovation and technological superiority is becoming more difficult to sustain. Lastly, services have shown to contribute to customer loyalty, thereby making customers more dependent on the supplier (Baines et. al., 2009).

The Emerson employees described the technical support provided by Emerson as a core strength, and that many of the competitors do not offer the same level of service. Furthermore, it was stated that Emerson is known to be a reliable partner as the customer can turn to if they have problems, and that Emerson wants to have that role. Emerson has a long tradition of radar measurements, and a lot of inherent knowledge about the instruments, how to use them and how they impact the processes they are part in. The customers explicitly expressed a lack of knowledge in this, and as something that risks limiting their operations in the future. Expanding the offering within customer support services is thereby an essential opportunity for Emerson, which also means that Emerson should start transitioning into becoming a service provider.

7.2.4 Management of customer maintenance

During the interviews, it became clear that the customers perform minimal, close to non-existing, preventative maintenance - most maintenance was performed when an instrument broke or showed incorrect values. All customers thought that maintenance was important because faulty measurements had consequences for them, and they said that preventative maintenance would help, but that they do not have time for it. Furthermore, how easy the maintenance is strongly impacted the interviewees perception of the quality of the instruments.

Moreover, all interviewees were aware of the self-diagnostic feature in the instruments and wanted to use them. However, it was mentioned that they do not have the knowledge or organisation built up to handle the self-diagnostics data.

As previously stated, Porter (1985) mentions how reducing customer costs and improving customer performance is the two ways of creating customer value. Simplifying the way maintenance is performed would do both. Performing preventative maintenance leads to reduced costs and improved performance (Bergman and Klefsjö, 2010). All interviewed customers have an old-fashioned way of performing maintenance, as they do not do it preventatively. This would help their operations to do more maintenance before breakage.

According to previous reasoning around services, customers are generally willing to pay for services and expects them to be included more and more in the offerings (Oliva and Kallenberg, 2003; Slack, 2005). Furthermore, Gebauer and Fleisch (2007) state that companies must innovate in customer service, for example related to maintenance. Also as previously mentioned, Emerson has large capabilities in competences around customer service and support. Moreover, Emerson is offering a self-diagnostic feature that enable the customers to perform preventative maintenance. However, it was mentioned that the customers do not have time or the resources to utilise the feature. The customers all mention the same issue, that there is not enough knowledge or resources to perform preventative maintenance, and no supplier is offering a solution to this. Offering customers, a service of helping them perform preventative maintenance is therefore an opportunity of providing a unique service that fulfils an unfulfilled need.

7.3 Customer relationships

During the customer interviews, it has been clear that the companies in the Chemical segment highly value having close relationships with their measurement instrument suppliers, and that it is a main factor when choosing an instrument supplier. According to Ford et. al. (1998), customer relationships are one of the most important assets in a company. Lucrative relationships often go on for years and increase the profits of the company. Thus, it is important for Emerson to manage their customer portfolio in a good way.

During the customer interviews, the interviewees described how the salesperson is the person who influences the relationship the most. Several interviewees stated that it is important that the salesperson makes regular visits to present new ideas and help with problems they face. Furthermore, it was stated that the salesperson whom they have the closest relationship with, is the one that sells the most. All interviewees appreciated visits from their suppliers.

The sales force is, according to Ford et. al. (1998) the most important person in the coordination of effective customer relationships. If this coordination does not exist, the relationship might demand unnecessary resources and go in an unwanted direction. It is thereby important to facilitate the sales organisation in their work with the customer relationships. Moreover, to make sure they have the resources they need, especially as customer relationship management demands for a lot of resources (Peppers and Rogers, 2016).

One way of facilitating the sales force's work, is to provide the salespersons with technical support in difficult problem-solving dilemmas. In the interviews with Emerson employees, it was mentioned that providing technical expertise was time demanding and sometimes difficult for the sales personnel. In the customer interviews,

it was mentioned that the salespersons, regardless of which supplier, do not always have enough technical knowledge to understand specific processes and issues that arise.

According to Wheelwright and Clark (1992), cross-functional integration helps with sharing information and spreading knowledge in the company which decreases workload by improved communication. Furthermore, this will strengthen the technical support provided to the customers, which will be more thoroughly explained. According to Ford et al. (1998), it is especially important to make sure that the sales organisation has enough resources to manage all new customer contacts in the beginning of the relationship, as new customers often demands a higher intensity of personal contact.

The interviewees described that it is important to trust the supplier, both in terms of knowledge and delivery. Furthermore, Gadde et al. (2003) describe that trust is important in relationships and that it is built on social interactions and by helping customers with problem solving. The social interactions through the salespersons are therefore crucial and should be strengthen, also in combination with stronger technical knowledge.

According to Ford et al. (1998), customer relationships involve many different people in the customer organisation, and the personal contacts are important as they help the company understand the customer's problems and uncertainties. Furthermore, there are many people who influence the decision of which product to purchase where the decision maker can be separated from the one using the product and the ones paying for it (Porter, 1985). In many cases, Porter also says that there are so called influencers, who do not have any power to decide but influences the decision, for example by vetoing suppliers.

During the project, it has been clear that the people working with maintenance (instrument technicians and instrument engineers) have different opinions about which product to buy than what purchasing have. Furthermore, it was described that the IT department stops certain new technologies because they do not believe it is safe enough. Therefore, Emerson's sales force must target different parts of the organisation which means that the value given by Emerson is clearly explained to all parts that influence which product to choose. For example, in trying to sell wireless instruments, the IT department of the customer must be involved to understand that it is safe.

Furthermore, distance (both physical, social and cultural) can impact the relationships (Belu and Caragin, 2008; Ford et al., 1998). By frequently visiting potential customers, distance can be reduced. The customer interviews have also revealed that the customers want a contact person that is located close to them.

