Servitization to promote a circular economy

The case of the Swedish process industry

Master's thesis in Quality and Operations management

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Abstract

The urgency to change due to the climate crisis, has increased the awareness of the need to break the linear economy and strive for circular economy. To do so, companies has started to change, creating new value with less resources. One way of doing so, is to sell the function of a product rather than the product itself. How does circular economy and selling the function interlink and, how does the customers perceive these offerings? This thesis explores the development of circular economy and servitization within a large manufacturing company, with its customers in the Swedish process industry. Found in the literature is that servitization enables features in circular economy which were further acknowledged by the qualitative interviews conducted at the chosen case company and with their customers. Further, a quantitative survey has been used to provide more detailed insights of how different companies perceives circular economy and the connection to servitization. As part of the survey, a Discrete Choice Model has been used to quantify possible trade-offs between attributes of services or products. The results indicates that customers within the Swedish process industry are highly aware of circular economy and perceives it as very important. Regarding service attributes, they highly values saved CO2 & increased uptime, which they also are willing to pay more for. Several gaps were also identified, both within the company studied, but also between the company and their customers. This could imply different strategies to reach a circular economy and, as there are gaps, two companies could work in different directions even though they have the same goal - a circular economy.

Key findings
- Different definitions of a circular economy may lead to challenges.
- Servitization is one way to enable the features of circular economy.
- The awareness of circular economy is regarded as high.
- Customers values saved CO2-emissions and increased uptime the most.
- There is a gap between customer needs and provided offerings.
- There is a risk that circular economy stays at strategic level.
- A 50/50 combination of traditional affairs and service offerings is most likely in the future based on the customers opinion.

Key propositions
- Incorporate the voice of the customer to a greater extent when developing offerings.
- Implement the right KPI's together with key stakeholders.
- Develop the traditional affair as well as services.
- Dare to continuously improve to reach circular economy.

Keywords: servitization, circular economy, customer needs, discrete choice model, Swedish process industry

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Problem Description & Aim

1.1 Setting the scene

The world faces one of the greatest challenges in history as the rising global temperature is causing natural disasters and crashed ecological systems (United Nations, 2020). According to the Global Resource Outlook, 90% of the biodiversity loss and water stress and over 50% of the climate change globally is caused by the extraction and processing of natural resources (Oberle et al., 2019). To solve this problem, each country needs to contribute. Governments have an important role in setting the rules and regulations to reduce emissions, but as companies are a big part of causing these challenges, they therefore have a significant role to play (Regeringskansliet, 2020). One of the identified causes to this development is the traditional way of doing business, which for a long time have been based on a linear economic model (Ellen MacArthur Foundation, 2013). This refers to companies creating value by making a product, selling it to the customer, who then uses it and put it to waste. This consumer habit of single-use and take, make and dispose of has pushed the planetary boundaries (Esposito et al., 2018). In the light of this urgent situation, the circular economy mindset and a new type of business model have emerged as a strategy for reducing the overall global usage of resources and the environmental impact caused by society (Regeringskansliet, 2020).

The circular economy can be viewed as a concept with a living system as a role model, e.g. the water cycle, which is a continuous flow where all resources are utilized and reused (Ellen MacArthur Foundation, 2013). It can further be defined as “an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximize ecosystem functioning and human well-being” (Murray et al., 2017, p.377). Therefore, the focus on the circular economy could be seen as optimizing the complete system rather than the single produced components. Arguably, circular economy seems, in theory and by policy, to be one appropriate way to handle the urgent matter of climate change. However, in achieving the real benefits of the concept, policies and frameworks are not sufficient. There is a need for deep changes that transform the production and costumers behaviour (Kern et al., 2019). How will this effect companies, and their customers, that uses a traditional linear business model when trying to adapt and change into a circular way of doing business?

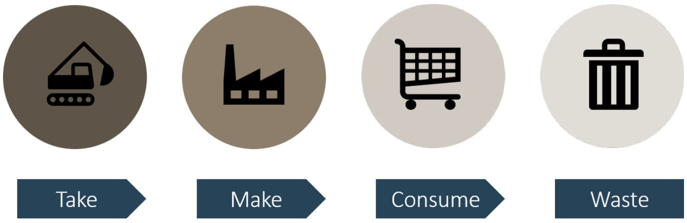


Figure 1.1: Linear economical model

As seen in Figure 1.1, companies that are using the linear economic model are creating value for themselves and their customers by solely delivering products. This implies that, from promoting increased consumption and linear sales, more monetary value is created for the companies and satisfies the customers. In contrast to the linear mindset, the circular economy concept, see the simplified model in Figure 1.2, creates value by fully utilizing the resources with their customers to create a circular and sustainable consumption. Thereof, if a circular concept is applied, the company can no longer make a profit by mass production and mass consumption and hence, there is a need to transform the overall way of doing business and consumption.

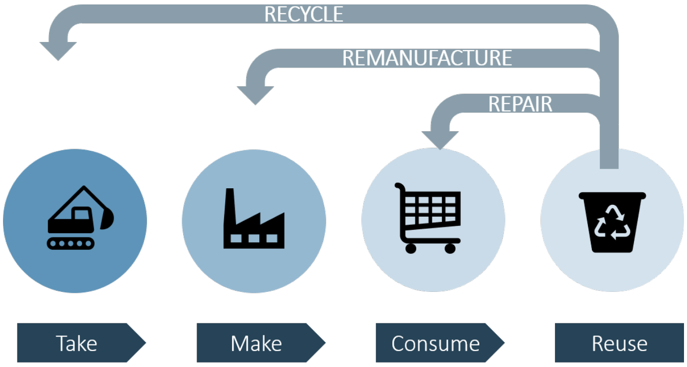


Figure 1.2: Simplified circular economical model

One way of enabling a circular economy and thereby breaking the linear economical model is through the concept of servitization. According to Kowalkowski et al. (2017, p.8), servitization can be defined as; “The transformational processes whereby a company shifts from a product-centric to a service-centric business model and logic”. By delivering a service, rather than a one-time delivery of a product, companies have the possibility to focus not on mass-production but on reusing, recycling and maintenance to extend the lifetime of a product which is one of the central aspects in the circular economy (Kowalkowski et al., 2017). Servitization does not only benefit the customer but the supplier as well, which will gain more extended customer contracts and strengthen customer relationships (Turunen, 2012).

With this situation in mind, this report seeks to investigate two different main objectives. The first objective is to understand if, or in what ways, product and service offerings support a servitization approach and if it can enhance a company's move into becoming aligned with a circular economy (visualized in Figure 1.3). This will be done, firstly, through a literature review, providing us with a conceptual model and secondly, we will explore the topic by looking at how a traditional manufacturing business model has developed due to servitization. Importantly, such a change of business model is only possible if the customers' needs are met in an accurate and timely manner. Our second objective is, therefore, to scrutinize how this change into servitization is experienced from the customers perspective and if, in what ways it may enhance a circular economic model within the customers organization. This has been accomplished through analyzing customers' current and future needs and to what extent these needs are met by the service offers.

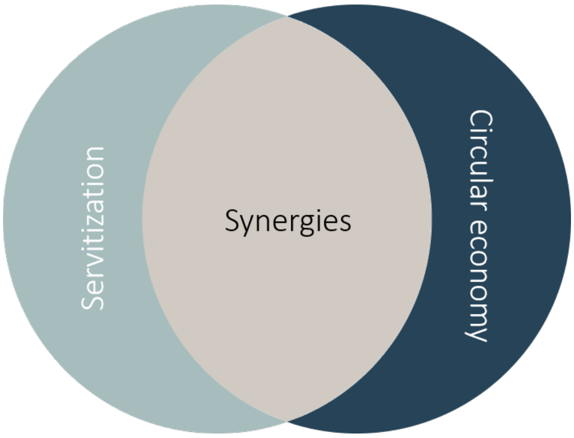


Figure 1.3: Synergies between Servitization & Circular Economy?

1.2 Background

The following paragraphs presents the current backdrop for this thesis with a focus on the development of a circular economy. This provides a general understanding of why circular economy is one possible solution for the urgent situation of the climate change, the current local landscape of circular strategies and the relevance of the chosen manufacturing company. During the last decade, the term circular economy has become integrated in the global agenda for sustainable development to deal with the inherent problems of consumption and linear production (United Nations, 2015). The 2030 Agenda was determined in 2015 by setting 17 Sustainable Development Goals (SDG) to change the financial, political and economic system for every country (United Nations, 2015). The twelfth SDG is to: "Ensure sustainable consumption and production patterns", and is mainly aimed towards manufacturing and food processing companies. To fulfil this goal, companies must, amongst other sub-goals, use natural resources efficiently and reduce waste which is enabled by a circular economy. One of the main benefits is to unite economic and environmental objectives (Lazarevic and Brandão, 2020). Some of these has been quantified, an estimation provided by Ellen MacArthur Foundation (2013) shows that circular products has the potential to unlock a major cost reduction enabled by decreased material usage. This can lead to net material savings worth approximately 340-380 billion USD in

Europe. Further, for companies involved in machinery and equipment, there are material savings in Europe worth approximately is 110-130 billion USD (Ellen MacArthur Foundation, 2013). Another saving, perhaps the most important one, is a significant impact on reducing CO2-emissions, an estimation of about 48% reduction until 2030 only in Europe (Ellen MacArthur Foundation, 2013)

1.2.1 Development in the local market of Sweden

This report will focus on one manufacturing company based in Sweden therefore, it is of interest to briefly present the current situation in terms of circular economy in Sweden. In 2020, the government of Sweden presented an overall strategy and action plan to reach the global environmental goals in the 2030 Agenda. The strategy contains approximately one hundred measures on how to achieve a circular economy within several different areas such as: industry, recycling, technological development and waste management (Regeringskansliet, 2020). The main purpose of the strategy is to promote long term change towards a circular and sustainable society, by acting within four defined focus areas;

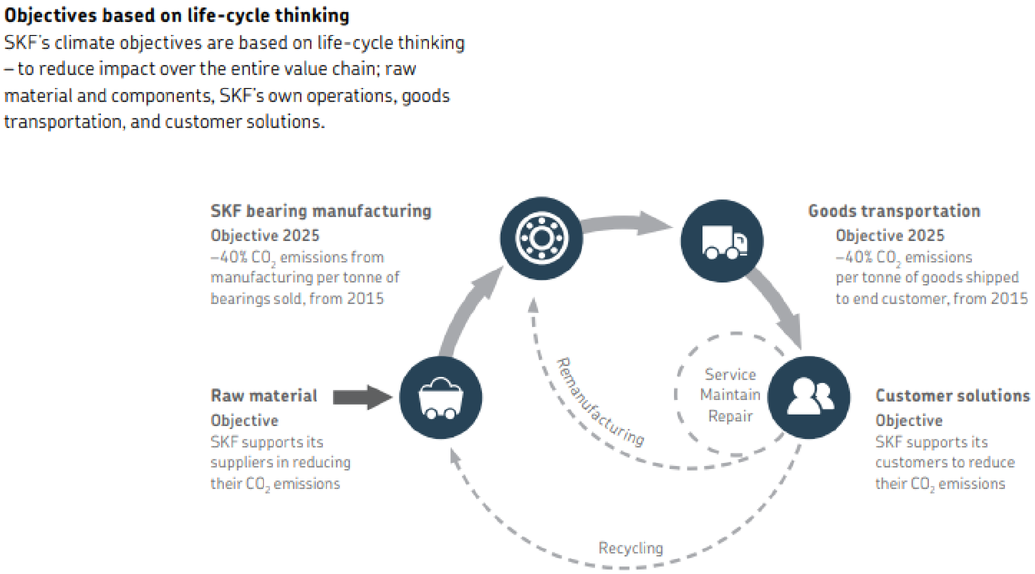
- Sustainable production and product design.
- Consume and use materials, products and services in a sustainable way.
- Toxic-free and circular cycles.
- Make circular economy as a driving force in business and other actors, by actions that promote innovation and circular business models.

By excelling in these areas, Sweden and Swedish companies can contribute to the global development and transformation towards circular economy (Regeringskansliet, 2020). With Sweden's clearly stated goals for a sustainable future, regulations and policies for circularity can soon be in use (Regeringskansliet, 2020). Therefore, to get a general understanding of the current state of circular economy and how companies handle its ongoing implementation of the concept, this report has its starting point in an traditional manufacturing company that has begun its transformation towards a circular economy.

1.2.2 The case of SKF

SKF has for a long period of time sold bearings in a linear way, and supported their sale with services that extends the lifetime of their sold products and increases the productivity for their customers. However, the reason for some customers to purchase bearings are, not always, to own the product per se, but rather to acquire the bearings function: rotation. This shift, from selling products linear, to selling rotation as a service is one main argument why this project is seen as appropriate to conduct at SKF. By doing so it is possible to understand how circular economy is applied and growing on a daily basis. As the shift has been ongoing for some time, it will be possible to compare the case of SKF with the current literature within the field and analyze the connection between servitization and circular economy. Further, and one of the main reasons is the current need of SKF to understand their customers needs in a better way. By doing so, SKF will be able to optimize their service portfolio and together with their customers, develop towards a sustainable future based upon the circular economy.

SKF's product portfolio consist of mainly bearings but also seals, online monitor systems, services and lubrication systems. Around 73% of the sales originates from the industrial market and the remaining 27% from the automotive market. These products are sold to over 40 industries in 130 countries (SKF, 2020). There are two primary reasons for companies to increase their activities in becoming more circular; either there is a prominent possibility to increase their business, or there is a need to do so due to regulations (Kortmann and Piller, 2016). In the case of SKF's, they have found that circular economy is a good business case for all parties involved in handling climate change and, also one way of being ahead of the upcoming regulations (Regeringskansliet, 2020). SKF has understood the benefits of servitization and has implemented service solutions connected to their products for over a decade (SKF, 2020). This has been done in several ways but has been a great challenge and not incorporated on a large scale. Though during the last years, the speed of changing the way of conducting business has rapidly increased, and a newly started department called SKF Circular Economy Center has integrated the servitization and circular economy aspect in the overall strategy to a greater extent (SKF, 2020). The focus is now to further change the business model from a more traditional linear model to becoming more focused in delivering services and life cycle thinking, see Figure 1.4. From being a producer of bearings and rotation equipment, the strategy is transformed and aimed at rotation equipment performance which in short means that SKF, through various services, delivers performance over a period of time rather than solely selling the customer a new product (SKF, 2020).



Objectives based on life-cycle thinking

SKF's climate objectives are based on life-cycle thinking – to reduce impact over the entire value chain; raw material and components, SKF's own operations, goods transportation, and customer solutions.

SKF bearing manufacturing
Objective 2025
–40% CO_2 emissions from manufacturing per tonne of bearings sold, from 2015
Goods transportation
Objective 2025
–40% CO_2 emissions per tonne of goods shipped to end customer, from 2015
Raw material
Objective
SKF supports its suppliers in reducing their CO_2 emissions
Remanufacturing
Service
Maintain
Repair
Customer solutions
Objective
SKF supports its customers to reduce their CO_2 emissions
Recycling

Figure 1.4: SKF:s climate objectives SKF (2020)

SKF is now capable of providing several complete service solutions to their customers that could help them and SKF to lower the overall emission from production and maintenance at different industries. During the ongoing transformation, SKF has identified several challenges; How willing are their customers in the aftermarket, in the scope of this report within the Swedish process industry, to use and utilize these service solutions? Further, which attributes of the products and service offerings are most valuable for the customers? By solving these challenges, SKF could develop their overall service- and fee-based-strategy and become more efficient in circular solutions. Hence, there is a potential for SKF to further contribute to the development of a circular economy in society.

1.3 Research aim

This thesis aims to provide general knowledge of how servitization can be used to reach circular economy and how servitization is currently used in one manufacturing company. By analyzing a specific case, it is possible to understand the potentials and interlinks of servitization and circular economy. Furthermore, analyzing how customers in the industrial aftermarket values service offerings and how willing they and SKF are to utilize the potential of circular economy. This will enable the possibility to provide recommendations and insights on how to act in the future. To be able to reach the general aim, a set of different objectives or specific aims are set:

- Create a conceptual model based on a literature review to identify how servitization may interlink to a circular economy.
- Map the current and future needs of SKF customers in the investigated industrial aftermarket by using interviews and quantitative surveys.
- Compare needs and provided solutions to give recommendations for SKF on how to develop services that leads to a circular economy for SKF and their customers.

1.4 Limitations

The geographical limitation for this project is only to consider SKF's customers in the Swedish market. The companies that will be investigated are active in the industries of steel, mining and pulp and paper. These are chosen foremost, based on the available data and also the segments that SKF has predicted the biggest possible impact. Therefore, the report will be limited to services and products used the in current largest aftermarket-segment. Further, the project will be limited to current customers, not gathering data from potential new or upcoming customers.

There are several different definitions of both circular economy and servitization. This report will not touch upon every aspect of the concepts, though this does not imply that other definitions or aspects are irrelevant. The thesis does not aim to bring a new definition of circular economy or servitization, but instead summarize and conclude earlier research and findings. Despite there being several methods of working to reach a circular economy, this thesis will only focus on how the concept of servitization can be used. Since the report aims to first evaluate a specific part, (see Figure 1.5) of the value offering of SKF, the report will not go into detail in all aspects of the circular economy strategy that SKF provides, e.g. raw material extraction. However, the other parts of the strategy will most likely be affected since the different areas are interlinked as a value chain.

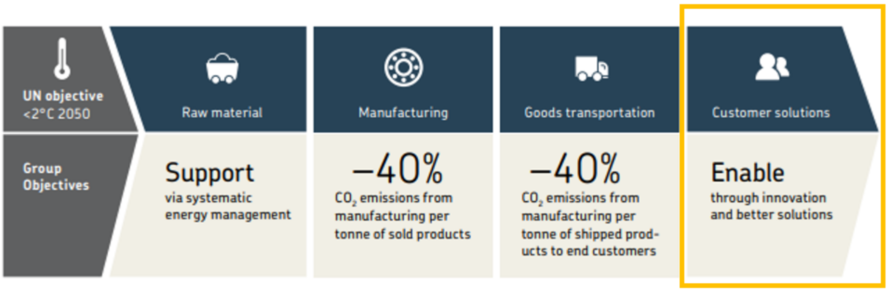

UN objective
<2°C 2050
Group Objectives
Raw material
Support
via systematic energy management
Manufacturing
−40%
CO₂ emissions from manufacturing per tonne of sold products
Goods transportation
−40%
CO₂ emissions from manufacturing per tonne of shipped products to end customers
Customer solutions
Enable
through innovation and better solutions

Figure 1.5: SKF's life cycle thinking, SKF (2020)

1.5 Research questions

Based upon the identified needs at SKF and to explore how circular economy and servitization is being used and perceived, the following research questions will be answered:

- How does SKF and their customers perceive circular economy?
  - Are there knowledge and awareness gaps?

- In which ways is servitization provided by SKF, for their customers and themselves to promote a circular economy?
  - How does servitization interlink to SKF's strategy?
  - How does servitization interlink to a circular economy?

- Which attributes of the offered products and services, enabled by servitization, does the industrial after market value the most?
  - Which are the current and future needs?
  - Which are the gaps between customer needs and SKF's provided solution?

2

Reaching a Circular Economy

The purpose of this chapter is to create a conceptual model to make it clear how circular economy interlinks with servitization and its effects. The aim of the conceptual model is to support the analysis and also make the method, result and discussion of this report more tangible to the reader. This is done by presenting a brief review of the previous research and literature in the area of circular economy and interconnected topics. The aim is to explore how to define the concept of circular economy, present main themes and how circular economy can be implemented and integrated in a strategy. This chapter will also briefly, explain what a company's strategy entails, what a business model is and how it is connected to the strategy. This will be followed by the theory of customer needs and the usage of a discrete choice model to uncover these. All this is viewed from the aspect of circular economy and its affect to these concepts (Figure 2.1).

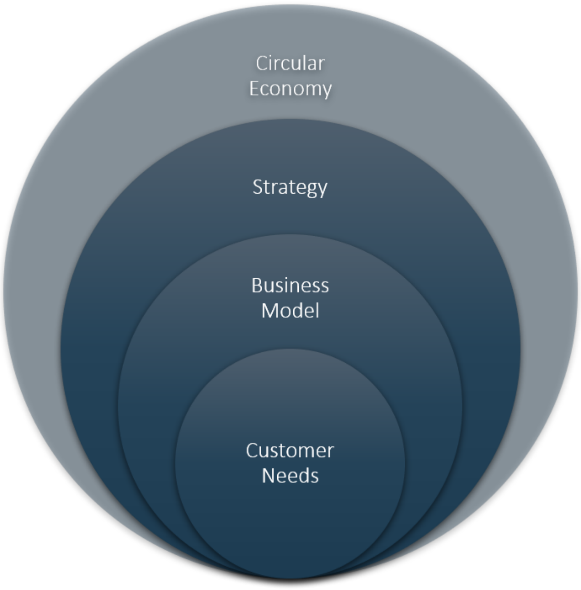


Figure 2.1: Interlinked concepts to be explored

2.1 Definition of a circular economy

The definition of circular economy is frequently discussed in the literature (Brandão et al., 2020; Ellen MacArthur Foundation, 2013; Ghosh, 2020; Korhonen et al., 2018). Therefore, it is found important to summarize and conclude the definition to get a backdrop for this report. In an extensive review of the definitions presented by Kirchherr et al. (2017), one of the most frequently used and employed definition of circular economy is the one presented by Ellen MacArthur Foundation (2013), which define circular economy as;

"A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models." (p. 7)

The core of this definition is to completely design out waste throughout the industrial system and its value chain, both for the renewable and the finite materials. By this definition, products will be created by using renewable energy sources and designed to be reused and recycled (Ellen MacArthur Foundation, 2013). The definition implies that the consumer of a product is viewed as a user of product performance, which enables business to go from product based contracts to performance based (Ellen MacArthur Foundation, 2013; Stahel, 2010). Even though this definition is widely used it has received some criticism in missing the aspect of the social value that the circular economy can bring (Kirchherr et al., 2017; Korhonen et al., 2018; Murray et al., 2017). Murray et al. (2017) argues that there is a need of, to a greater extent, involve the three pillars of measurement of sustainable development; economic, environmental and social, e.g. the triple bottom line (Slaper and Hall, 2011). Based on this opinion, the article present the following definition;

"The Circular Economy is an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximize ecosystem functioning and human well-being." (Murray et al., 2017, p.377)

This is further emphasised by Kirchherr et al. (2017) whom highlights the fact that the link between circular economy and sustainability has been weak in previous research, and that only three of 114 reviewed articles includes all three aspects of the triple bottom line. As follow, this is one definition to promote sustainable development;

"A circular economy aims for the creation of economic value (the economic value of materials or products increases), the creation of social value (minimization of social value destruction throughout the entire system, such as the prevention of unhealthy working conditions in the extraction of raw materials and reuse) as well as value creation in terms of the environment (resilience of natural resources)." (Van Buren et al., 2016, p.3)

This report will not provide a new definition of circular economy however, it is found to be important to highlight that the concept of circular economy can be used and interpreted in numerous different ways. One aspect that is found to be less highlighted in previous research is to include the triple bottom line concept and foremost the social aspect of the concept. Not only is it a concept to improve economic value to business and its overall processes, but to improve and develop society by minimizing negative social impact, e.g.

unhealthy working conditions, and maximize ecosystem functioning. To be concluded from these definitions is that the circular economy also describes a transformation from linear business and provides a model that will take the whole system into consideration. Not solely optimizing a single product or service, but rather to maximize the complete system to favor a sustainable development based on the aspect of the triple bottom line.

