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Circular Economy Principles as Strategy for a Sustainable Business Model

A Case Study in the Norwegian Maritime Industry

Truls Hansen Dybvig

Industrial Economics and Technology Management
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Supervisor: Luitzen de Boer, IØT

Norwegian University of Science and Technology
Department of Industrial Economics and Technology Management

Problem Statement

In this master’s thesis, the author will explore and analyze how a maritime equipment supplier has adopted circular economy principles to their business. The purpose and objectives are to examine and provide a comprehensive overview of their circular business model and assess how circular economy principles has been incorporated, and identify challenges and possibilities for further growth in the context of corporate sustainability.

Preface

This master's thesis is written by Truls Hansen Dybvig as the concluding part of a Master of Science (MSc) degree in Industrial Economics and Technology Management (IØT) at the Norwegian University of Science and Technology (NTNU). The foundation and direction for the thesis has been guided by the author's specialization in Strategy and International Business Development. The study has been conducted in the spring semester of 2018.

This thesis is part of the competence project Sustainable Innovation and Shared Value Creation in Norwegian Industry (SISVI). It is a collaboration between industry actors, NTNU, SINTEF and the Norwegian Research Council. The goal is to develop knowledge and strengthen the industry's competitive abilities consistent with the concepts of shared value creation and sustainability. Circular economy and sustainable business models are chosen as topics in this thesis, with a case study of a Norwegian company in the international maritime industry.

I would like to thank my supervisor, Professor Luitzen De Boer for the guidance and help he has provided me with. Also, I would like to thank the case company for their time and contribution, especially Logistics Manager Adis Cemalovic and Project Manager Vidar Jensen at Kongsberg Maritime Subsea.

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Truls Hansen Dybvig

Contact: trulsdybvig@gmail.com

Executive summary

This master's thesis explores and investigates how a Norwegian maritime equipment supplier, Kongsberg Maritime Subsea, has adopted circular economy principles to their business. The case company have developed a strategy containing processes and activities concerning some products that utilize key circular economy principles, which could be defined as a circular business model. The objective and purpose has been to provide a comprehensive overview of this circular business model and how circular economy principles has been incorporated, and identify challenges and possibilities for further growth in the context of corporate sustainability. To do this, three research questions have been formulated and answered in this thesis.

A comprehensive literature review was conducted to provide a foundation for the study to fulfill the problem statement and purpose of the thesis, and to present state-of-the-art knowledge and practices regarding the researched topics and concepts. The initial review of the relevant literature revealed that the concepts of corporate sustainability, shared value creation, circular economy and sustainable business models are often mentioned in the context of sustainability and sustainable development. However, they have received criticism regarding the practical applicability, fuzziness and mixing of the concepts and how they contribute to sustainable development. The first research question sought to provide clarity regarding this by investigating how these concepts are interrelated and related to sustainable development. It was shown that these concepts are highly interrelated and have different roles and contributions in the context of sustainable development for corporations. Sustainable development when incorporated by corporations, can be called corporate sustainability. Circular economy, with its main objective of sustainable development, is by many viewed as the best way for corporations to approach sustainable development, and hence achieve corporate sustainability. Further, sustainable and circular business models are very important in a transition to and as enabler of circular economy, and thus for corporations to be sustainable. In this context, innovating new sustainable business models and adjusting existing ones is highly topical. Business model frameworks are an efficient tool in this regard to describe, break down, assess and analyze business models. A framework for circular business models is presented and described in this thesis.

To fulfill the problem statement, research question 2 inquired how the case company have adopted the core circular economy principles reduce, reuse and recycle, known as the 3 R's, to their business. A comprehensive case study of the company is given in the empirical findings. The circular business model was explored and analyzed by using the presented framework, to answer research question 2. It was revealed that this business model mainly fosters reuse of materials and products by utilizing the circular economy principles repairing, refurbishing and remanufacturing. A

comprehensive presentation and analysis of this circular business model and how they utilize these principles is given in this thesis.
As per the problem statement and research question 3, the challenges and possibilities for further growth in the context of corporate sustainability for the case company has also been considered and identified. The case company can achieve growth in the context of corporate sustainability by further adopting circular economy principles, develop their circular business model and transition towards a circular economy. It is important that they have a conscious approach to the sustainability elements of this business model and the application of key circular economy principles in general to do this. They should also prioritize the development of the circular business model and the endeavors in second-hand markets to a greater extent than they currently do. This entails that managers must allocate more resources and provide a strategic focus to it. A possibility is to scale up this business model in the company to include more products and further investigate how it can become more circular. A line of inquiry for the latter is to consider how value can be recovered multiple times.

Some of the challenges for further growth in the context of sustainability are the low priority this business model has at the case company, and the consequent sustainability aspects it entails. Change and an increased focus on this is necessary. Cannibalization is often considered a challenge and hinder for development regarding sale of used and restored products. However, it has been argued and provided research supporting that this should not be a major concern in this case. The relative low volumes and high levels of customization which the case company operates with on their products can be another challenge for further developing this model and to become more sustainable.

The findings from the literature review provides clarity regarding the researched concepts and their interrelations, which was a recurring issue mentioned in literature, and this thesis provides a contribution in this regard. Moreover, the utilization of the framework to explore and analyze a circular business model of a specific manufacturing company to assess how circular economy principles has been adopted, and to identify challenges and possibilities for further growth in the context of corporate sustainability, can provide valuable insight and learning for others. The thesis has with this sought to contribute with knowledge to the SISVI project and to the field of research on the addressed concepts.

Sammendrag

Denne masteroppgaven utforsker og undersøker hvordan en norsk maritim utstyrsprodusent, Kongsberg Maritime Subsea, har tatt i bruk prinsipper fra sirkulær økonomi i virksomheten sin. Selskapet har utviklet en strategi som inneholder visse prosesser og aktiviteter knyttet til noen produkter som benytter sentrale prinsipper fra sirkulær økonomi. Dette kan defineres som en sirkulær forretningsmodell. Formålet med oppgaven har vært å gi en omfattende oversikt over denne sirkulære modellen og hvordan kjerneprinsippene fra sirkulær økonomi har blitt tatt i bruk. Videre har målet vært å identifisere utfordringer og muligheter for vekst knyttet til bærekraftighet for bedriften. For å gjøre dette har tre forskningsspørsmål blitt formulert og besvart in denne avhandlingen.

Det ble gjennomført en omfattende gjennomgang av litteratur for å gi et fundament til det videre arbeidet med oppgaven slik at besvarelse av den overordnede problembeskrivelsen ble muliggjort. I denne gjennomgangen ble det identifisert at konseptene selskapsbærekraftighet, delt verdiskapning, sirkulær økonomi og bærekraftige forretningsmodeller ofte nevnes i sammenheng med bærekraftighet og bærekraftig utvikling. Disse konseptene har blitt kritisert for deres praktiske anvendbarhet, uklarhet og at de blandes. Det første forskningsspørsmålet adresserer dette med et formål om å oppnå klarhet omkring hvordan disse konseptene henger sammen og hvordan de er knyttet til bærekraftig utvikling. Det vises at disse konseptene er tett knyttet sammen med hverandre og har ulike roller og bidrag knyttet bærekraftig utvikling. Selskapsbærekraftighet er en betegnelse på når bærekraftig utvikling er innlemmet i selskaper. Hovedformålet med sirkulær økonomi er bærekraftig utvikling, og det er blant mange ansett som den beste måten for bedrifter å tilnærme seg bærekraftig utvikling og dermed oppnå selskapsbærekraftighet. Videre så er bærekraftige og sirkulære forretningsmodeller sentrale i en overgang til sirkulær økonomi og for å legge til rette for dette, og derfor også viktige for at bedrifter skal være bærekraftige. I denne sammenhengen er nyvinning knyttet til bærekraftige forretningsmodeller og endringer av eksisterende modeller særs relevant. Here er rammeverk effektive verktøy for å beskrive, bryte ned, evaluere og analysere forretningsmodeller. Et rammeverk for sirkulære forretningsmodeller presenteres og beskrives i denne oppgaven.

For å oppfylle problembeskrivelsen adresserer det andre forskningsspørsmålet hvordan bedriften har tatt i bruk kjerneprinsippene reduser, gjenbruk og resirkulering, kjent som de 3 R’er, fra sirkulær økonomi. En omfattende presentasjon av selskapet og den sirkulære forretningsmodellen er gitt. Videre benyttes rammeverket til å utforske og analysere forretningsmodellen for å besvare forskningsspørsmål 2. Det ble funnet at denne modellen fremmer gjenbruk av materialer og produkter gjennom bruk av sirkulær økonomi-prinsippene reparering, oppussing og gjenproduksjon. En grundig presentasjon og analyse av den sirkulære forretningsmodellen og hvordan den tar i bruk disse prinsippene er gitt i denne oppgaven.

I henhold til problembeskrivelsen og forskningsspørsmål 3 så har utfordringene og mulighetene for videre vekst knyttet til selskapsbærekraftighet blitt identifisert og diskutert. Bedriften kan oppnå vekst her ved å i større grad ta i bruk sirkulær økonomiske-prinsipper, videreutvikle den sirkulære forretningsmodellen og ved å generelt bevege seg mot en mer sirkulær økonomi. I denne sammenhengen er det viktig at de har et bevisst forhold til de bærekraftige elementene i denne forretningsmodellen og bruk av sirkulær økonomiske prinsipper generelt. De bør også i større grad enn på nåværende basis prioritere å videreutvikle denne forretningsmodellen og innsatsen mot bruktmarkedet. Dette innebærer at lederne må allokere mer ressurser og gi dette strategisk prioritet. En mulighet er å skalere opp denne modellen ved å benytte den på flere produkter og løsninger, og gjøre videre undersøkelser på hvordan den kan bli mer sirkulær. For sistnevnte kan det lønne seg å undersøke hvordan verdi kan bli gjenvunnet flere ganger.

Noe av utfordringene med videre vekst knyttet til bærekraftighet er den lave prioriteten denne sirkulære forretningsmodellen har i selskapet og de følgende bærekraftige aspektene den innebærer. Here er det nødvendig med forandring og et økt og mer bevisst fokus. Kannibalisering er ofte betraktet som en utfordring og et hinder for utvikling knyttet til salg av brukte produkter. Basert på forskning er det argumentert for at dette ikke bør være en særlig bekymring for bedriften i denne saken. De lave volumene og individuelle tilpasningene på produktene som er vanlig i casebedriften kan være en annen utfordring for videreutvikling av denne forretningsmodellen og for å bli mer bærekraftige.

Funnene fra litteraturgjennomgangen bidrar til klarhet omkring de undersøkte konseptene og hvordan de henger sammen, noe som var en gjentagende sak i den undersøkte litteraturen, og denne avhandlingen gir et bidrag i denne sammenhengen. Videre så har bruken av rammeverket til å utforske og analysere en sirkulær forretningsmodell for et spesifikt produksjonsselskap for å vurdere hvordan prinsipper fra sirkulær økonomi har blitt tatt i bruk, og identifiseringen av utfordringer og muligheter for vekst knyttet til selskapsbærekraftighet, bidratt med innsikt og læring som kan være verdifull for andre. Denne avhandlingen har ettertraktet å gi et bidrag til SISVI prosjektet og til fagområdene relatert til de undersøkte konseptene.

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List of Abbreviations

KG – Kongsberg Gruppen ASA
KM – Kongsberg Maritime AS
KMS – Kongsberg Maritime AS – Subsea
SISVI – Sustainable Innovation and Shared Value Creation in Norwegian Industry
MNC – Multinational corporation
CS – Corporate sustainability
BM – Business model
SBM – Sustainable business model
CE – Circular economy
SVC – Shared value creation
CSR – Corporate social responsibility
TBL – Triple bottom line
BMI – Business model innovation
EMF – Ellen MacArthur Foundation
SCM – Supply Chain Management
UMAP – Underwater Mapping
UPM – Underwater Positioning and Monitoring
MARO – Marine Robotics
AUV – Autonomous Underwater Vehicles
NDRE – Norwegian Defence Research Establishment

1. Introduction

This section offers an introduction to this thesis. In addition to background and context of the topics investigated, motivation, research questions, scope and boundaries will be presented. Lastly, the structure of the report will be explained.

1.1 Background, context and motivation

In recent years the focus on conserving our planet and environment has gained increased attention. According to NASA (2018) the current rise in global temperature, the sea level rise and warming, glacial retreat and increased extreme weather events are all the results of human activity since the mid-20th century. And it is proceeding at a rate unparalleled in history (NASA, 2018). The public and political awareness of climate change, pollution, use of nonrenewable energy sources and the rate of resource consumption has set the agenda for a more environmentally friendly way of life. Eweje et al. (2011) states that these different forces like growing weather volatility, diminishing food reserves, increased world population and planetary overheating together form a "perfect storm" of change. The strain on the planet has exceeded its capacity and measures need to be taken to reduce, stop and reverse the negative effects (Eweje et al., 2011). To preserve our planet for future generations, sustainability efforts are crucial.

There is no general agreed upon definition of sustainability. However, in ecology it refers to how natural systems remain in balance by how it produces everything it needs, function and remain diverse (Environmental Science, 2018). Sustainably in the context of this report can be explained by the term sustainable development, introduced by the Brundtland Commission in 1987 in the report *Our Common Future*. They defined sustainable development as:

> *"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987).*

Fundamentally, it is about balancing the need to move forward economically and technologically, and the need to protect the environment and society (Environmental Science, 2018). These core areas – economic, environmental and social – are called the three pillars of sustainable development, and its application often referred to as the triple bottom line approach. An important realization is that these pillars are not mutually exclusive, instead they can be mutually reinforcing. Morelli (2011) argues that one can not exist without the others in the long run as they are interdependent.

Sustainability as a concept is everywhere around us in daily life. Some people strive to live sustainably and goes to great lengths to do so with having it in mind regarding

decisions and actions constantly. Whereas some make smaller efforts like waste recycling. Nevertheless, all efforts contribute to the global sustainability initiative.

Not only individuals and governments are concerned about sustainability, in the corporate world this has also gained attention parallelly. In business, sustainable organizations are those who engage in actions that contributes to eliminate the destructive effects on the environment and society (Eweje et al., 2011). Thus, the three pillars of sustainability are equally topical and applicable for corporations as for individuals, politicians and governments. According to Amini and Bienstock (2014) a company can not completely separate its economic sustainability from social and environmental sustainability as they impact each other in a variety of ways and are interdependent. The long term success of a corporation demands emphasis on all three pillars of sustainability (Amini and Bienstock, 2014). This has been increasingly recognized by mangers in recent years (Lewandowski, 2016). The question has more often become how to incorporate sustainability, not whether to incorporate it (Eweje et al., 2011). However, some companies are still reluctant to fully embrace corporate sustainability into their business as it often requires strategic change, investments and negative economic effects in the short run. Even though corporations may have short term economic benefits from not considering social and environmental development, the triple bottom line approach will thrive and surpass short term focus and lead to success in the long run, according to Amini and Bienstock (2014), Ameer and Othman (2012), Eccles et al. (2014) and Baumgartner et al. (2010).

The realization that initiating environmental and social sustainable efforts does not negatively affect economic growth of a company, but rather strengthens its position has been an important factor in corporate sustainable development. This underpins that corporate sustainability is not something companies should or need to do purely based on conscience, public perception and perceived responsibility, but it will also foster economic growth, competitiveness and other advantageous. Shared value creation is a concept introduces by Porter and Kramer (2011). It conceptualizes the aforementioned aspects of corporate sustainability, how to simultaneously create value for the company and society. Porter and Kramer (2011) defines shared value creation as:

> *“Policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates.”*

A basic premise of the concept is that not only economic, but also social progress and benefits must be addressed using value principles (Porter and Kramer, 2011). This approach has been widely discussed in academia and adopted by corporations globally. This thesis is part of a competence project called Sustainable Innovation and Shared Value Creation in Norwegian Industry (SISVI), where Porter and Kramer’s concept naturally is important. It is a collaboration between NTNU, SINTEF

and Norwegian industry actors. The project seeks to strengthen the Norwegian Industry's competitiveness consistent with the concept of shared value creation (SISVI, 2017). This thesis aims to contribute in this regard, with an exploration of circular economy principles as strategy for a sustainable business model (SBM). Porter and Kramer's concept has seen some critique in relation to the practical applicability of the theory (Crane et al., 2014). The SISVI project addresses this with also having focus on implementation and integration of the gained knowledge (SISVI, 2017). This thesis also seeks to address this by exploring and analyzing how the case company has implemented and integrated core circular economy principles to their business. Circular economy and these core principles are key in corporate sustainability and sustainable development, which will be further argued and explained below and later in this thesis.

Circular economy is another concept that has emerged in recent years in the sustainable development movement. It has gained a lot of attention and companies are progressively adopting circular economy principles to their supply chains and businesses to become more sustainable (Lieder et al., 2017). Essentially, circular economy is about transitioning away from the traditional way of viewing the economy, consumption and production as linear (Urbinati et al., 2017). Grounded in the pursuit of sustainability it seeks to replace the "take, make, disposal" mentality with circularity and closed production systems (Masi et al., 2017). In a circular economy resources are reused and kept in a loop of production and usage (Urbinati et al., 2017). To achieve this, key aspects in the circular economy are recycle, reuse, repair, remanufacture and reduce, often referred to as the 5 R's. However, these R's are presented in many ways in the literature. The 3R's recycle, reuse and reduce are most commonly featured (Kirchherr et al., 2017). According to Pan et al. (2015) a circular economy system and business model (BM) should be based on these R's. This thesis uses that as a foundation, and the overall problem statement for this thesis is to explores and analyze how a company in the maritime industry has adopted these key circular economy principles to their business and utilized them for sustainable development, competitiveness and revenue generation. The objective is to examine and provide a comprehensive overview of their circular business model and how they have incorporated key circular economy principles, and identify challenges and possibilities for further growth in the context of corporate sustainability.

Urbinati et al. (2017) argues that there is a lack of framework to explain how corporations adapt their business models or create new ones to become circular, despite the interest for the concept. The current representation of circular economy does not allow for distinguishing of different modes of adaption by companies (Urbinati et al., 2017). The focus has mainly been on industry or industry segment, and not on the adoption of individual firms. Thus, in the field of strategic management, Urbinati et al. (2017) calls for more research on how circular economy

is being applied at a different extent by corporations. This thesis seeks to contribute to filling the research gap in this regard.

A project thesis was conducted by the author in the autumn of 2017. How the supply chain was affected by a shift towards circular economy was researched (Dybvig, 2017). Knowledge gained from the project thesis will be will be applied in the work with this master's thesis. Mainly regarding the literature search that was conducted. Furthermore, the work with the project thesis peaked the author's interest on the subjects and has motivated to do further research. The author finds the topics of this master's thesis both interesting, topical and important. Circular economy has been the most recent and best attempt to conceptualize the integration of environmental wellbeing and economic activity in a sustainable way (Murray et al., 2017). The need for sustainability in both the world in general and in businesses is undisputed. And circular economy could very well be the go-to economic model of tomorrow with the increased attention and adaptation it gets. This has motivated the other author to choose this topic for research and hopefully make a minor contribution to field. Additionally, there has been a broad call for more research in academia on the concept of circular economy, its application, implementation and effects i.a. (Masi et al., 2017, Urbinati et al., 2017, Lieder and Rashid, 2016, Pan et al., 2015, Lewandowski, 2016, Merli et al., 2018), which has driven the author in the work with this thesis.