To conclude, managing the customer relationships are crucial in a company (Peppers and Rogers, 2016). Strong customer relationships can create lock-in effects (Storbacka, Strandvik and Grönroos, 1994). As it is easy for customers to switch between radar instruments, Emerson has the opportunity to create lock-in effects, making it more

difficult for customers to switch suppliers. How well Emerson manages the customer relationships is directly linked to their competitive advantage (Ford et al., 1998).

7.4 Targeting customer needs

This section will present three approaches to the market opportunities explained previously, namely, innovation, involving the customers and cross-functional integration. As Porter (1985) mentions, an organisation can differentiate if it creates value and satisfies the customer's needs. If Emerson would focus on solving these needs, there are several opportunities to gain related to competitive advantage.

7.4.1 Innovation

According to Doran and Ryan (2014), innovation is important in order for an organisation to increase performance and productivity. The Chemical customers interviewed during the study stated that they only switch a product when something breaks or cannot be used. Cooper and Kleinschmidt (1993) state that in order to increase the willingness to try a new product in the Chemical segment is to offer a trial period. Furthermore, the customers want the new product to provide additional value, as there is no interest in changing the product for fun. However, if the products provide a solution to an issue, they are more intrigued to try something new. As mentioned by Tellis and Griffin (2006), it is essential to develop new products or services that are based on customer needs. This implies that Emerson should focus on developing and innovating products and services that creates new value for the customers.

As mentioned by Porter (1985), a company can gain competitive advantage by developing technology that increase the value for the customers. Regarding the market opportunities, described in 7.2 Understanding customer needs, Emerson can target these through innovations focused on satisfying and creating value for the customers. This can be done both by radical and incremental innovation.

Radical innovation creates, according to Toner (2011), a disruption of the market and can, according to Hauser et al. (2006), contribute to long-term profits and a superior value for the customer. However, Leifer et al. (2001) mention that large organisations may have a harder time to develop a radical innovation due to the increased uncertainty. When developing new technologies, radical innovation cause chaos and uncertainty which is more difficult for large organisation to manage because they already have a structure that is hard to change.

But, if the organisation manages to do so, there is a lot to gain. As mentioned by Timsit et al. (2015), *de alio* firms, which is aligned with Emerson's business, usually have large resources and capital but have a harder time to be flexible. According to Doran and Ryan (2014) organisations with financial stability have advantages when developing radical innovation since the product and service development process

includes more risks and costs. Therefore, Emerson should utilise its financial stability to innovate, where some of the innovation might be radical.

Moreover, Doran and Ryan (2014), claim companies must set an organisational structure that includes experienced employees, and encourage them to overcome changes and uncertainties that innovation causes. From the interviews with the employees, it was revealed that Emerson sees innovation as crucial. Moreover, it was mentioned that the employees working with product development are both skilful and experienced. This implies that Emerson should set a structure within the organisation that utilises the experienced employees and makes it possible to innovate products and services. Another reason to innovate is that competitors will have a hard time to imitate (Slater et al., 2014). This will increase the competitive advantage.

This approach and mindset within the organisation will enable Emerson to solve the market opportunities previously described. Furthermore, it can increase the market shares within the Chemical segment, since there are opportunities to differentiate through technology and innovation development.

7.4.2 Involving customers in product and service development

The interviews with the customers in the Chemical segment showed that the majority thought it was fun to be involved with suppliers collaborate in for example pilot projects. As mentioned by Fang et al. (2008) customers have during the last years become more aware of the positive effects of being involved in the supplier's product or service development, such as decreased costs and increased performance.

In general, customers find it hard to pinpoint what they really need (Thomke and Hippel, 2002). Moreover, Gadde et al. (2003) mention that trust increases when customers get help to solve issues that they have not been able to solve themselves. Furthermore, Fang et al. (2008) state that suppliers tend to discuss solutions instead of what the customers need. Therefore, it is crucial for Emerson to reveal what their customers need. Brockhoff (2003) states that solicited cooperation is when an organisation involves the customer in the product and service development. This can be done through a methodology called QFD (Bergman and Klefsjö, 2010).

QFD enables the translation of customer needs to product characteristics and enhance the communication and participation within the organisation. One market opportunity for Emerson, mentioned in section 7.2 Understanding customer needs, is accuracy and repeatability in complex applications, in which the instruments used by the customers today cannot provide reliable and accurate measurements. This cause costs according to the customers, and Porter (1985) mentions that reducing customer's costs can contribute to customer value creation. Therefore, it is an opportunity for Emerson to solve these issues, not only through innovation, as was mentioned earlier, but also through involving the customers in the product and service development.

According to Ford et. al. (1998), there are three categories of closeness between the customer and the supplier: transactional, facilitative and integrative relationships. All three implies different outcomes. Close relationships, as integrative, can increase the knowledge for both the customer and the supplier (Neale and Corkindale, 1998). During the customer interviews it was mentioned that Emerson's products, in general, are easy to use. However, the majority of the instrument technicians thought that the installation was hard in some cases, while the engineers found it easier. Therefore, Emerson has the opportunity to involve the instrument technicians when developing new products or services, in order to gain knowledge and insights from their perspective. Since it was mentioned that it takes a lot of extra time and is difficult when the interface of the instrument is not user friendly, this is a way to develop a feature that can create additional value for customers.

All interviewees in the Chemical segment emphasised the importance of having a good customer support service. This market opportunity, described in 7.2 Understanding customer needs, explains that the interviewees have a hard time to gain enough knowledge to know the root causes of errors in the measurements, and to find the right competences. According to Ford et al. (1998) involving the customers can fill knowledge gaps both for the customers and for the suppliers. It was also mentioned during the interviews, that it is highly valuable to be close to and trust the supplier. Brockhoff (2003) states that trust between both parties can increase when customers are involved, since the customer feels appreciated when its opinion is considered to be important. Furthermore, the customers have expressed a lack of knowledge which can limit their future operations. Therefore, Emerson has the opportunity to involve customers and by that offer new services that can help the customer fill their knowledge gaps.