2.2 How to reach circular economy?

The implementation of circular economy has begun, new regulations and international strategies are put in place that will promote and, to some extent, force companies to really strive for circularity (European Commission, 2020; Regeringskansliet, 2020; Sarja et al., 2020; United Nations, 2020). The transformation from a linear business into a circular business requires new strategies, new tools and new business models to be able to utilize the potential of the circular economy (Esposito et al., 2018; Lacy and Rutqvist, 2016; Geissdoerfer et al., 2018a).

An extensive literature review by Geissdoerfer et al. (2018b) provides the connection between circular economy and business models by visualising the relation and the definition of business models, sustainable business model and also circular business, see Figure 2.2. The sustainable business model is a modification of the traditional model which trying to capture concepts, goals that aims at sustainability or to integrate sustainability in the overall value creation chain or value proposition (Geissdoerfer et al., 2018b). Furthermore, it is argued that a circular business model has its base in the sustainable business model, but further expands the possibility to create sustainability by focusing in creating e.g. closed supply chains, narrowing resource loops etc, Figure 2.2 (Bocken et al., 2014; Geissdoerfer et al., 2018a).

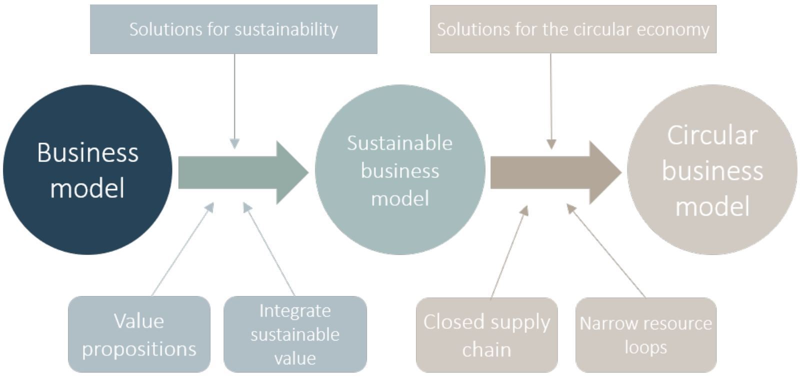

Solutions for sustainability
Solutions for the circular economy
Business model
Sustainable business model
Circular business model
Value propositions
Integrate sustainable value
Closed supply chain
Narrow resource loops

Figure 2.2: Connection sustainable business model (Bocken et al., 2014; Geissdoerfer et al., 2018a).

2.3 A note on business strategy and business model

The terms business strategy and business model are widely used even if it could be vague what these terms really implies, and the definitions and implications differ in different contexts. To make the terms more tangible, they will be defined for this report and to be able to explore the connection, the following paragraph present a short summary of business strategy and business model.

2.3.1 Business strategy - What is it?

The origins of strategy and one of the most traditional definition of strategy is the one by Sun Tzu (1964):

> *Strategy is the great work of the organization. In situations of life and death, it is the Tao of survival or extinction. Its study can not be neglected.* (Sun-tzu, 1964)

The strategy of a business is not the same as a strategy used during war, but the definition pinpoints the importance of having one and that it can not be neglected. The main meaning of this quote is the importance of having a strategy when you face difficult or challenging situations and not only when it is challenging times is strategy of great importance. Today, business strategy is viewed as a contingent plan of how individuals or its organizations achieves their objectives (Grant, 2019). Porter (1996) further describes a company's strategy as:

> *..strategy is the creation of a unique and valuable position, involving a different set of activities.* (Porter, 1996, p.68)

According to several definitions presented by Grant (2019) a strategy often involves setting different goals, allocate resources to reach the goals and lastly establish consistency to create coherence throughout the organization.

These definitions, of what a strategy is, focus on what can be achieved through the use of a strategy. It is also somewhat connected to goals, but is lacking the aspect of time. This is defined by Chandler (1990):

> *The determination of the long-run goals and objectives of an enterprise, and the adoption of courses of action and the allocation of the resource necessary for carrying out these goals.* (Chandler, 1990, p.13)

Arguably, a strategy is based upon long-term focused goals and objectives. The business strategy is also intended to answer two types of questions; Where should the company compete and how to compete? (Grant, 2019). These two strategic questions also include the aspect of present and future. A strategy can cover and answer questions such as "where are we competing?" and "how are we competing in the present market?". It can also prepare the company for the future in answering the questions "what do we want to become?", what to we want to achieve and "how will we get there?" (Grant, 2019).

To summarize, a strategy is viewed as a long-term plan for companies on how to handle and utilize their resources and reach their overall goals. Furthermore, by using a strategy the companies are able to choose and utilize the most appropriate business models. (Casadesus-Masanell and Ricart, 2010)

2.3.2 Business Model - What is it?

The term business model has a strong connection to strategy and has been widely and frequently discussed during the last two decades. It can incorporate everything from economic models, strategies and revenue model (DaSilva and Trkman, 2014). One example of a definition on business model, is presented by Casadesus-Masanell and Ricart (2010):

> *Business Model refers to the logic of the firm, the way it operates and how it creates value for its stakeholders.* (Casadesus-Masanell and Ricart, 2010, p.196)

This definition indicates that a business model answers the question of how to operate and, emphasises on how the actual value is created. A further well cited definition is presented by Morris et al. (2005):

> *A business model is a "concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets".*(Morris et al., 2005, p.727)

The term business model can differ but, in short, its the main purpose is to explain, describe or promote how a company through their resources and activities, creates value for their customers (Osterwalder et al., 2005). Spencer (2013) provides a final definition of the concept that also align with the view of how this report handles the term of business model:

> *A business model is a tool or a concept that will help you to build or analyze your company. Your business model is also reflected in the systems and processes that you put into place to create and deliver value to your customers and to capture value for your firm. It is the foundation on which you will build your strategy* (Spencer, 2013, p.7)

2.3.3 Business model and Strategy - The relation

It is not always easy to understand the relation or distinction between a strategy and a business model. This section present some of the published theories that facilitates the possibility to grasp the two concepts and how they relate to each other.

There is one important difference between a strategy and a business model, a strategy is a contingent plan of what business models to use. By choosing a certain business model, companies also choose in which way they want to compete and create value for their customers (Casadesus-Masanell and Ricart, 2010). Porter (1996) highlights another important distinction by stating that, strategy is something that always is relative to your competitors. By doing something better than your competitors, you are able to gain more value to your firm or create more value to your customers. A business model cannot be put in relation against a competitor and evaluated without a clear connection to a strategy. Therefore, a business model is not a strategy in it self, and by connecting it to a strategy it can create more or less value. From this point of view, the foundation of the strategy should be the business model e.g. the business model explains how the company creates value for themselves and their customers, whereas the strategy is the plan how to utilize this value creation the most (Spencer, 2013).

DaSilva and Trkman (2014) presents a generic framework to visualize the connection between the concepts (see Figure 2.3). The Figure shows the interaction of the business model and the strategy whereas the business model is the foundation of the strategy and

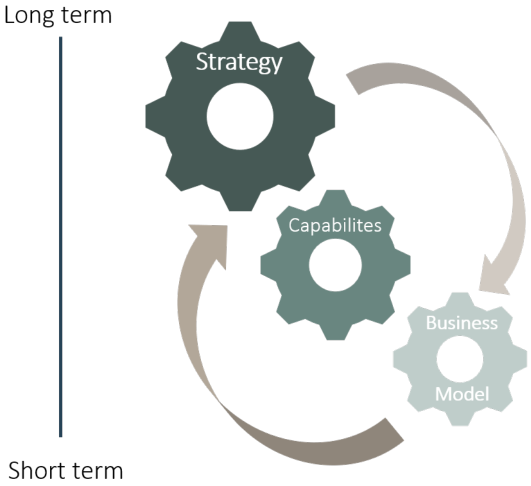


Figure 2.3: Figure based upon the findings of DaSilva and Trkman (2014)

should continuously be reflected throughout the organization. Hence, it is of great importance to have a clear and operational strategy connected to the business model. The aspect of time is also visible, as the overall strategy is mainly focus on long term goals or perspectives, when the business model in general focuses more on how to actually generate value in the present. It also introduces the term of capabilities (DaSilva and Trkman, 2014; Casadesus-Masanell and Ricart, 2010). A company's capabilities can be defined as plans of action that are done within the boundaries of the business model (Casadesus-Masanell and Ricart, 2010). The actions refers to the company's capability in strategic management to integrate, adapt and reconfigure the internal environment but also how to coordinating the resources and continuously learn and being innovative (Teece and Pisano, 2003; Eisenhardt and Martin, 2000). Teece (2018) presents the importance of having strong capabilities:

> *The strength of a firm's capabilities is implicated when business model changes are translated into organizational transformation. Provided the new business model is not an impossible reach from the existing business, excellent asset orchestration skills are needed to effectively manage new business structures alongside existing operations.* (Teece, 2018, p.48)

Having capabilities is the link between a company's strategy and its business model. By having strong capabilities it is possible to align the business model and the strategy to continuously develop this relation to maximize the value both for the customer but also for the company itself. To summarize, the previous theories presents the relationship between the concept as Figure 2.4 shows. Business models are the way companies creates value, the strategy is the choice and configuration of business model and the capabilities is the company's ability to utilize and transform the business models to reach the overall goal.

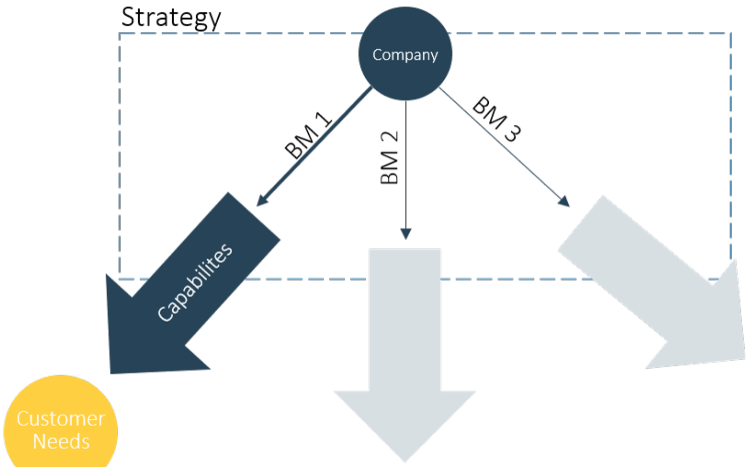


Figure 2.4: Relationship based on findings from Casadesus-Masanell and Ricart (2010)

2.3.4 Key Performance Indicators

How can a company know that the business model and capabilities are generating the right value to reach the overall set strategic goals? One commonly used tool to answer this question is the Key Performance Indicators (KPI). According to Parmenter (2015, p.7) KPI's are defined as:

> *A set of measures focusing on those aspects of organizational performance that are the most critical for the current and future success of the organization.*

These performance indicators guide and align the strategic objectives throughout the whole organization. By measuring the same thing and use local adaptions it is easier for each department and individual to know how to contribute to the overall strategy goals of the organization (Parmenter, 2015). The KPI's should be developed to support the partnerships internally among personnel and departments, but also with key customers. It is important that all key stakeholders are aware and included in the development of the KPI. By doing so, it is possible to utilize the KPI to a greater extent by reaching a mutual understanding of the need of KPI's and why the usage is important (Parmenter, 2015). If there is not a mutual understanding and agreement, there is a risk that the KPI's will just be another measurement for the top management, without getting the full potential to engage the organization towards the same goal. The engagement will also help the organization to understand which KPI's they should measure, since it is crucial to measure and report only the things that matters the most for the organization and the key stakeholders (Parmenter, 2015).

2.3.5 How to reach a sustainable business model?

Presented by Lacy and Rutqvist (2016), there are three key drivers for development towards sustainable business models; resource constraints, technological development and socioeconomic opportunity. This is further argued in an recently published article by Sarja et al. (2020), where 69 articles were reviewed, covering the subject of transformation from linear to circular to identify obstacles and enablers. It is found that resource constraints is one of the major obstructive factors, expected economic and other benefits are identified as the greatest catalysts. The design and technical aspect are regarded to be one of the most mentioned ambivalent factors (Sarja et al., 2020). To promote circular growth and utilize these three drivers of development, but also deal with the obstacles, new strategies or tools are proposed (Esposito et al., 2018);

- Circular supply chain
- Recovery and recycling
- Building products to last
- Product-as-a-service or servitization

These strategies or tools focus on different aspect of the circular economy. In short, creating a circular supply chain pushes fully renewable and recyclable products throughout the value-chain and its therefore possible to recover and recycling all products. In this supply chain, waste is minimized, optimized and reused. By taking back, refurbish, upgrade and resell products it is possible extend its total life cycle (Esposito et al., 2018). Lastly, the strategy of product-as-a-service, which has grown in manufacturing companies in the last years, utilizes performance contracts (further explained later in the report) rather than traditional contracts and selling products (Stahel, 2010). This model is also argued by Frishammar and Parida (2019) to be one of the solely most common starting points of transformation for manufacturing companies. Concepts within the model are presented as for example pay for use, leasing, rental and performance agreement (Esposito et al., 2018; Baines, 2013).

By evaluating the findings from the literature, it seems to be a general understanding that a sustainable business model is an enabler or a starting point to implement several of the fundamental concepts of circular economy i.e. optimizing the complete system for a sustainable development (Esposito et al., 2018; Ellen MacArthur Foundation, 2015; Geissdoerfer et al., 2018a). Some argue that circular economy is a unique business model that focus solely on creating a circular resource chain while, other argue that a combination of several strategies or concepts leads to and, enables the concept of circular economy and is per definition not a business model.

The previous research shows different definitions of circular economy. Some argue that it is a unique business model whereas others perceive it as a combination of sustainable businesses models and strategies that leads to a circular economy. One may conclude that the literature implies that a sustainable or a circular business model has its foundation in designing out waste, optimize resource outtake, use renewable sources, share knowledge and competences and sell function or services rather than a product. Even if choosing weather or not to label it as a sustainable business model or a circular business model, the outcome is the same, i.e. using these models and strategies will lead to a more sustainable development and therefore, lead to a more circular economy.

2.4 Servitization and circular economy

Changing a company's business from linear sales to a more service-oriented approach requires both a strong purpose as well as a well-communicated strategy. The following paragraph will present some reasons for servitizing one's business as well as some strategies for doing so.

2.4.1 What is servitization?

The increase of services within manufacturing companies originates from the customers need of the function of a product rather than the product itself (Bergman and Klefsjö, 2012). The function of the product is regarded as the value for the customer, which makes it possible for manufacturing companies to deliver and making profit from adding a service connected to their products instead of solely selling their core product (Hutt and Speh, 2014). This way of delivering new value by connecting services to product has expanded among manufacturers and is called servitization (Baines, 2013). Servitization can consist of selling services along-side a product which are referred to both as hybrid offerings (Hutt and Speh, 2014) but also a product-service-system (PSS) (Baines, 2013). A hybrid offering, or a PSS, could consist of several products as well as several services if it is sold together. The concept of servitization is regarded as a first step towards circular economy compared to a traditional transaction-oriented manfacturer (Kortmann and Piller, 2016). Furthermore, the shift from selling only products to selling products together with services linked to these products can lead to differentiation in the market as well as competitive advantages (Baines, 2013).

There are several reasons for a manufacturing company to provide and develop these hybrid offerings and servitization, which some are presented below.

Knowledge from product usage and data regarding processes where data can be gathered from installed products and later used to develop better suited hybrid offerings. For this hybrid offering to work, the supplier must know how to collect the data but also to interpret it and use it to help the customer increase their efficiency and reduce costs (Hutt and Speh, 2014). Better product development and improved capabilities for manufacturing where future research and development projects can lead to an improved competitive advantage. However, good product knowledge is a must in order to be able to both promise a new offering towards customer, but the supplier must also be able to deliver what they have promised (Hutt and Speh, 2014). For new research and development projects, it is important to take into consideration that products must be designed for service, where service offerings are capable with products that are being sold to the customers (Hutt and Speh, 2014). The organization can be further developed to deliver after-sales services for new and existing customers. Research indicates that 45 percent of a company's gross profit comes from the aftermarket and contributes to 25 percent of the revenue (Hutt and Speh, 2014)

2.4.2 Performance contracts

One type of contract that can be used to combine the sale of products and services and create value with the customers is when a manufacturing company are starting to sell performance contracts. These contracts are unique for each customer and the manufacturing company can position themselves at different levels in this value proposition. The highest level is more connected towards the customers production processes and are therefore contracted to deliver e.g. output, availability and capability (Baines, 2013). The products connected to the performance contracts are still owned by the supplier and they therefore have incentives to make these products last as long as possible before being replaced but also function as long as possible to avoid unnecessary breakdowns and repairs (Han et al., 2020b). For selling these performance contracts, three types of suitable levels of a performance economy are presented by Stahel (2010):

Level 1: Selling solutions and prevention based on knowledge and science (suits companies best with a proven track record).
Level 2: Companies that sell performance and services that leads to a promised result, where the supplier are in control of value chain, all the way down to their customer.
Level 3: Companies have the possibility to loop their products, which means that they are returned to the supplier through a reversed logistics.

2.4.3 Circular economy & servitization - The connection

Servitization or PSS, is found to be one of several strategies or business models, that enables the transformation to become more circular. The concept of servitization has been defined as a process where a company transforms from product-centric to a service-centered way of doing business (Kowalkowski et al., 2017). Making a service of a product or adding a service to products makes it possible to make revenue without increasing the sales of more products hence, breaking the linear way of doing business (Baines, 2013; Lazarevic and Brandão, 2020; Frishammar and Parida, 2019). The linear business has been viewed has one of the major problems with the traditional business whereas increased revenue also implies increased sold products and use of resources. For example, by using leasing contracts where the customer pays for usage and thereafter returns the product, the lifetime of the product extends. Since it is the products' function, not the product itself, the company can also make money on the product for a longer period of time (Agrawal et al., 2012). The product-service-offerings also has the possibility to generate additional revenue from, by example, converting old goods into fresh new products, using the concepts of remanufacturing or reconditioning (Schenkel et al., 2015; van Loon et al., 2020). For the manufacturer to take responsibility of their once manufactured goods and seeing the business opportunity in converting old goods into new products and selling these again, are known as a rebound manufacturer. It is also found that a company can provide add on services such as online monitoring to optimize the service interval of a product, and thereby extend the lifetime of a product. Combining a product with a service makes it possible to maximize or extend its life cycle and by doing so create new more sustainable value offerings (Hutt and Speh, 2014; Han et al., 2020b). Therefore, it can be argued that the literature presents servitization as one way of enabling or promote the circular economy (Baines, 2013; Kowalkowski et al., 2017; Turunen, 2012).

2.5 Conceptual model

The main purpose of this chapter was to create a conceptual model to make it clear how circular economy interlinks with servitization and its effects. A conceptual model can be defined as a visual representation of data in a system, which provides the possibility to present the data in a organized and simple way to make the findings comprehensive both for the audience and the authors (Ruth, 2020). Conceptual models can be used in different contexts and presented in several ways such as diagrams, picture, maps etc. Therefore, it is found suitable to create and present a form of conceptual map of the findings from the literature review to understand the topic and its implication for the report. The conceptual model was created by breaking down circular economy to understand its different definitions and, further investigate which parts that enables the actual implementation of the concept. By doing so, it was possible to understand the connection between servitization and circular economy, which is one of the stated research questions. The previous research outlines that circular economy is one appropriate way to deal with the urgent situation of climate change but, also to keep businesses going. Circular economy is one way to end a linear way of doing business by involving the entire value chain. It is found that the definitions incorporate a transformation from a traditional way of doing business to a new circular model. Therefore, the first step for a company to become more circular is to decide upon a shared vision of the transformation to a more circular business model. In the conceptual model, (No.1, Figure 2.5:Conceptual Model) it can be seen that the circular economy transforms or evolves from traditional or linear ways of doing business which is emphasised by several factors or stakeholders in the system such as new rules and regulations, customers, society etc.

To create a circular economy, companies are forced to change their business models since the traditional one is dependent on increased consumption and waste is integrated in the value chain. The customer is regarded as an end user and there are less opportunities to create for example a circular supply chain. It is found that there is a need of sustainable business models to reach a circular way of doing business (No.2, Figure 2.5: Conceptual model). Several different business model or strategies are presented in the literature, such as PSS, closed loop supply chains, sharing platforms, recovery and recycling etc. One key aspect that these models or strategies have in common is that they through its features enables the possibility to create the circular economy concept (No.3, Figure 2.5: Conceptual model)).

One new way to reach circular economy for the manufacturing business is found to be servitization or PSS (Baines, 2013; Frishammar and Parida, 2019). By implementing the concept of servitization, companies are able to keep revenue without selling more products and by this create new values for themselves, society and their customers (No.4, conceptual model). Using the aspect of the circular economy as the definition to maximize the complete system to favor a sustainable development. To further connect to strategy, business model and capabilities, seen in figure 2.5, as the overall strategy is to reach circular economy, the new value is reached by servitization as a business model which is enabled by the internal capabilities.

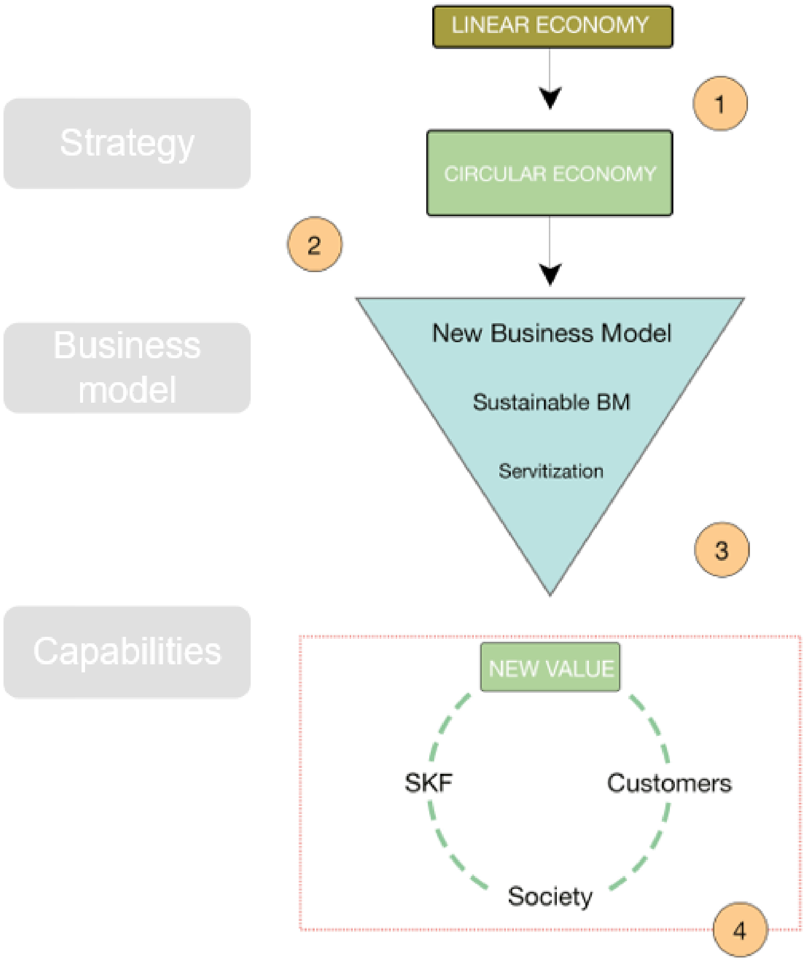

LINEAR ECONOMY
1
Strategy
CIRCULAR ECONOMY
2
Business model
New Business Model
Sustainable BM
Servitization
3
Capabilities
NEW VALUE
SKF
Customers
Society
4

Figure 2.5: Conceptual Model

3

Research Design

3.1 Overview & empirical components of the study

This chapter aims to present the design of how the research questions were answered. To summarize, the research design could be clustered in three main phases and primary data sources to answer the research questions;

- SKF:s strategies and business model (integrated in the literature review) - How is servitization provided by SKF?
- Literature review - How does servitization interlink to a circular economy?
- Interviews - Understand how SKF and their customers perceives circular economy.
- Survey - Which attributes of the offered products and services, enabled by servitization, does the industrial after market value the most?