1.2 Research questions

The motivation explained in the previous part and an attempt to contribute with knowledge to the SISVI project has formed the foundation and problem statement for this thesis. Additionally, the identified research gap has guided towards problem analysis and research objectives. As per the problem statement given initially, the main purpose of this thesis is to explore and analyze how a specific manufacturing company, Kongsberg Maritime Subsea AS (KMS), has adopted circular economy principles to their business and supply chain. And further, to examine and provide a comprehensive overview of their circular business model, identify challenges and possibilities for further growth in the context of corporate sustainability. Bryman and Bell (2011) emphasizes the importance of formulating research questions as they will serve as the basis for the investigation and provide the work with a clear focus. Three research questions have been formulated for this thesis and they will be presented in the following.

The concepts of corporate sustainability, shared value creation, circular economy and sustainable business models are often mentioned in the context of sustainability and sustainable development. These concepts are highly relevant in connection with the research and objectives in this thesis and thus it is deemed relevant to introduce these concepts. However, they have received criticism regarding the practical applicability, fuzziness and mixing of the concepts and how they contribute to

sustainable development (Crane et al., 2014, Strand et al., 2015, Kirchherr et al., 2017, Engert et al., 2016, Hahn et al., 2015). To provide clarity regarding this and to form a foundation for the further work in this thesis to fulfill the problem statement, the following research question (RQ) has been developed:

> *Research question 1: How do corporate sustainability, shared value creation, circular economy and sustainable business models relate to sustainable development and how are these concepts interrelated?*

RQ 1 will be addressed in chapter three in the conceptual background. Each concept will be presented based on the conducted literature review, and discussed in the context of sustainable development and each other. As mentioned, the main purpose of this thesis is to explore an analyze how a specific maritime equipment supplier has adopted circular economy principles to their business. This has led to the following research question:

> *Research question 2: In what way have a specific manufacturing company adopted the circular economy principles reduce, reuse and recycle to their business?*

Kongsberg Maritime Subsea AS will be the case company in this thesis. RQ 2 will be addressed and answered by the presentation of the empirical findings in chapter four and the following analysis in chapter five. The collected empirical data will be presented in a case study in chapter four and further analyzed in chapter five, grounded in theory from chapter three. I.e. KMS' circular business model will be mapped and investigated based on a framework for circular business models to provide a comprehensive overview of the business model and reveal how they have adopted CE principles. The empirical data has been obtained by qualitative interviews with employees, information submitted by KMS and research by the author.

In addition to RQ 1 and 2, as per the problem statement, the objective is also to identify challenges and possibilities for further growth in the context of corporate sustainability for KMS. Research question 3 is formulated as follows:

> *Research question 3: What are the challenges and opportunities for further growth in the context of corporate sustainability for the case company?*

For the third research question, the information and knowledge obtained from the empirical findings and the second research question will be considered and discussed to look for challenges and opportunities for further growth in the context of corporate sustainability. This discussion will have basis in and revolve around the investigated circular business model, which has been the focus of this thesis. Thus, RQ 3 will be answered in chapter 6.1, but the findings and suggestions here will be

identified and compiled based on the analysis of the business model from chapter five and the empirical findings.

1.3 Scope and boundaries

The case company KMS is a multinational corporation (MNC) with presence at many locations across the globe. They are part of Kongsberg Maritime (KM), which again is part of a larger conglomerate called Kongsberg Gruppen (KG). Only the Subsea division with headquarters in Horten and its supply chain will be in the scope of this thesis. KMS' main market is in the maritime industry. They also have a lot of business with companies that can be defined as actors in the oil and gas industry. When it is referred to the maritime industry in this thesis this also include maritime activities related to the oil and gas industry, in addition to obvious actors like ship builders and fisheries.

The supply chain in this case will include all relevant parties directly involved in the researched business model, from suppliers to end users. Further, boundaries are set with only investigating the specific business model related to application of circular economy principles. Research question 2 quite broadly addresses the main circular economy principles known as the 3 R's. It was revealed in the initial work with this thesis that the case company has developed a business model concerning some products which has a circular nature and utilizes key circular economy principles. It was chosen to focus on this particular business model in this thesis, as it was considered very interesting and relevant, but also for delimitation purposes as the 3 R's can be linked to a lot of operations and processes in a corporation like the case company. Consequently, the circular economy aspects of this BM will be emphasized and other aspects of reduce, reuse and recycle which is applied to KMS' business will not be given much space here. I.e. RQ 2 addresses how the 3 R's are applied to their business on a more general level, but the investigation and analysis of this will be concentrated around the mentioned business model and how the 3 R's are incorporated here. Specifically, reuse and the enabling and underlying circular economy principles refurbish, repair and remanufacture will be given more attention than reduce and recycle. Thus, some aspects of the 3 R's of circular economy that may be used by KMS will not be investigated in depth here, even though the RQ addresses this in a broad way on the business level. For instance, KM and KMS have organizational presence all over the world for after-sale service and repairs. Extending product-life through repair is a central aspect of CE, but this will not be investigated in detail in this thesis as it is considered outside the boundaries of the business model in question. This may be viewed as a limitation, but the author considered it better to focus on the said business model and provide transparency regarding this. Also, when considering that the case company in this master's thesis suggested and desired an investigation of this business model, and the decision to further focus only on this was done for standard delimitation purposes to enable in-depth investigation and analysis. Additional information and clarification regarding

delimitation, boundaries and scope of the case study and analysis are given in chapter 4.4.1.

The business model and accompanying value proposition researched in this thesis is merely a part of the larger business model of the company. Thus, the overall business model of KMS will not be inspected. When it is referred to their business model in this thesis, the part concerning circular economy and certain products and processes associated with this, is intended. This business model will be thoroughly presented and described later. KMS was previously called Simrad, and they still use the Simrad brand on certain products and in certain channels. Today, the subdivision that focus on technology and solutions for the fishing industry is called Simrad. Also, many of the products under the Simrad subdivision are branded Simrad. To avoid confusion, it will be explicitly mentioned if “Simrad” is used to refer to the company in the period before it was called KMS, otherwise “Simrad” refers to the subdivision and the fishery products, and KMS to the company itself. Distinction between the subdivision Simrad and the brand Simrad will also be made where this is deemed necessary to avoid confusion.

For RQ 2 their entire business model regarding circular economy is sought to be investigated and understood. This is to get a broad and holistic picture of the said business model and their adoption of circular economy principles, to answer the research question and overall problem statement. With a clear understanding of their business model, RQ 3 can be examined and discussed in chapter six to identify challenges and possibilities for further growth in the context of corporate sustainability.

1.4 Thesis structure

This thesis consists of seven chapters. They follow a standard linear approach with an introduction, methodology, conceptual background, empirical findings, analysis, discussion and conclusion. The contents of each chapter will be briefly presented in this section.

The introduction chapter, which this section is a part of, seeks to introduce the thesis and create interest for the reader. The general topics of the study is presented with the background and context. The research questions which has set the agenda and guided the work with this thesis are stated. Further, the scope and boundaries of the work are clarified, with a presentation of the structure of the thesis lastly.

In the methodology in chapter two the research design and quality are put forward together with how data was collected and analyzed. Information about how the interviews were conducted and with whom is presented in this part, alongside a brief presentation of the case company. The planning and execution of the literature review will also be explained. Following the methodology is the conceptual

background. Here, relevant theoretical material regarding the researched topics will be presented. RQ 1 will be addressed and answered in this part. This section also forms the basis for the further analysis of the case company. It contains a more thorough presentation of the theoretical background and topics presented in the introduction and gives an overview of state-of-the-art knowledge and practices. It includes relevant research and knowledge on corporate sustainability, shared value creation, circular economy and sustainable business models, and how these concepts are interrelated and related to sustainable development, as per research question 1. The framework used for mapping and analyzing the case company's business model will also be put forward and explained here.

In part four, empirical findings, all relevant information about the case company and their circular business model will be given. This information is further analyzed in chapter five by utilizing the framework presented in chapter three and additional theory from the conceptual background. Research question 2 will thus be addressed and answered in 4.4 and chapter five. This is also illustrated in figure 1 below. RQ 3 will be answered in chapter six, but as mentioned it will be connected to the two previous chapters and the findings there. In addition to addressing RQ 3 in 6.1, discussion of the limitations of the study and future research are included in chapter six.

Lastly, concluding remarks upon the findings and results of the thesis in chapter seven. The purpose and objectives of the study and the fulfillment of them will be considered. The structure of the thesis is depicted in figure 1. Here, it is also indicated where the RQs are addressed and answered.

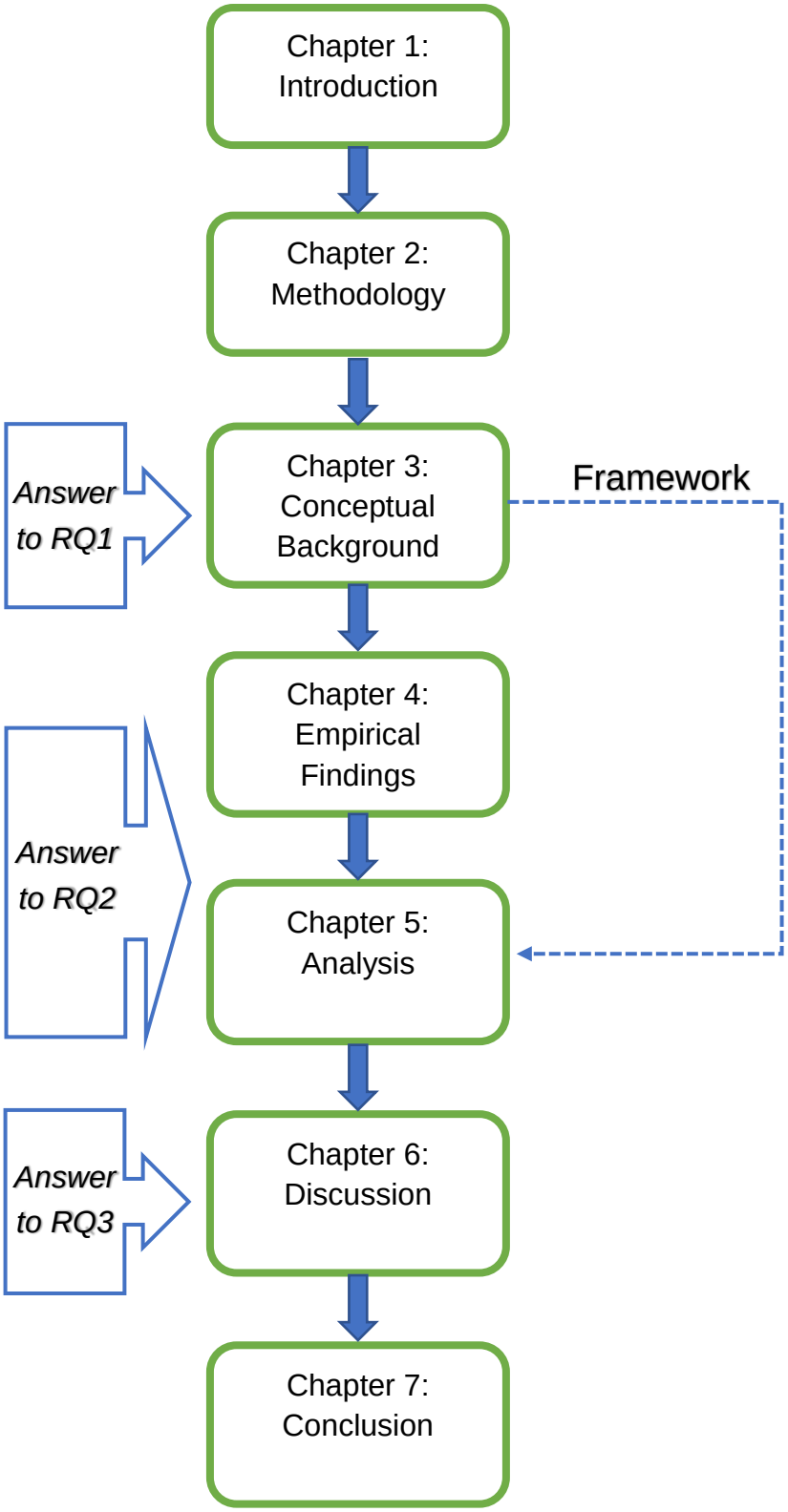

Figure 1: Thesis structure.

2. Methodology

In this part the research design and methods used for collecting and analyzing data and information will be presented. The quality of the research is also considered. The case company KMS is briefly introduced, alongside information regarding the qualitative interviews and literature review. The objective is to give the reader an understanding of how the research was planned, conducted and analyzed with the purpose of answering the research questions.

2.1 Research design

When doing research there is generally a distinction between qualitative and quantitative. However, there might be in some cases suitable to use a combination of the two (Flick, 2009). Bryman and Bell (2011) classifies six different research strategies and they are either qualitative, quantitative or a mixed method. Further, these strategies can either be considered as positivist or postpositivist (Bryman and Bell, 2011). When choosing strategy and design it is important to keep the research questions in mind and what is to be investigated (Bryman and Bell, 2011).

Research design is a structured guide and plan for the execution of the research and analysis of the data (Bryman and Bell, 2011). To obtain the best research data possible a good research design needs to be developed (Toledo-Pereyra, 2012). The different designs can be classified as either experimental, cross-sectional, longitudinal, case study or comparative (Bryman and Bell, 2011). The research questions in this thesis address and seek to inquire about one specific firm. The problem statement and main research question are of the “how” type. For this purpose a case study design is suitable (Yin, 2014). Further, a case study design is often chosen when a detailed exploration of a specific case or company is to be done (Bryman and Bell, 2011). Thus, a case study design was chosen for the research in this thesis.

Case studies have some traditional concerns which are important to note when conducting a case study (Yin, 2014). Case studies are associated with a lack of rigor compared to other research methods and according to Yin (2014) a good case study is difficult to do. Thus, it is important to follow systematic procedures and avoid equivocal evidence to influence the research and its findings (Yin, 2014). Another common concern is the issues regarding generalizing from case study findings. The critique is often that the findings are inherent for the specific case and not applicable in other cases or contexts (Yin, 2014). The research in this thesis concerns a single case company. Such single-case studies also have the same issues and critique as mentioned above. A single-case is chosen here due to the nature of the problem statement and the purpose of thoroughly investigating a specific company. Though, it should be noted that this initially choice was affected by time and resource constraints and the access the author was given. Single-case studies do have some

concerns and disadvantages compared to multiple-case studies (Yin, 2014). Multiple-cases are often preferred it the researcher has this option as the analytic conclusions are more credible and externally valid. Also, the issues with the uniqueness and lack of ability to generalize case-studies is more profound in single-case research than in multiple-cases (Yin, 2014).

2.1.1 The case company

For this study, a single case (company) is selected. The author was put in contact with Kongsberg Maritime Subsea AS, facilitated by NTNU and the SISVI project. KMS was chosen based on the author's background and expertise, and the proposed topic of the master's thesis grounded in the objectives of the SISVI project. KMS is one of the divisions of Kongsberg Maritime. They are located in Horten, Norway, and are a cornerstone company there. KMS produce and supply advanced instruments for underwater exploration. Their core competence is within hydroacoustics. I.e. sound under water. The product segment is broad in the maritime context and they have customers all over the world. KMS have five subdivisions which constitutes their different products and markets: Simrad, Underwater Mapping (UMAP), Underwater Positioning and Monitoring (UPM), Marine Robotics (MARO) and NAVAL.

They have developed a business model with a circular supply chain where some of their products and systems gets their product-life extended using circular economy principles. These products are resold in second-hand markets. The products involved in this circular supply chain belongs to the Simrad subdivision. Essentially, the business model consists of strategies and processes for creating new value by upgrading and repairing used products that are returned from customers and reselling these products to either the initial customer or to new customers. This will be more thoroughly presented in chapter four.

2.1.2 Theoretical background

To answer RQ 1, and provide context and background for the research and a foundation for the analysis, a literature review on relevant subjects was conducted. This was also done to achieve insight on the topics and concepts discussed in this thesis. Yin (2014) stresses the importance of conducting a thorough literature review when doing a case study. Considering the objective of a comprehensive assessment to get an overview of the researched topics, a narrative approach was taken. A complementary overview of the researched topics and a framework for mapping the case company's business model will be presented in chapter three, in addition to addressing RQ1.

During the work with the project thesis prior to this master's thesis, the author did an extensive literature search on several of the key topics of this master's thesis (Dybvig, 2017). Some of the results and information gathered will be rendered in this study. Particularly, this applies to circular economy. However, to account for possible newly published research, new searches and inquiries into this topic was made.

Predominantly, scientific articles and books are researched and used in this thesis. For the actual search for and collection of relevant literature, an online database has been used. The Oria platform was chosen based on the access it gave the author into numerous other academic databases and publications. It is an online search engine provided to the students at NTNU by the University Library. To yield relevant searches keywords where used. This is a commonly used method (Bryman and Bell, 2011). To choose appropriate keywords some important considerations should be made. Possible synonyms, alternative spellings and abbreviations should be considered (Bryman and Bell, 2011). They main keywords were compiled from the principal topics of this thesis and from the author's experience and knowledge, including but not limited to:

- Sustainability
- Sustainable development
- Corporate sustainability
- Shared value creation/creating shared value
- Circular economy
- Business models
- Circular supply chain
- Sustainable business model
- Circular business model
- Business model innovation
- Business model framework
- Business model mapping
- Maritime industry

These keywords were used in the search individually and put together in different combinations. An extensive narrative review of the literature the searches yielded was conducted. Articles and books were evaluated based on their relevance by reviewing their title, abstract/introduction and table of contents. They were either discarded or categorized as relevant based on this evaluation. The ones that was deemed relevant was further reviewed. At this stage snowball sampling was also utilized by inspecting the references in the reviewed literature to find additional relevant literature. The results were collected and categorized using EndNote. They are rendered in chapter three.

Most of the searches generated a lot of hits. In hindsight, some of the searches could have been done differently with more constraints to yield more narrow and relevant results. This may have made the process more efficient and precise and less time consuming. Specific databases could also have been utilized. However, the literature review gave the author a lot of interesting material and new knowledge. This enabled answering of RQ 1 and the further work with the thesis and analysis of the business model in the relevant context. There is no way to know for sure what information that might have been missed, but based on the extent of relevant information gathered,

the insight gained by the author and the findings related to RQ 1, the design and execution of the literature review is deemed successful.

2.2 Data collection

Data collection in this context refers to the method used for the collection of data (Bryman and Bell, 2011). The standard approach is to choose the method for data collection after the design has been determined. However, the research method is often confused and mixed with research design (Bryman and Bell, 2011). It was in the previous section presented that a case study research design was chosen for this study. According to Yin (2014) there is a set of methods suitable for this type of design: participant observations; direct observations; interviews; documentation, archival records and physical artefacts. For the research in this thesis, interviews and documentation has been utilized.

2.2.1 Interviews

Interviews are one of the most common and valuable sources of information in case studies (Yin, 2014). There are several different ways of conducting them and the choice depends on several factors like the number of interviewees and the information sought to obtain. According to Bryman and Bell (2011) semi-structured interviews or unstructured interviews are usually applied in qualitative research interviews. The research in this thesis is exploratory, and having and unstructured or semi-structured approach allows for the interviewee to elaborate on answers and for the interviewer to ask follow-up questions. Magnusson and Marecek (2015) underlines the importance of preparing and interview guide before the interview takes place. The main reason for this is to aid the interviewer's memory to ensure that every topic is covered in sufficient detail (Magnusson and Marecek, 2015). Considering this, the author chose a semi-structured approach to the interviews.