Another opportunity related to offering services is described in 7.2.4 Management of customer maintenance. Most of the customers interviewed mentioned that they do not perform preventative maintenance. It was also mentioned that there is a lack of resources and limited amount of time to manage this. Moreover, the customer stated that they did not know how to take advantage of the self-diagnostic feature. As mentioned before, reducing the customer's costs increase the value for the customers (Porter, 1985). Furthermore, Neale and Corkindale (1998) state that involving the customers creates an opportunity for the supplier to provide extended knowledge. By involving customers, Emerson has the opportunity to find knowledge gaps that customers have, and thereby develop services that contributes to filling that gap. Helping customers with a system to handle the data from the self-diagnostic feature would be one of these things, that in turn would help decrease customer's costs and thereby provide value.

To conclude, there are a lot to gain when involving customers in the product and service development. The customers appreciate to be involved and have a positive attitude to try new things that can contribute to solving their problems. However, it should be

mentioned that there are some risks in the involvement related to differences regarding culture, goals and capabilities (Wang et al., 2020). Moreover, it can also lead to increased costs for the supplier (Thomke and Hippel, 2002). However, the involvement should be a win-win situation where both the customer and the supplier can gain new knowledge and increase the performance.

7.4.3 Cross-functional integration

During the interviews with the employees at Emerson, it was revealed that salespersons within the organisation put a lot of time on answering and helping customers with technical issues and concerns. This implies that the salespersons have to prioritise between tasks, and in some cases, this made it difficult to spend time on their actual work task of selling. During the interviews with the customers in the Chemical segment, it was mentioned that some salespersons do not have enough technical knowledge to understand all complex applications.

According to Byung Sung Yoon and Jetter (2015), it is usual that marketing, including sales, interact with the customers first and then talk to engineering. Since the engineers are in the core of developing new products, it is important that they understand customer needs in order to fulfil these needs. Therefore, it is important for Emerson to integrate marketing, including sales, and engineering. Griffin and Hauser (1992) mention that it is important for marketing to understand the technical requirements, but also for engineering to understand the market and the customers. This implies that cross-functional integration is one way to be able to solve customer's complex and technical issues. Wheelwright and Clark (1992) state that collaboration, not only between marketing and engineering, is crucial in order to reduce the time to market and costs.

As suggested by Griffin and Hauser (1992), a methodology that can increase the communication and integrate departments to create successful product and service development is Quality Function Deployment (QFD). In relation to this, it is important to create trust between the departments within the organisation in order to manage a successful product or service launch (Wheelwright and Clark, 1992). Moreover, Carucci (2018) states that cross-functional integration increase trust and respect, since it contributes to an increased understanding of different department's purpose. However, it should be mentioned that the integration can increase costs due to increased number of meetings and time that is put on transferring knowledge between departments. Moreover, this can cause conflicts due to different backgrounds of the employees (Brettel et al., 2011). But, Carucci (2018) also mentions that it is the organisation's responsibility to create an environment that encourages such integration. However, if an organisation has coordination between departments that works well, and the customer needs are clear, cross-functional integration is not beneficial.

Emerson has an opportunity to focus on integrating engineering, marketing and manufacturing in order to gain knowledge about each other's purposes and processes. When integrating departments, it is important to open for communication between managers of different departments in order to find common values to increase the understanding of each other's purposes. This is also supported by Carucci (2018).

Furthermore, the product development should be centred around the customers and their needs. It is important that engineers become more involved in the understanding of customer needs. Therefore, it is important for Emerson to create conditions that enable engineers to become more involved with the customers. In some cases, it will not be possible for the engineers to communicate directly with customers, for example in cases where the customer is located in another part of the world. In those cases, the integration between marketing and engineering becomes crucial, as the local marketing department will be the one that understands the needs of the customers that they are close to. Therefore, Emerson should create a structure that encourages communication between departments and helps the employees create a shared understanding of each other's goals and interests.

By integrating marketing, sales included, and engineering and thereby increase the collaboration, the salespersons can get support from engineering when customers ask difficult technical questions. This will create free time for the salespersons, and at the same time make the engineers more aware of the customer needs. Furthermore, the technical support can be strengthened when engineers are a larger part of it. Moreover, it will also contribute to solve the customer's issues in an efficient way.

Cross functional integration can contribute to solve the market opportunities mentioned in the previous section, especially when it comes to customer support and managing issues in complex environments since these require increased communication and collaboration between engineering, marketing and manufacturing.

7.5 Business Model Canvas

The Business Model Canvas is a tool used to understand the business model of a company - to position the company in the competitive landscape and to understand how the future business model must be shaped (Osterwalder and Pigneur, 2010). Since Emerson wants to grow their market share in markets in which their business model has not traditionally been adapted around, this implies changes in Emerson's business model.

During this project, it has become clear that Emerson has a strong business model which helps them create competitive advantage in their traditional customer segments. Many aspects in the Chemical segment are similar to Emerson's traditional customer segments, which is one of the reasons to why Chemical was chosen as a target segment. Therefore, if Emerson's business model is mapped by the BMC tool, most of the

building blocks remain the same and will thereby not be discussed further. The three prominent ones that implies changes are: customer segments, revenue streams and value proposition.

The customer segment building block should clarify the groups of potential customers a company wants to target (Osterwalder and Pigneur, 2010). An active decision regarding which customers to target and which to ignore should be taken, to make it clear who the most important customers are. If Emerson considers the Chemical segment to be a new target segment, it should be added to the customer segment block.

The next building block where changes should be considered are in the value proposition. The value proposition aims to describe the offering designed to create value for the specific customer segment (Osterwalder and Pigneur, 2010). Furthermore, the value proposition provides the reason to why customers choose the focal company and aims to solve a problem or target a need of the customers present in the segment. The value proposition should clarify which of the customer problems the company wants to solve and how the offering should be designed to target these.