These four data gathering phases were followed by a thorough synthesis. By using a mixed approach, both a qualitative and a quantitative part, it was possible to get both an overview of the topic but also to quantify specific perceptions.

The intended workflow and its components are shown in Figure 3.1, starting with the problem statement that was used to narrowing down the aim of the thesis. Following the problem statement, a literature review was conducted, the keywords for research can be seen in paragraph 3.3.1. Simultaneously, a mapping of the situation at SKF was done, focusing on their current usage of strategies and business models. The gathered information from the literature review led to the researchers own interpretations of a conceptual model that was used as a tool to understand and visualize the data. The conceptual model also supported in which area and which specific topics the interviews were done. Followed by the literature review was the qualitative interviews where firstly, internal interviews were conducted and thereafter, interviews with SKF's customers in the Swedish process industry. The first analysis of the qualitative interviews were conducted to improve the knowledge of SKF, their products, their market and their customers. The last part of the thesis was a quantitative market study by using a survey including a Discrete Choice Model. The survey was distributed both internally and externally to understand how SKF employees perceives their service offerings and how their customers values current and future service offerings. Finally, a synthesis of the findings from both the interviews and the questionnaires were done. Comparing the result from the findings in the survey and interviews made it possible to find any gaps between what SKF employees think matters the most to the customers and what customers in different industries value the most.

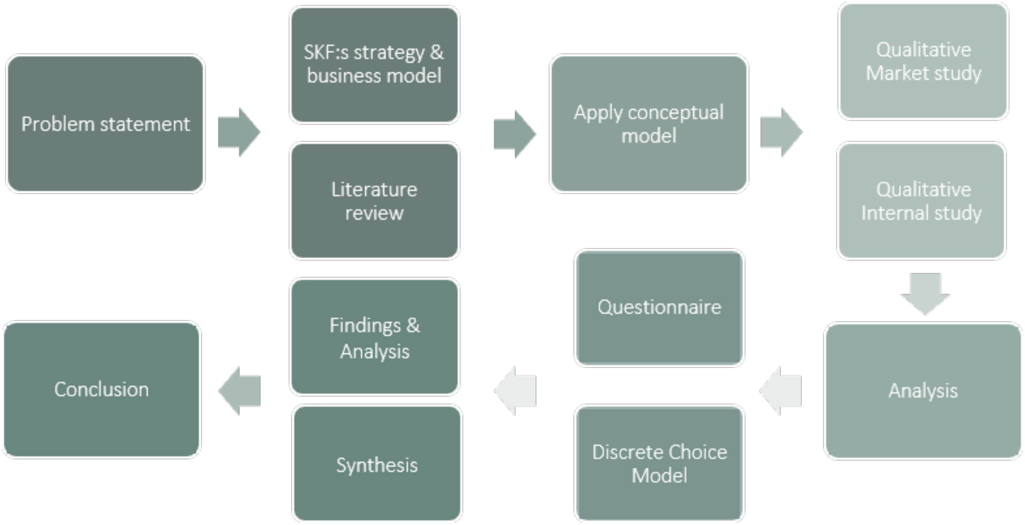

Problem statement
SKF:s strategy & business model
Literature review
Apply conceptual model
Qualitative Market study
Qualitative Internal study
Analysis
Questionnaire
Discrete Choice Model
Findings & Analysis
Synthesis
Conclusion

Figure 3.1: Flowchart of components for this research

3.2 Data sources

This section first present general knowledge of how to incorporate the customer needs in terms of appropriate methods and data sources. Thereafter, the sources used in this study are explained.

3.2.1 Customer knowledge

As mentioned in the introduction it is important to integrate the customer needs into the new business model. A commonly used tool to integrate the voice of the customer in product and service development is to use Quality Function Deployment (QFD) (Zairi and Youssef, 1995; Bergman and Klefsjö, 2012). QFD is a strategic tool or technique that enables companies to become more aligned with what the customer perceives as desirable quality of a product or service. Using QFD can bring a variety of benefits such as; help to define product specifications, ensure consistency between requirements and deliverables, show relationship and affects throughout the organization etc. (GOAL/QPC Research Committee and others, 1989). It is also possible to compare quality aspects with competitors and thereby, be able to excel in identified areas (Zairi and Youssef, 1995). Figure 3.2 shows the outline of the tool where the main pillars or objectives of QFD has been defined by Zairi and Youssef (1995) as:

- Identify who the customer is
- What the customer wants
- How to fulfill the needs

To be able to utilize and choose business model, such as servitization and build a strategy, it is of great importance to understand the voice of the customer e.g. what the customer wants, this part of the QFD is therefore the most useful for this report and also highlighted in Figure 3.2 (Bergman and Klefsjö, 2012). There are several methods to increase your knowledge of the customers, for example: interviews, focus groups, observations or surveys.

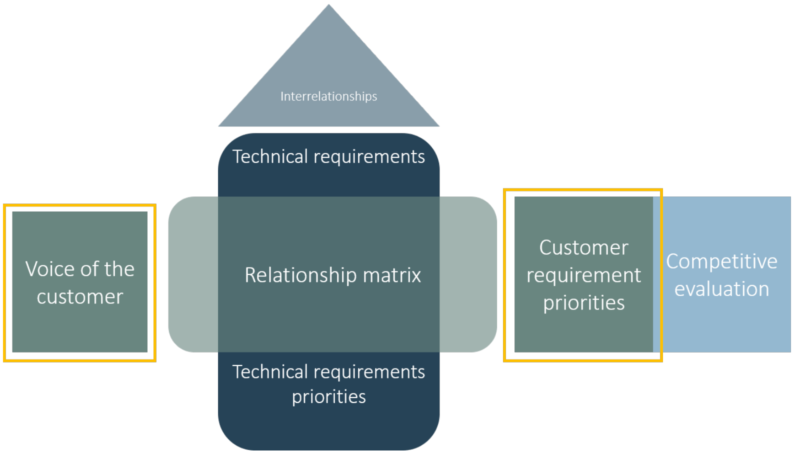


Figure 3.2: Components of QFD

The type of information that is desired should decide how to gather your information. A survey could give quantitative result that can be used on a wide customer base and the result can easily be compared. It is also possible to add in other types of methods get knowledge of the customer (Secor, 2010). A survey can be used to give further perception of the customers as well as their preferences, where a Discrete Choice Model is regarded as usable (Coast et al., 2012). Therefore, this study intends to use both qualitative and quantitative methods and data sources.

3.2.2 SKF's strategies and business models

The first step of the data gathering was to compile and summarize how SKF are working with their strategies and business models today. By doing so, the authors gained knowledge to build the research upon and provided a foundation for the analysis of the current and future gaps. This was done in the early phase of the thesis simultaneously with the literature review. The primary data source of SKF's strategy and business models was found in their annual report and published data on SKF official website. This knowledge was further strengthened by information from internal documents published on the SKF intranet.

3.2.3 Perceptions within SKF

The second data source aimed to answer how SKF's employees perceive how they and their customers deal with the circular economy today. This was explored by conducting several semi-structured interviews with employees within the organization. The primary purpose of the qualitative interviews was to gather knowledge about how circular economy and servitization are used and perceived at different levels within the organization and investigate which attributes their customers demand. By asking the interviewees, which interact with different customers in different ways and at different levels of their companies, gave a broad understanding about which attributes are the most important.

3.2.4 Customers needs and perceptions

Followed by the interviews at SKF, there was a need to explore how their customers perceive and use circular economy today. This data was gathered in the same way; by conducting interviews. When conducting interviews, first-hand data of how the company actually uses the term circular economy, how they deal with it today, and find which attributes are the most important for them. As for the internal interviews, this was key for being able to understand the situation and thereby generate a suitable survey. The interviews were important material to be able to answer which gaps and need there are today and in the future.

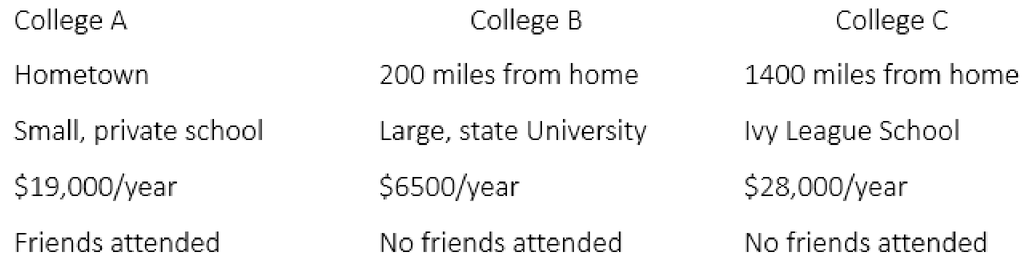
3.2.5 Survey Design

Based on the result from the interviews and literature review, a quantitative questionnaire was formed (Blomkvist and Hallin, 2014). For this study, a combination of a questionnaire and a DCM was used which provided a quantitative result based upon the qualitative data and therefore created the possibility of quantifying qualitative data (Sauerwein et al., 1996). The first part of the survey focused on more general questions regarding the concept of circular economy, how familiar the respondent felt about the concept but also how it is used and measured in their company. The last part contained the DCM, see paragraph 3.2.6, which was designed from the desired attributes collected from the internal and external interviews. As previously mentioned the design of the DCM was stated preferences, but the used type of DCM was the mixed logit model which allowing random taste variation across choosers, unrestricted substitution patterns across choices, and correlation in unobserved factors over time (Train, 2009). Figure **??** shows the three offerings with different attributes and levels that were presented. Dividing the survey into two parts made it possible to get a broader view of the concept of circular economy and servitization and get a more detailed nuance in terms of attributes of the products. The main benefit of the DCM that was used is the possibility to get knowledge of how the customer values different attributes relatively for example, price compared to saved carbon dioxide.

3.2.6 Discrete Choice Model

The discrete choice model (DCM) is used to gather knowledge of the probability of what a customer will choose between two or more products or services where each attribute is represented with a unique setting of levels. Each attribute has varying levels, that can be e.g. different prices, material and cost. The choice of a specific attribute will show what the customer value the most in terms of what they are willing to give up for other attributes (Oppewal and Timmermans, 2001). By making the customer, or the respondent, choose multiple times between different options, with different level of the attributes, will show the trade-off that the customers are willing to make (Coast et al., 2012). These attributes will be ranked from the highest LogWorth-value to the lowest, where the Logworth-value indicates the importance of each attribute. The attribute with the highest LogWorth-value, is the most important for the customer (Raharjo, 2020). This trade-off between attributes could be e.g. that they are not willing to pay more for a smaller portion or how the effect of an exclusion of goods in a product or service affects the customer choice (Van Loo et al., 2011).

Typical choices that is used in a DCM is visualized in Figure 3.3. For each of the choices, in this case, the respondent can choose from three colleges, or options, that have the same attributes but different levels, for example distance from home, cost, wherever friends attend the same college. These attributes are shown with different levels between the colleges and the respondent will choose which option that will fulfill their need the best. The respondent will be asked several times where the levels are changed with each offering which will then show which factors matters the most.



College A	College B	College C
Hometown	200 miles from home	1400 miles from home
Small, private school	Large, state University	Ivy League School
$19,000/year	$6500/year	$28,000/year
Friends attended	No friends attended	No friends attended

Figure 3.3: Different attributes and levels for a Discrete Choice Model from (Berdie, 1998)

.

With price being an attribute, it is possible to evaluate the customers willingness to pay (WTP). The WTP can give identify how the customers values different attributes and what they are willing to pay for different attributes (Van Loo et al., 2011). The attributes that the respondent can choose from are often gathered from qualitative interviews with customers or with people with good knowledge of the products or services.

The levels of the attributes are meant to make the options more realistic and if possible, some alternatives could relate to current options on the market. Levels of the attributes that relate to today's option could be set to e.g. 10% higher or 10 % lower. Other levels could be fictional levels that gives a relative comparison between offerings (Alpizar et al., 2001). If the DCM is not based on real market choices, but instead hypothetical, it is based on stated preferences rather than revealed preferences. A stated preference study does not have real market levels for corresponding attributes. These levels will therefore give a relative comparison between the three offerings. The number of offerings to choose from, three, corresponds with what is appropriate for these types of surveys (Kroes and Sheldon, 1988). As for design of this study, the stated preference will be used. To allow random taste variation across choosers, unrestricted substitution patterns across choices, and correlation in unobserved factors over time this study further used the mixed logit model. (Train, 2009)

3.2.7 Utility function

From the DCM it is possible to calculate the utility function for each attribute. Lancsar and Louviere (2008) argue that from their empirical experience, twenty respondents per Discrete Choice Experiment is required to build a model, and therefore that will be seen as the lowest amount of respondents for this study. The utility functions can be described as how desirable an option/offering is depending on the given attributes, the customer and an unknown component (Raharjo, 2020). The unknown component is in the equation to symbolize other attributes not given during this DCM (Han et al., 2020a). The utility functions could be separated into two different functions the aggregate utility functions or disaggregate utility functions. Aggregate utility functions generalizes the responses and therefore provides the same utility for each respondent and therefore gives each attribute an aggregate weight. For the disaggregate utility functions, each utility is specified for each respondent. The aggregated utility function shown in Equation (2.1) show the utility of a cup with price of 100 SEK with the attributes: insulation, handle and price. For the disaggregated utility function, Equation (2.2) shows the utility for, in this case: Carl, how he values each of the attributes: handle, insulation and price.

Aggregate Utility function

$$\mathrm{U}_{\text{Bio cup with handle at 100SEK}} = \boldsymbol{\beta}_1 \text{ Insulation } + \boldsymbol{\beta}_2 \text{ Handle } + \boldsymbol{\beta}_3 \text{ Price } + \varepsilon \quad (3.1)$$

Disaggregate Utility function

$$\mathrm{U}_{\mathrm{B}iocup\ with\ handle\ at\ 100SEK\ for\ Carl} = \beta_1^{\text{Carl}} \text{ Insulation } + \beta_2^{\text{Carl}} \text{ Handle } + \beta_3^{\text{Carl}} \text{ Price } + \varepsilon (3.2)$$

3.3 Details on data collection

The components of the research design has been outlined, the next section aims to present how the different components were used.

3.3.1 Literature Review

The first set of data was collected by conducting a qualitative literature review. This was done to increase the understanding of the concepts and to identify trends and important areas within circular economy and servitization. To ensure the quality of the literature review, it followed an eight step checklist towards completing a successful review presented by Byrne (2017);

- **Search terms:** Formulate search terms.
- **Database search tools:** Use database search tool.
- **Key Publications:** Identify key publication within the subject.
- **Web search tools:** Extend with web search tools.
- **Scanning:** Scan abstracts, review and summaries to decided if relevant.
- **Reading:** Read the most appropriate articles.
- **Thematic organization:** Organize the findings.
- **Write the review:** Summarize key findings.

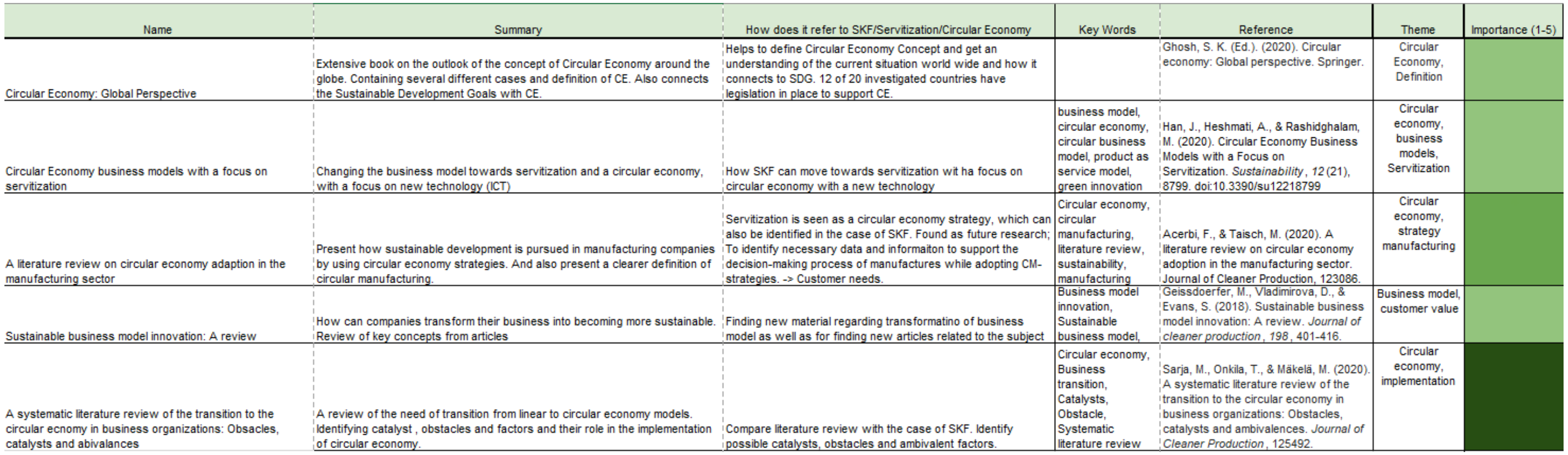
The literature was foremost gathered by using the Chalmers Library, but also Science Direct, Springer and EBSCO by searching for topic key words and asking authors active in the area for advice. Used keywords for the literature review was; *circular economy, circular economy business models, traditional business models, business model transformation, servitization, manufacturing, servitization* and *circular economy.* Some of these keywords were originated from the start of the project while some were added throughout the search. The findings from the literature review outlines a conceptual model which made it possible to a greater extent understand how servitization and circular economy is defined, how they have developed and in which way they are interlinked according to the current research. A conceptual model can be defined as a visual representation of data in a system, which provides the possibility to present the data in an organized and simple way to make the findings comprehensive both for the audience and the authors (Ruth, 2020). Conceptual models can be used in different contexts and presented in several ways such as diagrams, picture, maps etc. Therefore, it is found suitable to create and present a form of conceptual map, see conceptual model, of the findings from the literature review to understand the topic and its implication for the report.

By using the eight step checklist the analysis of the literature review was done foremost by the thematic organization, see Figure 3.4 and then summarized in a conceptual model, see chapter 2.

3.3.2 Interviews

For the qualitative part, the primary data was gathered by conducting semi-structured interviews with open-ended questions. By using open-ended questions the interviews provided broad and thorough insights of SKF and their customers (Blomkvist and Hallin, 2014). The open-ended questions also ensure that the interviewee can answer the questions to the best of their ability and add additional information if necessary, which is suitable for the qualitative study (Eriksson and Wiedersheim-Paul, 2008). If the questions were constructed to give yes/no answers or numerical answers, it would not give as descriptive answers which were desirable at this stage of the project (Kvale et al., 2009). The interviews were held mainly in Swedish which was done to make sure the interviewee could express their answers fully by avoiding language barriers. In total, ten interviews were held with SKF employees and nine interviews were held with interviewees at different companies. According to Blomkvist and Hallin (2014), approximately 10-15 is a somewhat guideline for the number of qualitative interviews for a masters thesis. However, this was fulfilled already internally at SKF and therefore had to be increased to obtain knowledge from SKF's customers as well.

The first interviewees were chosen in collaboration with the supervisor at SKF to get a diversified sample but also key players in terms of knowledge and involvement in specific areas. The majority of them were mid-level to top-level management which were chosen due to their area of expertise and that they are currently in charge of and leading different departments and hence have good knowledge when it comes to SKF's customers. The interviewees were further asked if they had any particular person that would be of great interest for the topic, i.e. using snowball sampling (Biernacki and Waldorf, 1981). The internal interviews were followed by nine interviews conducted externally at seven different customers of SKF in the Swedish process industry and SKF authorized distributors. The interviews were conducted with several different customers at different levels in the organization, mainly chosen with the help of Key Account Managers at SKF. Using contacts at SKF to provide contact information for the external interviews was the most effective way to contact them at the different sites. As for the internal interviews, the snowball sampling were used as some interviews generated new candidates.



Name	Summary	How does it refer to SKF/Servitization/Circular Economy	Key Words	Reference	Theme	Importance (1-5)
Circular Economy: Global Perspective	Extensive book on the outlook of the concept of Circular Economy around the globe. Containing several different cases and definition of CE. Also connects the Sustainable Development Goals with CE.	Helps to define Circular Economy Concept and get an understanding of the current situation world wide and how it connects to SDG. 12 of 20 investigated countries have legislation in place to support CE.		Ghosh, S. K. (Ed.). (2020). Circular economy: Global perspective. Springer.	Circular Economy, Definition	🟩
Circular Economy business models with a focus on servitization	Changing the business model towards servitization and a circular economy, with a focus on new technology (ICT)	How SKF can move towards servitization wit ha focus on circular economy with a new technology	business model, circular economy, circular business model, product as service model, green innovation	Han, J., Heshmati, A., & Rashidghalam, M. (2020). Circular Economy Business Models with a Focus on Servitization. *Sustainability*, *12* (21), 8799. doi:10.3390/su12218799	Circular economy, business models, Servitization	🟩
A literature review on circular economy adaption in the manufacturing sector	Present how sustainable development is pursued in manufacturing companies by using circular economy strategies. And also present a clearer definition of circular manufacturing.	Servitization is seen as a circular economy strategy, which can also be identified in the case of SKF. Found as future research; To identify necessary data and informaiton to support the decision-making process of manufactures while adopting CM-strategies. -> Customer needs.	Circular economy, circular manufacturing, literature review, sustainability, manufacturing	Acerbi, F., & Taisch, M. (2020). A literature review on circular economy adoption in the manufacturing sector. Journal of Cleaner Production, 123086.	Circular economy, strategy manufacturing	🟩
Sustainable business model innovation: A review	How can companies transform their business into becoming more sustainable. Review of key concepts from articles	Finding new material regarding transformatino of business model as well as for finding new articles related to the subject	Business model innovation, Sustainable business model,	Geissdoerfer, M., Vladimirova, D., & Evans, S. (2018). Sustainable business model innovation: A review. *Journal of cleaner production*, *198*, 401-416.	Business model, customer value	🟩
A systematic literature review of the transition to the circular ecnomy in business organizations: Obsacles, catalysts and abivalances	A review of the need of transition from linear to circular economy models. Identifying catalyst , obstacles and factors and their role in the implementation of circular economy.	Compare literature review with the case of SKF. Identify possible catalysts, obstacles and ambivalent factors.	Circular economy, Business transition, Catalysts, Obstacle, Systematic literature review	Sarja, M., Onkila, T., & Mäkelä, M. (2020). A systematic literature review of the transition to the circular economy in business organizations: Obstacles, catalysts and ambivalences. *Journal of Cleaner Production*, 125492.	Circular economy, implementation	🟩

Figure 3.4: Excerpt from analysis of Literature Review

The interviews were structured and segmented in different areas; circular economy in general, business model, suppliers and customers, see Appendix A.1 for a detailed view of the questions. The questions were formed from findings in the literature review and in collaboration with supervisors at SKF. Furthermore, they were updated and adapted along the way as certain questions gained greater insights relevant for this thesis. Depending on the role of the interviewee, certain questions could not be answered and were therefore skipped.