Three interviews were conducted with two informants employed at KMS. The first interview was carried out at their headquarters in Horten. The author was invited to a company visit for a full day at their facilities and had an informative interview. In addition, the author was given a tour of the production facilities and met other employees. For this interview session the logistics manager was the interviewee and it lasted for about 90 minutes. An interview guide prepared by the author was used as a guideline to cover the information that was sought to obtain. However, the interview was open-ended and developed like a conversation between the two parties. Thus, some new questions that was not prepared beforehand arose during the interview naturally. This was both follow-up questions that arose caused by the answers the informant gave to either clarify or inquire further, but also due to some aspects the author had not thought of beforehand. The possibility of doing this is one of the advantageous of conducting the interviews open-ended and in a semi-structured way (Bryman and Bell, 2011). Most of the questions where related to inquire about their business model related to circular economy. With the aim of

gaining sufficient information to map and analyze this model and all relevant aspects of it, so the research questions could be answered. The questions mainly concerned the motivation behind this strategy, the processes and parties involved and customers. In addition, more general questions about the informant, the company, competitors and the industry were asked.

The second interviewee was not present when the author visited the facilities. Thus, this interview was conducted two weeks later by telephone. The informant in this case was a project manager at KMS and the interview lasted approximately 60 minutes. Except for some minor adjustments, the same interview guide was used for this interview as well. Even though both informants are involved in the researched business model, they have different roles in the organization, and it was very insightful to get information and hear the thoughts and opinions of two different employees. Their answers complemented each other in a valuable way. The interview guide for these two interviews can be found attached in the appendix. A third interview with the project manager was conducted by telephone 8 weeks later. It was considered valuable to have an interview session at a later stage as questions arose during the creation of this thesis. This interview lasted for about 30 minutes and sought to inquire mainly about specific issues that have arose, clarification of ambiguities and verification of information and notions. In addition to the interviews there was contact by e-mail correspondence between the author and the interviewees. The information acquired from interview sessions will be presented as a case study in the empirical findings later in the thesis.

2.2.2 Documentation

The other method that has been used for data collection in this thesis has been documentation. Alongside interviews, this is another valuable source of information in case studies (Yin, 2014). It can be used to verify information from other sources and to increase knowledge on certain investigated aspects (Yin, 2014). The documentation reviewed in this study has either been provided by the informants at the case company or sought ought on the internet by the author. This concerns e-mail and telephone correspondence, presentational documents about the company and reports.

2.3 Data analysis

According to Yin (2014) the analysis of case studies is of the least developed aspects of doing case studies and there are few fixed formulas or tools to guide this stage in qualitative case study research. If often comes down to the researcher’s own style of empirical thinking, adequate presentation of evidence and consideration of alternative interpretations (Yin, 2014). This calls for an analytic strategy for the data analysis and such strategies can mitigate the potential analytic difficulties (Yin, 2014).

In *Case Study Research: Design and Methods* Yin (2014) stresses that the analytic strategies must cover the key research questions. The main objective in this thesis is to map, explore and analyze a company's business model. For such analysis it is deemed highly relevant to analyze the collected data by using a framework. Yin (2014) outlines four main strategies for analyzing data, of which developing case descriptions is one. This strategy involves organizing the case study data according to a descriptive framework (Yin, 2014), and it has been utilized in this thesis. Further, the framework itself or ideas for it should originate from the initial review of literature (Yin, 2014). The framework in question her is the *Circular business model canvas* developed by Lewandowski (2016). This framework was discovered by the author during the conducted literature review, which is congruent with the appropriate approach outlined by Yin (2014).

The collected data from the interviews was transcribed and thoroughly examined alongside the gathered documentation. Based on this a thorough case study of the company and the business model in question was developed and presented as the empirical findings in chapter four. Further, the mentioned framework by Lewandowski (2016) was used for analysis of the data. The business model was broken down into fundamental building blocks and analyzed. How this framework was utilized for data analysis will be additionally and more thoroughly described in chapter three and chapter five.

2.4 Research quality

The quality of research design can be evaluated according to certain logical tests since the research is supposed to represent a logical set of statements (Yin, 2014). Trustworthiness, credibility, confirmability and data dependability are four concepts for such test (Yin, 2014). Case study research can be considered a part of the larger body of empirical social research (Yin, 2014). Here, four tests are commonly used to determine the quality of research. Thus, for case study research the most relevant test are according to Yin (2014) construct validity, internal validity, external validity and reliability. For each test, Yin (2014) outlines some case study tactics and which phase of the research they are relevant for. To judge and establish the quality of the research in this thesis these tests and the corresponding tactics used will be described in the following sections.

2.4.1 Construct validity

Constructing validity centers around identifying correct operational measures for the concepts being studied and mainly relates to the data collection phase of case study research (Yin, 2014). The pitfall in this regard is that the collected data are based on the researcher's preconceived notions that are confirmed by subjective judgments (Yin, 2014). To avoid this and to construct validity, Yin (2014) presents three case study tactics; use multiple sources of evidence; establish chain of evidence; have key informants review draft case study report.

The data collection phase in this study used several sources of evidence. For the interviews, which constitutes the main body of collected data, two different informants employed at the case company were interviewed. As mentioned in 2.2.1, these employees had different roles in the organization, but they had both specific and highly relevant knowledge and information regarding the researched topics. Questioning both interviewees about the same inquiries in different interview sessions revealed congruence in the given information and thus aided in constructing validity. A third interview was also conducted with one of the interviewees to corroborate evidence and clarify ambiguities. In addition to the interviews, documentation was utilized as another source of evidence to both strengthen and compliment the gathered data from the interviews. The key informants have not reviewed the report in its entirety, but they have been consulted regarding key aspects in addition to correspondence throughout the work with this thesis. If the informants had been available to review the finished report this would have strengthened its validity. Also, additional interviews with other relevant informants in the organization or in the supply chain would have constructed a stronger validity. However, the author considers a sufficient level of validity has been constructed.

2.4.2 Internal validity

Internal validity seeks to establish a causal relationship between events that are not spurious relationships (Yin, 2014). This test and the tactics used mainly relates to the data analysis phase of the research. A common treat to internal validity is when a causal relationship between two events *x* and *y* are established and concluded upon, where in fact a third factor *z* not accounted for was involved and may have caused *y* instead of *x* (Yin, 2014). In such a case the research design has failed to address a treat to internal validity. However, internal validity is generally only a concern for casual and explanatory studies and not a concern for descriptive or exploratory studies (Yin, 2014). This case study, with the overall problem statement and main research question concerning the key words *explore, examine and analyze how,* are clearly of an exploratory nature. Thus, internal validity is of little relevance here and will not be addressed further.

2.4.3 External validity

This test concerns the issues regarding whether a study and its findings are generalizable beyond the study itself (Yin, 2014). According to Bryman and Bell (2011) the generalizability of case studies has received a great deal of discussion. The external validity relates to the research design phase and should start to be addressed at this stage (Yin, 2014). External validity in case study research relates directly to what Yin (2014) calls analytic generalization and for single-case studies the use of theory is important. Using theory or theoretical propositions can aid in generalizing the findings from a case study (Yin, 2014). Single-case studies are not appropriate to generalize across a larger population nor be representative for a broad number of other cases. Thus, this is not sought in this thesis. However, this case study pursues to shed empirical light on the researched theoretical concepts as per

the identified research gaps mentioned in chapter one. Though, the findings in this single-case study can not be argued to be directly transferable to other cases for other corporations, but at least some learning can be taken in similar cases as the transition towards circular economy is highly relevant and topical in the world of business. Since the analysis and findings are grounded in theory and theoretical concepts this increases the level of generalization. Also, RQ1 directly addresses to shed light on and clarification of theoretical concepts and together with the conducted literature review forms a basis for the further research. It can be argued that the findings for RQ1 and the review of literature can be viewed separately from the case study and thus has a higher level of generalizability.

As argued, there is to a certain extent transferability of the findings in this thesis for similar cases. The findings from RQ1 can on itself be informative and transferable, but also the findings from RQ 2 and 3 can provide valuable insight and learning. However, being a single-case study, this thesis will inherently have limited external validity.

2.4.4 Reliability

Reliability concerns the repeatability of the research. The aim of reliability is to minimize the errors and biases in a study (Yin, 2014). The research and its methods and procedures should be presented and described in a way that enables other researchers to conduct the same case study over again and arrive at the same results (Yin, 2014). The reliability mainly concerns the data collection phase of a case study (Yin, 2014). Documentation of the procedures in this regard is a key aspect to ensure reliability of the research. Yin (2014) suggest two tactics for the reliability test; use a case study protocol and develop a case study database.

The author did not develop a case study protocol to a level of detail and extent as described by Yin (2014). However, an interview guide was prepared and used for the interviews, and several of the aspects of a such protocol was covered including the theoretical framework for the case study, data collection plan and expectations, and procedures for protecting human subjects and confidential information. For transparency considerations and enabling reliability the interview guide can be found attached in the appendix. The interview guide was compiled in Norwegian as the interviews was conducted in Norwegian, and the guide attached in the appendix is a translated version of the original. The transcripts of the interviews are not given due to confidentiality and they were written in Norwegian. However, this is not considered to negatively affect reliability excessively as a comprehensive case study derived mainly from the interviews are presented in the empirical findings in chapter four. Also, the transcripts can be made available to researchers upon request after consent from the interviewees.

The other tactic for ensuring reliability, develop a case study database, has been conducted by the author. The database is stored electronically both locally and online

(cloud-storage), and contains all the data, transcripts, documents and information from the case study. Alongside the mentioned transcripts, this database can be made available for reliability and repeatability purposes.

The author has sought to provide transparency and the necessary information and documentation as described above so that the single-case study conducted in this thesis can be repeated. The author considers a sufficient level of reliability has been reached. However, replication of the study at a later stage will probably yield some differences in results and findings as the internal and external circumstances, and conditions in the case company will likely change over time.

3. Conceptual background

This chapter is based on the gathered information from the literature review that was conducted in the work with this thesis. It presents the topics and concepts deemed relevant in the context of this thesis and the connection between them. The terms corporate sustainability, shared value creation, circular economy, business models and sustainable and circular business models are presented and discussed based on relevant literature. Finally, a framework for circular business models, which is to be utilized for analysis of the case company's business model in chapter five, is presented. The main objective of this chapter is to answer RQ 1 and establish a theoretical foundation to enable further analysis by understanding of the concepts and their correlation. Several of the concepts and terms associated with sustainability in the business world have blurred boundaries, no consensus on definition and are used interchangeably (Strand et al., 2015). Thus, it is sought to provide clarity regarding what these concepts mean, their similarities, differences, how they are connected and relate to sustainability. I.e. this chapter seeks to answer RQ 1. Further, the intention is to present a comprehensive overview to the reader of the state-of-the-art academia on the researched and relevant topics in this thesis.

3.1 Corporate sustainability

In this section the concept of corporate sustainability (CS) is presented. This includes its emergence, how it is defined and general understanding of the term and its use. CS has increasingly gained attention and been researched in academia in recent years (Amini and Bienstock, 2014). Corporations are progressively committing to and applying the concept (Engert et al., 2016, Amini and Bienstock, 2014). Despite a wide acceptance regarding its main components, which will be discussed below, plenty of definitions exist and there is still confusion regarding what the concept fully entails and how to apply it (Engert et al., 2016, Hahn et al., 2015)

Sustainability, as seen in chapter one, can be understood by the term sustainable development. It is defined by the Brundtland Commission as: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). Further, sustainable development when incorporated by corporations, can be called corporate sustainability (Baumgartner et al., 2010).

Dyllick et al. (2002) applies the idea of sustainable development proposed by the Brundtland Commission to the business level with an understanding of corporate sustainability as meeting the needs of a firm's direct and indirect stakeholders, without compromising its ability to meet the needs of future stakeholders as well. In this context the stakeholders might be shareholders, employees, clients, pressure groups and communities etc. (Dyllick et al., 2002). To reach this goal, Dyllick et al. (2002) argues that companies must maintain and grow their social, economic and

environmental capital base while contributing to sustainability on a political level. Further, they identify three key elements of CS: 1. Integrating the economic, ecological and social aspects in a 'triple bottom line'; 2. Integrating the short-term and long-term aspects; 3. Consuming the income and not the capital. The triple bottom line (TBL) approach, integrating and addressing economic, ecological and social aspects, is considered paramount in sustainable development and CS (Amini and Bienstock, 2014, Morelli, 2011, Dyllick et al., 2002, Hahn et al., 2015).

There seems to be a broad consensus in academia regarding these three pillars of sustainable development and its relation to CS (Baumgartner et al., 2010, Engert et al., 2016, Hahn et al., 2015). Despite this, there is no unanimity on a clear definition (Hahn et al., 2015). However, there is recognition that alongside a focus on corporate growth and profitability, CS entails a pursue of societal goals related to sustainable development like environmental protection, social justice and equity (Hahn et al., 2015). For corporations to truly be sustainable they need to have a holistic perspective on all three dimensions and their interrelations and impact (Engert et al., 2016). However, Vildåsen et al. (2017) states that the inter-linkages between these dimensions are treated differently in literature. Whereas some view them as distinct elements, some cluster them. The social and environmental dimensions are often used interchangeably (Vildåsen et al., 2017). For companies to be successful in the long-run, they should aim at being sustainable by adopting this holistic approach (Amini and Bienstock, 2014, Baumgartner et al., 2010). Studies suggest a strong correlation between financial performance and CS orientation and performance (Ameer and Othman, 2012, Eccles et al., 2014). Corporations classified "high sustainability" companies and who apply superior sustainable practices significantly outperform those who do not, in the long-term (Eccles et al., 2014, Ameer and Othman, 2012). This supports the notion that the three pillars of sustainability are mutually reinforcing, and that the TBL approach will prevail in the long-run and improve the corporation's competitiveness and economic performance. Thus, even if the motivation is solely better economic performance and not to contribute to sustainable development, corporations can and should commit to CS and the TBL because of the evidence that this is a source to increased competitiveness and profits.

The economic dimension refers to generic aspects that leads to good sustainability and financial results for the company. These aspects are: innovation and technology, collaboration, knowledge management, processes, purchase and sustainability reporting (Baumgartner et al., 2010). Dyllick et al. (2002) refers to economically sustainable corporations as: *"Companies who guarantee at any time cashflow sufficient to ensure liquidity while producing a persistent above average return to their shareholders".* Further, the ecological dimension deals with the environmental impacts due to corporate activities (Baumgartner et al., 2010). Resource use, emissions, waste, impact on biodiversity and environmental aspects of products throughout its life cycle are the main contributors to environmental impact from

corporate activities (Baumgartner et al., 2010). For a company to be ecologically sustainable Dyllick et al. (2002) claims they can only consume natural resources at a rate below the development of substitutes or the natural reproduction. Further, that they do not engage in activities that degrades eco-systems or cause emissions that accumulate in the environment at a rate beyond what the natural systems can handle (Dyllick et al., 2002). For the last of the three dimensions, the social, is aimed at positively influencing all present and possible future relationships with stakeholders (Baumgartner et al., 2010). Socially sustainable companies positively influence communities where they operate (Dyllick et al., 2002).

Amini and Bienstock (2014) emphasizes the importance of equally prioritizing all three dimensions of sustainability. However, Hahn et al. (2015) argues that both in academia and practice the economic dimension often is prioritized over the two others. This approach to CS is called the instrumental logic (Hahn et al., 2015). This logic recognizes that there are financial gains to be made for corporations by addressing societal and environmental concerns, but situations when there is conflict between financial outcomes and the two other aspects are dismissed (Hahn et al., 2015). An opposing view is that firms should pursue all three aspects of sustainability equally and simultaneously. And that this is also the case when they appear contradictory (Hahn et al., 2015). This is called the integrative view and addresses that the possible tensions and conflicts between the aspects should be considered, but that it should not instantaneously lead to the economic dimension prevailing (Hahn et al., 2015). Vildåsen et al. (2017) revealed that the interrelationship between the dimensions of sustainability are often clustered, which can hinder assessment of their implications.

It exists several concepts and terminology concerning environmental and social aspects, sustainability and corporations, like corporate sustainability, corporate social responsibility (CSR) and environmental management. A common misconception is that CS is the exact same as corporate social responsibility (CSR) or simply mixing the two terms (Idowu et al., 2015). Some uses the terms as synonyms and others as completely distinct concepts (Strand et al., 2015). Montiel (2008) attempts to clarify the differences and congruences between the two terms in *Corporate Social Responsibility and Corporate Sustainability.* In practice, many firms use the terms interchangeably, but historically they have different origins (Montiel, 2008). Despite different beginnings the concepts are converging in terms of what the seek to achieve and how they are applied (Montiel, 2008). Though, when it comes to sustainable development, CS is considered the “ultimate goal” and more proactive by nature, whereas CSR constitutes and “intermediate state” and is more reactive by nature (Idowu et al., 2015).

3.2 Shared value creation

Shared value creation (SVC) is another concept that has emerged in the field of business with a clear connection to sustainability. It has been highly recognized and researched in literature and applied by practitioners. In this section the concept of shared value creation is presented. Its origin, description of the concept and connection to sustainability in the context of corporations will be discussed.

It is claimed that an emphasis on all three dimensions of sustainable development is paramount for corporations to thrive in the long-run, and that this will outperform short-term economic considerations in the short run, despite the conflicts between them and the difficulty to always align them (Amini and Bienstock, 2014, Hahn et al., 2015). However, many disregard this integrative view and let economic considerations prevail when there is incongruity between the dimensions (Hahn et al., 2015). Though, the holistic integrative view on CS is becoming increasingly recognized (Lewandowski, 2016), shared value creation emerged as a concept describing how corporations can simultaneously enhance its competitiveness and the societal conditions in communities (Porter and Kramer, 2011). Thus, seeking to dispel the notion that environmental and social considerations and prioritizations are conflicting and comes at the expense of corporation's economic considerations. Porter and Kramer (2011) underlines that shared value is not social responsibility or even merely sustainability, but a new way of achieving economic success.

The concept originates from 2006 when Porter and Kramer (2006) published the article *Strategy and Society: The Link Between Competitive Advantage and Corporate Social Responsibility.* Here, they criticized the current approaches to CSR and argued that they were fragmented and disconnected from strategy and business (Porter and Kramer, 2006). They introduced a framework for identifying the effects companies have on society, and to determine which and how to address them. This was a proposed alternative to the view of corporate success and social welfare as a zero-sum game (Porter and Kramer, 2006). However, it was not until 2011 when they published a follow-up that the concept was widely recognized. In *Creating Shared Value,* Porter and Kramer (2011) further developed the concept with a more detailed explanation and how to apply and achieve shared value creation. Though, the concept has received criticism regarding its practical applicability (Crane et al., 2014). Claims have been made that it is merely new branding of older theory and literature. Strand et al. (2015) claims SVC essentially is a restatement of stakeholder theory that can be traced back to Scandinavian origin.

A basic premise for the concept is that corporations must realize the potential in creating shared value. That is, the benefits of creating economic value in a way that also creates value for society (Porter and Kramer, 2011). They argue that corporations view value creation to narrowly, mainly aimed at improving short term financial performance, when they should aim at expanding the total pool of societal

and economic value (Porter and Kramer, 2011). This claim has been corroborated in studies showing the benefits and increased performance of focusing on sustainability aspects besides financials (Eccles et al., 2014, Ameer and Othman, 2012). To create shared value, Porter and Kramer (2011) proposes three aspects for corporations to consider:

1. Reconceiving products and markets.
   This concerns corporation's considerations regarding whether their products are good for their customers or for their customer's customers. Companies should identify what are or could be embodied in in their products when it comes to possible harms, benefits and societal needs. An exploration in this context and improvement of societal value of products, will lead to new opportunities in traditional markets and recognition of previously overlooked potential in new markets.