The customers in the Chemical segment have mentioned a lot of issues around knowledge gaps, where they do not know how to solve certain issues or how to use the instruments in the most optimal way. A value proposition directed to the Chemical customers can therefore take advantage of this. Furthermore, the customers stated that their main challenge is to keep a high uptime in their production. As the level measurements influence the uptime and efficiency in the processes, targeting that need is thereby a potential issue to target in the value proposition.

The last building block where changes should be considered are in the revenue streams. The revenue stream building block aims to define how the company makes money and includes to find out what the customers are willing to pay for, and how they want to pay for the company's products and/or services (Osterwalder and Pigneur, 2010). The authors further explain two main types of revenue streams, the one-time customer payment and the ongoing payment.

Emerson's pricing method is, as of today, based on one-time customer payments where the customer pays for the product or the number of service hours purchased. If Emerson is to move into becoming a service provider, it implies a change in the revenue stream building block by going from one-time payments to ongoing payment in the form of subscriptions.

7.6 Summary

The key for Emerson's success in the Chemical segment does not lie in competing on cost. There are already competitors that perform well in the cost leadership, and according to Porter (1985), several companies competing on cost, leads to fierce rivalry and a situation that harms all parties involved. Emerson has, as mentioned, a tradition

of being a differentiator leader, where they successfully have found differentiating features that customers are willing to pay extra for.

Emerson's business model is not built on delivering low-cost products. Osterwalder and Pigneur (2010) describe how low-cost organisations are built to minimise cost in all their operations. As Emerson has built their business model on delivering premium value, the organisation would need a complete restructuring to compete on price. Instead, Emerson can take advantage of their strong brand and premium offering by meeting new market needs that differentiates Emerson's offering. This is also strengthened in the findings of the customer interviews where the customers are satisfied with the instruments they use in the standard applications.

Generally, the customers do not switch to a new product before the old one is obsolete at the vendor. Furthermore, they choose measurement equipment based on the experience they have with their existing instruments. Only introducing cheaper instrument alternatives will not make the customer switch to an Emerson product. There might be an advantage in broadening the portfolio to include cheaper alternatives of instruments, however it does not have to be the main focus. Emerson must provide something unique, something that the customer values and lacks in their existing instruments.

8 CONCLUSIONS AND RECOMMENDATIONS

This part intends to give recommendations to Emerson based on the aim of the study. The aim and suggestions related will be discussed in the end of this section.

8.1 Creating competitive advantage

Emerson has an opportunity to differentiate their offering in the Chemical segment, which would imply to compete on a premium offering instead of price. Thereby, the focus should not only be on how to make the products cheaper, it should be on finding more things that the Chemical customers are willing to pay for. Emerson is well aware of those features in the Oil & Gas segment, and this study have found some proposals to initially target the Chemical segment.

The three proposals include/are; considering radical innovation, involving customers and cross-functionally integrate within Emerson. The mentioned proposals will be explained in detailed below.

8.2 Innovation

As the customers do not care about small incremental changes, Emerson has an opportunity to focus on innovation, where some of it might be radical. In order for customers to switch product, the new one must solve a previously unsolved issue and provide something that the customer is missing.

Radical innovation might be difficult for Emerson as the organisation is large and traditional. Therefore, Emerson can take advantage of their already competent personnel and financial stability in order to invest in new endeavours.

8.3 Customer relationships

Emerson has strong relationships with their existing customers. The Chemical customers highly value the supplier relationships; therefore, it is crucial for Emerson to continue to build strong relationships even with the Chemical customers. The salespersons are the ones that build and influence the relationships to go in the right direction. New relationships demand more resources, which means that Emerson should make sure that the sales force has enough resources and support. One part in this could be to integrate sales and engineering, in order to give the sales force support in more complex technical issues.

The instrument technicians are influencers to the rest of the organisation, which makes them a great way of entry to the rest of the organisation. However, only talking to them

is not enough as other departments may stop certain endeavours because they do not have the information they need. Therefore, other parts of the customer organisations must be targeted by the sales force. For example, IT can be involved in questions related to cyber security such as apps and wireless applications, and in other cases purchasing. It is crucial to make sure that the sales force has time to make regular visits to new and existing customers, as the instrument technicians appreciate visits from suppliers a lot.

The Chemical customers also want salespersons to be located close to them, therefore, it might be a good idea to assign local sales personnel that target certain attractive areas.

8.4 Involve the customer in product and service development

To succeed with innovation, it is important to be aware of market needs. For Emerson, this is extra important since Emerson is getting into a segment where they do not have much previous knowledge, and they need to find unique customer needs to differentiate the offering.

The Chemical customers appreciate to be involved in pilot projects, and value to be part in testing new solutions, which Emerson already does to some extent. Therefore, this should be continued, and done to a larger extent. Furthermore, this creates an opportunity for Emerson to involve the customers in the beginning of the development. In the beginning of the development process, it is important to consider customer's problems and needs. The focus should, in that case, be on the problems, not the solutions. Moreover, customer involvement gives an effective and efficient product development.

Furthermore, as many different people in the customer organisation have a say in the purchasing decision, people from different parts of the company should be involved. For example, when developing documentation and user experience (UX), the instrument technicians (who in this case is the user), could be involved but when developing features that impact the customer's IT department, they could be involved too.

Customer involvement could also be used to develop the service offering as the involvement of customers can help Emerson understand the customer's knowledge-gaps, and thereby find unique services to offer. Two examples mentioned in this study are self-diagnostics and expanded customer support. Transitioning into becoming a service provider is however difficult, therefore it is suggested to start with smaller steps. In this case, Emerson can start with expanding the technical support offering.

8.5 Cross-functional integration

Emerson has the opportunity to cross functionally integrate marketing, which includes sales, and engineering because of two main reasons.