Due to the ongoing pandemic, all interviews were conducted online, using digital meeting tools such as Teams or Zoom. As the major part of both SKF employees and their customers are and have been working from home during the last year, the online setting of the interview was perceived as the normal way of doing business and not perceived as an obstacle. All interviews were done with both researchers present, which made it possible for one person to only focus on being present in the conversation and conducting the interview and the other person mainly taking notes but also ask extra and follow-up questions. A great benefit of both being present is the possibility to complement each other in but also to take detailed and high qualitative notes, which save a lot of time in the transcription phase.

3.3.3 Survey

The survey was continuously improved and updated to capture the most relevant data for this research. This was done by several iterations between the researchers, the supervisor both on SKF and Chalmers and an expert within the area of DCM. When a first draft was complete, it was piloted internally and generated 16 unique answers. The respondents were also asked to give general feedback on the survey to make it possible to improve it. Based on the feedback, some questions were updated and additional information was added to make the survey more clear. To further understand how the respondent was thinking when answering the survey, one in-depth interview was conducted with a respondent of the pilot survey. The pilot study also made it possible to test the software (JMP) used for the statistical analysis and to verify that the survey generated usable data.

The survey was created in Google survey and distributed to 195 respondents via e-mail both internally at SKF, mainly in the industrial sales department, but also to other business units with knowledge of the Swedish process industry and their customers within the Swedish process industry. Google survey was chosen due to the authors already being familiar with the tool from previous courses and works well with the data analysis tool, JMP. The selection of these customers was made, as for the interviews, together with supervisors from SKF that are aware of the customers business and know if these customers could provide information that is related to this thesis. The respondents were also asked to spread the survey to their colleagues to get a greater spread and thereof, increase the possibility to get a statistically significant result. An important part of the survey's design was how to keep the respondent interested throughout the survey and make sure that they not randomly answered the questions. One way of dealing with this issue was to add a control question in the survey. In this case, this was done by presenting an offering in the DCM part that outperformed the other alternatives by far, e.g. this alternative should always be chosen. By doing so, it is possible to see if a person really has read and answered the question correctly or just randomly chosen the answers. If the person would not choose the best answer for the control question, their response was removed from the survey to increase validity for the survey.

3.4 Details on data analysis

The components and how they were used are explained, the last section aims to outline how the analysis of the collected data was done.

3.4.1 Qualitative data

All interviews were recorded and partly transcribed using the thematic analysis and sentence concentration (Kvale et al., 2009). To process the interviews in several steps, transcription and thematic analysis provided a general understanding and enabled the possibility to make a conclusion of the findings from the interviews. The answers and findings from each interview were summarized in two tables, see Figures 4.2 and 4.4. This is viewed as an appropriate method to analyze data gathered from qualitative interviews and from here, patterns and connections can be identified (Graneheim and Lundman, 2004). Results and insights from the interviews were also iterated and discussed continuously between the researchers to improve the data collection, find connections to the literature and recognize patterns in the interviews. The findings and insights were also discussed internally at SKF, mainly with the supervisors. The primary purpose of the findings from the qualitative interviews was to serve as a foundation for the survey. Though, the interviews also fulfils a purpose in terms of highlighting the area of circular economy internally. As the respondents needed to elaborate and make their own reflection about the subject, there is a possibility to increase the interest and knowledge about the circular economy.

3.4.2 Quantitative data

The first part of the analysis of the survey was to remove irrelevant answers from the responses, i.e. incomplete surveys. Respondents that had answered precisely the same throughout the survey and respondents that had answered the control question incorrectly were also removed. The results from the first part of the survey were analyzed and summarized in different graphs. Mainly using the built-in features in Google survey, but also summarizing different segments and relevant answers using Excel and PowerPoint. Using graphs and visual aid made it more convenient to present the results from the survey and to use it as a point of discussion in different forums.

3.4.3 Discrete choice model analysis

The result gathered from the survey connected to the DCM was first exported to Excel and then imported to JMP, which was the primary tool for statistically analyzing the result. The second step of importing it to excel was to categorize and clean up some data which was easier done in Excel than JMP. The software was chosen because of the previous knowledge of the authors. Regarded as a key benefit with JMP is the possibility to get visual aid of the statistical analysis and, to easier present the result in an understandable way. From the analytical tools in JMP it is possible to reveal several different insights from the gathered data. Firstly, which of the presented attributes regarded as the most important, based on LogWorth-value. To make sure the ranking of attributes reflects the characteristics of the entire population of respondents, the P-value is set at a 5% significant level. The estimates of the attributes are also presented i.e. the possibility that a specific attribute will be chosen in this particular setting. Based on the DCM, it was also possible to understand the utility of each attribute and level as shown as Parameter Estimates.

A positive number means an increased chance of customer selecting the product due to that attribute and vice versa. Lastly, the feature of willingness to pay (WTP) was used.

3.5 Strategy of analysis

The research design supports the possibility of answering the research questions and reaching the overall aim with this report. This is mainly done by the usage of different valid methods and also by using several different data sources.

Followed by the data gathering is the presentation of the result in combination with the analysis. The strategy of analysis used in this report is divided into three major part. Firstly, the results from the qualitative interviews are displayed and analyzed by identifying patterns and connection to previous research. This is followed by the result of the quantitative market research, where the result from the survey and DCM are presented. In the same way as the first part this is also analyzed by showing casualties to the previous research, but mainly by displaying trends and contradictions in graphs found from the survey. The last part of the analysis is found in chapter 5, where the findings from the complete data gathering are synthesized. The synthesis will also provide general proposition on how to use these findings. The findings and propositions are further discussed in the backdrop of the previous research and the connection to the research questions are clearly stated and described.

3.6 Research quality

This section presents the authors' reflections on the research quality and aims to point at some strength and weaknesses. As a summary this study has its strength in multiple data sources where both qualitative and quantitative data and methods is used. Further the data has been continuously discussed with stakeholders to make sure it reflects the correct things and to validate the result. Found as weakness is the fact that, even though the result from the survey are significant, the respondents only represent a very small part of the whole industry, and therefore the transferability is affected.

3.6.1 Ethics

All interviewees and respondents of the survey were informed about the purpose of the research and how their contributions would be used. By this, the respondents is aware of the intentions of the research and in what way they are contributing (Bryman and Bell, 2011). The participation in both the interviews and surveys has been anonymous, and the answers have been handled with great confidentiality to ensure the integrity of the respondents. In the transcription and the presentation of data, key characteristics of the respondent and its work tasks have been left out. In line with the recommendation from Vetenskapsrådet (2017) all the interviewees have been informed about their rights to cancel the interview at any time or not answering certain questions without further reasons.

3.6.2 Trustworthiness

The main quality criteria of qualitative research are transferability, dependability, credibility and confirmability, which together forms the criteria of trustworthiness (Korstjens and Moser, 2018). A reflection is that one of the key aspects of credibility is the usage of triangulation e.g. use various types of sources of information. Using several sources of literature in combination with both qualitative interviews and quantitative surveys is therefore, found to increase the credibility of the research. This was also experienced by the researchers when interviewees confirmed information from the literature. Further aspects that have been found to improve credibility are the fact that peer-review sessions were done with other students, continuous feedback with supervisors both at Chalmers and SKF and piloting both interviews and surveys to assure higher quality on the outcome. The survey was also discussed and developed together with an expert in the field of DCM before sent out to the respondents. These discussed aspects are some of the strengths of the design of the study and will also validate the results.

Some criterion's that could adversely affect the trustworthiness is that the interviewees and respondents of the survey were not completely randomized but chosen from the experiences of the supervisor. One reflection is also the possibility that the respondents can be biased when the main subject is presented as circular economy. Suppose the term or focus on sustainability and circular economy had not been mentioned, would the respondent answer the questions in a different way, e.g. does the "buzzwords" affect the respondents mindset? Furthermore, the research is only done within a small area of the industry and did not cover all roles and departments and therefore, affect the possibility to make too general assumptions.

The transferability can be explained as the possibility of the qualitative research can be transferred or used in different settings and contexts (Korstjens and Moser, 2018). For this study it can be argued that the general findings such as the perception of circular economy and how circular economy and servitization interlinks can be transferred into different settings and companies. This because of the overall urgency of the climate change and that servitization and circular economy is used world wide. The more specific evaluation and findings regarding attributes of SKF's services and products is to be challenging to transfer, due to the unique setting of this company and may be seen as a weakness of this study.

3.6.3 Validity of the survey

Validity in terms of research quality refers to if an indicator or measurement measure the indented concept (Bryman and Bell, 2011). Therefore, the validity of the survey to strengthen the thesis and its result was often a point of discussion. To improve the validity of the survey, it was designed in several different steps and had a starting point from the results from both the literature review and the qualitative interviews. The first draft was discussed with a experienced professional, a PhD at the Division of Service Management and Logistics at Chalmers University of Technology, in the area of DCM to make sure that the design was valid in combination with the pilot survey internally at SKF, which improves the validity. The final result of the DCM was also shown and validated by the expert with the main purpose to make sure that the DCM generated valid data.

To further increase the validity of the survey and the DCM, the level of the attributes were kept at a lower degree to mimic somewhat realistic measurements. The DCM's attributes is also based on the qualitative interviews which makes sure the right questions is being asked. Due to this survey being more exploratory to find which attributes is the highest valued by the respondents and not investigating a specific product, the levels are kept to be reasonable for the respondent. To further increase validity, the respondent cannot proceed with the survey without answers the questions related to the DCM. To further increase the validity, each attributes were thoroughly described and the respondent was able to go back to the stage were the information was available (Boyle, 2003).

Throughout the design the authors tried to ask themselves what answer could or will this question or choice generate. The aim was to make sure that all answer in some way connected to the research questions and to remove redundant information and questions. To further reach higher validity and strengthen the study, the authors had the possibility to have a session with one respondent who answered the pilot survey. The person was asked to explain how the question was interpreted and why specific choices was done. This increased the possibility to clarify if the questions and choices answered the intended question in the way the authors had planned.

Another challenge was to decide upon which and how many attributes that should be included in the DCM. If one thinks broad, a product or service from SKF can bring too many attributes i.e. it will be impossible for the respondent to answer. Therefore, it is of great importance to get a valid picture of which attributes are perceived as the most important from both SKF's, but mainly from the customers, point of view. The attributes were found from the qualitative interviews and those attribute that were chosen were those that was found important in several interviews and those that could be shown in different levels. For example, price can easy be set into different levels but quality could be difficult and misleading to have different levels of. Other attributes that were found not to be useful for this service was; binding period with supplier, payment method and degree of interaction with supplier. Since the DCM is often used in business-to-consumer-mapping, its standard settings is not optimized for B2B. Initially, the plan was to use the DCM to get a general understanding of the customers, not specifying a product or service. This caused problem in terms of interpretation of the attributes, in which settings should the question be answered? For example, if a question regarding a general offering is presented for a person it will answer based on their own interpretation of the offer. Both this and too many attributes will harm the validity since it is hard to say what the survey answers. This was handled mainly by specifying the offering in the DCM (see Appendix B.1) which made it possible to understand how the question is interpreted a greater extent and therefore, get a more valid conclusion.

3.6.4 Challenge of distributing the survey

One major challenge and weaknesses by having a survey as a quantitative data gathering method, is the fact that the number of responses could be lower than planned. During the qualitative interviews, which were held with several different departments and companies, the authors mentioned that the next step of this thesis was to distribute a survey which were told in order to increase the possibility to get a higher response rate. The authors also used the contact from key employees at SKF to distribute the survey. To make sure the respondents were not discouraged from answering the survey, there was a lot of work in making it short, concise and only asking what could be beneficial for this study.

The amount of time it would take to fully answer the study were explained in the beginning of the study and it was found, from the prior pilot questionnaire, that it would take 5-10 minutes which were deemed not too time-consuming.

However, to increase the response rate, one method could be to contact each individual by phone to further explain the purpose of this report and asking for their approval to send them a link to the survey. However, this was seemed as too time-consuming for this thesis.

Internal response rate

The survey was sent out to approximately 115 employees at SKF by email. After two weeks, including two reminders, 49 answers were received, generating a response rate of 42,6%. Due to the DCM containing a control question, respondents who did not pick the clearly best option were not included in the result. Respondents that also chose the same alternative, e.g. only choosing one option, were also sorted out. From this data cleaning, 39 responses remained, from the initially 48. This generated a response rate of 33,9% on the analyzed data.

External response rate

The survey was sent out to approximately 90 people working outside SKF, which included several different customers as well as SKF authorized distributors. In total 49 respondents answered the survey which gave an response rate at 54,4%. From these 49 respondents, 42 of them remained after the data cleaning of respondents who did not choose the right option. This gave a somewhat higher response rate compared to the internal, where the external response rate was 46,6%.

In an extensive study by Baruch and Holtom (2008), where over 1500 articles were analyzed, the average response rate of a survey in an organization was found to be 35,7%. The response rate for this study could overall be argued as acceptable, since both internally and externally generated more total answers than 35,7%.

4

Findings & Analysis

This chapter outlines the findings from the collected data. It is therefore clustered as presented in the research design i.e. perception of SKF, perception of customers followed by the survey including the DCM. The findings are also combined with a analysis connected to the previous presented research within the field.

4.1 SKF's perception of a circular economy

This section presents the results from the qualitative interviews. To make the result easier to follow and to present the most relevant data, the result from the interviews is condensed and summarized into three main headings for the internal interviews and four for the external interviews. These headings are based upon the interview template used to conduct the semi-structured interviews. The most relevant data is the answers that firstly contributes to the making of the questionnaire but also the ones highlighting the area which the research questions is intended to answer.

The following paragraphs presents the findings from the qualitative interviews conducted internally at SKF.

4.1.1 Definition of circular economy

As described in chapter 2, the definition of circular economy can differ and cover several different areas. Therefore, the first question covered the definition of circular economy, by asking how they, themselves, would define the concept of circular economy. The interviewees touched upon a wide range of definitions such as to optimize the usage of resources, the mindset of re-using of products and materials, extend the life span of products and to promote the circularity throughout the whole life cycle. A major part also highlighted the great urgency of the implementation of circularity to, not only keep the company going, but to stop the overall climate change. The interviewees stated that this can be done by reducing overall waste, implementation of new business models to promote new service offerings, re-manufacturing and reduce traditional business.

By categorizing the definitions into main categories, it is possible to see a clear connection to the previous research. The categories are taken from and explained in chapter 2; resilience of natural resources, economic value, social value and a merge of resilience of natural resource and economic value. As shown in Figure 4.1, the definitions are only covering two of the areas. There is a clear focus on the resilience of natural resources in a somewhat combination of the economic value. Whereas, there is a lack of coverage in the pure economic value and also social value. As argued by Murray et al. (2017) there is an overall tendency to neglect or not prioritize the social aspect of circular economy, this seems to be the case at SKF as well.

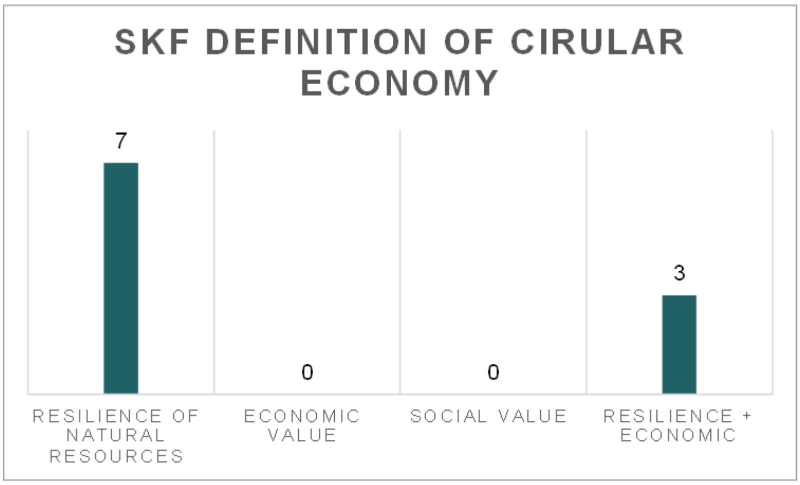


Figure 4.1: SKF employees definition of circular economy

4.1.2 How aware is SKF of the needs and benefits of circular economy?

The first part of the interviews was focused in the general perception of circular economy. By asking questions about how aware SKF's employees are about the need and the benefits of circular economy it was possible to explore the development of circular economy internally. By doing so it was possible to find if the communicated strategy aligned with the internal perception. The question per say is two-parted, first whether the interviewee is aware about circular economy and secondly if they know about the benefits that is connected to the topic. What can be seen in table 4.2 is that the term "how aware" SKF's employees are, is that there is a higher awareness than it has previously been. Several employees mentioned that they perceives SKF to be more aware about circular economy than their competitors, customers or their SKF authorized distributors. It could therefore be argued that the awareness and interest for circular economy has increased and is viewed as higher now than in the past years.

Yet, this can not be seen as an clear argument that SKF's employees are more aware of circular economy now since there is no starting point or measurement of the development. However, the respondents explained the increased awareness to be connected to several components or reasons i.e the possibility to create "green value" through new service offerings enabled by changed business model, the increased overall focus on sustainability on a higher strategy level, reconditioning and re-manufacturing of products, lubrication management etc.

This perception was shared by the majority of respondents though, it should not be seen as the only one. Several of the interviewees also perceived that SKF has a long way to go regarding the awareness and development of circular economy. Some of the interviewees mentioned the fact that there are no KPI's or monetary goals connected to support increased circularity. This was discussed in relation to other KPI's where the interviewees was rewarded by, for example, increased sale or saved money per sold product. The respondents argued that there is a great possibility to increase the awareness and willingness to implement more circular solutions if there was a clear measurement connected to circular economy. Examples of measurements presented was saved carbon dioxide per product sold, instead of or complemented with the monetary amount for the sold products.

However, several interviewees connected circular economy with SKF's ability to provide services alongside their products. By delivering services and other products alongside their bearings, seems to be perceived as delivering "green value" and extending the bearings lifetime. It was also identified to be a challenge that the perception of circularity differs within the company. Further, the increased awareness was found to be positive but a perceived challenge was how to utilize the awareness on a individual level. The overall strategy is now, to some extent, set to circularity. But according to the respondents there is a lack of knowledge and operational strategy on how each individual and department can and will contribute.

4.1.3 SKF's perception of which attributes their customers demand

This question was one of the main pillars for the design of the survey and foremost for the DCM. It also provided a view of what SKF perceived that their customer values. The most common answers regarding which attributes there customers demanded were: price, cost, service-level, lead-time, different definitions of up-time and CO2-saving. The attributes are argued to be different amongst the customers, though it was not specified by the respondents in which case the attributes were desirable. This changed from case to case depending on the industry but also in terms of were in the organizational level the decision was made.

As SKF supplies several larger companies within the process industry, a major part of the interviewees argued that when it comes to service solutions and bigger products, price is not the biggest concern among their customers. In general, for example uptime, service-level or quality of the product were seen as more important attributes. Though, when it comes to single sales of smaller bearings or products, the single unit price is of greater value the their customers. These attributes were all taken into consideration when developing the survey and the DCM. Other less common, but also important attributes, were quality and long-term partnership which is further discussed in section 3.6.

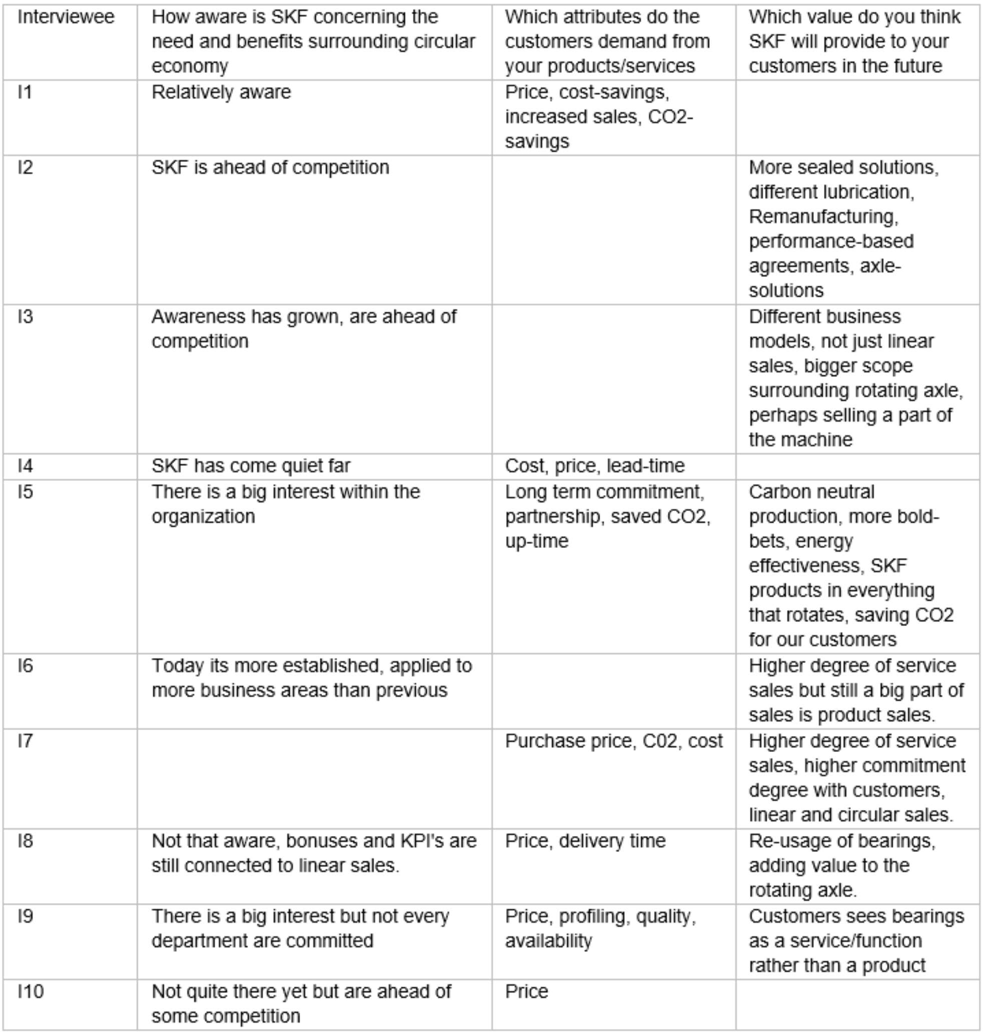
4.1.4 SKF perception of future business models

Several respondents mentioned that they consider a higher degree of service sales will be used in the future. Some argued that this can be done by for example changed and developed business models which supports circularity. Other mentioned a greater commitment from SKF concerning the customers overall rotating performance rather than the sale of single products. It was also found that the newly opened SKF Circular Economy Center at SKF was built in order to give circular economy and sustainable production a clear focus. This is regarded to be one capability that promotes or support a new business model. At the SKF Circular Economy Center, SKF has the possibility to remanufacture and refurbish SKF products which could later be sold again. By using online monitoring, SKF is able to handle their performance contracts. This is done at the Rotating Equipment Performance Center and is functioning as a communication hub for delivering value for customers with a performance contract. Further mentioned is that for remanufacturing services to work at optimal level, higher degree of customer interaction is necessary. As previously mentioned, there was a belief of a higher degree of service sales and a change of business model to support this. This goes along with what Kortmann and Piller (2016) presents: how a transaction-oriented manufacturer can transform their business model into becoming circular by first adding services alongside their linear sales and later, have a rebound flow of sold products. Rebounded products have the possibility to be refurbished or remanufactured and sold again. This service gives a direct environmental saving in form of reused material and thus reduction of new materials inserted into the process. The rebound of a company's products also goes along with strategy No. 3 presented by Stahel (2010) in paragraph 2.4.2. The Rotating Equipment Performance Contract could be viewed as one way that SKF uses the concept of performance contracts. Choosing the right strategy for these type of agreements, mentioned in 2.4.2, can help SKF deliver and utilizing their knowledge and expertise to create value together with their customer. These strategies: circular supply chain, recovery and recycling and products-as-a-service, is what is explained in chapter 2.3.5, to build a sustainable business model.