2. Redefining productivity in the value chain.
   This aspect addresses how shared value can be created in terms of the value chain being more efficient and productive by being more sustainable. Considering that efforts in improved environmental and societal performance can lead to cost savings by better resource utilization, quality and process efficiency through innovations and new technology.

3. Enabling local cluster development.
   As clusters play crucial role in driving competitiveness, innovation and productivity, cluster development is paramount and should be prioritized. The logic here further relies on the notion that success of a local cluster is connected to the communities' success.

Shared value creation is evidently closely linked to sustainable development. It can be viewed as an approach to CS, and an alternative to the traditional means presented in the previous section. The common goal is for corporations to be competitive and thrive economically while at the same time contribute to sustainability for society and the environment. However, whereas the traditional integrative approach to CS aims at enhancing the three pillars of sustainable development and balancing the trade-offs between them, SVC seeks to expand the total pool of economic and societal value (Porter and Kramer, 2011). Thus, SVC aims to increase the total value for all stakeholders without accepting that this entails trade-offs between parties or dimensions. Although, much of the criticism towards the shared value proposition has been that the concept ignores the inherent tensions in responsible business activities (Camilleri, 2017). Porter and Kramer (2011) also emphasize that to create shared value, corporations must integrate their environmental and societal endeavors and activities with their business strategy. This kind of integration and thinking differs to some extent from the traditional view of CS and takes it one step further.

3.3 Circular economy

Circular economy (CE) is yet another concept in the field of business that aims at contributing to sustainability and addressing how society can undertake resource scarcity, consumption of nonrenewable resources and how to preserve our planet. CE has gained increased interest in academia and a growing number of businesses is applying the concept (Lieder et al., 2017, Masi et al., 2017), and it has started to be integrated in the CS agenda of corporations (Stewart and Niero, 2018). This section will provide an introduction to the concept of circular economy and its relation to CS and sustainable development according to RQ 1. It will partly be based on the findings from the author's project thesis *How shifting to circular economy affects the supply chain: A literature review and case study (Dybvig, 2017)*.

CE has emerged as an opposing view and alternative to the traditional view on the economy where production and consumption are linear. Historically, the linear economy has centered around mining of minerals for production of products, and consumption of the products before they are discarded and thrown away. The concept of CE has surfaced in the context of the increased attention to sustainable development and sustainability recent years. It is by many viewed as a solution to address sustainable development (Geissdoerfer et al., 2018). Since it has become evident that the historical and still currently most widespread view on the economy as linear is not sustainable, there has been a call for a new approach and more sustainable business models (Weetman, 2016).

To understand CE a commonly used comparison is to compare CE to the life cycles found in nature; where one species' waste is another's food. This implies that what people often considers to be waste may actually be resources which can be utilized in different ways (Weetman, 2016). Essentially, instead of the linear production and consumption and a "take, make, dispose" mentality, the CE aims at circularity and closing production systems where resources are kept in a loop of production and usage (Urbinati et al., 2017). The material flow of a linear economy and CE is illustrated in figure 2.

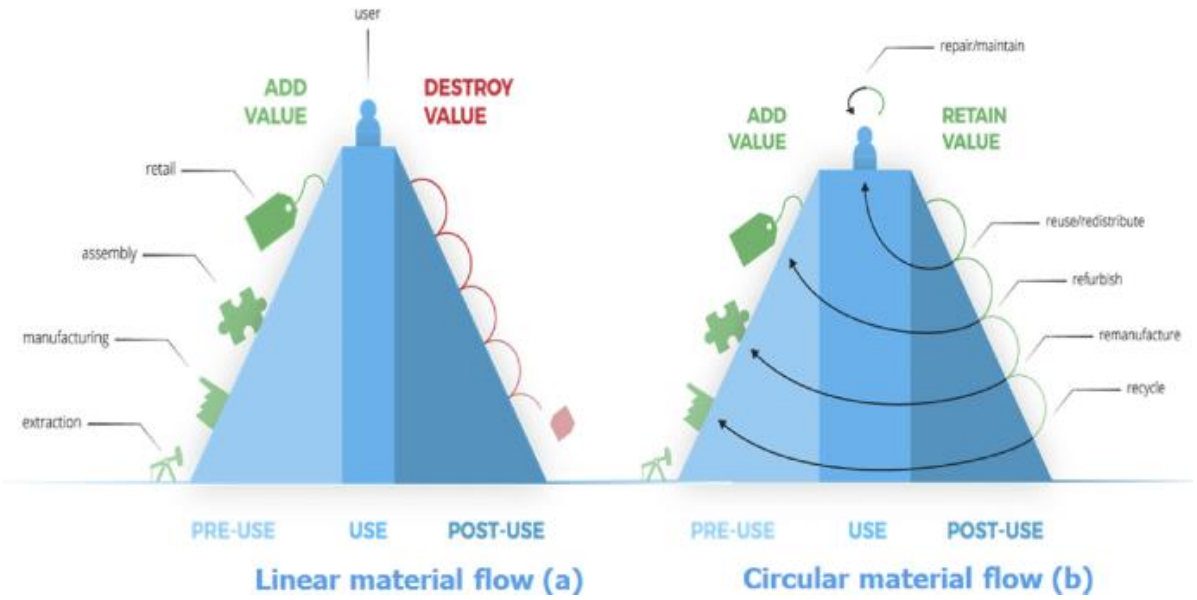

Figure 2: Linear material flow vs circular material flow. Source: Fischer and Pascucci (2017)

In *A Circular Economy Handbook for Business and Supply Chains,* Weetman (2016) describes four principles for a circular economy cycle:

1. Waste = food: There is no such thing as waste in living systems. By redesigning products so they can be disassembled or reused at the end of life we can reduce waste, or even design out waste. By doing this products and materials are kept at their highest possible value at all times.
2. Building resilience through diversity: Companies, nations and economic systems can use diversity to build resilience and resources.
3. Use renewable energy: In a circular economy many actors work together, while everything is increasingly powered by renewable energy to create efficient flows of materials and information.
4. Think in systems: Create opportunities for planet, people and profit by looking at the connection between ideas, people and places.

An important actor in the development of the circular economy is the Ellen MacArthur Foundation (EMF). This foundation aims to accelerate the transition to circular economy in businesses worldwide. EMF emphasizes that the circular economy does not just aim at reducing the negative impacts of the linear economy, but represent a systematic shift to build resilience, provide environmental and social benefits, and generate economic and business opportunities (Ellen MacArthur Foundation, 2012). It can be observed from this a clear resemblance and similarities to the sustainable development in general and the concepts of CS and SVC. The foundation describes four building blocks for the circular economy (Ellen MacArthur Foundation, 2012):

1. Circular economy design: To enable product recycling, reuse and cascading, system and product design needs a different approach than the current one. They point out focus areas like standardized or modular components and material selection. In the design process the aim should be easy end-of-life reuse, durability, separation or sorting of products and materials, and to look for new potential uses and by-products for “waste”.
2. New, innovative business models to replace existing ones or seize new opportunities: To help drive circularity into the mainstream, major companies can and should use their scale and vertical integration. Brand leaders can assist in accelerating the circular economy transition by leading by example and inspire others.
3. Reverse cycles: With the return of used materials to the soil or back into production systems and new material and product cascades, new approaches are needed. Some of the elements here are storage, risk management, logistics, power generation and molecular biology. To support a circular design there must be systems for effective and efficient collection, sorting, treatment and segmentation of end-of-life products.
4. Enablers and favorable system conditions: Educational institutions, policymakers and popular-opinion leaders need to support new or revised market mechanisms. As these mechanisms can encourage a widespread reuse of materials and higher resource productivity.

The EMF is considered one of the pioneers in the field of CE, but as a relatively new and developing concept there are numerous definitions and conceptualizations. The CE means different things to different people (Kirchherr et al., 2017). In *Conceptualizing the Circular Economy,* Kirchherr et al. (2017) investigated a total of 95 definitions to the CE. As with many other terms and concepts in the context of sustainability, as seen in the previous sections, there is a lack of consensus on a clear conceptualization and a sense of fuzziness regarding the concepts. Such unclarity and blurriness can be raised as a criticism towards concepts (Kirchherr et al., 2017). If there are various understandings of a concept this may lead to its collapse or remaining in deadlock due to the permanent conceptual contention (Kirchherr et al., 2017). Thus, a broad consensus both in academia and by practitioners on what the CE is and entails is important. In their conceptualization of the CE, Kirchherr et al. (2017) investigated its core principles, aims and enablers. They found that in their sample of 114 scientific articles on CE featured 95 different definitions (Kirchherr et al., 2017). Of these, the most prevalent definition was the CE definition provided by the EMF, which was found in 12 of the articles. This is supported by Geissdoerfer et al. (2017) who claims that the EMF definition is the most prominently used in academia. Their definition is: (Ellen MacArthur Foundation, 2012):

> *"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."*

As for the core principles of the CE, Kirchherr et al. (2017) distinguishes between those relating to the R frameworks and the systems perspective. Literature on the latter argue that instead of incremental changes to the current system, CE requires a fundamental shift. Further, that the transition to CE has to occur at the macro, meso and micro level of the CE system (Kirchherr et al., 2017). The micro level generally considers products, individual corporations and customers. The meso level often concerns eco-industrial parks as systems, and the macro perspective addresses the need for adjustment of the entire economy and industrial composition (Kirchherr et al., 2017). Whereas some definitions focus on certain system levels, Linder et al. (2017) promotes a holistic view where fundamental changes at all three levels simultaneously is required for a transition to CE.

Next to the systems perspective view, the R frameworks are considered key in the CE and constituting its core principles (Kirchherr et al., 2017). The reason for "frameworks" in plural is due to the number of different key terms that are used and how they are defined. This again adds to the confusion, lack of clarity and fuzziness of the concept. The R frameworks are considered the "how to" of CE and thus its core principles (Kirchherr et al., 2017). In literature, 3R, 4R, 6R and 9R can be found (Van Buren et al., 2016, Sihvonen and Ritola, 2015, Ghisellini et al., 2016). Though, 3R and 4R are most prominent (Kirchherr et al., 2017). The components of the frameworks, the Rs, are also used differently. Recycle, reuse, repair, refurbish, remanufacture, reduce, recover, rethink, refuse are some of the Rs found in various frameworks (Kirchherr et al., 2017). However, the 3R framework consisting of reduce, reuse and recycling are the most prevailing (Kirchherr et al., 2017). It is important to note that each of these three components may include some of the other Rs mentioned above. The 3Rs reducing, reusing and recycling does not count out others like repair or remanufacture. For instance, reusing often entails repairing and/or refurbishing, and recycling may involve remanufacturing.

A goal of the CE is closing the loop of material flow where no waste is generated and all output is the input of something else (Merli et al., 2018). This is a fundamental shift a big leap from the linear economy. However, there is an "intermediate" step between the two. This is often referred to as the recycling economy or the economy with feedback loops (Van Buren et al., 2016). It differs from the CE in the way that the recycling economy still involves input of raw materials and generation of residual waste. The linear economy, economy with feedback loops and the CE are depicted in figure 3, illustrating their characteristics and differences.

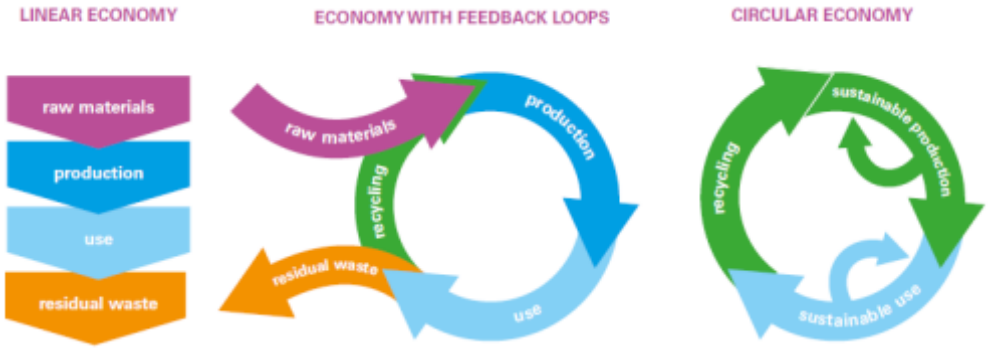

Figure 3: The linear economy, economy with feedback loops and circular economy. Source: Van Buren et al. (2016)

Scholars argue that the aim should be a complete transition to a circular economy, not incremental changes to the current system (Kirchherr et al., 2017). However, completely closing the loop of material flow might not be feasible for many companies at present time. Thus, a recycle economy can be an option for some as an intermediate state, or at least a step towards the CE and away from the linear. Though, this can be contradictory to the views that a fundamental shift towards CE is necessary.

Lieder and Rashid (2016) argues that environmental considerations are the most profound in discussions on CE. However, the findings of Kirchherr et al. (2017) supports the general notion of economic prosperity being the first and foremost aim of CE. Though in a sustainable manner (Ellen MacArthur Foundation, 2012). This is coinciding with the principles of SVC. CE have a very clear connection to sustainability, as it is viewed by many as the way to approach sustainable development and hence to achieve CS (Geissdoerfer et al., 2018). Genovese et al. (2017) found that integration of circular economy principles provides a profound effect on environmental aspects. The main objective of CE is sustainable development (Ghisellini et al., 2016, Kirchherr et al., 2017). Thus, CE can be viewed as a tool, approach or a strategy to use for achieving sustainability for corporations. This is similar to how SVC relates to CS and sustainable development. However, scholars argue that CE mainly focuses on economic prosperity and environmental quality, neglecting the social dimension (Murray et al., 2017, Kirchherr et al., 2017). Thus, it does not address all three pillars of sustainable development in a sufficient manner. The lack of direct consideration of the social dimension in CE is fundamental difference from the SVC concept. By this, it can be argued that to fully achieve CS and an excellent performance across all three pillars of sustainability, considering and exploiting both the concept of SVC and CE can be favorable.

The Ellen MacArthur Foundation (2012) highlights the need for new innovative and sustainable business models as an important necessity for the CE and enabler for the transition to CE. This is supported by many scholars and there has been a call for

novel business models in this context (Antikainen and Valkokari, 2016, Kopnina et al., 2015, Kirchherr et al., 2017, Geissdoerfer et al., 2018, Heyes et al., 2018, Urbinati et al., 2017, Lewandowski, 2016). Lewandowski (2016) claims there is unity in literature on the view that circular business models are the core of CE. Thus, CE is highly interconnected with business models, and further with CS and sustainable development as argued previously. Despite the consonance regarding the importance of sustainable business models for the CE and CS and the connection between them, Lieder and Rashid (2016) found a lack of discussion on business models in the context of CE. However, the author observe that this field of research has gained attention with many publications on the theme since Lieder and Rashid's article, with Antikainen and Valkokari (2016), Geissdoerfer et al. (2018), Heyes et al. (2018), Manninen et al. (2018), Urbinati et al. (2017), and Lewandowski (2016) for instance. Sustainable business models will be further presented in the following section.

3.4 Business models

In this section a general presentation of the concept of business models will be given. Further, emphasis will be on sustainable and circular business models and its connection to CE, CS and sustainable development in accordance with RQ 1. The concept of business models has been well-documented in academia since the beginning of the 1990s. Though, it has been practiced in business and trade since long before that (Zott et al., 2011).

3.4.1 The concept of business models

It can be argued that business models are a well-known term even outside business and academia for non-practitioners and "regular" people. Further, most have a notion of what the concept means. However, scholars do not agree on what a BM is and despite several explicit definitions there is no consensus on a clear definition (Zott et al., 2011). This seem to be a recurrent phenomenon, as we have seen with the other concepts presented in this chapter. Also, business models are often researched without a distinct definition of the concept (Zott et al., 2011). Despite the lack of consensus there are some recurring components like value proposition, revenue streams, customers and partners (Zott et al., 2011, Lewandowski, 2016). In *The Business Model: Recent Developments and Future Research,* Zott et al. (2011) describes four conceptual themes emerging, in their literature review:

1. The BM is a unit of analysis that is distinct from the product, firm, network or industry. Its boundaries are wide, but it is centered around a focal firm.
2. BM represent a description of how firms "do business" with a holistic approach on a system-level.
3. The activities of the focal firm and its partners are key elements in business models.
4. BMs intend to describe how value is created and captured.

Zott et al. (2011) accentuate that the findings of these recurring themes could act as a foundation for further and more unified research on BMs. In literature, many characteristics has been used to describe the BM. A statement, representation, description, conceptual tool or model, framework and a method are some of the words the BM has been referred to as (Zott et al., 2011). Johnson et al. (2008) argues that a BM consists of the four elements value proposition, profit formula, key resources and key processes, and when they are taken together create and deliver value. Of these, customer value proposition is the most important (Johnson et al., 2008). Teece (2010) also connects the BM to a customer value proposition, claiming *"a business model articulates the logic, the data and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value"*. While Chesbrough and Rosenbloom (2002) refers to the BM as realization of economic value through technical potential connected by a heuristic logic. As stated initially, creating and offering value is recurring in these definitions. *"Value creation is at the heart of any business model"* (Bocken et al., 2014). By this, it is evidently a resemblance and connection between business models and the concept of SVC, with the focus on value creation in both. However, while for instance Chesbrough and Rosenbloom (2002) definition is mainly concerned about creating economic value for the firm, shared value creation seeks to create economic value in a way that simultaneously also creates societal value. As we will see in the next section, sustainable business models are even more connected to SVC, as it also addresses the social and environmental aspect of value creation.

Casadesus-Masanell and Ricart (2010) links the BM to strategy, claiming it reflects the firm's realized strategy. Barquet et al. (2013) supports this and further states that strategy guides companies in defining their BM and thus it is a driver for creation of BMs. Morris et al. (2005) also associate strategy with BMs. They define a BM as: "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). Thus, also linking the BM to creation of competitive advantage. They further argue that a BM consists of six fundamental components (Morris et al., 2005). Though, the two terms BM and strategy are often mixed and used interchangeably, they are not the same. The BM describes how the firm's different activities are combined to execute the strategy (Zott et al., 2011). This is consistent with the view of Casadesus-Masanell and Ricart (2010) on BMs.

According to Osterwalder et al. (2010), a business model *"describes the rational for how an organization creates, delivers and capture value".* As Morris et al. (2005) and Johnson et al. (2008), Osterwalder et al. (2010) relates the BM to consisting of some fundamental components, claiming the BM consists of nine basic building blocks that show the logic of how a company intends to make money. These are: Customer segments, value proposition, channels, customer relationships, revenue streams, key

resources, key activities, key partnerships and cost structure (Osterwalder et al., 2010). The chosen framework for analyzing the case company's business model in this thesis is based on the Osterwalder et al. (2010) definition of BM and the building blocks. Thus, this is the chosen conceptualization of the concept in this thesis. Also, the author finds the definition recognizable and precise. The framework will be presented below in section 3.5.

3.4.2 Sustainable and circular business models

As we have seen previously in this chapter there has been an increased focus in recent years on sustainable development and sustainability in the corporate world. This is also made evident in the field of business models with the concept of sustainable business models. Essentially, SBMs considers the corporation's environmental and social effects and aspects as an integrated part of the BM (Bocken et al., 2013). Sustainable business models can be defined as BMs that create competitive advantage through superior customer value while contributing to sustainable development of the company and society (Bocken et al., 2013). We can observe a clear resemblance and common features with SVC here. Innovations and redesigning of business models to make them sustainable are key to create greater social and environmental value while at the same achieving economic growth (Bocken et al., 2013). Thus, SBMs are highly interconnected with the three pillars of sustainable development and achieving corporate sustainability, and as we saw in 3.3 they are necessary and important enabler of CE. By this, we observe that these concepts are highly interrelated, as per the query in RQ 1. In addition to society and the environment, Bocken et al. (2013) describes customers, investors and shareholders, employees and suppliers and partners as the six main stakeholder types for SBMs.