The sales force is the closest connection to the market, especially in cases where the customer is located far away from R&D. It is important that the sales force understand the engineering perspective and can communicate the market needs to the engineers, and that the engineers get a better understanding of the customer needs.

Furthermore, the technical knowledge of the salespersons is not always enough and if they work closer with engineering, the technical support connected to sales can be strengthened. An example of a first step of integrating sales and engineering is to have engineers accompany the salespersons on certain customer visits, where the customer is known to have difficult technical issues.

8.6 Business Model Canvas

Changes in how Emerson is to target the Chemical segment implicates changes in Emerson's business model. If the BMC tool is considered in this aspect, most of the building blocks will remain the same, however some of them needs to be changed.

Apart from the existing customer segments, Chemical should be seen as a target customer segment. Accordingly, a value proposition for the Chemical segment should be specified. Emerson wants to provide measurements that the customers do not have to care about, and the customers want measurements they do not have to care about. Thereby, Emerson have an opportunity to take responsibility for more activities related to the instruments, and thereby include services in the value-proposition. In the long run, this can implicate complete solutions where Emerson takes responsibility for the entire level measurement handling. The base of the value proposition is to help the customer maximise uptime in their processes. In this case, that implies that the value-propositions could include that Emerson aims to help customers reduce the amount of difficult problems and the knowledge gaps related to the problems.

A transition towards a larger service offering implies a change in Emerson's revenue streams. This creates an opportunity for Emerson to change how they charge customers for services, from one-time payments to ongoing payments, for example in the form of subscriptions. In this case, it is important to regard how the customers want to pay. An example of the new Business Model Canvas can be seen in figure 5.

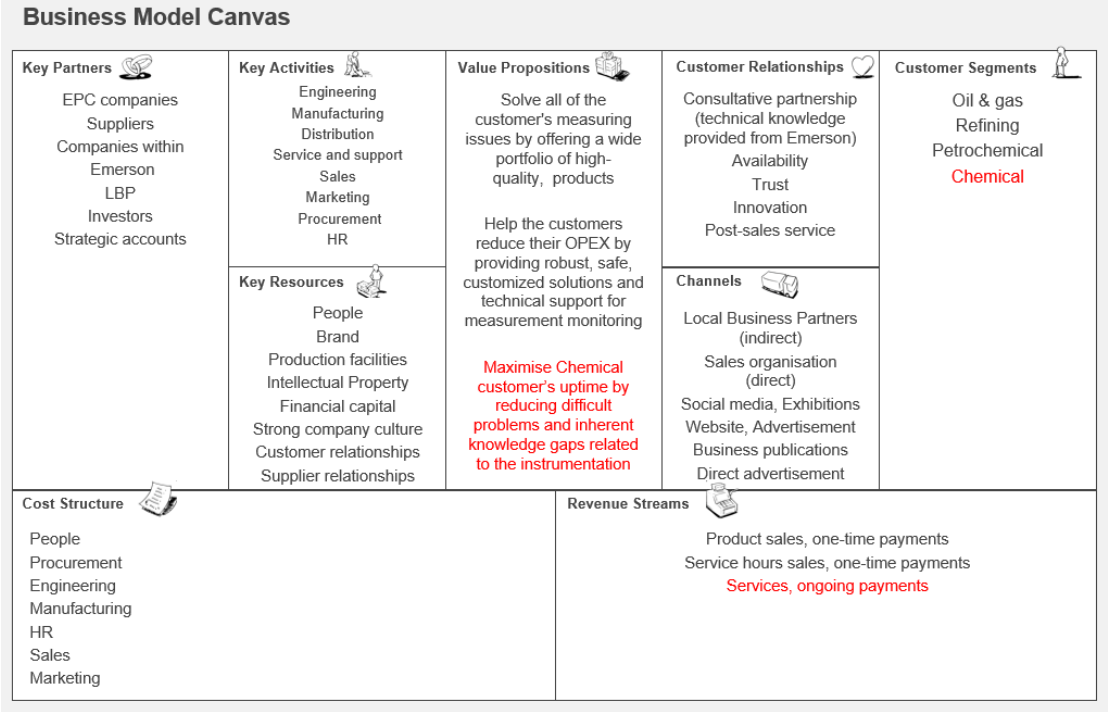

Figure 5. *Business Model Canvas Poster.* Wikipedia (2020). Adapted with permission.

8.7 Summary

The aim of this project is to:

- Identify customer needs where Emerson can differentiate their offering to Chemical customers
- Understand what Emerson can do to take advantage of the market opportunity of growth with radar technology in the Chemical segment

In order for Emerson to grow and continue to be a premium brand in the Chemical segment, it is important to understand the customers. This means finding customer needs that make it possible to differentiate in the Chemical segment. During this project, interviews have been conducted with several Chemical customers and employees at Emerson. This can be seen as an initial process of more thoroughly understanding customer needs in the Chemical segment. The identified customer needs are issues in complex applications, the importance of usability and customer support, and issues related to maintenance.

Since the aim has been to understand how Emerson can take advantage of the growth in the Chemical segment, three solutions have been suggested: Focusing on innovation, where some of it might be radical, involve the customer in the development process of both services and products, and integrating departments within Emerson. Furthermore, it is important to focus on continuing to build strong customer relationships within the Chemical segment in order to succeed.

These should be seen as different examples of opportunities that Emerson can take advantage of. In order for Emerson to differentiate and grow in the Chemical segment, the focus should be on utilising the already existing premium brand, rather than offering low-cost products. Competing on price is not a part of Emerson's business model, and it will be very difficult for Emerson to transitioning into becoming a cost-leader. Emerson is a company built on delivering unique features, and they should continue to do so.

REFERENCES

Baines, T. S., Lightfoot, H. W., Benedettini, O., & Kay, J. M. (2009). The manufacturing servitization: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management, 20*(5), 547-567.