4.1.5 Summary of perceptions of SKF

To summarize the ten internal interviews, a general perception within SKF was the sense of urgency to transform their business towards going circular to reduce their overall environmental impact. This combined with the need of becoming more circular to be and stay competitive in the business. The interviewees own definition of circular economy relate to re-using, recycling and reduction of waste, where the main focus is in reducing resources usage and keep the revenue. The interviewees answered that the desired attributes for the customers are: price, overall cost, lead-time, quality. The interviewees further explained that there is a lack of KPI's and measurements of circularity. Saved emissions are not premiered or measured throughout the organization which several interviewees have pointed out.

Despite SKF's main business is to sell bearings in a linear way, there is a great belief in servitization. The interviewees highlighted that the sales of services, seals, lubrication, performance contracts and condition monitoring could all help extend the lifetime of their products. It was also pointed out that in the future, there will be more sales based on service and knowledge, which indicate that more sales will be connected to expanding the product life of products installed at customers.
(Note: The reason for some of the cells in table 4.2 are empty is due to the questions was not asked during the interview or that the interviewee could not answer the question).



Interviewee	How aware is SKF concerning the need and benefits surrounding circular economy	Which attributes do the customers demand from your products/services	Which value do you think SKF will provide to your customers in the future
I1	Relatively aware	Price, cost-savings, increased sales, CO2-savings	
I2	SKF is ahead of competition		More sealed solutions, different lubrication, Remanufacturing, performance-based agreements, axle-solutions
I3	Awareness has grown, are ahead of competition		Different business models, not just linear sales, bigger scope surrounding rotating axle, perhaps selling a part of the machine
I4	SKF has come quiet far	Cost, price, lead-time	
I5	There is a big interest within the organization	Long term commitment, partnership, saved CO2, up-time	Carbon neutral production, more bold-bets, energy effectiveness, SKF products in everything that rotates, saving CO2 for our customers
I6	Today its more established, applied to more business areas than previous		Higher degree of service sales but still a big part of sales is product sales.
I7		Purchase price, C02, cost	Higher degree of service sales, higher commitment degree with customers, linear and circular sales.
I8	Not that aware, bonuses and KPI's are still connected to linear sales.	Price, delivery time	Re-usage of bearings, adding value to the rotating axle.
I9	There is a big interest but not every department are committed	Price, profiling, quality, availability	Customers sees bearings as a service/function rather than a product
I10	Not quite there yet but are ahead of some competition	Price	

Figure 4.2: Internal interview compilation

4.2 Customers perception of a circular economy

This paragraph displays the summary of the external interviews. The main purpose of the interviews was to gather knowledge about how SKF's customer perceives circular economy and to explore their needs.

4.2.1 Definition of circular economy

Several of the interviewees defined the concept with focus on reduce waste, reuse resources, maximize life span and life cycle. Some answered with the economic value in focus. This by highlighting the importance of making or saving more money in combination with circularity, to have economical viability and profitability with less usage of material and decreases maintenance cost.

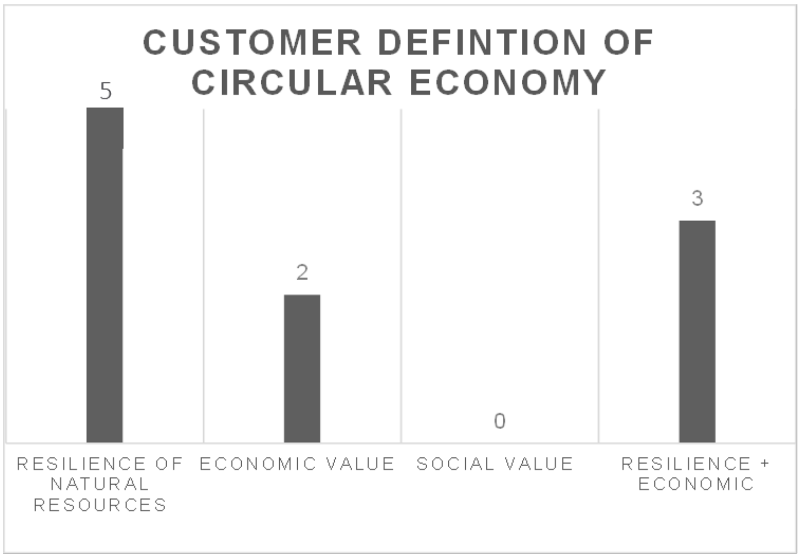


Figure 4.3: Customers' definition

As for the perception of employees at SKF, one can see in the Figure 4.3 that the customer has more focus on the economical value of circular economy. Though, several highlighted the importance of reducing the usage of material and the resilience of natural resources. Similar to the interviews at SKF, there is a lack of focus in the social value aspect among the customers, which is further discussed in chapter 6.

4.2.2 How aware is your company of the need and benefits of circular economy?

Following the same pattern as for the internally interviews, questions were asked to evaluate the awareness of circular economy within their company. According to several of the respondents the overall awareness of circular economy has increased rapidly during the last years. This is caused by external forces such as new rules and regulations but also by an internal urgency to help prevent climate change and the increased economic value generated from circular economy. The perception of the awareness between the companies was found to differ. Some of the respondents regarded their awareness as very high, which was argued by having a clear overall strategy that permeated the whole organization. They are also continuously striving to reduce their environmental impact to stay in front of their competitors. Other interviewees stated that they perceives circularity as something challenging and somewhat hard to implement in their position. In their business, and in their position, the focus is more on pay-of time than sustainability of the service or product. Even tough the overall awareness has increased, and the awareness of monetary or financial value connected to circular economy has starting to change in their business, there is a long way to go.

The general perception of circular economy amongst the customers can be viewed as wide. Depending on which company, but also in which position one work, the respondents answered the question differently. This could be argued to be a result that shows that certain businesses are more or less aware of the circular economy.

4.2.3 How do you quantify your environmental savings?

To clarify how the possible strategy of circular economy reflects throughout the organization the interviewee were asked about how they measure environmental savings. The overall perception was that several measurements were in place at the interviewees company. The most common measurement for environmental savings mentioned several times were reduced CO2-emissions. Others were energy savings, water savings, noise levels. Only one interviewee mentioned bonuses connected to environmental savings on a corporate level.

A major difference between the different customers was the standpoint of the usage of measurements of environmental savings. Where some of the interviewees were measured and had a clear connection to their daily work, though no extra bonus or monetary incitement was connected to this KPI. The environmental savings were perceived as that fundamental and obvious, that no extra incitement was needed. While others perceived a need of more KPI's and bonuses connected to them. By implementing monetary incitements the interviewee perceived a possibility to increase the awareness and willingness to work towards a more circular economy. Several of the KPI's regarding environmental savings were often connected to the interviewees own production and not to purchasing or suppliers. This could imply that the customers are more concerned with their own emissions and not having clear demands or requirements for what comes from their suppliers.

4.2.4 Which attributes are most important to you?

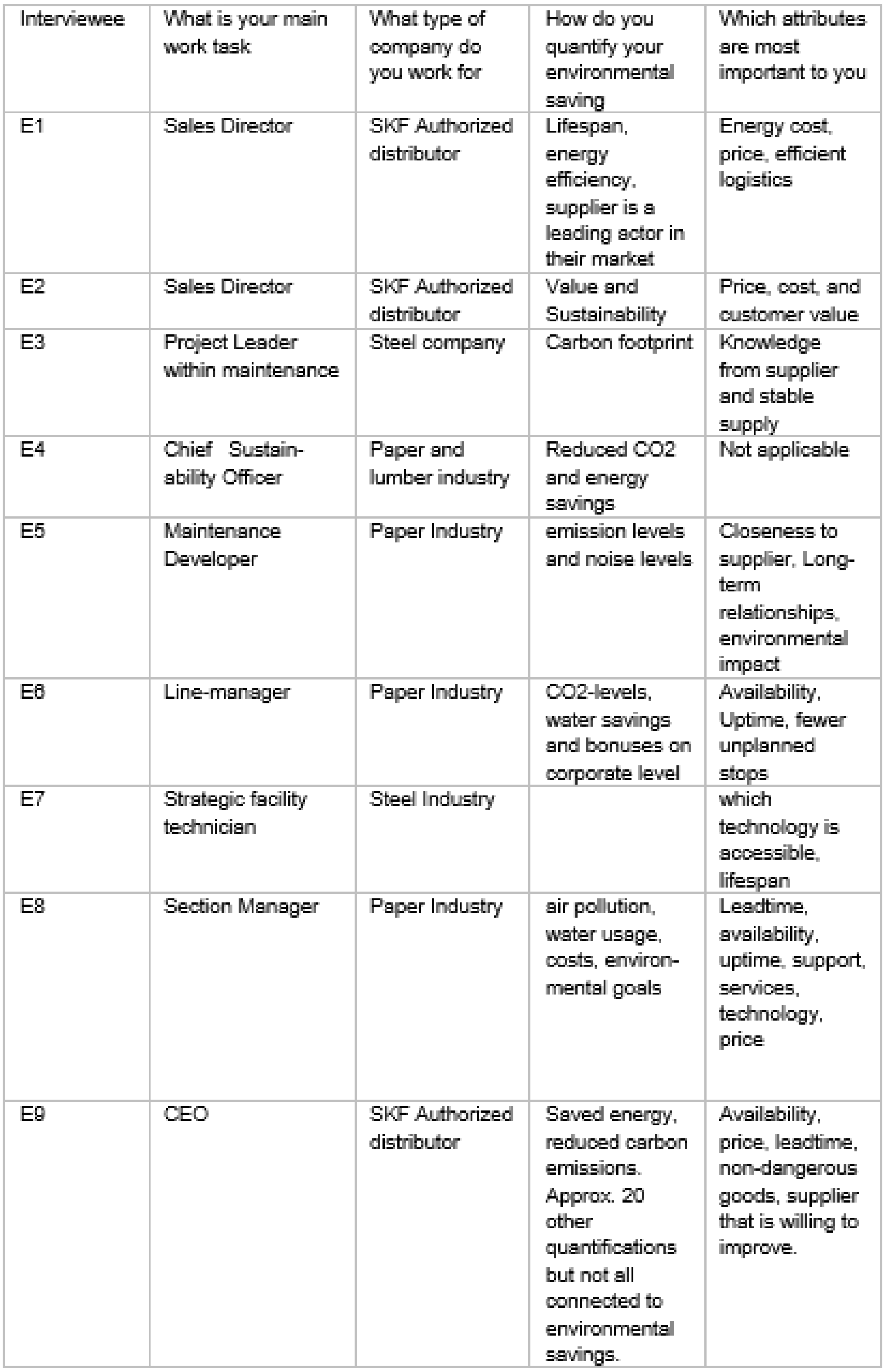
When it comes to key attributes of purchasing new products or services, the most frequently mentioned attributes were: price, cost, up-time or availability, lead-time, available support, interaction with supplier, efficient logistics and environmental impact. In terms of price, some mentions that it is important, though, since several respondents often handle large and complex procurement's the price is not the most important attribute. It is of greater value to achieve a higher overall availability of the production and make sure that the quality of the products or service meets the performance requirements. One customer explained the value over price by stating that: "We are always choosing value over price, we will not choose the cheapest, because we are not the cheapest actor. Our mission is to have sustainability as the most desired attribute".

According to the previous quote, the possibility to reduce their environmental impact is valuable, but is often not the most important one. Though, some argued that a product or service that reduces overall environmental impact often implies a better availability or reduced cost due to a better performance. One interviewee explained this by reasoning about the possibility to buy reconditioned bearings and states: "We have bought reconditioned bearings for a long time, the main reason is not the saved material, it is because it is actually cheaper than buying new ones". The respondent connected the possibility that a more sustainable solution could provide a lower overall cost evaluated over time. Further, the possibility to access support and knowledge from experts was perceived as a highly prioritized attribute. When it comes to cost, one interviewee explained the value of reducing cost of production over time, for example decreased maintenance cost due to the investment in new equipment. The interviewees did also put this in relation to price, if one achieve a lower overall cost, the price of the service or product is a less important attribute.

4.3 Summary of customers perception

Several interviewees responded that both they and their companies were highly aware of the need of circular economy and its benefits. Some companies and their employees have to some extent incorporated a circular business model and already proceeded in the transition, which is perceived as needed. These customers also explained the fact that they are forced to obey laws and regulations that thereof, could be regarded as a driver of the development of circular economy.

In terms of attributes, the interviewees expressed that they value increased availability, access to support and expert knowledge rather than a low price on the service or product. It was also mentioned that the possibility to reduce carbon footprint with the help of a new service or product is desirable, though not the most important attribute. According to several respondents the main overall attribute was that the investment should be profitable over time. They also stated that if the offer also implies gained circularity, it is even more desirable. The interviewed companies also clarified that they demand certain environmental requirements on their suppliers. These two requirements on suppliers in the value chain indicates that the consumers further down in the value chain are aware regarding what environmental demands they can put on their suppliers.



Interviewee	What is your main work task	What type of company do you work for	How do you quantify your environmental saving	Which attributes are most important to you
E1	Sales Director	SKF Authorized distributor	Lifespan, energy efficiency, supplier is a leading actor in their market	Energy cost, price, efficient logistics
E2	Sales Director	SKF Authorized distributor	Value and Sustainability	Price, cost, and customer value
E3	Project Leader within maintenance	Steel company	Carbon footprint	Knowledge from supplier and stable supply
E4	Chief Sustainability Officer	Paper and lumber industry	Reduced CO2 and energy savings	Not applicable
E5	Maintenance Developer	Paper Industry	emission levels and noise levels	Closeness to supplier, Long-term relationships, environmental impact
E6	Line-manager	Paper Industry	CO2-levels, water savings and bonuses on corporate level	Availability, Uptime, fewer unplanned stops
E7	Strategic facility technician	Steel Industry		which technology is accessible, lifespan
E8	Section Manager	Paper Industry	air pollution, water usage, costs, environmental goals	Leadtime, availability, uptime, support, services, technology, price
E9	CEO	SKF Authorized distributor	Saved energy, reduced carbon emissions. Approx. 20 other quantifications but not all connected to environmental savings.	Availability, price, leadtime, non-dangerous goods, supplier that is willing to improve.

Figure 4.4: External interview compilation

4.4 SKF's perception of their customers

This section presents the data gathered from the survey sent to respondents at SKF.

4.4.1 Individuals perceptions of circular economy

The first part of the survey is covering individual perception of circular economy. As to be seen in Figure 4.5 the main part of SKF employees are familiar with the concept of circular economy and also believed that circular economy is something important. Some stated that they find circular economy to be important but they did not regard themselves as aware of the concept. The next question explored if the employees know about SKF's strategy to achieve a circular economy and how they can contribute to reach these goals. Figure 4.6 shows the summarized answers where about 50% of the responses indicate that they are aware or well aware (4-5 on the scale) of the SKF's strategy and know how to contribute. The remaining 50% are neutral, about 30% (3) and the rest are not aware (1-2) of the strategy or does not know how to contribute to the development of circular economy.

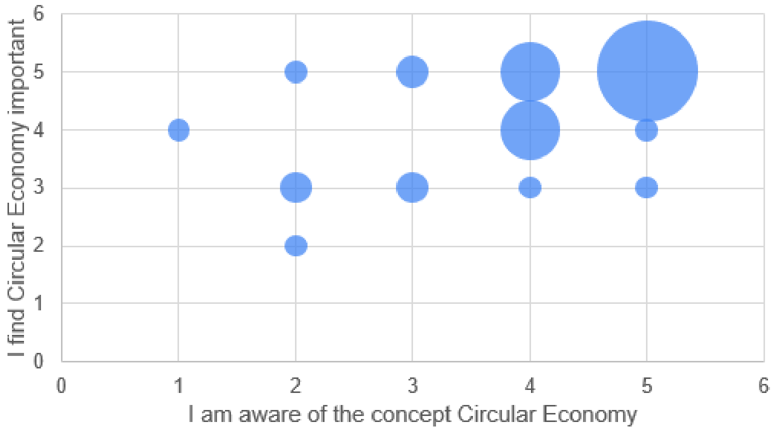


Figure 4.5: SKF employees view on circular economy

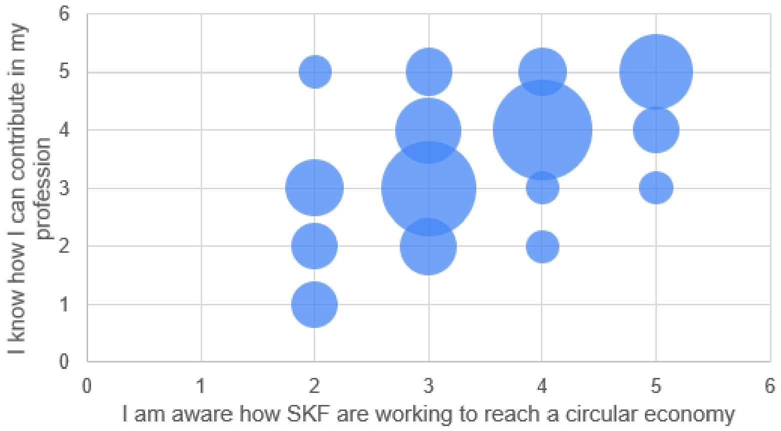


Figure 4.6: SKF employees awareness and application of circular economy

The last question, in this part of the survey, touched upon why each employee work or want to work with circular economy. There were several choices to choose from to get a better overall view of the driving forces for working with circularity within the company. As one can see in Figure 4.7 the top three reasons was internally driving forces in the company, a personal urgency and the profitability connected to circular economy. Rules & regulations and taxes was not viewed as important factors. Only 32% answered that sustainability was included in their work description, something that could be one cause of why 50% perceives that they are not sure on how to contribute to circular economy.

The general finding is that SKF employees are aware about the circular economy concept and perceived it as important. The top three reasons to work with the concept was profitability, personal urgency and internally driving forces. There seems to be a gap in what the company states as a strategy for circularity and the employees possibility or knowledge to contribute or affect this strategy. To clarify, the size of the bubbles in Figure 4.5 and Figure 4.6 can not be compared since the biggest bubble in the diagram in Figure 4.5 holds 20 answers while the biggest bubble in 4.6 holds nine answers, even though they are somewhat equal in size. Therefore, the size of the bubbles between the different diagrams should not be compared.

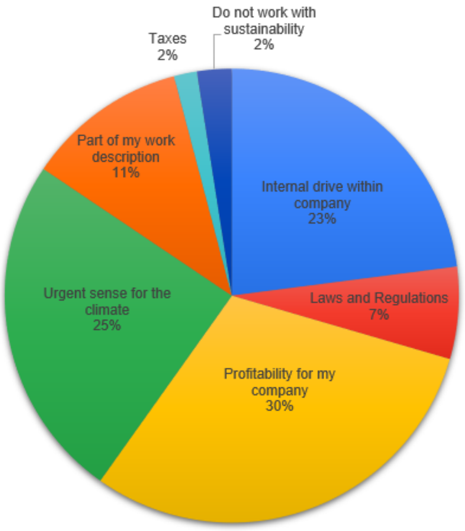


Figure 4.7: SKF employees reasons to work with circularity

4.4.2 SKF's mechanisms and KPI for circularity

The second part of the survey focused on measurements and through which mechanisms SKF works with circular economy. As Figure 4.8 shows, a majority of the respondents stated that they, their colleagues or their department are not measured on their performance in terms of environmental impact, such as CO2-emissions, energy savings etc.

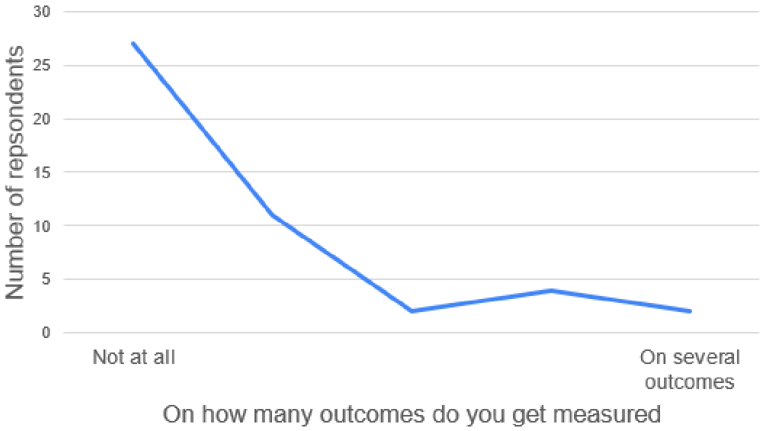


Figure 4.8: How often are SKF's employees environmentally evaluated on their outcomes

In the next question, the respondents were asked to choose which mechanisms that are or should be used at SKF. The alternatives can be viewed in Figure 4.9. These alternatives were based on the qualitative interviews as well as what was found in the literature. The blue stack visualise which aspects were perceived to be SKF's overall strategy. What was found is that new business models, longer life span of products and new product offerings are the top aspects. This is followed by sustainability KPI's, sustainable transportation, increased availability, re-cycling, renewable energy.

The red stack represents what the respondents actually work with. As one can see is that this stack is relatively low compared to what is seemed as the overall strategy and what is considered to be more desirable to work with. This can imply that there is a gap in the overall strategy and what the organization actually does. It should be added that not all mechanisms are possible or suitable to work with on a daily basis.

For aspects that are desirable to increase focus on, several of the aspects were found as important. KPI's connected to sustainability, sustainable transportation, increased availability, increased usage of renewable resources and energy. As shown, there are more respondents that regarded theses aspect to be more desirable to work with rather than what they actually do today. Thereof, it can be considered to be a great awareness and willingness to increase focus on mechanisms supporting a circular economy. Further, some aspects have the same or nearly the same value as the blue stack. This can once more imply that that there is a need of making overall strategy more tangible in the local organization.