In the context of SBMs it is necessary to consider the concept of business model innovation (BMI). To create new sustainable business models or developing existing ones to become sustainable, innovations in regards to BMs is essential (Bocken et al., 2014). Further, it is argued by scholars that BMI is key to general business performance and competitiveness (Zott et al., 2011, Chesbrough, 2010). In the context of sustainability, Bocken et al. (2014) defines BMI as:

> *"Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organization and its value-network create, deliver and capture value or change their value proposition.*

They further argue that to foster sustainable development, innovations must introduce change at the core of the business (Bocken et al., 2014). It is necessary to note that innovations for SBMs may not be economically prosperous at the beginning, but that it will be in the long run (Bocken et al., 2014). Managers should not be discouraged by the possibility of negative economic effects in the short-run as

studies have shown that commitment to sustainability will be superior in the long-run (Ameer and Othman, 2012, Eccles et al., 2014). The focus should be on maximizing societal and economic benefits, rather than solely economic gain (Bocken et al., 2014). This is consistent with and similar to the integrative view of CS and SVC. Further, it supports the notion of Hahn et al. (2015), Amini and Bienstock (2014) and Porter and Kramer (2011) and has been corroborated in the studies mention above, that a holistic approach on sustainable development will outperform short-term economic focus in the long-run.

To contribute in building up SBMs Bocken et al. (2014) describe groupings of mechanisms and solution in a categorization of SBM archetypes. These eight archetypes are grouped as either technological, social or organizational and they are depicted in Table 1.

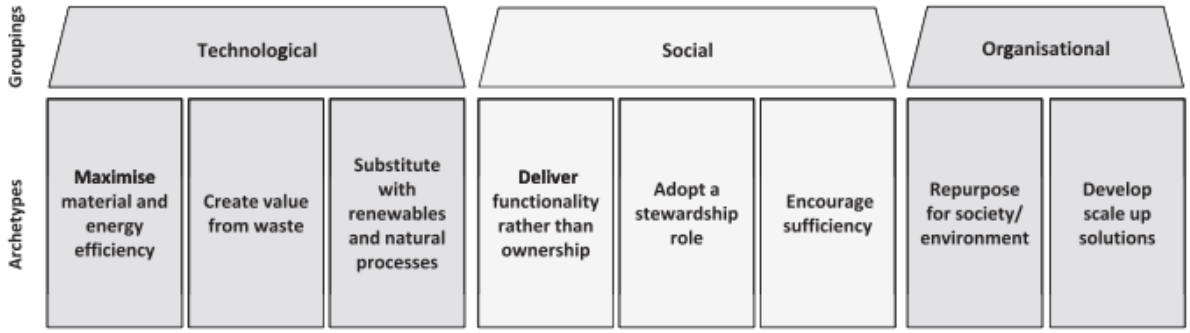

Table 1: The sustainable business model archetypes. Source: Bocken et al. (2014)

The technological group consist of SBMs with a dominant technical innovation component, for instance regarding the manufacturing process (Bocken et al., 2014). Whereas the social and organizational grouping have profound innovations regarding their respective aspects. According to Bocken et al. (2014), these archetypes can assist in making BMs sustainable which further can be a source of competitive advantage.

The link between CE, CS and sustainable development has been made evident throughout this chapter. With the main goal of CE being sustainable development, and by many viewed as the best way to approach sustainability (Geissdoerfer et al., 2018, Kirchherr et al., 2017, Ghisellini et al., 2016). The role of BMs in CE was also elaborated. SBMs are very important in a transition to and as enabler of CE (Ellen MacArthur Foundation, 2012, Antikainen and Valkokari, 2016, Geissdoerfer et al., 2018, Urbinati et al., 2017). In the context of circular economy these BMs are often referred to as circular BMs or sustainable circular BMs. Thus, a circular BM can be viewed as a type of sustainable business model. According to Antikainen and Valkokari (2016), SBMs and circular BMs are closely related literature streams. Lewandowski (2016) states there is a broad notion among scholars that the circular business model is at the core of CE.

In *The Circular Economy,* Stahel (2016) classifies circular economy business models into two groups: Those that utilize recycling of materials to turn old products into as-new resources, and those that foster upgrades, repair, retrofits, reuse and remanufacturing to extend service life. Both models imply a shift towards a service-oriented economy, i.e. shifting to towards selling services instead of goods (Lieder and Rashid, 2016). According to Urbinati et al. (2017), companies who seek to become sustainable and circular can either adopt existing BMs or create new ones. Which alterations to the current BM or how the new should be depends on the level of circularity that is sought (Urbinati et al., 2017). However, completely closing the loop of material flow may not be feasible or realistic in the near future for many corporations for many reasons. Thus, many initially aim for partially closing material flows and transition towards becoming fully circular. The willingness to become circular and applying CE principles, and the level of circularity adopted mainly depends on the commitment and will of the company and its decision makers (Urbinati et al., 2017). Urbinati et al. (2017) suggest four modes of adoption of CE based on the level of circularity and the principles that are utilized. According to them, a company can either be linear, upstream circular, downstream circular or fully circular based on the implementation of circularity concepts in the value proposition to customers and their internal activities and relationship with suppliers (Urbinati et al., 2017). Further, that a circular BM should base on shifting towards a renewable energy system, increase the adoption of sustainable production practices, reduce dependency of virgin materials and adjusting the value chain (Urbinati et al., 2017).

In *Circular Business Model Innovation: Inherent Uncertainties,* Linder and Williander (2017) defines a circular business model as:

> *"A business model in which the conceptual logic for value creation is based on utilizing economic value retained in products after use in the production of new offerings."*

This implies reverse flow of resources from the users to producers. Linder and Williander (2017) claims a circular BM always involves recycling, remanufacturing, reuse or one of their sibling activities like repair and refurbish. Different from Urbinati et al. (2017), Linder and Williander (2017) defines the level of circularity in the BM on the fraction of new products that come from used products.

Sustainable and circular business models are evidently key in value creation, CE, CS and sustainable development. These concepts and terms are highly interconnected and interdependent as we have seen throughout this chapter. The R's of CE are core principles that can be utilized in a circular BM for a corporation to become sustainable and enhance profitability and competitiveness. RQ1 is by this and the presentation of the concepts and argumentation throughout this chapter considered addressed and answered.

3.5 Framework for sustainable business models

Scholars have stressed the need for novel SBMs in the context of CE, CS and sustainable development (Antikainen and Valkokari, 2016, Kopnina et al., 2015, Kirchherr et al., 2017, Geissdoerfer et al., 2018, Heyes et al., 2018, Urbinati et al., 2017, Lewandowski, 2016). This requires innovation for new BM or adjusting existing ones. BMs describe how a company intends to create, delivers and capture value (Osterwalder et al., 2010). Thus, they are at the core of any business and a source of competitive advantage. Innovating, improving and adjusting the BM can hence bring significant advantages. In this context it is useful to describe, break down, assess and analyze BMs. Frameworks are an effective tool to utilize in this regard (Osterwalder et al., 2010). A breaking down and mapping of a BM may also be valuable to assess its performance, identify competitive advantages and areas to improve. In this section a framework for circular business models will be presented. As seen in the previous section, circular business models can be viewed as a type of sustainable business models. This framework will be used to explore, map and analyze the case company's circular business model in chapter five.

It exists several BM frameworks in academia (Lewandowski, 2016, Morioka and de Carvalho, 2016, Antikainen and Valkokari, 2016, Witjes and Lozano, 2016, Bocken et al., 2014). The different frameworks are based on different definitions and components and vary in terms of intention for use. The various frameworks will not be presented here, only the one chosen for further use in this thesis. Of the variety of frameworks the author has reviewed, the circular business model canvas by Lewandowski (2016) is deemed the most relevant in the context of the problem statement, RQs and the case company in this thesis.

Lewandowski's framework is based on the business model canvas by Osterwalder et al. (2010). The business model canvas consists of nine basic building blocks that shows the logic of how a company intends to make money. It is based on the definition that a BM *"describes the rational for how an organization creates, delivers and capture value"* (Osterwalder et al., 2010). The business model canvas is a well-recognized and applied framework for BMs (Lewandowski, 2016). It has been developed by several scholars for different purposes. Barquet et al. (2013) developed the framework to support the adoption of product-service systems. Whereas Nilsson and Söderberg (2015) adjusted the framework to evaluate the BM differences in the urban mining industry.

The business model canvas by Osterwalder et al. (2010) consists of the following building blocks: value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure. Each of these will be further explained below. Lewandowski (2016) recognized the need for further development of the framework to fit in the context of CE and sustainability. According to him, there are very few if any studies that cover in

a comprehensive manner how a circular business model framework should look. Further, that no studies have sufficiently answered how the principles of CE can be applied to a business model and what components it should consist of (Lewandowski, 2016). As the circular BM canvas seeks to answer this, it is deemed very relevant in the context of the problem statement and RQ 2 in this thesis.

Lewandowski (2016) conducted a narrative conceptual review to identify which components are needed for a circular BM and how the principles of CE can be applied to a BM. He identified two additional components for the circular business model. These were take-back systems and adoption factors (Lewandowski, 2016). With these two additional components, the circular business model canvas consists of 11 building blocks. In addition to adding the two extra components, all 11 building blocks should be identified, evaluated and analyzed in the context of CE (Lewandowski, 2016). The building blocks in the circular business model canvas are (Lewandowski, 2016):

1. **Value proposition.**
   This is the core component of the BM. It seeks to solve customers' problems and satisfy their needs with offering value in the form of a product, product related service or service. The value proposition should offer value to the customer that is either different, superior or at a lower cost than competitors' offers. It is important to note that value for the customer often goes beyond the specific product or service itself. I.e. for instance, delivery method and time or after-sale service possibilities can be value adding for the customer and thus part of the value proposition. Circular products utilize maintenance, repair, refurbishing, redistribution, upgrading and reselling to enable product-life extension. Products should be designed in a way such that reusing, recycling and cascading is possible and fostered. This implies that modular design of products should be promoted and choosing materials that allow reusing, cascading, remanufacturing, recycling or safe disposal. Further, in a CE, products should be designed to use less raw materials or energy to reduce emissions, and they can be offered as product-service systems. The latter entails that the company offers value in form of access to a product while they retain ownership. Thus, customers become users and they can rent, lease or pool products instead of buying. This may be preferred by some and hence provides added value for the customer. Often the value proposition contains incentives for customers in by-back programs or take-bake systems which can also be value adding.

2. **Customer segments.**
   Customers are the ones companies create and offers value to. It is crucial that the value proposition is desirable and fitted for a particular customer segment. Thus, customer segments are closely linked to the value proposition, and alignment of the value proposition and the customer segments' needs are

paramount in any BM. The segments are the different groups of customers that the company seeks to offer value to. Understanding the needs of different customer segments is essential and they can be grouped according to common features, needs, expectations and behavior.

3. **Channels.**
   This concerns which channels a company uses to communicate, deliver and sell their value propositions to different customer segments. In a CE context such channels can be virtual. A company can offer a virtualized value proposition, like digital products, and deliver it virtually. Or they can sell material products via virtual channels such as online sales/website. The communication with customers can also be done virtually using e-mail, web advertisements and social media.

4. **Customer relationships.**
   This building block relates to the relationship the company has with its customers. It can be considered on an individual basis or the relationship with different segments or their entire customer base in general. What kind of interaction and cooperation companies have with their customers, the level of trust or simply if the relationship is considered good and prosperous or bad, are relevant aspects here. Relationships can be tight and personal or very spaced. Having a close relationship is advantageous in CE in terms on eliminating waste, only producing what is necessary and what the customer wants. Applying CE principles as recycling and reuse may also be beneficial in marketing strategy and reinforce and foster relationships with actors that are concerned with sustainable development.

5. **Revenue streams.**
   Revenue streams concern how corporations capture value and the way they make money. I.e. the cash they generate from customers as payment for the value proposition. The various customer segments might have different revenue streams in terms of strategies and systems. In a CE there is several possible revenue stream configurations. These are mainly associated with product-service systems. For instance, revenue streams can be oriented towards subscription-based renting or pay per use. This building block may also be related to the value retrieved from collected products. Which is a type of revenue stream as the products can be resold after repair, refurbishing and/or remanufacturing.

6. **Key resources.**
   This building block involves the assets that are required to create, offer and deliver the value propositions. Further, the key resources that are necessary in their channels to receive the revenue generated from the value proposition and maintaining and developing relationships. Thus, essentially all the key

resources required for the BM to function. The key resources relate to CE mainly regarding input choices and regenerating and restoring natural capital. The latter concerns sustainable efforts like saving water, using renewable energy sources, choosing sustainable production locations and land restoration. The input choices relate to changing input materials and components. The input can be obtained from circular material flows or substituted with better performing and more environmentally friendly materials.

7. **Key activities.**
   This is the activities required to which directly or indirectly lead to creating, offering and delivering the value proposition. I.e. the activities necessary for the BM to function. CE principles are very relevant for this building block in terms of increasing performance, product design, technology exchange, repairing, remanufacturing and recycling. Increased performance can come from technology changes and equipment modification, better process control and good housekeeping of processes. As mentioned in the first building block appropriate product design is important in CE. This enables extending product-life, circulation of the product and material, reducing or eliminating waste, less raw-material and energy consumption and reducing emissions. When remanufacturing, repairing or recycling are an important part of the BM it is a key activity.

8. **Key partnerships.**
   Key partnerships constitute the corporation's network of suppliers and other collaborating partners that are directly or indirectly part of the BM and how value is created, offered and delivered. Cooperative networks are an important part of obtaining key resources and performing key activities. Most companies and their BMs rely on partners, whether it is to supply resources, deliver products or support production processes, research or financial functions. Building partnerships and alliances are becoming increasingly important in the highly competitive world of global business to create and maintaining competitive advantages and offering desirable value propositions. Key partnerships are even more important in a transition to a CE, as achieving circularity requires collaboration between actors. Further, the more circular the partners in the supply and value chain are, the more circular the economy is.

9. **Cost structure.**
   This building block is closely related to the revenue streams and together they describe how value is captured in a BM. The cost structure illustrates the cost associated with the creation, offering and delivering of value. Changes to the cost structure might stimulate more circular changes to the business model, as it might entail changing materials, production processes and ways energy consumption.

10. **Take-back system.**
    The take-back system includes the channels and customer relations required for the reverse flow of product and materials back from customers to the company. Looping of materials and resources are the core idea of CE and for this to be feasible value must be collected from the customer by a system involving reverse logistics. A take-back system is an essential building block in a circular BM. As reusing, repairing, refurbishing, remanufacturing and recycling to resell, requires collection of materials prior to their application. Management of the system and incentives for return and collection are important aspects of take-back systems. Reverse logistics in such systems, might require different customer relations, channels and partners than the forwards logistics of the BM.

11. **Adoption factors.**
    The final building block of the circular BM canvas relates to the organizational capabilities and external factors which supports the transition towards a circular BM and application of CE principles. Corporations must anticipate and counteract the various reasons for a circular BM to be rejected. The internal factors involve the capabilities of a corporation for a shift towards a circular BM. These factors might concern intangible resources like organizational culture, transition procedures, knowledge and team motivation. Consequently, change management, team building, developing human resources and different tools and methods of BM design and innovation, are important drivers and enablers of the internal capabilities. The external factors involve economic, political, sociocultural and technological issues.

Together, these 11 building blocks constitute a framework for a circular business model. Figure 4 presents how these components are put together in a system in the circular BM canvas.

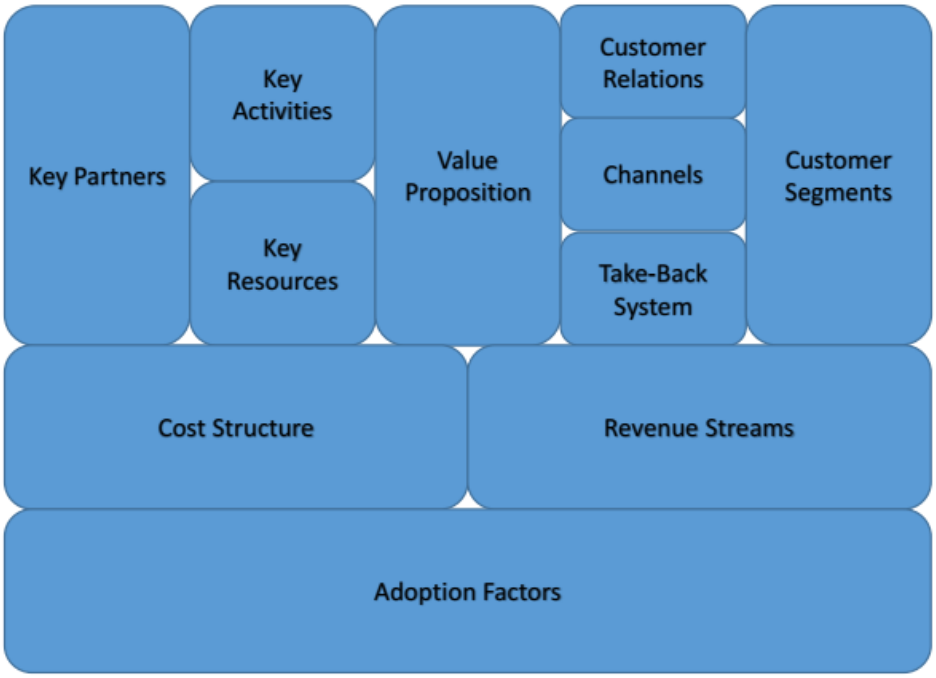

Figure 4: The circular BM canvas. Adapted from: Lewandowski (2016)

Apart from the adoption factors, which concerns internal capabilities and external factors, all building blocks can be grouped according to the three keywords of the BM definition by Osterwalder et al. (2010); create, deliver and capture value. This grouping is illustrated in Figure 4. The value proposition, key resources, key activities and key partners relates to how value is created. Value is delivered through customer segments, channels, take-back systems and customer relationships. And value is captured by the corporation's revenue streams and cost structure. All 11 building blocks of the BM are interconnected and should fit each other. However, some components are more closely linked, and some fits are more important. These particular fits are considered key success factors for a BM and for a transition towards a circular BM (Lewandowski, 2016). Lewandowski (2016) refers to this as the triple fit challenge. The value proposition, including the take-back systems, must fit the customer segments. Secondly, the cost structure must fit the revenue streams, and the BM should indicate profit possibilities. Lastly, there should be a fit between the implemented changes towards a circular business model and the adaptation factors which can hinder this transition. The triple fit challenge is illustrated in figure 5.

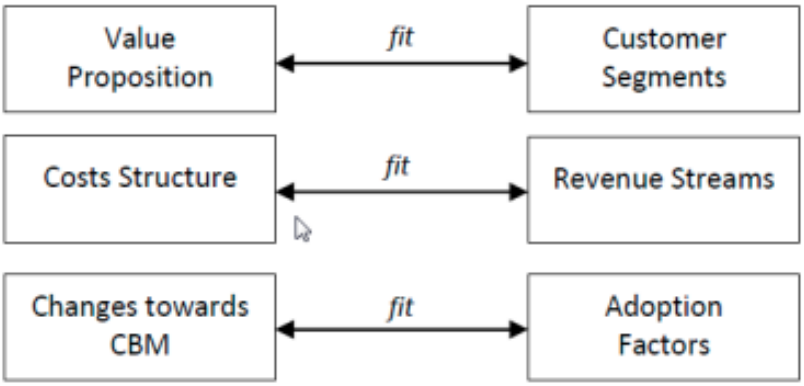

Figure 5: The triple fit challenge. Source: Lewandowski (2016)

As this framework is aimed towards circular BMs and fostering implementation of CE principles, it is consequently less useful to utilize for designing of linear BMs. The complexity of the framework, with its 11 components and their interlinkages, is a possible downside and can make it difficult to apply. Lewandowski (2016) also points out the lack of empirical verification of the framework's practical applicability as a weakness. Thus, this thesis contributes in that regard by applying the framework to an empirical case.