Banker, R. D., Mashruwala, R., & Tripathy, A. (2014). Does a differentiation strategy lead to more sustainable financial performance than a cost leadership strategy?. *Management Decision, 52*(5), pp. 872-896.

Belu, M., & Caragin, A. R. (2008). Strategies of entering new markets. *The Romanian Economic Journal, 11(*27), 83-98.

Bergman, B. & Klefsjö, B. (2010). *Quality: From Customer Needs to Customer Satisfaction.* Lund: Studentlitteratur.

Boehe, D. M., & Cruz, L. B. (2010). Corporate social responsibility, product differentiation strategy and export performance. *Journal of Business ethics, 91*(2), 325-346.

Bond III, E. U., & Houston, M. B. (2003). Barriers to matching new technologies and market opportunities in established firms. *Journal of Product Innovation Management, 20(*2), 120-135.

Brettel, M., Heinemann, F., Engelen, A., & Neubauer, S. (2011). Cross-functional integration of R&D, marketing, and manufacturing in radical and incremental product innovations and its effects on project effectiveness and efficiency. *Journal of Product Innovation Management, 28(*2), 251-269.

Brockhoff, K. (2003). Customers' perspectives of involvement in new product development. *International Journal of Technology Management, 26*(5-6), 464-481. doi: 10.1504/IJTM.2003.003418

Bruggeman, W., & an der Stede, W. (1993). Fitting Management Control Systems to Competitive Advantage. British Journal of Management, 4(3), 205. https://doi.org/10.1111/j.1467-8551.1993.tb00059.x

Bryman, A. & Bell, E. (2011). *Business Research Methods.* New York: Oxford University Press Inc.

Business Retriever. (n.d) Rosemount Tank Radar AB. Retrieved from https://web.retriever-info.com/services/businessinfo/displayBusinessInfo?orgnum=5560435124&country=SE

Carlsson, B. (1997). Grundläggande forskningsmetodik: för medicin och beteendevetenskap. Göteborg: Liber.

Carucci, R. (2018). How to Permanently Resolve Cross-Department Rivalries. *Harvard Business Review Digital Articles*, 1.

Chevalier-Roignant, B., Dixit, A. K., & Trigeorgis, L. (2011). *Competitive Strategy: Options and Games*. MIT Press. Retrieved from: http://ebookcentral.proquest.com/lib/chalmers/detail.action?docID=3339355.

Cooper, R. G., & Kleinschmidt, E. J. (1993). New-product success in the Chemical industry. *Industrial Marketing Management, 22*(2), 85-99.

Cornell Chuck. (2016). 3.4.4 Float/Buoyancy Level Measurement Techniques. In Control Systems Engineer Technical Reference Handbook. ISA. Retrieved from:

https://app.knovel.com/web/view/khtml/show.v/rcid:kpCSETRH07/cid:kt0113T1K7/viewerType:khtml//root_slug:control-systems-engineer/url_slug:float-buoyancy-level?&kpromoter=federation&page=48&view=collapsed&zoom=1'

Creswell, J. W. (2014). *Research design: Qualitative, Quantitative, and Mixed Methods Approaches.* Thousand Oaks, California: SAGE Publications Inc.

Davenport, T. H., & Klahr, P. (1998). Managing customer support knowledge. *California management review, 40*(3), 195-208.

Doran, J., & Ryan, G. (2014). Firms' skills as drivers of radical and incremental innovation. *Economics Letters, 125*(1), 107-109.

Dempsey, L., Dowling, M., Larkin, P. & Murphy, K. (2016). Sensitive Interviewing in Qualitative Research. *Wiley Periodicals, Inc. 39*(6), 480-490.

Denscombe, M. (2014). *The Good Research Guide: For Small-Scale Social Research Projects*. Retrieved from https://www-dawsonera-com.proxy.lib.chalmers.se/readonline/9780335264711

Dubois, A. & Gadde, L-E. (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research, 55*, 553-560.

Easterby-Smith, M., Thorpe, R. & Jackson, P. R. (2015). *Management and Business Research.* Thousand Oaks, California: SAGE Publications Inc.

Emerson. (2019). *2019 Edition Engineer's Guide to Level Measurement.* Retrieved from: https://go.emersonautomation.com/rmt-en-l-resources-level-measurement-guide?utm_source=eas_us-pdpl-dd&utm_medium=mixe&utm_content=lm_gd&utm_campaign=20grmtl-lvel_resources_eg91

Fang, E., Palmatier, R. W., & Evans, K. R. (2008). Influence of customer participation on existing and sharing of new product value. *Journal of the Academy of Marketing Scien*ce*, 36*(3), 322-336. doi: 10.1007/s11747-007-0082-9

Ford, D., Gadde, L.-E., Håkansson, H., Lundgren, A., Snehota, I., Turnbull, P. and Wilson, D. (1998). *Managing business relationships.* Wiley.

Gadde, L.E., Huemer, L., and Håkansson, H. (2003). Strategizing in industrial network. *Industrial Marketing Management, 32*(5), 357-364.

Gary, T. (2015). How to do your case study. SAGE.

Gaubinger, K., Rabl, M., Swan, S. & Werani, T. (2009). *Innovation and Product Management: A Holistic and Practical Approach to Uncertainty Reduction.* Retrieved from https://link-springer-com.proxy.lib.chalmers.se/content/pdf/10.1007%2F978-3-642-54376-0.pdf

Gebauer, H. and Fleisch, E. (2007). An investigation of the relationship between behavioural processes, motivation, investments in the service business and service revenue. *Industrial Marketing Management, 36*(3), 337-48.

Griffin, A., & Hauser, J. R. (1992). Patterns of communication among marketing engineering and manufacturing - A comparison between two new product teams. *Marketing Science, 38*(3), 360-373.