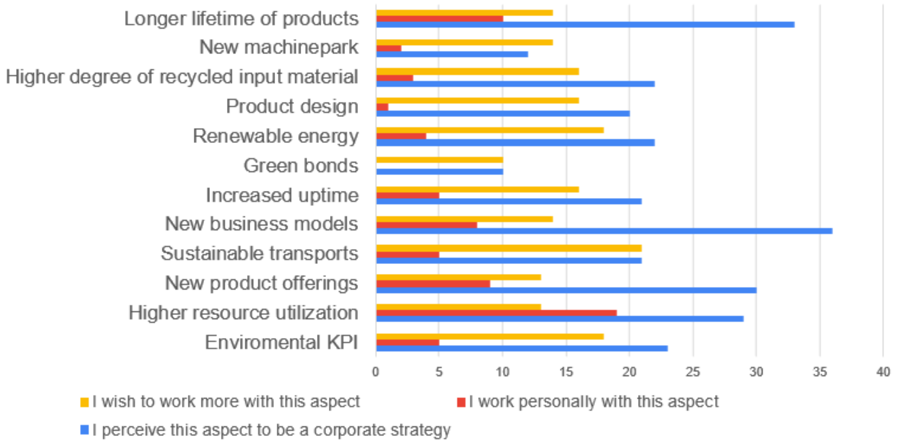


Figure 4.9: Mechanisms at SKF to reach a circular economy

It was found that the respondents does not perceived that they are being measured or evaluated on sustainability or circular economy. However, several answered that KPI's connected to sustainability and several other aspects are a overall strategy of SKF. Therefore, once more, it seems that there is a gap between overall strategy and the local adaption and implementation.

4.4.3 SKF's measurement of their suppliers

A major part of the respondents, 45 %, did not know if SKF is measuring their suppliers on sustainability, such as produced CO2-emissions, usage of renewable energy. 19% stated that SKF is measuring their suppliers on sustainability in occasional cases. Meanwhile, 17% stated that SKF is not measuring their suppliers on sustainability and 17% stated that SKF is measuring their suppliers on sustainability in most cases.

Being measured by one's customer could also indicate how the trends regarding sustainability and what demand the end-consumer is requiring of SKF's products. 23% of the respondents at SKF stated that they do not know if their customers are measuring SKF on sustainability and 23 % stated that they are not being measured by their customers. 30% stated that they are being measured on occasional cases and 21% stated that they are being measured in most cases.

Since 52% of the respondents stated that SKF's customers are measuring SKF on sustainability in occasional and most cases, whereas 37% stated that SKF are only measuring their suppliers in occasional and most cases. This could be a indication of a growing environmental awareness down the value chain regarding the importance of choosing the most sustainable option.

4.4.4 Customers perception of SKF's products and solutions

The last part of the survey focused on why the customers chooses SKF's products and services based upon performance objectives but also sustainability.

The respondents were asked to estimate in which order their customers would grade a set of specific performance objectives which can be viewed in figure 4.10. The result in Figure 4.10 shows that quality was perceived to be the number one selling point and is followed by knowledge in second place. In third and fourth place are performance and sustainability, followed by the fifth place where the majority perceives that cost of the product or service should be placed.

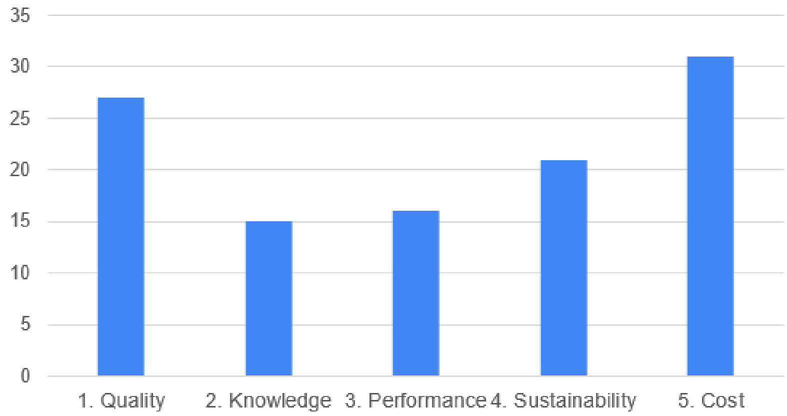


Figure 4.10: How SKF think their customers rank SKF's performance objectives

Regarding sustainability, the respondents were asked as in the same way as the previous question to evaluate which products or services that have the biggest positive environmental impact for their customers. As for the previous question this was asked to compare with the answers of the customers to find causalities and gaps. From the survey, it was found that the employees of SKF perceives their remanufacturing and reconditioning services to contribute the most for their customers. This is followed by lubrication management, online monitoring and application technology. Some respondents also valued the education services and the expert knowledge from field service which SKF can provide.

The last question touched upon the future aspect where the respondents were to answer the question: "In ten years, customers within the Swedish process industry are mainly: leasing the products, owning their products or co-owning the products together with the supplier". From the survey, it was possible to see that 50% of the respondents think that the customers within the Swedish process industry will co-own their products together with the supplier in the future. 33% believed that the customers will have some sort of leasing agreement and only 17% that the customers will continue to purchase and keep ownership of the products.

To summarize the last part of the survey, SKF's employees evaluated their quality and knowledge to be key selling points as this is perceived as why their customers chooses SKF as a supplier. Sustainability was regarded to be driven mainly by several different services provided by SKF. This was also reflected in the last question where SKF's employees perceived the future to involve service solutions and shared assets to a greater extent than today.

4.5 Customers perception of circular economy

For this question, the answers have been clustered between the end-costumer in the Swedish process industry and two of SKF's main authorized distributors. This was done in order to be able to make a better evaluation and comparison. To understand each end-customers perception of circular economy and wherever they find it important, questions were asked if they knew about the concept of circular economy and if found important.

4.5.1 Individuals perceptions of the customer

As shown in Figure 4.11, the main part of the customers were aware of the concept of circular economy, where the majority answered a three or a four on the scale of five. Most of the customers also perceived that circular economy is important. These two questions combined shows that the respondents could have greater awareness concerning circular economy even tough many find it important.

In Figure 4.12, one can see that the awareness and knowledge regarding how the respondent's company is working to reach a circular economy was relatively high. The same applies for the question: if each respondent know how they can contribute in their profession and role at their workplace to reach a circular economy, where the majority answered between three and five on the five degree scale. These two questions combined shows how each individuals work tasks corresponds to the company's overall circular economy goals or strategy, which in this case seems to some extent corresponds. Since it was not fully aligned it may imply that there is room for improvement in terms of connecting the overall strategy the each individuals work tasks.

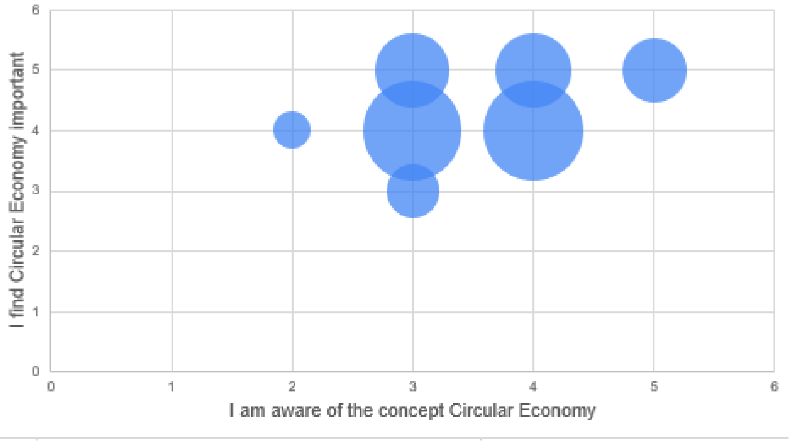


Figure 4.11: Customers knowledge regarding circular economy

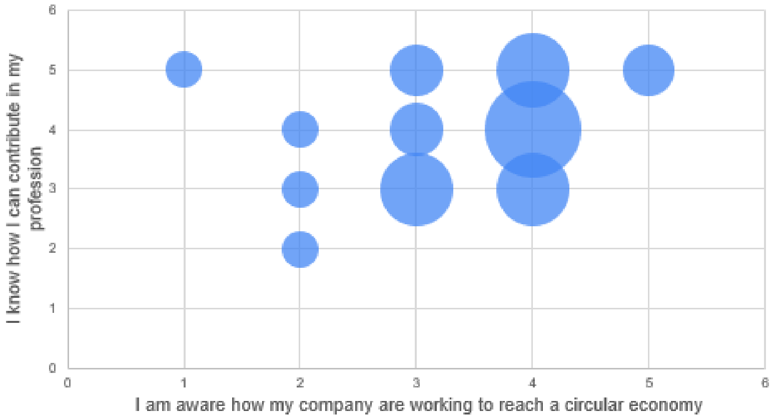


Figure 4.12: Customers knowledge regarding circular economy and its application

4.5.2 Individual perception of the SKF authorized distributors

The majority of the respondents from SKF authorized distributor's were aware of the concept of circular economy and only a few answered two or three, showed in Figure 4.13. From the figure it is also possible to see that circular economy was found to be of great importance. One identified challenge could therefore be to close the gap to make sure that all employees perceives the topic in the same way and feels even more secure in how to contribute.The majority answered between three and five regarding the awareness of how their company is working to reach a circular economy, see Figure 4.14. Some picked the lowest value which could imply that they did not know if the company is working to reach a circular economy. For the second question, if they knew how they can contribute to a circular economy, the majority answered between three and five. Overall, how the majority of the employees are working corresponds towards their company's strategy, even tough it seems that some work is needed on both individual level and how the company's ways of working are communicated internally.

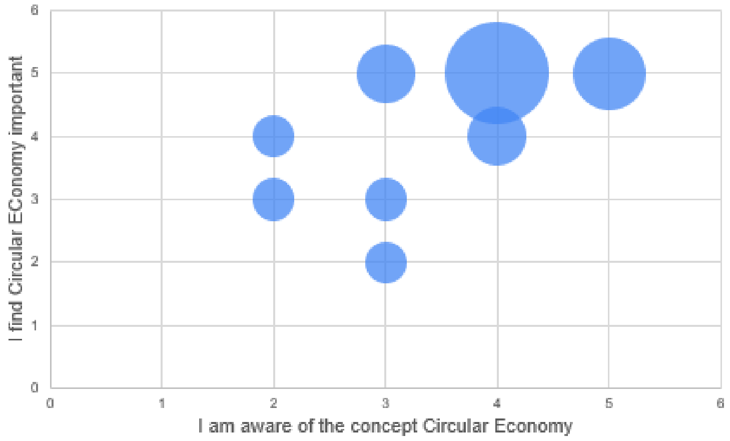


Figure 4.13: SKF authorized distributors view on circular economy

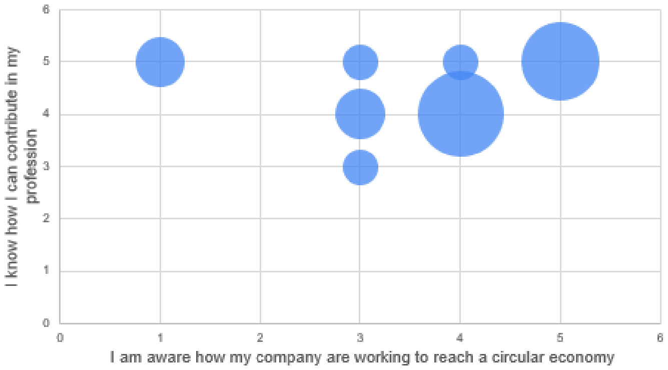


Figure 4.14: SKF authorized distributors awareness and application

4.5.3 Customers' and distributors' mechanisms and KPI for circularity

Both the SKF authorized distributors and the customers within the process industry are working towards a circular economy, but how? The next question identified through which mechanisms they are using, a majority stated that they, their colleagues or their department are being measured on their performance in terms of environmental impact. Each respondents also had the possibility to state how they are being measured; where the most frequent answer were: CO2-emissions from manufacturing, CO2-emissions from company cars, energy, oil and water usage and freights. As for the survey at SKF, the respondents were to choose between different mechanisms and classify them if: They believe it is the company's overall strategy, if they work with it personally or if this is something they want to work more with. What was found, which can be seen in figure 4.15, is that most think that KPI's connected to the environment, digitalization, higher resource utilization, new product offerings, sustainable transports and increased availability was top picked answers on how their company's are working to reach a circular economy.

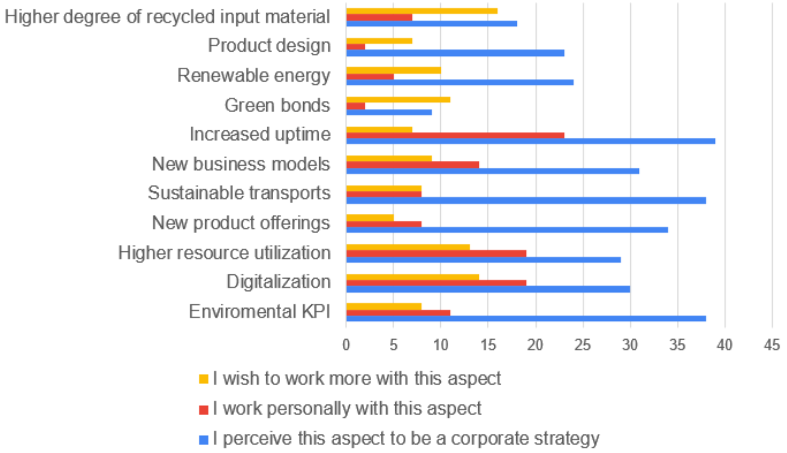


Figure 4.15: Customers Mechanisms for reach a circular economy

The top three mechanisms that the customers are personally working with was: digitalization, higher resource utilization and increased availability. The last two mechanisms are connected to a higher manufacturing utilization and to understand the status of one's machinery and digitalization. Digitalization could also lead to e.g. that maintenance could be more easily planned if one can observe how the machinery are functioning on a daily basis. The top three mechanisms that were wished to work more with was: digitalization, higher resource utilization and a larger degree of recycled input material for the production.

The personal reasons for working to reach a circular economy, both for the SKF authorized distributor and customers within the Swedish process industry, can be seen in Figure 4.16. For this questions, the respondents had the opportunity to select multiple reasons. This shows that 31% were working to reach a circular economy due to increased profitability for their company. 22% were working to reach a circular economy because of an internally driving force within their company. Almost as many, 19%, were working to reach a circular economy due to their own personal sense of urgency for the climate. The less chosen reasons for working to reach a circular economy are due to laws and regulations, 14%, and equally many answered that they working to reach a circular economy since they have to do that due to their work description. The fact that 19 of 49, did not have circularity in their work description, could be a sign of environmental saving not being premiered or prioritized through the organizations. However, more respondent stated that they are working to reach circularity due to themselves seeing profitability and also being affected by a internal drive within their company. No one chose the option of working with circularity due to taxes and no one choose the option "Do not work with sustainability" which indicates that each respondent are working with sustainability even though it is not part of their job description.

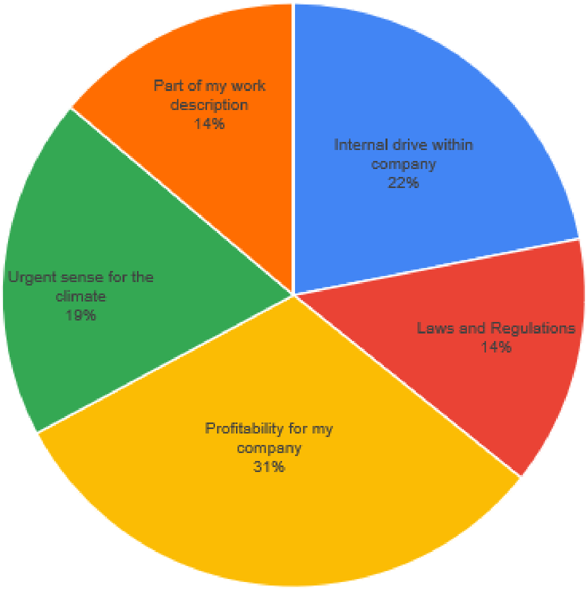


Figure 4.16: Reasons for customers to work for a circular economy

From this part of the survey, it was also investigated if and how often the SKF authorized distributors and the customers performances are measured on the environmental impact. This result is visualized in Figure 4.17, where it was found that the majority are measured based on their environmental impact. If put in relation to the result from why the customers are working to reach a circular economy, more respondents stated that they are being measured on their environmental impact than the amount of respondents that have to work to reach circularity in their job description. This showed that their company's goals and measurements are not aligned with individual job descriptions.

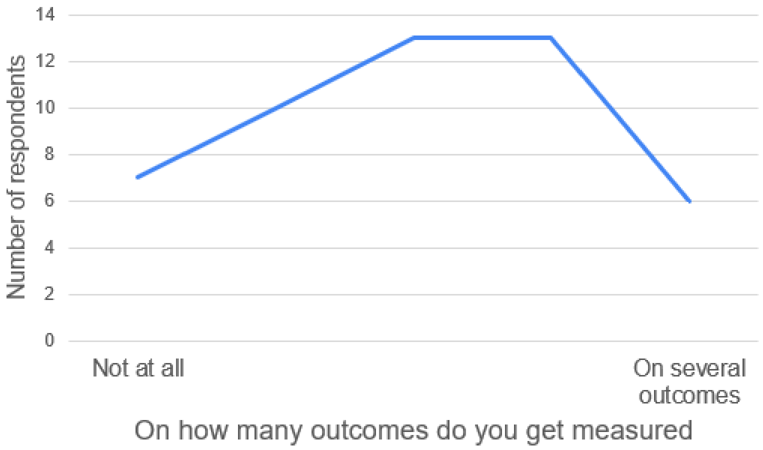


Figure 4.17: How often are customers evaluated on their environmental outcomes

4.5.4 Why SKF & future aspect of circular economy

The products or services that the customers perceived have the biggest positive impact on the environment was the condition monitoring. To monitor the status of the product and to have the ability to plan when maintenance is due and, thus avoid unnecessary breakdown, was seen as important for environmental impact. Followed by condition monitoring was application engineering, who designs and helps the customer get the right products for their application. Tied to application engineering, is the remanufactured services. What was not seen as having an equally positive impact on the climate was the field service and lubrication management. This could be ranked low due to the customers not being aware of the services or of the environmental saving coming from these products and services.

To better understand why the customers are choosing and using SKF products, the respondents were to grade SKF depending on five performance objectives, which can be seen in Figure 4.18. This shows that quality was the most important objective for using SKF products, followed by performance, third knowledge and fourth was sustainability. Performance, knowledge and sustainability was somewhat tied for the second place. The fifth objective that leads to customers selecting SKF products was cost. This gives an indication of where SKF either need to improve their operations and business, especially for the sustainability and cost objectives, or keep their position in quality and performance.

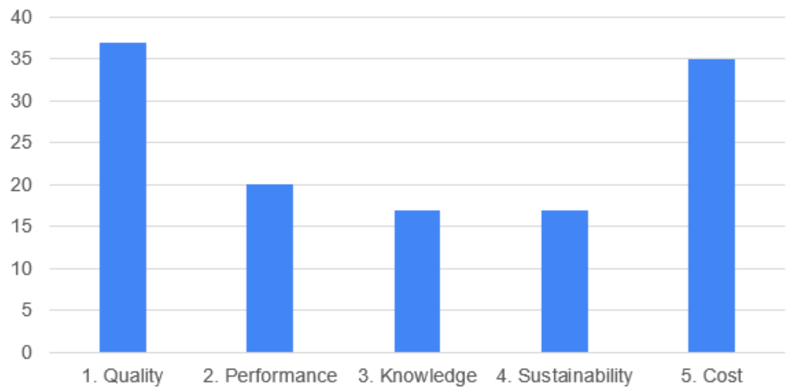


Figure 4.18: Customers ranking of performance objectives

There have been some indications on new business models and new contract types for the future from the qualitative interviews, where both performance contract or subscriptions have been mentioned. However, the existing type of purchasing is still a traditional linear way, therefore, one question during the survey was how the customers evaluates how their contract types will be in the future. There was a strong belief in that they will continue to purchase their good and supplies in a traditional linear way, which was stated by 47% of the respondents. There was also a strong belief in that performance contract will take a larger role, which 43% think future agreements will be based upon. Subscriptions however was ranked as low, only 10% think they will use these type of agreements. Since both performance and traditional agreements was somewhat equally strong, one can assume that some products and suppliers will have more performance agreements while other suppliers have traditional. Regardless type of agreement, there is a great need to improve and include sustainable solutions.

4.6 How does SKF and their customers value attributes of products and services?

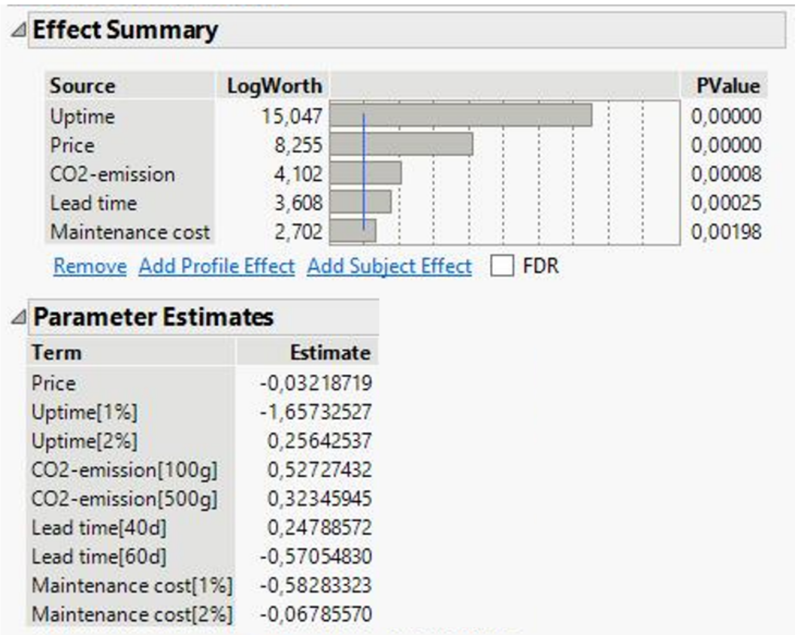
Some of the result from the DCM has been clustered into three categories; SKF, SKF authorized distributor and end-customers, like in the survey. This has been done mainly to make the evaluation more comprehensive and provide the possibility to give more accurate recommendations.