3.6 Summary of conceptual background

The circular BM canvas, as presented in this section, will be used as a framework to describe, map and analyze the case company's circular business model in the context of the research questions and with the objective of answering them. In chapter five, KMS' circular BM will be examined and analyzed for each of the 11 building blocks according to how they are described in the section above. This will include the general characteristics and features for each block in the case of the BM in question here. The building blocks will also be viewed in the context of CE and sustainable development. The analysis in chapter five, together with the description of the circular BM in the empirical findings in chapter four will provide a comprehensive overview and insight into KMS' circular BM and how they have applied CE principles to their business. Thus, it will answer RQ 2 and the overall problem statement for this thesis. Challenges and possibilities for further growth in the context of corporate sustainability will follow in chapter 6 to answer RQ 3.

In summary, to answer RQ 1 and underline the relation and role of the presented framework in this context, sustainable development when incorporated by corporations, can be called corporate sustainability (Baumgartner et al., 2010). The main objective of CE is sustainable development, and CE is by many viewed as the best way to approach sustainability efforts for corporations (Murray et al., 2017, Ghisellini et al., 2016, Kirchherr et al., 2017, Geissdoerfer et al., 2018). Thus, CE can be viewed as a tool, approach or a strategy to use for achieving CS. This is similar to

how SVC relates to CS. In CE and the context of CS, sustainable and circular BMs are very important in a transition to and as enabler of CE (Ellen MacArthur Foundation, 2012, Antikainen and Valkokari, 2016, Geissdoerfer et al., 2018, Urbinati et al., 2017). Lewandowski (2016) claims there is unity in literature on the view that circular business models are the core of CE, and the 3 R's of CE are key principles to apply in a such BM. As BM are at the core of any business, sustainable and circular BMs are hence key in a CE and further for CS. With the importance of sustainable and circular BMs in value creation, CE and CS made evident, scholars have stressed the need for novel business models in this context (Antikainen and Valkokari, 2016, Kopnina et al., 2015, Kirchherr et al., 2017, Geissdoerfer et al., 2018, Heyes et al., 2018, Urbinati et al., 2017, Lewandowski, 2016). This requires innovating new BMs and improving and adjusting existing ones. In this context it is very useful to describe, break down, assess and analyze BMs. Frameworks are an effective tool to utilize in this regard (Osterwalder et al., 2010). Thus, it is deemed highly topical and relevant in the context of CE, CS and sustainable development to utilize the circular business model canvas as framework to explore, map and analyze the case company's circular BM in this regard.

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4. Empirical findings

In this chapter the case company will be thoroughly presented. The goal is to provide broad insight into the case company in general and the investigated topics specifically. This is to create a comprehensive overview of the company and its activities for the reader, and the circular business model in accordance with the problem statement. Thus, background information and the history of the company will be given, together with information concerning the researched topics which will enable the analysis of the BM in the next chapter. In this context it is deemed relevant to provide and introduction to maritime industry. Thus, a presentation of the maritime industry and its characteristics is given initially.

The chapter is divided into two main parts. Firstly, a general industry and company presentation in 4.1, 4.2 and 4.3, followed by a thorough presentation of the circular business model and related aspects to be investigated in 4.4. The latter part is mainly based on the empirical findings from the interviews with the interviewees at the case company, whereas the presented information on the industry and company in general is partly based on the literature review, documentation, the interviews and additional online research by the author. Section 4.4 will also together with the analysis in the next chapter reveal how KMS has adopt key CE principles to their business by their circular BM, and hence answer RQ 2.

4.1 The maritime industry

Before the above-mentioned the case company and its circular BM are presented, it is considered relevant to give the reader a brief introduction to the maritime industry and its main features and characteristics. In *Norwegian Maritime Equipment Suppliers 2016 – Key Performance Indicators and Future Expectations,* Mellbye et al. (2016a) defines the maritime industry as:

> *"All businesses that own, operate, design, build, supply equipment or specialist services to all types of ships and other floating entities"*

Additionally, the industry can be divided into four main groups: Shipping companies, maritime service providers, shipyards and maritime equipment producers (Mellbye et al., 2016a). The maritime industry supports other industries and it is very globally oriented by nature with vessels operating across the world's oceans by MNCs (Maritimt Forum, 2018). It is highly interconnected with the oil and gas industry, and it is particularly important for the international trade. There are about 50 000 ships worldwide and 90 per cent of all transport of goods in the world are done by maritime vessels (Maritimt Forum, 2017).

The four main groups in the maritime industry are interdependent and they have the role as either supplier or customer to the other actors. Of these four, the shipping

companies constitutes the biggest part of the industry. In Norway, they make up 60 per cent of the industry measured in value creation (Maritimt Forum, 2018). The four actors' value creation, measured by EBITDA plus salary expenses, in the maritime industry in Norway is depicted in figure 6.

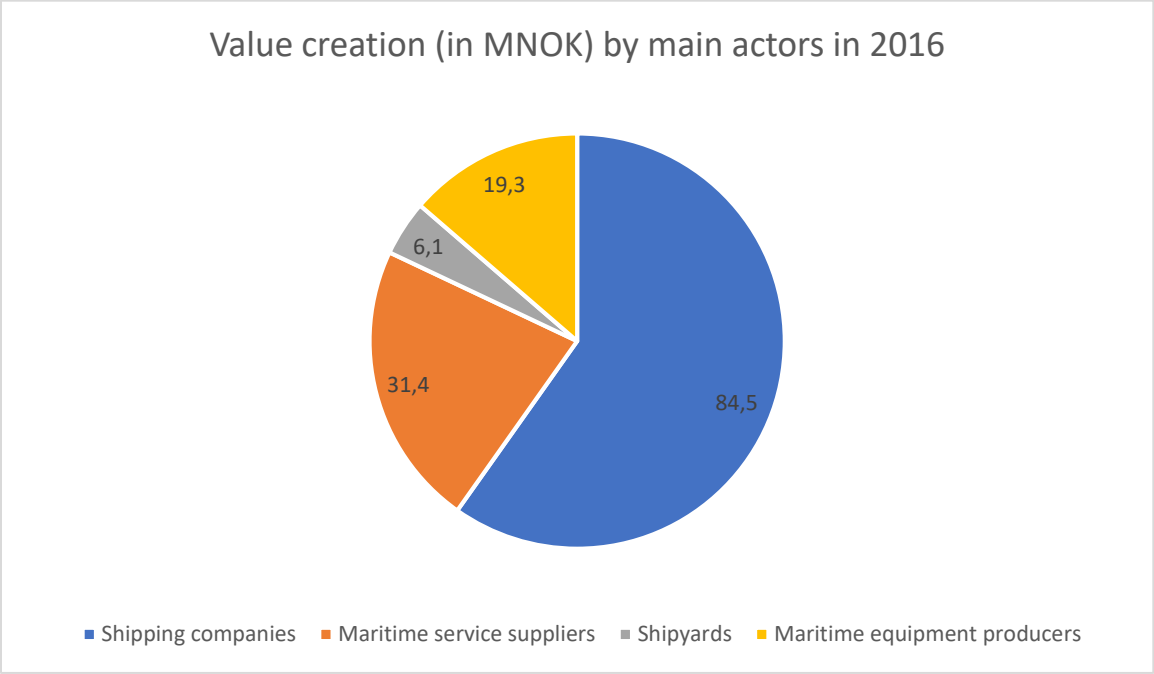

Figure 6: Value creation in Norwegian maritime industry by main actors. Source: Maritimt Forum (2018).

The shipping companies are the industry's main driver of demand through ordering of new ships. This triggers a chain of events where the three remaining actors cooperate and supply their services, technology and solutions to build and deliver new vessels (Maritimt Forum, 2018). The shipyards activities are initiated by orders for vessels by the shipping companies. Further, the service and equipment suppliers supply the shipyards with necessary technology and services throughout the shipbuilding project (Maritimt Forum, 2018). However, the industry is highly interconnected, and processes, dealings and cooperation follow many different pathways in the industry. For instance, it is common for equipment suppliers to cooperate with the shipping companies on innovations and to supply them directly with technology (Mellbye et al., 2017). Through the utilization of these vessels for different purposes the shipping companies supply a demand by other actors or other industries, like tourism and trade.

Norway is a very significant actor and has a strong presence in the international maritime industry. In *The Leading Maritime Capitals of the World,* Jakobsen et al. (2017) ranks the Oslo region as third of the worlds capitals, only beaten by Singapore and Hamburg. It is ranked second in the maritime sector of finance and law, and only beaten by Singapore on an overall assessment of attractiveness and competitiveness (Jakobsen et al., 2017). On maritime technology, which the case company in this

thesis is part of, Oslo is ranked as number one in the world. This speaks to the region's and nation's position in the global maritime industry. In 2016 the industry employed 90 000 people, accounted for over 400 billion NOK in revenues and value creation of 141 billion NOK in Norway (Maritimt Forum, 2018). The industry is characterized by being knowledge-based with highly skilled and capable organizations and people. Norway has remained a technological and innovative leading entity for decades, where solutions and innovations have pioneered the industry (Maritimt Forum, 2018). In recent years this has also been expressed in sustainable development and innovations through the Norwegian maritime companies frontrunner position here, and their commitment to corporate sustainability (Maritimt Forum, 2018). Green technology, innovations and new climate solutions are progressively on the agenda (Norwegian Shipowners' Association, 2018). Further, Norway is one of very few countries which can be said holds a complete maritime cluster consisting of leading international companies in all segments and parts of the industry (Norwegian Shipowners' Association, 2018).

The industry has suffered a significant downturn in recent years. In Norway, total value creation was reduced by 20 per cent in 2016 alone, and with profitability reaching the lowest levels since the turn of the century. Much of this is due to the downturn in the oil and gas industry (Maritimt Forum, 2018). Despite the continuing decrease in international activity levels, the outlook and opportunities for the future is promising (Maritimt Forum, 2018). In *Think Ocean – Maritime Outlook Report,* The Norwegian Shipowners' Association (2018) highlights new opportunities emerging within renewable energy, increased food production and harvesting of other natural resources, minerals and medicine from the world's oceans. However, low rates for shipping of goods, a surplus of vessels and overcapacity in shipyards are major challenges to overcome in the coming years (Maritimt Forum, 2018).

According to Mellbye et al. (2016b) in *Maritime Industry in the 21st Century*, the industry will be subject to an increase in environmental regulations and standards. This is already proven with the Paris-agreement and new regulations from the International Maritime Organization (IMO). Sustainable development will be key in the years to come with continuous innovation as an important factor (Mellbye et al., 2016b). Norwegian maritime industry, and in particular Norwegian maritime equipment suppliers, are in an excellent position to be a frontrunner in this development (Mellbye et al., 2017).

4.2 Kongsberg Gruppen and Kongsberg Maritime

The case company to be studied in this thesis is a previously mentioned Kongsberg Maritime Subsea AS (KMS). They are a division in Kongsberg Maritime (KM) which is a wholly owned subsidiary of Kongsberg Gruppen ASA (KG). The group has three main divisions, Digital, Defence & Aerospace, in addition to the Maritime division. Their organization has a divisional structure. An organizational chart in figure 7

illustrates the Kongsberg Group's subsidiaries, the KM divisions and the subdivisions of KMS. The divisions of Kongsberg Digital and Kongsberg Defence & Aerospace are not shown in this chart. Only KM and KMS are included here due to the scope of this thesis. KMS' subdivisions will be further elaborated below in 4.3. With all their divisions combined, the group supplies customers world-wide with high-tech systems and solutions in defence and aerospace, marine, and oil and gas industry (Kongsberg, 2018).

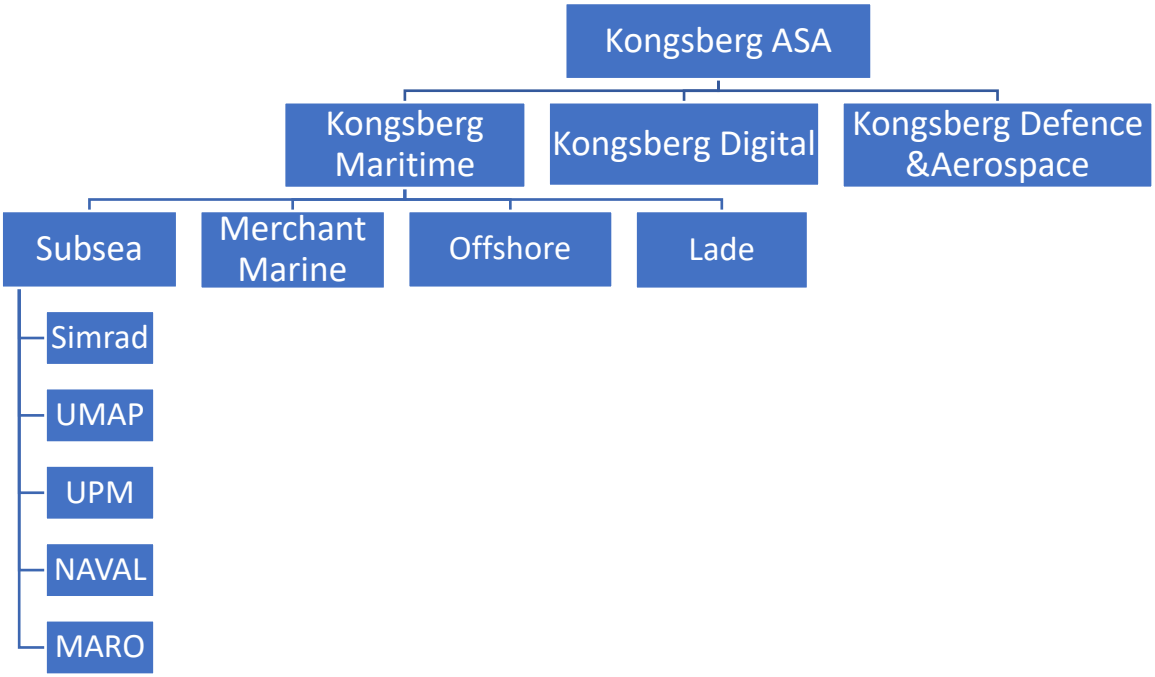

Figure 7: Organizational chart of Kongsberg Gruppen ASA with Kongsberg Maritime's main divisions and the subdivisions of Kongsberg Maritime Subsea. Drafted from: Kongsberg (2018) and KMS Interviewee 1 (2018).

KG has their headquarters in Kongsberg, where they also naturally have corporate staff and functions. Globally they have 6800 employees and revenues of 14.5 billion NOK in 2017 (Kongsberg, 2017). Recently, there have been changes and restructuring in the organization. Their oil and gas division was closed down in 2014 due to the drop in oil price and the consequent troubles the oil and gas industry had. In 2017 the two defence areas, Protech Systems and Defence systems, were merged to the Defence & Aerospace division. Additionally, they formed a new division called Digital, which has been operational since 2016.

Their Maritime division, which in 2017 constituted 51% of the total revenues for KG, have 3800 employees in Norway and abroad (Kongsberg, 2017). Both KG and KM have experienced declining turnover in the last couple of years. In 2017 KM had revenues of 7.4 billion NOK, down 13.6% from 2016. Although revenues have declined, their earnings rose from an EBITDA margin of 3.3% in 2016 to 8.6% in 2017. However, it is important to note that 2016 was weighed down by restructuring and write-downs. The top year was in 2015 with EBITDA of 1.1 billion NOK – almost

twice as much as 2017. Nevertheless, KM have had a downturn since the business from the oil and gas industry started to shrink. As a direct consequence they have made several cost reducing measures throughout the company and restructuring of the organization. They have among other things reduced the number of employees by almost 1000 since the peak in 2015.

Kongsberg Maritime is divided into four divisions. They have an offshore department located in Kongsberg. Their main products are within dynamic positioning. At Lade in Trondheim they have a division who produces sensors that are part of many of KM's products. Merchant Marine's focus area is consoles and control mechanisms for ships. They are also located in Horten, together with the case company for this thesis, the Subsea division.

4.3 Kongsberg Maritime Subsea

This section will provide an introduction to the case company, before the circular business model is presented in 4.4. The main features and characteristics of the company, strategy and their competitive advantages will be presented in 4.3.1, alongside a brief introduction to the company's history given below. Following this, the product groups and products of KMS, constituted by their subdivisions will be presented in 4.3.2. Characteristics and main features related to market, marketing, supply chain and sustainability will follow in 4.3.3, 4.3.4 and 4.3.5.

KMS is a cornerstone company in Horten with a little over 400 employees (KMS Interviewee 1, 2018). In addition to their headquarters they have offices and employees all over the world. The history of KMS dates back 70 years to 1947 when Willy Simonsen started the company Simonsen Radio (Simrad). They started out producing maritime radios, but also manufactured an echo-sounder that was developed by the Norwegian Defence Research Establishment (NDRE). Later they developed a commercial sonar for fishing vessels that was released 10 years after the startup, in 1957. The sonars gained traction in the market and became very popular through the 60s. In the 70s and 80s the company grew with expansion of the product portfolio and acquisitions, and the company became a major player in the industry, both domestically and internationally. They were recognized for their high-quality products within the fishing industry. Kongsberg Gruppen acquired Simrad in 1996 and Kongsberg Maritime Subsea was established.

Following the successful endeavors in the fishing industry they decided to expand their product portfolio further and branch out to other segments and industries. In addition to technology for fisheries with Simrad, four other subdivisions were established: Underwater Mapping (UMAP), Underwater Positioning and Monitoring (UPM), Marine Robotics (MARO) and NAVAL. This is also illustrated in figure 7 above.

KMS' business philosophy and all of their products are based on technology utilizing hydroacoustics, i.e. sound under water. This is their core competence and most of their products have a transmitter and a transducer which sends and receives signals under water (KMS Interviewee 1, 2018). A majority of the products and the components they contain that are offered to customers are developed, manufactured and tested in-house. Apart from some manufacturing in Spain and China, the value creation happens in Horten through development of technology and production of products. They collaborate with local subcontractors which has fostered a cluster of companies with competence in electronics and maritime technology.

4.3.1 Strategy and competitive advantage

The overall vision of Kongsberg Gruppen is to be *World class through people, technology and dedication* (Kongsberg, 2017). This is reflected through their values of being innovative, determined, reliable and collaborative. The vision and values are naturally embedded throughout the organization, down to the different divisions and subdivisions. Their strategy, ambitions and business endeavors are guided by these values and the vision. To ensure profitable growth and healthy business operations they have some strategic focus areas they believe is key for the organization (Kongsberg, 2017):

- Develop and sell attractive products and solutions and win new contracts.
- At all times have an organization tailored to the market and its demands.
- Deliver on time to the agreed price and quality.
- Positioning towards new markets and opportunities
- Continuous focus on innovations

This means they strive to be innovative, constantly changing and adapting, and provide the best value for customers to thrive in the industry. For the maritime sector they have a specific strategic priority to expand the product portfolio based on their leading position (Kongsberg, 2017). In addition to the strategic focus areas mentioned above, KG have a set of financial ambitions that were set in 2015 for the following five years (Kongsberg, 2017):

- Average growth of 10 percent, with approximately half being organic growth.
- A "double digit" EBITA-margin
- A requirement of 10-15 percent return on capital when evaluating new projects and initiatives.