Gruner, K. E., & Homburg, C. (2000). Does Customer Interaction Enhance New Product Success?. *Journal of Business Research, 49*(1), 1-14. doi: 10.1016/S0148-2963(99)00013-2

Hauser, J., Tellis G. J., & Griffin, A. (2006) Research on Innovation: A Review and Agenda for Marketing Science. *Marketing Science, 25*(6), 687-717.

Khosla, S. (2018). Re-evaluating Incremental Innovation. *Harvard Business Review, 96*(5), 22-25

Lagrosen, S. (2005). Customer involvement in new product development: A relationship marketing perspective. *European Journal of Innovation Management, 8*(4), 424-436.

Lantz, A. (1993). *Intervjumetodik*. Lund: Studentlitteratur.

Leifer, R., O'Connor, G.C., & Rice, M. (2001). Implementing radical innovation in mature firms: The role of hubs. *Academy of Management Executive, 15*(3), 102-113.

Lewis, J. (2012). *Solids Level Measurement and Detection Handbook*. Momentum Press. Retrieved from https://ebookcentral.proquest.com/lib/chalmers/reader.action?docID=881926

MarketLine. (2019). *MarketLine Industry Profile: Chemicals in Europe, November 2019*. Retrieved from: https://advantage.marketline.com/Analysis/ViewasPDF/europe-Chemicals-92378

MarketLine. (2020). *Emerson Electric Co.* Retrieved from: https://advantage.marketline.com/Company/Summary/emerson_electric_co

Mathieu, V. (2001). Services: From a service supporting the product to a service supporting the client. *Journal of Business and Industrial Marketing, 16*(1), 39 – 58.

Melvin, W. L., & Scheer, J. (2014). *Principles of Modern Radar : Radar Applications,* Volume 3. SciTech Publishing. Retrieved from https://app.knovel.com/web/toc.v/cid:kpPMRVRA06/viewerType:toc/root_slug:principles-modern-radar?kpromoter=federation

Neale, M. R., & Corkindale, D. R. (1998). Co-developing products: involving customers earlier and more deeply. *Long Range Planning, 31*(3), 418-425.

Oliva, R., & Kallenberg, R. (2003). Managing the transition from products to services. *International journal of service industry management, 14*(2), 160-172.

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers.* Retrieved from https://chalmers.skillport.eu/skillportfe/assetSummaryPage.action?assetid=RW$43:_ss_book:36516#summary/BOOKS/RW$43:_ss_book:36516

Peppers, D. & Rogers, M. (2016). *Managing Customer Experience and Relationships: A Strategic Framework (3rd ed.).* Retrieved from https://ebookcentral.proquest.com/lib/chalmers/detail.action?docID=4729311

Porter, M. E. (1985). Competitive advantage: creating and sustaining superior performance. Free Press.

Pruzan, P. (2016) Research Methodology: The aims, Practices and Ethics of Science. Springer.

Riquelme, H. (2001). Do consumers know what they want? Journal of Consumer Marketing, 18(5), 437-448. doi: 10.1108/07363760110398772

Roberts, E. B., & Berry, C. A. (1985). Entering New Businesses: Selecting Strategies for Success. *Sloan Management Review, 26*(3), 3–17.

Roper, S., Dub, J., & Love, J. H. (2008) Modelling the innovation value chain. *Research Policy, 37*(6-7), 961-977.

Sawhney, M., Balasubramanian, S. and Krishnan, V.V. (2004). Creating growth with services. *MIT Sloan Management Review, 34*(4), 34-43.

Shaw, V., & Shaw, C. T. (1998). Conflict between Engineers and Marketers: The Engineer's Perspective. *Industrial Marketing Management, 27*(4), 279-291. doi: 10.1016/S0019-8501(97)00060-6

Sherman, D. J., Berkowitz, D., & Souder, W. E. (2005). New Product Development Performance and the Interaction of Cross-Functional Integration and Knowledge Management. *Journal of Product Innovation Management, 22*(5), 399-411. doi: 10.1111/j.1540-5885.2005.00137

Sigala, M., Rigopoulou, I.D., Chaniotakis, I.E., Lymperopoulos, C. and Siomkos, G.I. (2008). After-sales service quality as an antecedent of customer satisfaction: The case of electronic appliances. *Managing Service Quality: An International Journal, 18*(5), 512-527. https://doi.org/10.1108/09604520810898866

Slack, N. (2005). Operations strategy: will it ever realise its potential. *Gestao & Producao, 12*(3), 323-32.

Slack, N., & Lewis, M. (2017). *Operations Strategy* (Fifth edition.). Pearson.

Slater, S. F., Mohr, J. J., & Sengupta, S. (2014). Radical Product Innovation Capability: Literature Review, Synthesis, and Illustrative Research Propositions. *Journal of Product Innovation Management, 31*(3), 552-566.

Storbacka, K., Strandvik, T. and Grönroos, C. (1994), Managing Customer Relationships for Profit: The Dynamics of Relationship Quality. *International Journal of Service Industry Management, 5*(5), 21-38. https://doi.org/10.1108/09564239410074358

Su, Z., Chen, J., & Wang, D. (2017) Organisational structure and managerial innovation: the mediating effect of cross-functional integration. *Technology Analysis & Strategic Management, 31(*3), 253-265. doi: 10.1080/09537325.2018.1495324

Swaddling, J. D., & Zobel, M. W. (1996). Beating the Odds. *Marketing Management, 4(*4), 20–33.

Thomke, S. & Hippel, V. E. (2002). Customers as innovators: A new way to create value. *Harvard Business Review, 80*(4), 74.

Timsit, J. P., Castiaux, A., Truong, Y., Athaide, G. A., & Klink, R. R. (2015). The effect of market-pull vs. resource-push orientation on performance when entering new markets. *Journal of Business Research, 68*(9), 2005-2014.