4.6.1 SKF's perception of what their customers value

For the Discrete Choice Model part of the survey, respondents at SKF were to choose which offer of each choice set they thought would be the best for customers in the Swedish process industry. The result from the DCM and in which order the SKF employees think their customers values and ranks each attribute was found to be:

1. Increased Up-time
2. Price
3. Leadtime
4. CO2-emissions
5. Reduced maintenance cost

These attributes was ranked from the highest LogWorth-value to the lowest, which is further explained in section 3.2.6. Each attribute has P-Values smaller than 0,05, which proves them to be statistical significance. The parameter estimates states the relative importance between each attribute and level, and what SKF respondents believed have a lesser utility for their customers. Believed to have lesser utility for the customers was: 1% increased up-time, 60 days leadtime and 1% and 2 % decrease of maintenance cost. The attributes and levels that the respondents think have a bigger utility for the customers are 2 % increase up-time, 1 and 2 ton of CO2-emissions and 40 days lead-time. The LogWorth-value and the parameter estimates can be seen in Figure 4.19.
What the customers was perceived willing to pay extra for attributes and, to keep the same utility value, is seen in Figure 4.20. This shows that employees at SKF think that their customers are willing to pay almost double the price for a 2,5 % increase of up-time. Further, willingness to pay for a product that decreases the more CO2 that is emitted, a 40 % decrease in price for the maximum amount of emissions. It was also perceived that the customers are willing to pay more for a shorter amount of leadtime as well as more for reduced cost for maintenance.

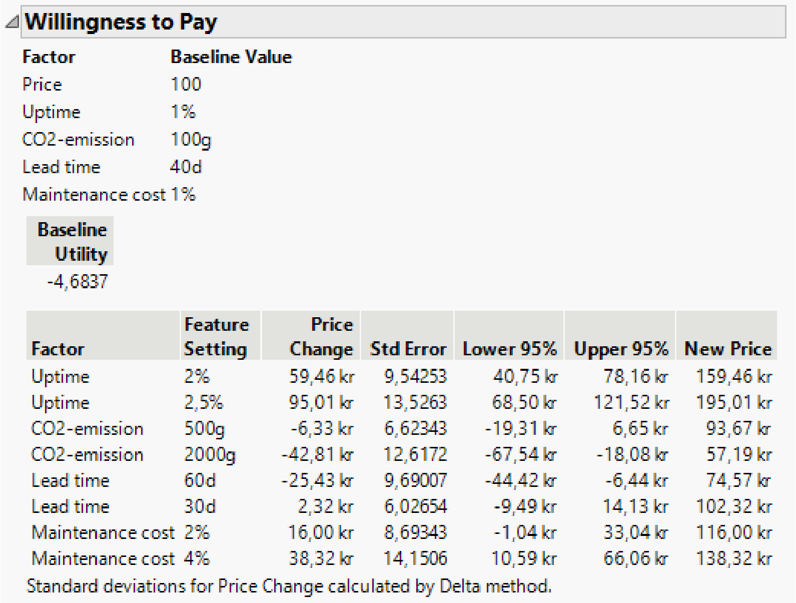

Effect Summary

Source	LogWorth	PValue
Uptime	15,047	0,00000
Price	8,255	0,00000
CO2-emission	4,102	0,00008
Lead time	3,608	0,00025
Maintenance cost	2,702	0,00198

Parameter Estimates

Term	Estimate
Price	-0,03218719
Uptime[1%]	-1,65732527
Uptime[2%]	0,25642537
CO2-emission[100g]	0,52727432
CO2-emission[500g]	0,32345945
Lead time[40d]	0,24788572
Lead time[60d]	-0,57054830
Maintenance cost[1%]	-0,58283323
Maintenance cost[2%]	-0,06785570

Figure 4.19: Internal Logworth and Parameter Estimates



Willingness to Pay

Factor	Baseline Value
Price	100
Uptime	1%
CO2-emission	100g
Lead time	40d
Maintenance cost	1%

Baseline Utility
-4,6837

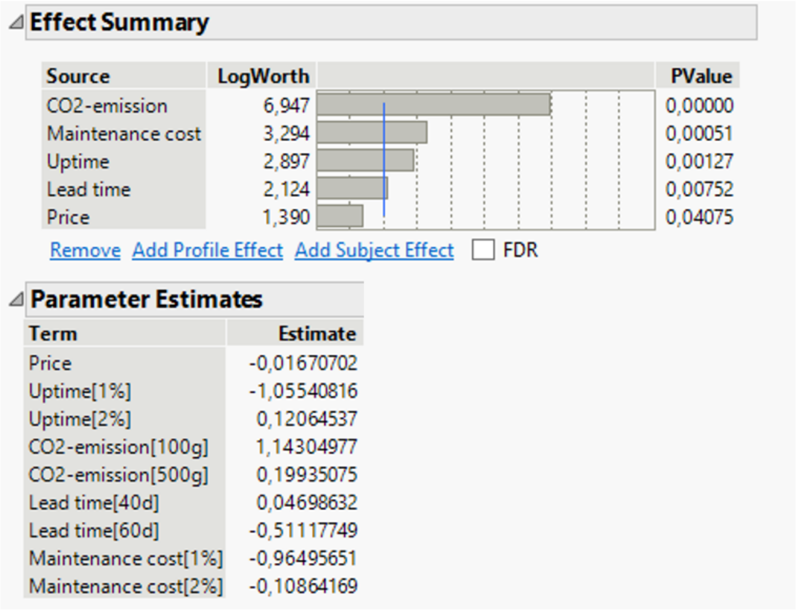
Factor	Feature Setting	Price Change	Std Error	Lower 95%	Upper 95%	New Price
Uptime	2%	59,46 kr	9,54253	40,75 kr	78,16 kr	159,46 kr
Uptime	2,5%	95,01 kr	13,5263	68,50 kr	121,52 kr	195,01 kr
CO2-emission	500g	-6,33 kr	6,62343	-19,31 kr	6,65 kr	93,67 kr
CO2-emission	2000g	-42,81 kr	12,6172	-67,54 kr	-18,08 kr	57,19 kr
Lead time	60d	-25,43 kr	9,69007	-44,42 kr	-6,44 kr	74,57 kr
Lead time	30d	2,32 kr	6,02654	-9,49 kr	14,13 kr	102,32 kr
Maintenance cost	2%	16,00 kr	8,69343	-1,04 kr	33,04 kr	116,00 kr
Maintenance cost	4%	38,32 kr	14,1506	10,59 kr	66,06 kr	138,32 kr

Standard deviations for Price Change calculated by Delta method.

Figure 4.20: Internal Willingness to pay

4.6.2 What SKF's authorized distributor values

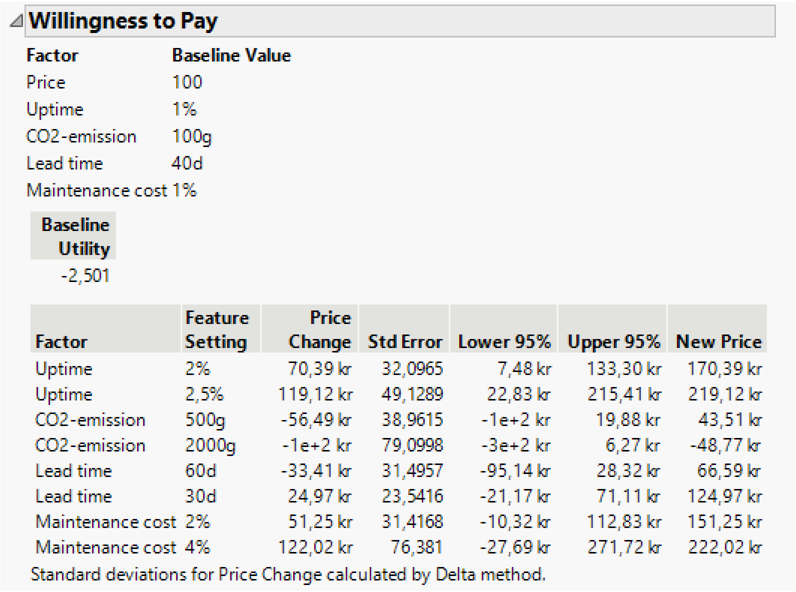
The survey was distributed to two of SKF's major distributors in Sweden since they was considered to have good knowledge regarding customers needs in the Swedish process industry. As can be seen in Figure 4.21 they chose CO2-emissions as the most important attribute, followed by reduced maintenance cost, increased uptime, leadtime and price. Due to that this customer is a re-seller of goods i.e. not producing any products of their own, within the Swedish process industry, one can assume that they choose what their customer are looking for, and in the end are willing to buy and pay for. All these attributes had a smaller P-value than 0,05 which indicates statistical significance. The parameter estimates that gives a positive utility for their customers are increased uptime, lower amount of CO2-emissions and shorter leadtime. The SKF authorized distributors perceived that their customers are willing to pay almost double for increased uptime and equally much for reduced maintenance cost. They also assumed that customers are willing to pay more for a shorter leadtime and that the willingness to pay is descending if the CO2-emission is higher. How they perceived what the customers are willing to pay can be seen in figure 4.22.



Source	LogWorth	PValue
CO2-emission	6,947	0,00000
Maintenance cost	3,294	0,00051
Uptime	2,897	0,00127
Lead time	2,124	0,00752
Price	1,390	0,04075

Term	Estimate
Price	-0,01670702
Uptime[1%]	-1,05540816
Uptime[2%]	0,12064537
CO2-emission[100g]	1,14304977
CO2-emission[500g]	0,19935075
Lead time[40d]	0,04698632
Lead time[60d]	-0,51117749
Maintenance cost[1%]	-0,96495651
Maintenance cost[2%]	-0,10864169

Figure 4.21: SKF authorized distributors logworth and parameter estimates



Factor	Baseline Value
Price	100
Uptime	1%
CO2-emission	100g
Lead time	40d
Maintenance cost	1%

Baseline Utility
-2,501

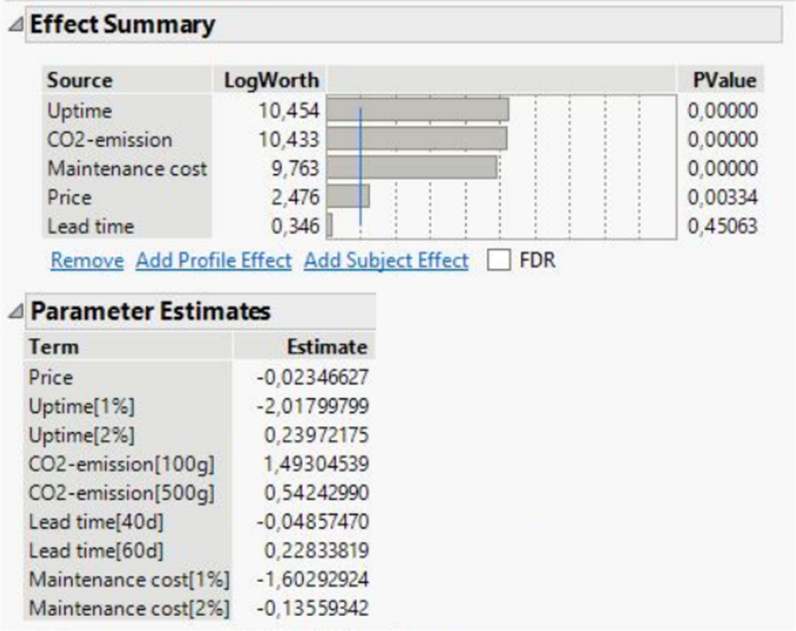
Factor	Feature Setting	Price Change	Std Error	Lower 95%	Upper 95%	New Price
Uptime	2%	70,39 kr	32,0965	7,48 kr	133,30 kr	170,39 kr
Uptime	2,5%	119,12 kr	49,1289	22,83 kr	215,41 kr	219,12 kr
CO2-emission	500g	-56,49 kr	38,9615	-1e+2 kr	19,88 kr	43,51 kr
CO2-emission	2000g	-1e+2 kr	79,0998	-3e+2 kr	6,27 kr	-48,77 kr
Lead time	60d	-33,41 kr	31,4957	-95,14 kr	28,32 kr	66,59 kr
Lead time	30d	24,97 kr	23,5416	-21,17 kr	71,11 kr	124,97 kr
Maintenance cost	2%	51,25 kr	31,4168	-10,32 kr	112,83 kr	151,25 kr
Maintenance cost	4%	122,02 kr	76,381	-27,69 kr	271,72 kr	222,02 kr

Standard deviations for Price Change calculated by Delta method.

Figure 4.22: SKF authorized distributors willingness to pay

4.6.3 What the customers value

How the customers rank each attribute and the result from the Discrete Choice Model shows that SKF's customers within the Swedish process industry ranked uptime, CO2-emissions and reduced maintenance cost as the top three attributes. As seen in figure 4.23, these three attributes are very close in Logworth value and only a slight difference can be seen. The fourth ranked attribute was price and all these four have a P-Value smaller than 0,05, which proves their statistical significance. The fifth and last attribute, leadtime, has a P-Value higher than 0,05 which indicates there was no statistical significance for this attribute. The result that leadtime has a P-value higher than 0,05 implies that this attribute did not reflect the characteristic of the whole population.



Effect Summary

Source	LogWorth	PValue
Uptime	10,454	0,00000
CO2-emission	10,433	0,00000
Maintenance cost	9,763	0,00000
Price	2,476	0,00334
Lead time	0,346	0,45063

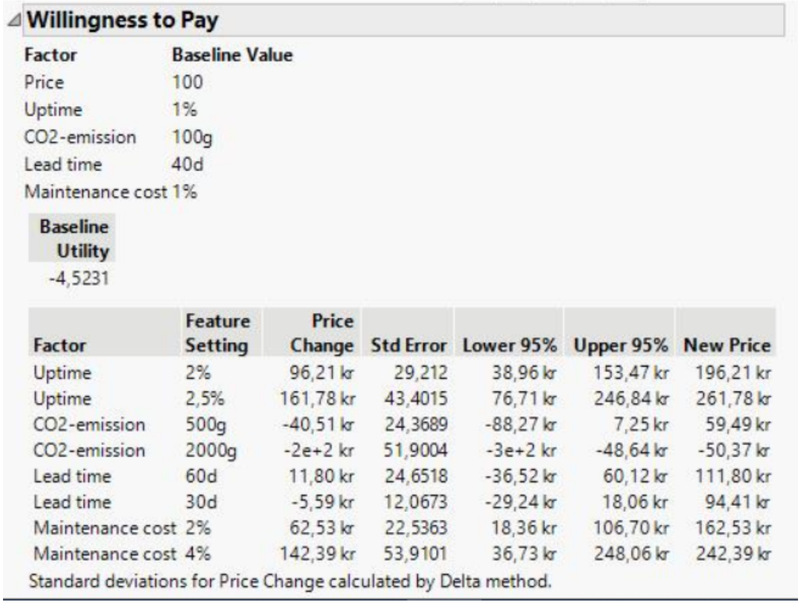
Parameter Estimates

Term	Estimate
Price	-0,02346627
Uptime[1%]	-2,01799799
Uptime[2%]	0,23972175
CO2-emission[100g]	1,49304539
CO2-emission[500g]	0,54242990
Lead time[40d]	-0,04857470
Lead time[60d]	0,22833819
Maintenance cost[1%]	-1,60292924
Maintenance cost[2%]	-0,13559342

Figure 4.23: Customers Logworth and Parameter estimates

The Parameter Estimates, what give the same utility for the customers if any level of the attributes changes, are found in figure 4.23. This shows that increased uptime, the lower CO2-emissions and 60 days leadtime all had a positive utility. What had a negative utility for the customers are price, lower uptime, shorter leadtime and lower value of reduced maintenance cost. That price has a negative utility means that products that costs more is less appealing for the customers.

The customers willingness to pay are higher for increased uptime, almost the same for the reduction of the maintenance cost. It was also stated that the more CO2 that is emitted, the willingness to pay decreases. This is shown in Figure 4.24.



Willingness to Pay

Factor	Baseline Value
Price	100
Uptime	1%
CO2-emission	100g
Lead time	40d
Maintenance cost	1%

Baseline Utility
-4,5231

Factor	Feature Setting	Price Change	Std Error	Lower 95%	Upper 95%	New Price
Uptime	2%	96,21 kr	29,212	38,96 kr	153,47 kr	196,21 kr
Uptime	2,5%	161,78 kr	43,4015	76,71 kr	246,84 kr	261,78 kr
CO2-emission	500g	-40,51 kr	24,3689	-88,27 kr	7,25 kr	59,49 kr
CO2-emission	2000g	-2e+2 kr	51,9004	-3e+2 kr	-48,64 kr	-50,37 kr
Lead time	60d	11,80 kr	24,6518	-36,52 kr	60,12 kr	111,80 kr
Lead time	30d	-5,59 kr	12,0673	-29,24 kr	18,06 kr	94,41 kr
Maintenance cost	2%	62,53 kr	22,5363	18,36 kr	106,70 kr	162,53 kr
Maintenance cost	4%	142,39 kr	53,9101	36,73 kr	248,06 kr	242,39 kr

Standard deviations for Price Change calculated by Delta method.

Figure 4.24: Customers willingness to pay

4.7 Summary of result from the survey

The findings from the survey can be summarized as firstly that all parties were well aware about the circular economy and also perceived the concept as something valuable and important. Secondly, the respondents from SKF were well aware of the overall strategy in terms of circular economy, but not as many did know how to contribute or work towards this strategy. This perception differ from their customers and SKF authorized distributor were the knowledge in how to contribute in the daily work were regarded as higher.

The reasons for striving for circularity were relatively consistent, where a personal urgency for the climate, profitability, internal driving forces and laws and regulations were regarded as key drivers. An overall perception was that there is a lack of integration of circularity in their job description. A further finding was that KPI's or measurement of sustainability differs. On a strategic level the overall view was more consistent, but when it comes to the local measurement within the organization there were gaps identified. Firstly between SKF and their customers, where the customers tends to measure sustainability to a greater extent, but also internally at SKF where the overall strategy seems to be measured but there was a lack of measurements in the local department and on a individual level.

The survey outlines that there were several mechanisms that are driving circular economy, both internally at SKF and at their customers. Commonly used mechanism were new business models, longer life span of products, increased availability, sustainability KPI's, higher resource allocation. One major difference that can be concluded from the mechanisms was that SKF employees perceived more mechanisms to be desirable to work more with than their customers. This can imply that SKF has a greater challenge to implement the overall strategy in the local department. This could also be seen as there is a bigger urge to focus on sustainability in their daily work.

The customers and SKF authorized distributors of SKF chooses SKF as a supplier mainly because of their quality, performance and knowledge. This conforms with SKF's view, where price was also valued as low. Further, the customers evaluates a higher usage of performance based contracts in the future in combination with traditional payment, this differ from SKF's perception which believed that a major part will be performance based or leasing. A further finding from the discrete choice model is that the customers evaluates CO2-emissions as important when making products choices, followed by up-time and decreased maintenance cost. Leadtime and price were regarded to be less important. This pattern reflects on their willingness to pay, where CO2 and up-time are the most influential.

5

Synthesis & Recommendations

This chapter will provide a synthesis of the findings from both the qualitative interviews and the quantitative survey in the backdrop of the previous presented literature. Following is a also a set of recommendations on how to proceed with the identified findings and challenges.

5.1 Servitization & circular economy

5.1.1 How does servitization interlink to a circular economy?

One of the intended research question was to investigate how the concept of servitization interlinks to a circular economy. Found from the literature review was that servitization is one possible solution to break the linear way of doing business. This is done mainly by the possibility to make revenue without increasing the amount of produced and sold products (Baines, 2013; Lazarevic and Brandão, 2020; Frishammar and Parida, 2019). This could be argued to be a clear connection in how servitization interlinks with circular economy. Further, the services increases the possibility to create closed resources and supply loops which reduces the overall waste, also incorporated in the circular economy. From the qualitative interviews conducted with employees at SKF it was found that there is a great interest an awareness of circular economy. Even though the term servitization was seldom mentioned by the respondents if not mentioned by the authors in the first place, several of the respondents did mentioned benefits connected to different provided service solutions. The employees of SKF, as well as their customers, are aware of the benefits that can be achieved from service solutions even though the name or terminology of servitization is rarely used. By doing so, the respondents also acknowledged the findings in the previous research by verifying the connection between servitization and circular economy.

5.1.2 Challenge of different definitions

A general observation made from the interviews and the survey was that both SKF and their customers are interested in circular economy. This was shown by a willingness to use products and services that supports a circular economy, but also by a highly graded awareness regarding circular economy. Yet, the respondents definitions of circular economy differed both internally at SKF and between SKF and their customers. This can create challenges mainly in the agreement of how to move towards a circular economy, both internally and together with the customers. Servitization enables several aspects of circular economy, but it was found important to clearly state and communicate the connection to which aspects each service offering will enable. Otherwise, there is a risk that the different parties, customer or in the internal discussions, does not have the same understanding or purpose with the intended service solution. It is crucial to have the customer need as the overall starting point, to really understand the needs and from this deliver a circular solution (Bergman and Klefsjö, 2012).

One additional finding was that the social aspect of the triple bottom line was not integrated in the definitions mentioned by the respondents. This correlates with the findings in the previous research, where several definitions lacks the integration of the triple bottom line and mostly the social aspect. To excel in the area of circular economy, both SKF and their customers have a possibility to incorporate or communicate the social part to a greater extent.

5.2 SKF:s strategy & capabilities

5.2.1 In which ways is servitization provided?

One of the intended research question was to explore in which ways SKF provides servitization. Today, SKF has several offerings that is created and provided through servitization, both in terms of pure services and services connected to their products, which are previously mentioned as PSS-offerings or hybrid offerings, remanufacturing, reconditioning etc. The result showed that a major part perceived the service offerings as the most important. These services are therefore evaluated to be the key parts of the servitization at SKF.

5.2.2 How does servitization interlink to SKF's strategy?

As mentioned, SKF has been using these types of services for several years but it has not been as widespread and implemented as today. This could be argued was caused by two main aspects. Firstly, the interest and awareness about circular economy are perceived as higher than before and therefore, the solutions provided by SKF is accepted to a greater extent. It was further found that the development of circular economy was perceived as driven by several factors, such as profitability for the company, urgency about climate change and increased rules and regulations. The offerings enabled by servitization could therefore be more accurate now than before.

Secondly, not only has SKF implemented the development of business models in their overall strategy, but they have also focused on creating capabilities to utilize the new business models. SKF's strategy today has a clear vision on how to become more sustainable, where parts of circular economy is incorporated in the overall strategy. As mentioned, business model development was one part of the strategy e.g. develop how the company provides value for their customers. The implementation of servitization was perceived as one way to develop their business model to become more circular. The difference between now and before was evaluated to be a greater investment in the organizations capabilities. The newly opened SKF circular economy center at SKF is one example on how the internally capabilities are evolving. By using the SKF Circular Economy Center to drive, sell and continuously develop the offerings with focus on sustainability, SKF are trying to align their business models with the overall strategy goal and vision.

5.3 Identified gaps

The third and final research question was to identify which service offerings enabled by servitization the industrial after market values the most, with sub questions to identify gaps between SKF and their customers. These questions was mainly answered from the survey with additional insights from the interviews. Following is the identified gaps and its implications.

5.3.1 SKF:s perception of their customers

From the DCM, it was found that SKF:s perception of which attributes their customer values the most differ from what their customers actually does. From Figure 4.19 one can see that SKF evaluated their customers to value firstly uptime whilst the external DCM showed that CO2-emission was highly valued when choosing a product. This may imply that SKF are not clearly aligned with what their customers values and their requirements. This can be caused by a gap in knowledge internally at SKF, where some parts of the organization or few people in key positions are aware of the situation but has not succeeded in spreading this knowledge. Further found interesting is that, in contradiction to what SKF believed, the customers are also willing to pay more to achieve a more CO2-neutral product or service. From the willingness to pay it was also found that reduced CO2-emissions are equally valued as uptime.