Currently they do not meet the EBITDA or growth ambition. Time will show whether the restructuring and cost reduction measures from 2015 to 2017 can do something about this combined with increased revenues.

KM and KMS pursues a so called "full picture" strategy and has done it for many years (KMS Interviewee 1, 2018). They seek to offer value far beyond single product

offerings, with integrated product solutions and excellent support. For their demanding customers KMS wants to be able to offer them everything they need. This entails having a broad product portfolio, systems and solutions. With having this in place, KMS can offer their customers excellent value and keep prosperous relationships with them. At the same time, they can minimize the customers' needs to deal with other suppliers and competitors of KMS since they get everything they need from the integrated solutions offered by KMS through their "full picture" strategy. KMS' acquisitions, development and expansions into different technology and product segments over the last 20 years has to a large extent been guided by this strategy (KMS Interviewee 1, 2018).

With the "full picture" strategy KMS makes custom deliveries including different types of technology and products to demanding customers, and support shipyards and vessel designers at the engineering and procurement phases. Further, they provide single source service and support to owners and operators throughout the life-time of a vessel. This involves close collaboration between all stakeholders to ensure satisfactory advanced technology solutions (Kongsberg Maritime, 2016).

Being a "full picture" supplier is one of the key sources of their competitive advantage and what differentiate them from competitors. For massive projects like ship building in shipyards one of the main challenges are managing the complex network of suppliers (Mello and Strandhagen, 2011). Thus, KMS has a clear advantage and will be a preferred supplier when they can offer integrated solutions and be a single source service and support provider.

Quality is a key characteristic KMS has been associated with for decades and traces back to the beginning when they were called Simrad and with the sonars in the 60s and 70s. These sonars were considered to be very reliable, durable and generally of high quality which were the key to their popularity. This feature of always delivering high quality is a major part of their value proposition to this day and something they are well known for. This has provided them with a competitive advantage. In fact, the Simrad brand is still used on many products for the fishing industry because of the strong position it has in the industry and the associated outstanding quality of the products (KMS Interviewee 1, 2018).

The "full picture" strategy combined with their excellent reputation with high quality in everything from technology to processes to customer support can be said to be the main competitive advantages for KMS.

4.3.2 Products

As pointed out in the previous part, KMS manufacture and sell many different products and solutions for the maritime industry, including offshore industry. They have a broad product specter aimed at a broad customer base. It spans from fishing sonars for recreational fishing to highly advanced and customized autonomous

underwater vessels for militaries. Their common denominator is that they are all linked to underwater exploration and to different extent utilize hydroacoustics.

Their main product groups can be classified according to the corresponding subdivisions. As mentioned earlier, these are: Simrad, Underwater Mapping (UMAP), Underwater Positioning and Monitoring (UPM), Marine Robotics (MARO) and NAVAL. Each of these will be presented in the following, but with an emphasis on Simrad due to its specific relevance to the scope of this thesis. Even though the other product groups will not be thoroughly examined and analyzed further, it is considered relevant to give a brief presentation of them. This is to give the reader a comprehensive overview on KMS' products and the extent of their business. They are also included here as they may be relevant for discussion regarding expansion of the analyzed business model to other parts of the business.

4.3.2.1 Simrad

Simrad offers different technologies and products aimed at the fishing industry. The business model that is going to be further presented and analyzed is mainly within the bounds of the Simrad subdivision. Thus, it is deemed relevant to introduce Simrad and its products in more detail than the others, and before the business model is presented in the next part in 4.4.

As stated earlier, KMS was previously called Simrad. Following the expansion, acquisitions and branching out into other markets in the last decades, Simrad is today a subdivision in KMS alongside the other subdivisions and product groups presented in the next parts. As the company has grown and developed new technologies intended for other customer segments in the maritime industry, they have been committed to keep their market share and strong reputation within the fishing industry.

The Simrad product group consists of technology for sustainable fisheries. The applications for the different products can vary, but they can be classified according to their intended field of application. These are fish finding and monitoring, fishery research and environmental monitoring. In each of these categories KMS have many different products. Of the various product groups KMS have, Simrad has the greatest number of different products, when considering off the shelf products and not all the different customizations that are available in other product groups. The Simrad products are generally less complex and have a greater turnover compared to the other product groups. Consisting of a greater sales volume with less complexity and shorter production lead time, the products in this group are generally made to stock (MTS). Whereas the other product groups utilize assemble to order (ATO), customize to order (CTO) or engineer to order (ETO) more often. It is also important to note that the price on Simrad products are generally lower compared to some of the other products KMS offer. Though, a new Simrad sonar, like the top of the line SU90, cost

approximately 2.2 million NOK. As a result of the above-mentioned features, Simrad differs in many ways from the other product groups of KMS.

The Simrad products are in most cases sold to end-users via a dealer or agent. These dealers are located all over the world. Although KMS also sells Simrad products to customers without any intermediaries, direct sales to customers are more prevalent in the other product groups. Price, volume, ease of access and the level of standardization are the main reason for this. When the customer requires little-to-none customization, a high level of cooperation and communication between manufacturer and user is not required.

As mentioned, Simrad has been an actor in the fishing industry for decades and they have a very strong reputation. As a consequence of the brand's standing, the Simrad products are marketed and sold under the Simrad name, not KM. The KM brand can simply not compare to Simrad in this market segment. Operating with the Simrad brand despite the fact that Simrad does not exist as a company anymore, has caused some practical and logistical challenges, but the Simrad brand is considered too valuable to discontinue. Though termination of the Simrad brand and logo on the products have been considered for streamlining and cost reduction, the pros are considered to outweigh the cons and there are no current plans to do this (KMS Interviewee 1, 2018).

The main part of the Simrad product portfolio consists of fish finding sonars and echosounders. The SN90, SU90, ES70 and ES80 are some of the most sought-after products in this category. The SU90 is possibly the most advanced and finest of the fish finding products. According to Simrad it is the most powerful and highest resolution low frequency sonar on the market (Simrad, 2017). This has been developed for customers who values performance over price. Excellent performance was the goal with this sonar and no compromises was made developing it. As many other KMS products it utilizes hydroacoustics, sending signals under water which are reflected to determine presence of fish in the water. Most of the sonars are made up by a power supply unit, processor unit, hull unit, operating panel, transceiver unit and transducer (Simrad, 2017). The main differences between the sonars are the level of performance, adjustments and configurations required and obviously price. More specific, the sonars offer different application, range and resolution depending on the different features they offer like operational frequencies, beam angle and number of beams.

Figure 8: SX90 Operating panel. Source: Simrad.com

In addition to fish finding sonars and echosounders, Simrad offers catch monitoring systems and sensors and trawl sonars. Some of the products in this category are the FS70, TV80 and PI50. These and others provide a range of applications for monitoring catch and equipment for fishing vessels. For instance, the catch in trawls can be monitored continuously so it will be pulled up at the right time. Also, adjustments of the trawl can be made based on information provided by the sensors and systems (Simrad Catch Monitoring Systems, 2017).

All the Simrad products offer technology that aids players in the fishing industry to save time, resources and cost, and provides an edge for catching fish. They also have a sustainability contribution. When the fish catching process are much more efficient is saves the trawlers lots of time and fuel spent. Further, monitoring systems can mitigate damage to reefs and ecosystems with proper use and adjustments of trawls. The technology also supports sustainable harvesting of the oceans resources with catching the right type of fish at the right amount in the most environmental way. The Simrad products involved in the circular business model which is to be explored and investigated in this thesis, will be further presented and described in section 4.4.2.

4.3.2.2 Underwater Mapping

UMAP produces equipment and solutions for underwater mapping. All products in this category is based on their core competence, sound under water. It consists of equipment that sends signals under water, receives them and transform them into images. This way maps of the seabed are generated. The products in this category are mainly distinguished based on the sea depth where they are to be used at and the required quality and detail of the maps. They are utilized for marine geology, archeology, habitat mapping, route surveying and by military.

For use in shallow waters, KMS offers for instance the M3 sonar. It has a wide range of applications from inspection in harbors, pipeline surveys, diver supervision, monitoring of reefs and shipwreck detection. Also, it can be integrated with other products in the KMS portfolio like the underwater vehicles. The M3 system consists of a sonar head which transmits and receives acoustic signals, operations cable and power supply, and a computer that communicates with the sonar head and renders and presents the imagery for the operator (Kongsberg Maritime M3, 2018). Whereas the M3 has a recommended application up to a depth of 50 meters, KMS also delivers systems for mapping and exploring the deepest trenches in the ocean. The EM122 is developed for deep water mapping up to 11000 meters (Kongsberg Maritime EM122, 2018). It has been utilized by several research teams to measure the depth of the deepest known point on earth, the Challenger Deep in the Mariana Trench (Gardner et al., 2013). Precise measurements at such depths is very difficult and the fact that researchers chose KMS' UMAP products for this is a seal of approval for KMS. In between the M3 and EM122, there are several UMAP products like the GeoSwath4 and the EM2040 intended for use at different depths and applications. Figure 9 shows different KMS echosounders and illustrates their intended application.

Figure 9: KMS Echosounders and illustration of use. Source: km.kongsberg.com

4.3.2.3 Underwater Positioning and Monitoring

UPM concerns navigation, communication and monitoring under water. Whereas the products in the UMAP group are mainly concentrated around sonars and echosounders for underwater cartography for different purposes, UPM has products and technology for broader set of applications. For navigation and positioning they have different solutions based on hydroacoustics. They can be used as an alternative to GPS for vessels. It utilizes a transducer mounted on the vessel and a transponder on the seabed. These communicate with signals under water and the data can be used for vessels to navigate, position correctly or keep still in rough sea. For the transducer KMS has the HiPAP platform with different products for different use. cNODE is a series of transponders that are compatible with the different types of transducers. The cNODE family and a HiPAP transducer are shown in figure 10, in addition to an illustration of use of the system. They can also be used for positioning and monitoring of structures underwater, for instance monitoring of wells. Like the UMAP products they are compatible and can be integrated with other products in the KMS product portfolio. Thus, supporting the “full picture” strategy. Remote operated underwater vehicles utilize this technology, and the products for navigation and positioning under water (KM Acoustic positioning systems, 2018, KM Subsea Monitoring, 2018).

Figure 10: cNODE family, the HiPAP 502 and illustration of use of the system. Source: km.kongsberg.com

4.3.2.4 Marine Robotics

The MARO product group mainly consist of Autonomous Underwater Vehicles (AUV) which essentially is marine robots/submarines, but also unmanned surface vehicles. It started out in the mid-80s with development of small AUV for test and technology purposes. Further development followed in the 90s in collaboration with Statoil, NDRE and Norwegian Underwater Intervention (NUI). Today, KMS offers seven different AUVs with various configurations in four product lines for a variety of applications. The product lines are MUNIN, REMUS, HUGIN and SEAGLIDER. These are generally highly customized for the customers and fitted with a wide range of technology and functionality, but they are also available as commercial off the shelf (COTS). As they are often integrated with other products from other groups in KMS' product portfolio to satisfy demanding customer needs, the AUVs are an important enabler to fulfillment of their "full picture" strategy. The AUVs are remotely operated, move wireless under water, are suitable for different depths and have different endurance. Their HUGIN AUV can go to depths up to 6000 meter and operate continuously for 75 hours (KM AUV/Marine Robots, 2018).

The applications for the AUVs range from offshore geophysical surveying, environmental monitoring, hydrography, asset location and marine archeology. The REMUS 6000 played a key role in locating the wreckage of Air France 447 in 2011 outside the coast of Brazil (The Woods Hole Oceanographic Institution, 2018). The REMUS 6000 is depicted in figure 11. Recently, in the spring of 2018, it was instrumental in finding the wreck of the Spanish galleon ship San José, which went down in 1708 with a treasure of emeralds, gold and silver with estimated value up to 16 billion dollars (The Woods Hole Oceanographic Institution, 2018). This illustrates that KMS' technology and products are a preferred choice for the toughest subsea jobs and when there are no compromises on quality and capability.

Figure 11: REMUS 6000. Source: km.kongsberg.com

4.3.2.5 Naval

This product group is intended for navy forces and especially technology for navy submarines. It includes solutions for mine and obstacle detection and avoidance based on sonar technology. In addition to the application for submarines, these

solutions can also be utilized for ships on the water surface. KMS also provides technology for anti-submarine warfare (KM NAVAL, 2018).

4.3.3 Market and marketing

KMS operates in the maritime industry. This is an immense globally spanning industry when considering all actors that can be classified as belonging to this industry to various extents. More specifically, as seen in section 4.1, KMS can be classified as a maritime equipment supplier/producer. They act as a provider of technology and solutions for maritime companies, including maritime activities in the oil and gas industry.

KMS have customers in many different parts of the maritime industry and with many different actors. This can be seen in the range of different products they offer. Previously, when the company was called Simrad, the technology they developed and offered to the market where mainly aimed at the fishing industry. Today, the fishing industry is still an important market segment in the maritime world for KMS, but they have also entered new markets and sought out new customer bases. Shipyards and ship owners constitutes a major customer group for KMS. Most of KMS' technology is either mounted and integrated with vessels or they interact with them. This obviously make the owners, operators and builders of ships significant customers. Commercial actors like these constitute the majority of KMS' customers (KMS Interviewee 1, 2018). However, they also have navy forces on their client list. Another market segment that is becoming increasingly relevant and prominent is the customers that utilize KMS' technology for scientific surveying and research. This customer group acquires technology and solutions from all of KMS' product groups from echosounders to AUVs depending on the application they seek.

A lot of maritime activity takes place in the oil and gas industry and KMS have positioned themselves as a supplier in this market as well. Several products and solutions in UMAP and UPM i.a. is utilized in activities related to oil and gas production. This market has been declining in recent years and currently equipment for the fishing industry is the biggest market for KMS (KMS Interviewee 1, 2018). The customers in the fishing market range from small-boat recreational fishermen to large fisheries and fishing fleets. The required application and level of advanced technology, alongside purchasing power varies greatly in between the segments in this customer group. Whereas recreational fishers can suffice with the most basic equipment, larger fishing vessels require more advanced solutions. Since KMS generally aims at the high-end market for most of their products, their customers have historically been more oriented towards performance and quality than cost. When the oil and gas industry were thriving some years ago, KMS' customers in this market often did not even ask about the price (KMS Interviewee 1, 2018). They were only concerned with performance, functionality and quality. Even though this is to some extent still the case when it comes to some naval customers, it is not the case

for the customers in the oil and gas industry anymore. In fact, the general tendency in the maritime industry has been an increased focus on cost and cost reduction.

Geographically, KMS has present all over the world, but some countries and regions are more important in terms of number and magnitude of customers. Southeast Asia is a major region for shipbuilding and shipyards, and consequently KMS has a lot of dealings with companies here. Especially Singapore is a prominent location in this context. Further, significant maritime nations are obvious valuable customers for KMS. This includes Australia, Spain, Japan, Brazil, the U.S, Korea, China and the domestic market in Norway.

Generally, being a producer of products that can be viewed as niche, KMS does not have many competitors, but they do exist (KMS Interviewee 1, 2018). However, this varies depending on the different markets they are present in. The AUV market, being possibly the most niche market, has very few genuine competitors at the level KMS operates (KMS Interviewee 1, 2018). Also, the cost of an AUV implies a highly limited number of possible customers. The entry barriers are also very high in this market due to the technological and engineering complexity involved. In the fishing industry there are several equipment suppliers. However, KMS operates mainly in the high-end market and historically they have had a very strong position here without too much competition. Though, competition is intensifying as actors from the low- to medium-end are trying to capture market shares in the high-end market (KMS Interviewee 1, 2018). And while KMS at the same time are trying to move in on the medium-end market. Some of the most significant competitors in the fishing market are the Japanese companies Furuno and Kaijo (KMS Interviewee 2, 2018).

When it comes to marketing, KMS relies heavily on their brand reputation and standing in the industry (KMS Interviewee 1, 2018). This is particularly the case with the Simrad brand. A large portion of KMS' revenues originate from existing and returning customers, whom they often have close collaboration and interaction with. To reach new customers KMS are present at fairs and exhibitions across the world to showcase themselves and their products (KMS Interviewee 1, 2018). Being a manufacturer of niche products in a high-end market with limited competition, the customers very often seek out KMS themselves.

4.3.4 Supply chain

KMS' supply chain is very complex when considering all actors, channels, technologies and products. It is not deemed relevant nor feasible to examine the entire supply chain in detail here when considering its complexity. However, main features and characteristics will be presented in the following. Certain aspects of the supply chain that are particularly relevant for the scope of this thesis will be further presented in section 4.4.2.

Their supply chain generally follows a standard linear structure for a manufacturer with different suppliers backwards in the chain and distribution either directly to customers or via third party dealers forward in the supply chain. Although a lot of the value creation takes place within the boundaries of the company, they rely on suppliers for certain technologies, components and equipment, and external inbound and outbound logistics partners.

KMS is part of an electronic and maritime cluster in the Horten Area. Many of their suppliers are located here. They are also part of the Oslo region cluster with maritime companies. This region is ranked third in the world of the leading maritime capitals, only surpassed by Singapore and Hamburg (Jakobsen et al., 2017). A large portion of their suppliers can be found domestically and within this region. Short geographical distances eases logistics and foster cooperation. Such clusters can be a key driver of competitiveness, innovation and productivity according to the shared value creation concept of Porter and Kramer (2011).

For the domestic customers most of the distribution is done on roads by trucks. However, a majority of KMS' customers are international. And many of these are located on other continents. This calls for other means of logistics than trucks. For the international customers KMS utilize either shipping by boats or airplanes for distribution (KMS Interviewee 2, 2018). Both methods are used regularly and the choice between the two depends on how quickly the delivery needs to be made and how much is to be delivered. If the shipment is very large and it is not urgent, shipping by sea is generally preferred. For urgent deliveries, airplanes are favored. In many chase the method of shipping is chosen by the customer (KMS Interviewee 1, 2018). However, there are some issues with the use of airplanes. A lot of KMS' technology and products involve batteries. Shipment of batteries by planes is becoming increasingly difficult with increasingly stricter regulations. In some cases this forces KMS to use shipping by boat when planes otherwise would have been preferred (KMS Interviewee 1, 2018).

KMS deals directly with a lot of their customers either from Horten or their sales office around the world, but some products goes through third party retailers and dealers. This is more often the case with less complex products and solution like the products in the Simrad group, which generally goes through dealers. The meaning of less complex in this case is relative as these products contain highly advanced technology and are complex, but they can be considered to be less complex and less customized than some of the other products like the AUVs.

KMS made restructurings to their organization in 2013 concerning their supply chain. They formed a subdivision called Supply Chain Management (SCM) to have oversight and handle the operations related to the flow of materials in, through and out of the company (KMS Interviewee 1, 2018). SCM consists of the following departments: storage and shipment, production, test and procurement. In addition to

the forward supply chain, KMS also have reverse logistics in place to handle products that are sent back from customers. This concerns products that are returned for repairs or products that are to be substituted. The latter is a central part of the circular BM which will be presented in section 4.4. Generally, it follows the same distribution channels as the forward supply chain, either by boat or airplane depending on the level of urgency, and it is handled by SCM (KMS Interviewee 1, 2018). That is, SCM oversees and are responsible for this at KMS, but the managing and organizing of the return of products are often done by the customers or their dealers. The reverse logistics and its associated processes will be further presented in chapter 4.4 and analyzed in chapter five.