Toner, P. (2011). Workforce Skills and Innovation: An Overview of Major Themes in the Literature. *OECD Education Working Papers, No. 55.* Retrieved from https://www.researchgate.net/publication/241764313_Workforce_Skills_and_Innovation_An_Overview_of_Major_Themes_in_the_Literature

Ulwick, A. W., & Bettencourt, L. A. (2008). Giving customers a fair hearing. *MIT Sloan Management Review, 49*(3), 62.

VDC Research. (2019a). *The Global Market for Process Level Measurement of Solids & Powders*. Retrieved from: https://www.vdcresearch.com/Coverage/IAS/reports/19-Process-Level-Measurement-of-Solids.html

VDC Research. (2019b). *The Global Market for Process Level Measurement of Liquids*. Retrieved from: https://www.vdcresearch.com/Coverage/IAS/reports/19-Process-Level-Measurement-of-Liquids.html

Waller, V., Farquharson, K. & Dempsey, D. (2016). *Qualitative Social Research: Contemporary methods for the digital age.* Thousand Oaks, California: SAGE Publications Inc.

Wang, L., Jin, J. L., Zhou, K. Z., Li, C. B., & Yin, E. (2020). Does customer participation hurt new product development performance? Customer role, product newness, and conflict. *Journal of Business Research, 109*, 246-259. doi: 10.1016/j.jbusres.2019.12.013

Wheelwright, S. C., & Clark K. B. (1992) Revolutionizing Product Development: Quantum Leaps in Speed, Efficiency and Quality. New York: Free Press.

Wikipedia. (2020). *Business Model Canvas Poster.* Retrieved from https://sv.m.wikipedia.org/wiki/Fil:Business_Model_Canvas.png

Yin, R. K. (2014). *Case Study Research: Design and Methods*. (5th ed.). Thousand Oaks, California: SAGE Publications Inc.

Yoon, B. S., & Jetter, A. J. (2015). Connecting customers with engineers for the successful fuzzy front end: Requirements of tools. *In 2015 Portland International Conference on Management of Engineering and Technology (PICMET)* (pp. 1585-1595). IEEE.

Zenger, T. R. (2016). Beyond Competitive Advantage: How to Solve the Puzzle of Sustaining Growth While Creating Value. Harvard Business Review Press.

Zott, C., & Amit, R. (2008). The fit between product market strategy and business model: implications for firm performance. *Strategic Management Journal (John Wiley & Sons, Inc.), 29*(1), 1-26.

APPENDIX

The following section includes the appendixes referred to in the report.

Substitute level measurement technologies

There are several different methods for level measurements, where the radar technology has been the focus technology in this report. This section will, for reference, introduce some other commonly used technologies.

Floats and displacers

Floats are most often mounted on the side of the tank or in an external chamber. It operates by the buoyancy principle; it floats on the surface of the liquid and measures the distance to the surface. Displacers rely on Archimedes' principle as the float lies in the liquid and pushes away some of it. The displacer is connected to an operating mechanism that converts the force to a level measurement (Cornell, 2016).

Floats and displacers are two very simple methods that are reliable and easy to maintain. High pressure and temperatures are no problem. However, as floats and displacers are, in themselves, moving parts there is a risk that these are getting stuck in thicker liquids. The instruments do not have any self-checking features which require maintenance regularly. Older variants of floats and displacers are manual, where the operator must go out to the tank to read the level in it. Furthermore, displacers are only applicable in low viscosity medias (Cornell, 2016).

Pressure transmitters

Pressure transmitters are a common technology in liquid level measurements. The method differs depending on whether the tank is open, closed or pressurised. If the tank is open, a gauge or a differential pressure transmitter is required. However, if the tank is closed or under pressure, a compensation for the tank pressure is needed which demands the differential pressure method. (Emerson, 2019)

In open vessels, the hydrostatic pressure is measured in the bottom of the tank and is related to the weight of the medium. If the level of the liquid changes, the pressure changes proportionally. In pressurised vessels, however, one pressure measurement is not enough as changes in pressure can emerge both because the level changes and because the vessel pressure changes. Therefore, the pressure is also measured in the empty space of the vessel and the medium level is measured by the difference in pressure between the empty part and the bottom pressure. (Emerson, 2019)

Pressure measurements are, in general, economical, have high usability and are common. This method can handle most liquids, both with foam and turbulence and

operates in environments with high temperatures and pressures. (Emerson, 2019) However, pressure transmitters are affected by changes in fluid density, hence caution actions are needed when the fluids are thick, corrosive or in some other way hostile. There are liquids that solidify when the concentration increases which makes it hard for pressure transmitters to handle. In some cases, the measurements can be impacted by changes in temperature. (Emerson, 2019)

Nuclear

In nuclear devices, a shielded radioisotope source is mounted on one side of a vessel, and a detector is mounted on the other side. Gamma rays emit from the source side and travel through the vessel walls and the medium to the detector. The amount of radiation that reaches the detector is inversely proportional to the level of material in the vessel. (Emerson, 2019)

The measurement technique can be used for point and continuous measurements for liquids, solids and interfaces. It is non-invasive, meaning that no holes are required in the tank or pipe (which is needed for all other methods). Furthermore, it is not in contact with the material which makes it unaffected by corrosive or abrasive materials, and it is not impacted by pressure or temperature. (Emerson, 2019)

However, If the material changes a lot in density, errors can occur. Also, if the material creates coats on the vessel walls it can reduce the capability of the measurement. The method has a relatively high cost and several licenses and leak checks are required, and there are requirements of health and safety checks and rules about how to handle and dispose the radioisotope source. (Emerson, 2019)

Weight

The level of material in a tank or vessel can be measured by weight (Cornell, 2016). In most cases, weight cells are used that convert the weight force into an electrical signal. Most often, four cells are used where two are in tension and two are in compression.

Weight measurements provide accurate measurements for both solids and liquids (Cornell, 2016). However, it is difficult to install on already existing vessels.

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