SKF evaluated that a major part of the contracts will be that they together with their customer co-owns the products or services and sharing the risk of investment. While about 15% of the respondents evaluated the traditional ownership, traditional one-time-payment affairs, to be the major contract in the future. In contradiction, the customers in the Swedish process industry evaluates nearly 50% of their business to based on traditional contracts. The different view of contracts in the future, may cause problems if SKF does not understand the need of developing the traditional contracts as well as the performance or leasing based affairs. Otherwise, there is a risk of creating service solutions, or payment methods for these, that their customers does not find attractive or useful.

To conclude, there is a need of getting to know the customer to a greater extent to deliver solutions based on the customer needs, not on internal perceptions.

5.3.2 Individual contribution to a circular economy

The overall awareness of circular economy and of how their companies' works to reach circularity, was regarded as high. However, the next identified gap was found in the lack of knowledge in how each individual can contribute to the circular economy. Nearly 90% of the respondents from SKF were aware or well aware of the overall strategy but only 45% stated that they are aware or well aware of how to contribute in their local organization. Among their customers, the distribution was more even, but also differed. 60% knew how their companies works and almost 80% knew how to contribute on an individual level.

This finding mostly address a need internally at SKF to in a more clear way state how each individual can contribute to the overall strategy of circular economy. There is a risk that the organization on a higher level perceives or states that they are further in the development of circular economy than they actually are. There is also a great possibility to excel within the area if the awareness and interest in circular economy is used to a greater extent than it is now. For SKF's knowledge it also of great interest to be aware of that their customers may be further ahead than what their overall strategy says, since the individual contribution is regarded higher than the overall strategy. The implication from these identified gaps could be summarized as there is a need to make sure that the overall strategy align with the individual and local contribution. This is tightly connected to the next identified gap or need.

5.3.3 Measurements of sustainability

Last of the main identified gap was the lack of measurement, in this case KPI, of circularity or sustainability. This specific area was something that the authors identified during the interview phase of the study as several respondents mentioned the lack of measurements. One frequently used argument was that if one is measured in monetary value e.g. saved money per sold product, there is no clear incitement to choose a more sustainable product that is more expensive. This question was transferred into the survey where 80% of the respondents from SKF stated that they are not or only on occasional basis measured on circular or sustainable values, such as reduced CO2, energy usage, resource usage etc. There was also no connection to monetary bonuses or other monetary incitements connected to sustainability measures. While SKF never or seldom measure, their customers stated that they are measured to a greater extent where about 65% evaluated that they are measured frequently on several outcomes.

To summarize, the customers' organizations has incorporated more measurements of circularity than SKF has done. One possible reason for this could be that the customers' industries are more regulated from laws and regulations which forces them to measure their climate impact to a greater extent. Further, at SKF there was a obvious gap in measurements between the strategic level and local one. A great challenge for SKF is therefore to implement the overall corporate strategy measurements all the way down to each local department.

5.4 Set of recommendations

From the findings four sets of recommendations has been developed by the authors. The recommendations are based upon the overall synthesis and previous research and the intention is to promote a further development of circular economy, both for SKF and their customers.

5.4.1 Incorporate the voice of the customer

There were several identified gaps between SKF's perception of their customers requirements and what the customer actually required or valued the most. These gaps can be identified as risks, such as if SKF believes that they know best what their customers wants and thereof deliver undesirable services or products. The authors are aware of that there are departments at SKF working solely with benchmarking, gather customer knowledge etc., but it can not be neglected that this study shows that there were gaps present at the time when this thesis was done. Thus, the first proposal is mainly to highlight the importance of incorporate the voice of the customer on daily basis.

To implement the voice of the could be done by using a clear strategy or framework to achieve a greater knowledge of the customers throughout the organization. One commonly used tool to integrate the voice of the customer is the Quality Function Deployment. By using the tool it is possible to find the relation between the voice of the customer, their requirements and SKF's provided products or services. The tool can also bring knowledge about how to rank the requirements and put this into relation to the internally capabilities to be able to promote servitization and circular economy (Figure 5.1).

This recommendation will not be the implementation of the QFD in detail. Therefore, it should be regarded as a more general proposal, to integrate the customer in the development of service offerings and circular economy where the main purpose is to highlight the gap. However, this whole report may be regarded as one way on how to gather data and further involve the voice of the customer in the organization.

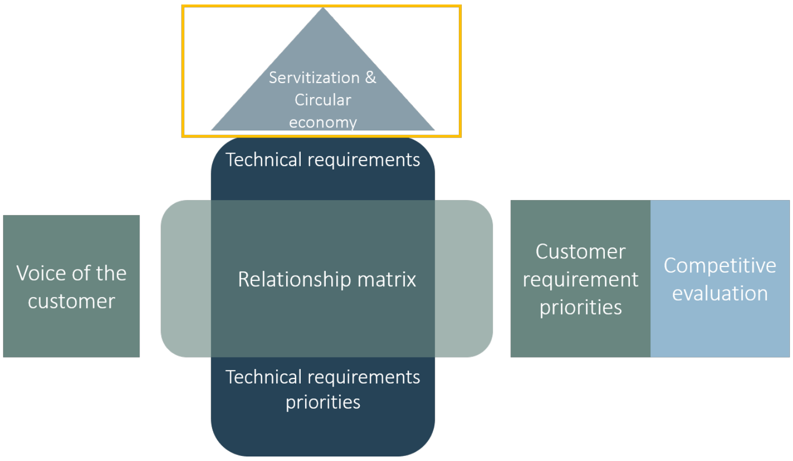

Servitization & Circular economy
Technical requirements
Voice of the customer
Relationship matrix
Customer requirement priorities
Competitive evaluation
Technical requirements priorities

Figure 5.1: Components of QFD with focus in servitization & circular economy

5.4.2 Implementation of new KPI's

There was a gap internally at SKF where the awareness of the company's strategy was greater than the awareness of how one self can contribute to the development of circular economy. As presented it is important to measure the right things throughout the organization to align the overall strategy and reach set goals (section 2.3.4). It was also found of great importance to include all key stakeholders in the development of the KPI's, not only internally but also key customers. The second recommendation is therefore, to implement measurements on sustainability on a local level. This is a great opportunity to develop the capabilities to utilize the business models and promote the strategy (section 2.3.3).

According to the respondents, no measurements were in place with a clear connection to promote the circular economy. The implementation of measurements on performance, with clear connection to sustainability, enables a great opportunity to increase the local contribution to the overall strategy. One important aspect to mention is to measure the right things, not choosing the most convenient, but to measure things that is providing value for the development of circular economy.

As the customers also stated that they have, to a greater extent, implemented KPI's of sustainability in their organization one further recommendation is to get inspired or co-develop together with the customers. By aligning the measurements to the customers it is also a possibility to understand the customers better and to deliver value pin-pointing their measurements. If not including key stakeholders into the development, there is a risk of measuring things that is not of value for the customer.

5.4.3 Developing traditional affairs

Fifty percent of the customers stated that they believe future agreements will continue to be based on traditional contracts. One possible way for SKF to combine traditional affairs with a circular economy could be to implement a deposit system for bearings or other components. Firstly, this deposit system can help SKF to reduce waste and create a type of closed resource loop. It will not cover all aspect of the circular economy or a direct connection to servitization, but it will enable the possibility to develop the traditional business to become more circular. Since the products will return to SKF it creates the possibility to either remanufacture the product or reuse the material in a partnership with by for example a steel supplier. By adding a reasonable fee to SKF's products, which is repaid on return, it creates an incentive for the customer to not put the product to waste. As this study has identified a great awareness of circular economy among the customers, this concept or system should be of great interest if developed together with the stakeholders. This concept can also be seen as a relatively simple way to implement a effective a circular solution. Since it contains few components that also are known for everyone, it could be a great way to start the journey towards circularity. Figure 5.2 present a rough outline of the proposed concept.

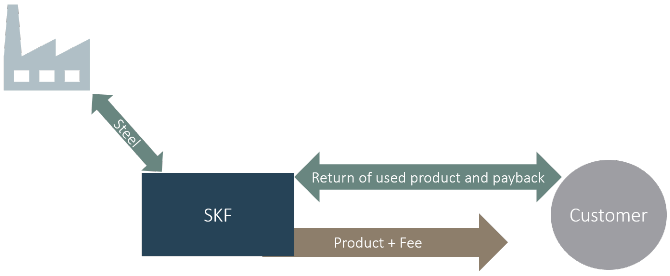


Figure 5.2: Proposal of deposit cycle

Further, the customers may be offered a reduced price on remanufactured products when they hand in their old bearing back to SKF. This system would give a economic incentive for the customers to choose more sustainable solutions, while at the same time, giving them a economic value while they are working with SKF to close the loop. As a lot of respondents stated, overall profitability is an important factor when setting up new contracts which may imply that this deposit system could give an edge for SKF. It could also provide a lock-up effect for SKF with their customers, since the deposit will solely work for SKF products.

5.4.4 Continuous improvements of circular economy

The final recommendation can be viewed as a summary of the findings from this study, as this recommendation calls for continuous improvement of servitization, offerings and partnerships that promotes circular economy. The findings shows that servitization is one way of promoting circular solutions, further the awareness and interest of circular economy is perceived as great. The research and data outlines that there is no other way to go than for more sustainable solutions which also has showed from the answers from the respondents.

Not only is there a climate change crisis but the laws and regulations in combination with the sense of urgency will force a major part of the company's to change the way they are doing business. Therefore, the authors propose to even more focus on circular solutions and to not be afraid of failure. This recommendation is meant to challenge SKF to strive even more, not only on a strategic level but also on a local level, to deliver more circular solutions. Dare to let go of old habits and to some extent monetary values, the customers and the climate are urgent to become more sustainable.

To put it short; there is no more time to think about circular economy, it is time for action!

6

Discussion of results

6.1 Reflections of the result

This chapter presents the authors general reflections of the result. It will be followed by general thoughts and identified challenges connected to the result.

6.1.1 Result of the survey

As one identified challenge of the result was what work role each respondent has. The distribution of the survey was sent out to several different companies and customers of SKF. However, the number of responses for each company differed as well as the distribution between different work roles. This could indicate that the opinion of one profession view of circular economy gives an uneven weight for the result. To handle this, the authors tried to distribute the survey to equally different work roles at different companies. The data was not cleaned or clustered depending on the distribution of work roles. For example, one respondent stated that he/she was the CEO and his/her answers were weighted the same as a purchaser responses from another company. This could be of interest to evaluate further since people working higher up in the hierarchy, in most cases, has the possibility to affect the overall strategy to a greater extent.

Further, is also the fact that the survey has been distributed and answered by different people, in different work roles and in different organizations. For the case of SKF all respondents in some way worked within the Industrial Sales unit but for the customers and distributors this has differed. From the customer and distributor it has been managers for different units, all the way up to CEO that has participated, so there was no clear segmentation. It can be viewed as a greater challenge for a sales department to measure sustainability than for a employee working tightly with production. This because of the lack of a direct connection to, for example, amount of resources used in production. The aspect of for example KPI's connected to sustainability can be easier to implement in different work roles and levels and could be a reason of why the KPI-levels is viewed as low at SKF.

6.1.2 Overall results

One general reflection is that there was a great challenge to align how to actually become more circular. There could be a risk that there is more talking about the circular economy than actually doing it. As the result shows, there was a risk that the circular economy can stay at a strategic level, where the local department did not know how to contribute. This risk may lead to companies thinking and communicating one thing but internally, the case is something completely different. SKF is a large organization and, therefore has a great challenge in aligning to become more sustainable throughout the whole organization.

This report has focused primarily on the Swedish process industry and the aftermarket. Due to that 73% of SKF sales comes from the industry sector and only a small portion of that relates to the after-market, presented suggestions and solutions can only connect to a small portion of customers. However, it was found that these customers are important to work closely with to promote a more circular economy. SKF will continue to have a big portion of linear sales, both in the industry section and in the automotive sector, which requires other environmental-friendly solutions.

Further identified was the implementation of a circular economy that at the time of this study not has had an apparent involvement in the daily work. To work with a circular economy was seen as something extra, and it becomes time consuming from the employees' ordinary work. This has to be changed to make the big difference. To implement some of the proposition from this report can be viewed as the start of this journey.

A more general reflection connected to the lack of social aspect in the definition of circular economy, is the affect of the geopolitical aspect. This study has been conducted in Sweden with companies with large customer bases within Sweden. According to OECD (2021) Sweden is regarded to have high social standards and this may be one reason of why this aspect is left out. Due to that the standard is regarded as high, it can be argued that there is a lesser need or focus to work with this aspect compared to a country with low social standard. If one were to do the same survey in a country with poor social standards, the reasons or definitions of circular economy will most likely be regarded from different or other aspects.

6.1.3 Setbacks of servitization

There are some setbacks with servitization, to be mentioned is that it requires an organizational shift into delivering services and not simply products. There is also a need of higher degree of interaction with the customers, which could be easy if the supplier and manufacturer are geographically close. For SKF and the Swedish process industry, this is not necessarily the case. A majority of the customers interviewed, and the respondents manufacturing sites, found in the northern part of Sweden whereas, SKF's headquarter is located in Göteborg. SKF has some supportive business unit closer to the customers, but the distances can be an issue when implementing concepts, supporting and aiding the customers. Another challenge with servitization is customer maturity for servitization and performance contract. Performance contracts are seemed to be a win-win situation between the supplier and the customer. Still, if the customer do not understand or are willing to see the benefits of sharing wins and losses, it could be difficult to implement. Connected to the degree of interaction, is the lock-up effect with one supplier that performance contracts have. Depending on how the cooperation precedes, it can be difficult for the customer to change supplier.

Further, it can also be argued that performance contracts change the payment models for companies. When a company changes to pay monthly instead of a one time payment, the billing company misses the chance to utilize the interest-to-interest effect fully. Also, by increasing servitization the amount of produced units will decrease, which will affect the company's' value in physical assets. This is something that need to be taken into consideration when scaling up servitization.

7

Conclusion

1. In which ways is servitization provided by SKF, for their customers and themselves to promote a circular economy?
    - How does servitization interlink to SKF's strategy?
    - How does servitization interlink to a circular economy?

This study has explored the concept of servitization and circular economy mainly within the setting of a large Swedish manufacturing company and its customer within the Swedish process industry. Firstly, the conducted literature review presented the backdrop, components of the concepts and synergies between servitization and circular economy, where SKF's service solutions is regarded as one way to strive for a circular economy. Further, since non-linear sales is promoted in the concept of circular economy and the features of servitization has the possibility to break this way of doing business, it is found the two concepts interlink. SKF's service solutions such as remanufacturing, online monitoring and Application Engineering are regarded to be ways that SKF provides servitization and promote a circular economy. The service solutions has also been further integrated in the overall strategy, where internal capabilities has been promoted mainly in terms of the SKF circular economy center.

2. How does SKF and their customers perceive circular economy?
    - Are there knowledge and awareness gaps?

Secondly, the conducted interviews and surveys internally at SKF and with their customers, have identified several gaps, not only between SKF and their customers, but also internally at SKF. The definition of circular economy seems to differ both internally and between SKF and their customers. The definitions focuses at different aspects, such as economic and resilience of natural resources. Both SKF and their customers have less focus in the social value, something that can be improved. It is also found that both SKF and their customers perceives circular economy as something important and overall, there is a great awareness about the benefits and increased need for circularity. There was an identified willingness to have a greater focus in circular economy and develop the local capabilities and goals. Further, the results from this study demonstrated that the customers are, to some extent, more aware of the concept of circular economy mainly in terms of how each individual can contribute in their profession.

3. Which attributes of the offered products and services, enabled by servitization, does the industrial after market value the most?
    - Which are the current and future needs?
    - Which are the gaps between customer needs and SKF's provided solution?

The customers valued services and products that provides increased uptime, reduced CO2-emission, and decreased maintenance cost the most. These are therefore regarded to be the current most attractive attributes and needs connected to the service offerings. In contradiction, SKF perceived their customers to value uptime and price the most. This is identified as one of the major gaps between customer needs and what SKF perceives to be the most important attributes. Internally there is a need for SKF to increase their knowledge of customer needs, and to improve how each department and individual can contribute to the overall strategy of circular economy. Further, there was a general understanding that the future will contain even more circular solutions such as the provided service offerings. Yet, a major part of the customers perceived the traditional contract to be used, where SKF has a greater focus in the performance or leasing contracts. This is identified as a gap in the future needs and therefore, it is important to develop the traditional offerings as well.

Lastly, the authors suggested a set of proposals to close the identified gaps and work with current and future challenges. These propositions can be summarized as to a greater extent incorporate the voice of the customer, together with key stakeholders implement and develop new and correct KPI:s, advance in both performance and traditional contracts and the continuous development of circular offerings.

Further research

The authors suggest further research to be conducted regarding the need of implement the voice of the customer in the development of services and products. As mentioned before, Quality Function Deployment is one tool for including the voice of the customer but wherever this is the best for SKF and how it should be implemented could be further investigated. Further research regarding servitization and further adaption could be in how the automotive sector evaluates the concept and if they are in a mature stage to utilize these type of contracts in their business. End customers are already leasing their cars, so could the manufacturers lease their parts from their suppliers? Another research topic could be how SKF's sustainable goals and related targets can be implemented further down in the organization and how to make it more tangible for every employee on a daily basis. As previous research implies, several stakeholders needs to be involved in setting the correct KPI. Which these stakeholders are and which measurements to be implemented needs to be further explored. This also applies for the proposed deposit system to develop the traditional business. How this concept or system should be set up and implemented, and how the actual deposit and fee will be designed should be further investigated.

The authors are hoping that this may encourage both SKF to develop their organization and inspire further research to be done within the area of development of circular economy.

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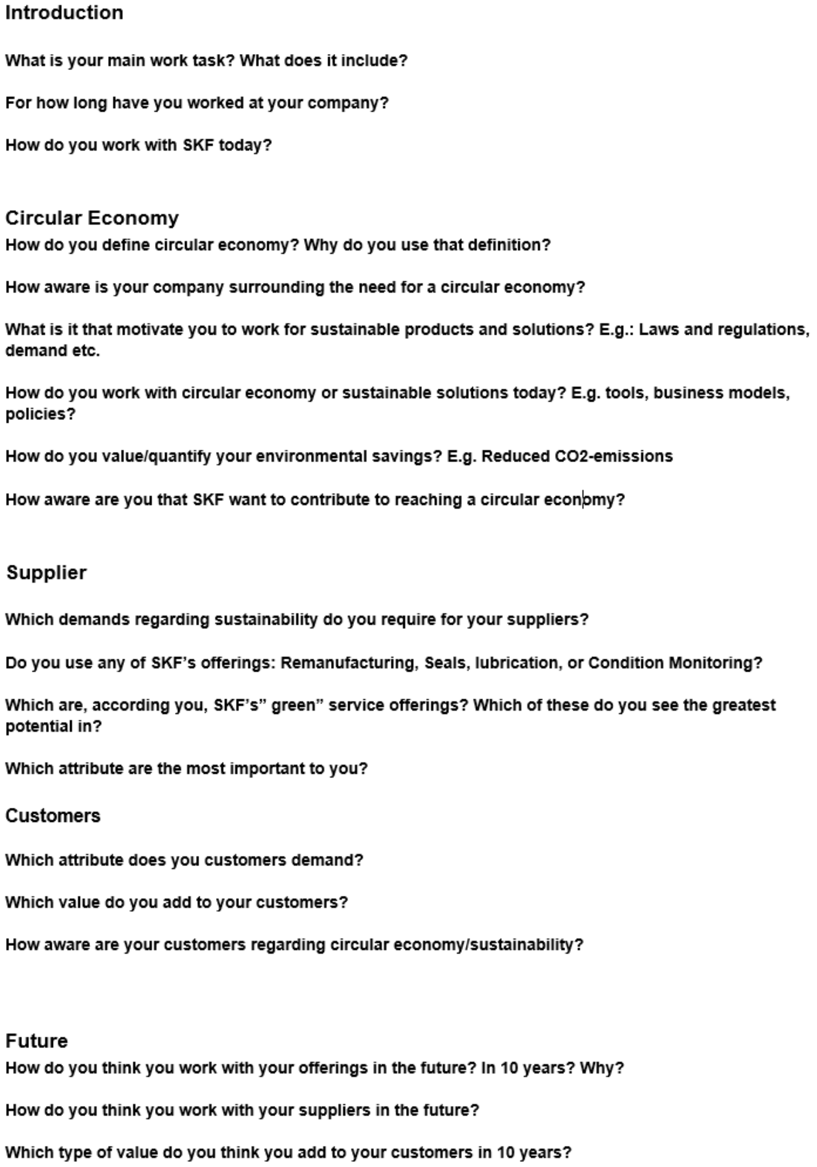
A

Appendix 1



Introduction

What is your main work task? What does it include?

For how long have you worked at your company?

How do you work with SKF today?

Circular Economy

How do you define circular economy? Why do you use that definition?

How aware is your company surrounding the need for a circular economy?

What is it that motivate you to work for sustainable products and solutions? E.g.: Laws and regulations, demand etc.

How do you work with circular economy or sustainable solutions today? E.g. tools, business models, policies?

How do you value/quantify your environmental savings? E.g. Reduced CO2-emissions

How aware are you that SKF want to contribute to reaching a circular economy?

Supplier

Which demands regarding sustainability do you require for your suppliers?

Do you use any of SKF's offerings: Remanufacturing, Seals, lubrication, or Condition Monitoring?

Which are, according you, SKF's" green" service offerings? Which of these do you see the greatest potential in?

Which attribute are the most important to you?

Customers

Which attribute does you customers demand?

Which value do you add to your customers?

How aware are your customers regarding circular economy/sustainability?

Future

How do you think you work with your offerings in the future? In 10 years? Why?

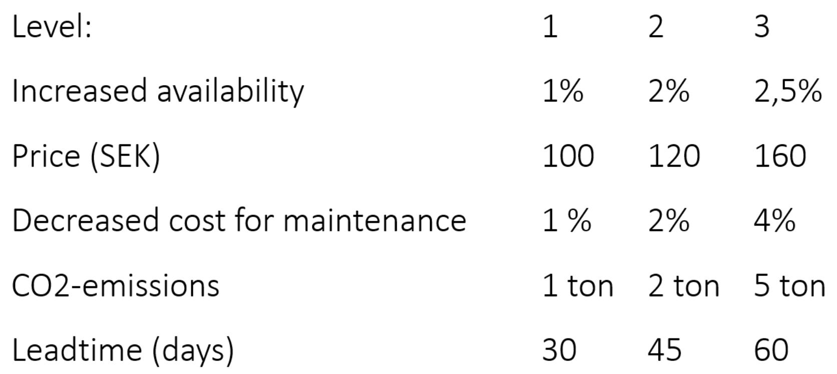
How do you think you work with your suppliers in the future?

Which type of value do you think you add to your customers in 10 years?

Figure A.1: Questions for interview

B

Appendix 2



Level:	1	2	3
Increased availability	1%	2%	2,5%
Price (SEK)	100	120	160
Decreased cost for maintenance	1 %	2%	4%
CO2-emissions	1 ton	2 ton	5 ton
Leadtime (days)	30	45	60

Figure B.1: Design of DCM

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