4.3.5 Sustainability

There has been an increased focus on corporate sustainability and environmental friendly operations and products in the maritime industry in recent years, and this has led to more environmental regulations (Maritimt Forum, 2017). KMS is also committed to sustainability efforts (KMS Interviewee 2, 2018, Kongsberg, 2017). They are obligated to follow laws and regulations in countries they operate in, and since the Norwegian state is a majority owner of KG they are subject to additional scrutiny and standards (KMS Interviewee 1, 2018). These include procedures for waste management, green certifications and standards for pollution and emissions among other things. They also have strict procedures for handling of potentially hazardous materials, which is highly motivated by HSE in addition to CS.

The green shift in the industry fosters sustainable innovations. KMS, alongside other actors in the Norwegian maritime industry are well-positioned for this change (Maritimt Forum, 2017). KM are currently in collaboration with Yara developing the world's first fully autonomous zero-emission containership called Yara Birkeland (Maritimt Forum, 2018). Projects like this alongside many others demonstrates their efforts in sustainable development.

KG publishes an annual and sustainability report each year. KM and KMS do not publish their own separate sustainability reports, but as subject to KG as subsidiaries they are included in the report for the group. The sustainability focus areas and priorities set by KG are imposed on KMS. Further, goals are outlined, and achievements reported. The purpose of the sustainability report is to (Kongsberg, 2017):

> "*Give stakeholders who are affected by or interested in our activities information about how Kongsberg approaches sustainability and social responsibility.*"

In this report they use the Global Reporting Initiative (GRI) standards for voluntary reporting of sustainable development, which include environmental, social and financial dimensions related to the organization. By doing this they show compliance

to the majority owner, the Norwegian State, in accordance with White Paper no. 27 (Ministry of Trade, 2014) and they communicate on progress on their commitment to the UN Global Compact initiative. In addition to this, they are required as a large enterprise to report on CSR by the Norwegian Accounting Act (Kongsberg, 2017).

KG has outlined some sustainability focus areas in their reports. Many of these are compiled on a strategic level for the group and does not reference KMS specifically. However, KMS are affected by these as they are incorporated downwards in the organization and they need to abide by them. The following main areas are outlined to be focused on (Kongsberg, 2017): Sustainability strategy and priority, business ethics and conduct, sustainable innovation, health, safety, environment and people, sustainability and CSR in the supply chain, and social responsibility. For each of these focus areas they have outlined certain goals for the following year and the next five years. Achievements on previously set goals are also presented.

In 2015 KG outlined a new strategy for responsible and sustainable business. The UN's 17 sustainability goals are an integrated part of this strategy (Kongsberg, 2017). In terms of sustainable innovation, KG believes their competitiveness will be strengthened through developing more environmentally friendly solutions for their customers. This belief is supported by the SVC, CE and CS concepts as seen in chapter 3. They have a long term commitment to reducing greenhouse gases and other negative environmental effects (Kongsberg, 2017). By focusing on sustainable innovations, they see their technology and expertise as a possibility to contribute to sustainable development in both the industry and the world in general (Kongsberg, 2017). They are aware of their role and social responsibility in addressing climate and environmental challenges, but at the same time they see significant business opportunities in this context. This is consistent with how Porter and Kramer (2011) claims corporations should view value creation, and also generally coinciding with the concepts of CE and CS. One of the challenges in this area is that there is an increased focus on cost in some of KG's markets, this includes some of KMS' markets as well. This often entails less inclination and capacity to invest in new technology. Therefore, KG states that it is important for their products and solutions to offer greater value both in terms of general cost and operational savings, but also reduced emissions and environmental impact (Kongsberg, 2017).

Part of their strategy for sustainable and responsible business operations is systematic and good collaboration on CSR in the supply chain. This covers suppliers' relationship with the climate and environment, human rights, workers' rights, ethical guidelines and anti-corruption. In 2017 the KG group had almost 3700 suppliers from all over the world, where 2000 of these were located in Norway. Collaboration with these on CSR and imposing certain requirements can have many positive benefits. They only want to work with suppliers who shares their values and requirements regarding sustainable and responsible business conducts, and KG has specific supplier conduct principles included in all supplier agreements. Imposing such

requirements and principles on their suppliers means that KG and KMS is a driving factor for sustainability efforts in these companies. Thus, they contribute in this regard to sustainable development far beyond their internal organizational boundaries. Also, by making their suppliers more sustainable, KG and KMS and the various supply chains becomes more sustainable. However, making sure all suppliers comply to these principles and requirements is a challenge (Kongsberg, 2017).

Another stated focus area is social responsibility. According to KG's *Annual and Sustainability Report* (2017), they contribute to economic development and value creation in the communities they operate in. Through collaboration with kindergartens and schools from elementary to college level they attempt to nurture kid's and young people's skills and interest in mathematics, physics and natural sciences. They also have a free science center called Kongsberg Vitensenter. Additionally, KG makes contributions to sports and culture where they operate, and support social, humanitarian and environmental activities that aims at sustainable development (Kongsberg, 2017). By this, it can be said they make an effort to CS and contribute to sustainable development. However, it should be stated that the author has not investigated in detail or corroborated the extent of these claims from other sources.

KG also demonstrates transparency in their activities by publishing *Climate Statement and Key Figures* as part of their *Annual and Sustainability Report* (2017). Here, an overview of their emissions, energy consumption and waste processing are given. In 2015 KG committed to a target of reducing CO_2 greenhouse gas by 20 per cent by the end of 2020. By the end of 2017 their CO_2 emissions have decreased by 17 per cent (Kongsberg, 2017). However, this reduction is predominantly due to lower emissions from transport and flights. Their direct emissions related to consumption of oil and gas connected to heating and processes has actually increased by 52 per cent from 2016 to 2017. Although these direct emissions only constitute 3 per cent of their total emissions. Indirect emissions from electricity, and emissions from flights and transport of goods and products constitute the rest of their emissions with the latter as the largest contributor. KG's total waste production has remained stable, but they have managed to reduce hazardous waste and recycled waste. However, the amount of residual waste has at the same time increased (Kongsberg, 2017).

4.4 Circular business model

KMS have developed a strategy containing processes and activities concerning some products that utilize key circular economy principles, which could be defined as a circular business model. To answer the research question 2, this business model will be presented here and further analyzed by using the framework in the next chapter. The parent business model for the organization will not be investigated as stated in chapter one, only the specific business model concerning these products in the

context of circular economy. However, since the mentioned BM is subject to the organization's overall BM they are connected.

As seen in chapter three, the concept of business models is defined in numerous different ways and with no unified clear consensus on a definition. Also, business models are often researched without a distinct definition of the concepts (Zott et al., 2011). Despite the lack of consensus there are some recurring components like value proposition, revenue streams, customers and partners (Zott et al., 2011, Lewandowski, 2016). For the research and analysis in this thesis, Lewandowski's (2016) circular business model canvas is used as a conceptualization of the concept. That is, a business model consists of basic building blocks that show the logic of how a company intends to make money (Osterwalder et al., 2010). The circular business model canvas has been expanded to capture the dimensions of CE from Osterwalder et al. (2010) business model canvas. The canvas and framework are presented in chapter three.

4.4.1 Delimitation and boundaries of the business model

A business model emerged from a strategy developed by KMS that utilizes key CE principles. Essentially, in the context of CE, the BM is about retaining value through reusing, repair, refurbishing and remanufacturing. As stated, this only concerns certain products and certain parts of the organization. The model involves strategies and processes for obtaining used products from customers as part of the sale of a new product, and reselling the used goods to other customers after it has been upgraded and restored to as-new (KMS Interviewee 1, 2018).

It is important to note that KMS do receive products at their HQ in Horten for repairs beyond the two specific products concerning the circular BM. These are mainly products that are repaired and sent back to the initial customer. However, sometimes the customers will get a new product from stock in return instead to speed up the process. The customers might also get an equivalent product or system in return that has already been repaired if they agree to this. Some of these aspects has clear CE features. And it can be argued that these cases can be included within the boundaries of the mentioned BM, but these cases are not driven by their top customers' desire to upgrade to the latest and best technology, nor KMS' desire to generate new sales – which is the case of the said BM, that will be further explained below. Also, the above-mentioned cases differ in terms of strategy, processes and other characteristics which will be further explained below, compared to the business model in question and the two specific products it contains. Thus, by this reasoning and for delimitation purposes these ordinary repair processes are defined as outside the boundaries of the BM here in this thesis and consequently will not be presented nor investigated in detail. However, as these cases also entails utilization of CE principles to KMS' business it is relevant to mention them in accordance with the problem statement, and it will be considered in the results and answers to the research questions. Additionally, KMS sometimes agrees to take customer's products

in return in exchange for a new or upgraded version as part of the value proposition to their most demanding customers when making the initial sale. This is the case for the two below-mentioned products, but might also in some cases apply to other products or systems. However, it has been most prevalently used for the two mentioned products and these are the only ones this value proposition and strategy has been systematically applied to (KMS Interviewee 2, 2018). Thus, for delimitation purposes and enabling of detailed analysis, only these two products will be considered as part of the circular BM considered here.

4.4.2 The model, development, strategy and motivation

The BM deals with two products in KMS' Simrad product group. Specifically, it concerns the sonars SU90 and SX90 (KMS Interviewee 2, 2018). Each of the sonar systems consist of four main components: processor unit, transceiver unit, operating panel and hull unit. The SU90 system can be fitted with either the SU92, SU93 or the SU94 hull unit, the SX90 utilize either the SX92, SX93 or SX95 (Simrad, 2018). The choice of hull unit depends vessel size and operational requirements (Simrad, 2018). When these sonars are referred to as products it is important to note that they are not just two standalone basic products, but systems consisting of several separate components. Thus, this business model actually concerns several products that constitutes the two sonar systems. Also, the various composition of the systems with the different hull units will not be distinguished in the following. I.e. the sonar systems will be referred to as the SU90 and SX90, even though a specific system can be called SX93 if it is fitted with that particular hull unit. The SX sonar system is depicted in figure 12. Here, A indicate the display which is just a regular monitor generally not included in the value proposition, B is the operating panel, C the processor unit, D the transceiver, E the hull unit with the transducer at the bottom and F a motion reference unit. The SU system consists of the same main components and looks mainly the same as the SX.

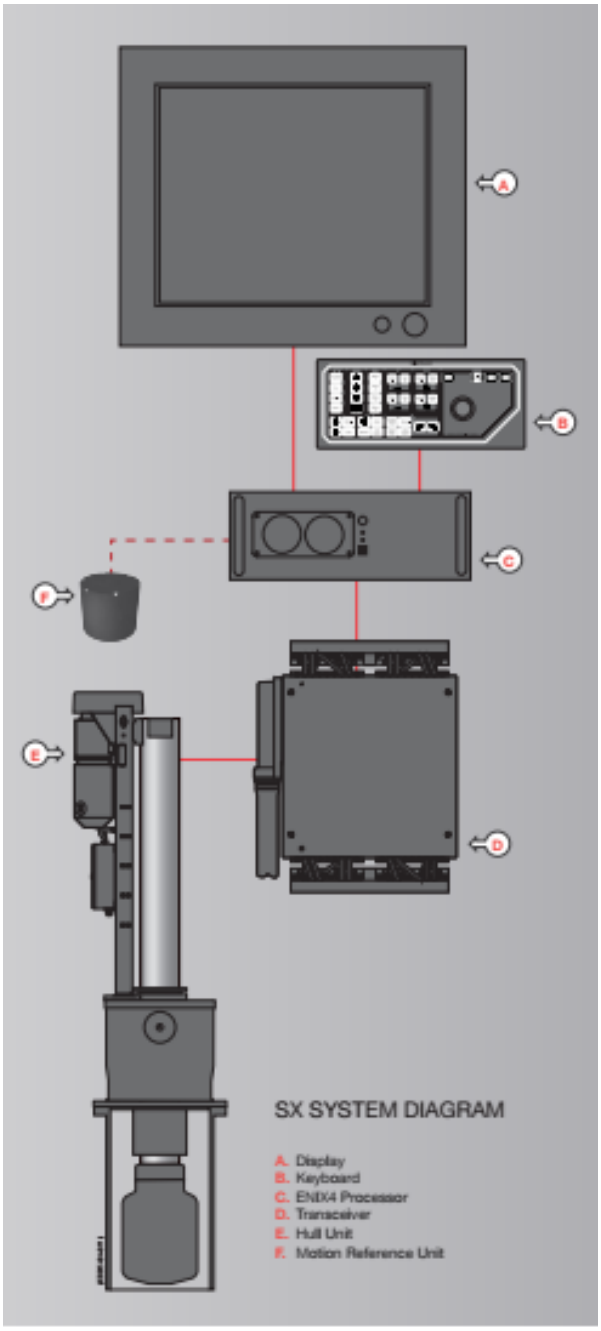

Figure 12: SX sonar system main components. Source: Kongsberg Maritime (2017)

Until a few years ago, the SX90 was KMS' top of the line fish finding sonar. Their customers who wanted and needed the best of the best had this (KMS Interviewee 1, 2018). Then KMS developed the SU90, which was considered the best and most advanced fish finding sonar to enter the market. Even though the two systems have some differences in intended application, the SU90 was considered to also outperform the SX90 on its main field of application (KMS Interviewee 2, 2018). No compromises where made in developing the SU90 and it was a value proposition to the customers who wanted the very best. KMS did seek to reach new customers with their new sonar. However, many of the potential customers in this segment were existing customers who already had the SX90 and they were more than happy with

that (KMS Interviewee 1, 2018). Some of these top and most demanding customers are continually looking to upgrade and have the very best technology at all times, but KMS also needed a way to incentivize these existing customers to buy the SU90 and upgrade from the SX90, to advance sales of their newly developed high-cost sonar (KMS Interviewee 2, 2018). The solution to this challenge ended up being utilization of circular economy principles and a new business model emerged. Though, it is important to note in this context that KMS were not conscious about the CE aspects here. This has not been part of a deliberate strategy of applying CE principles or transitioning towards CE. The managers at KMS saw an opportunity in the market they decided to act upon and this entailed implementing some processes and activities which will be presented below in 4.4.2. Thus, it was not intentionally developed as a specific BM through business model innovation or particular consideration of the concept of BMs, but more a case of realizing a strategy through implementing and applying certain processes and activities. However, it can clearly be categorized as a BM when consulting the BM definition of Zott et al. (2011) who claims a BM describes how the firm's different activities are combined to execute strategy, and the definition by Casadesus-Masanell and Ricart (2010) who also links BMs to strategy, claiming it reflect the company's realized strategy. Further, the BM in this case can be classified as circular according to the circular BM definition of Linder and Williander (2017), as described in chapter 3.4.2, which emphasizes that that the value creation is based on utilizing economic value retained in products after use in the production of new offerings. This is precisely what is done at KMS and hence it can be regarded as a circular business model.

There are several advantages to having the best possible sonar for fishing vessels. The better the sonar, less time is spent on locating fish. This leads to shorter time spent out on the sea, which again contributes to savings in fuel and other expenses. Further, they can judge the size of the fish and distinguish between species, thus avoid catching something they do not want. All these above-mentioned benefits also have positive biological and environmental sustainability aspects. In addition to these incentives for having the newest and best sonar KMS wanted to further encourage customers with a SX90 sonar to buy a SU90. As a selling point they offered to take the SX90 in return if customers bought the new SU90. The customers were offered a discount on the SU90 if they returned the SX90 in functioning condition. This way KMS encouraged existing customers to upgrade their sonar system by replacing their SX90 with the new SU90. It made a good contribution to the sales of the SU90 and still does.

The strategy behind this offering was well thought out as they had envisaged a new market for the SX90's that were returned from customers. Even though the SX90 was developed some years ago it is still one of the best fish finding sonars on the market. As mentioned, the market for the SX90 and SU90 is generally large fishing vessels and fleets that can afford a high-end sonar in this price category. A new SU90 sonar system costs approximately 2.2 MNOK (KMS Interviewee 2, 2018). However, KMS

saw a new market opportunity by offering used SX90's to customers that could initially not afford an expensive sonar like this. This is in accordance with their strategic focus area of positioning themselves towards new markets and opportunities, and also coinciding with the SVC and CE concepts. An upgraded and restored SX90 are offered in the second-hand market typically for about 1 MNOK (KMS Interviewee 2, 2018). In most cases this is smaller fishing vessels with less purchasing power than those who procure a new SX90 or SU90, and who had cheaper sonars from other manufacturers. By doing this, these customers get a better sonar than they currently have at a price they can afford (KMS Interviewee 2, 2018). Before they can be sold in the second-hand market the sonars need to be restored to as-new products. The returned SX90 must be operational and functional when returned for KMS to offer a discounted SU90. However, KMS receive sonars with varying decay, wear and tear (KMS Interviewee 1, 2018). Thus, depending on the condition of the sonar, it needs to be refurbished, repaired or remanufactured before it can be reused by others. These processes and activities will be further presented below in 4.4.2.

As it appears from how this business model emerged described above, the choice to apply CE principles to their business was mainly motivated by an opportunity to advance sales for increased earnings. A positive side effect was new market opportunities in the second-hand market, but this was not the of the principal reasons behind this strategy. Contribution to sustainable development by utilizing CE principles to extend product-life and second-hand use was neither a driving factor in the decision-making process in development of this BM, according to KMS interviewee 2, but rather a fortunate byproduct. This was a strategic decision made by the management team in the Simrad division mainly to improve sales of their top of the line sonar system. However, for this BM to be sustainable and economically viable, they needed to capture value and generate revenue from the used products to recoup the discounts given on sales of the new sonar systems.

4.4.2 Processes, supply chain and market

Several processes, departments, customers and external actors are involved in this business model. The overall process is triggered by a request from either KMS to the customer through dealers, or from the customer through dealers to KMS, regarding a proposition on upgrading from the SX90 to the SU90 sonar (KMS Interviewee 2, 2018). This can be predetermined from the initial sale of the SX90, or not. When the new SU90 sonar is sold, the option to trade this in at a later stage is also part of the value proposition, and hence promoting further circularity in the future. After contact has been made a deal is struck. This deal contains aspects like price, logistics and timeframe on delivery(KMS Interviewee 2, 2018). Regarding costs, the customers are either given an agreed upon discount on the new SU90, or they pay in full and get credited after the fact for the returned SX90 (KMS Interviewee 1, 2018). The latter implies selling a new product at retail price and buying back an old one for a settled price. Much like how dealings with car dealerships takes place when you deliver in a

used car. When the specifics of the contract and payment is agreed upon a new SU90 is shipped to the customer following the same processes and forward supply chain as any other sonar, as described above in 4.3.4 (KMS Interviewee 1, 2018). That is, considering that the same methods and types of logistics are used, not necessarily the exact same channels or involved parties.

The logistics for the shipping of the SX90 system back to KMS is managed either by the customer, their dealer or in rare cases by KMS. This is decided individually for each deal depending on the customer's request. The customers either manage this themselves or they have their dealers organize it on their behalf. KMS can offer to arrange this is rarely the case. The equipment is unmounted from the vessel, which must be done when it is anchored at bay. Shipping of the system back to KMS is in most case done by either cargo ships or airplanes. The reverse logistics utilize the same methods as the outbound logistics in the forward supply chain. The actors involved here varies as the reverse logistics are organized by individual customers or dealers which have their own logistical partners. Though, when the international deliveries arrive in Norway, KMS have two key partners for handling customs and declaration and transportation to KMS' facilities. These are Blue Water Shipping and Air & Road Transport.

When the delivery is received at KMS' HQ in Horten, the hull unit is routed directly to a subcontractor, Oswo, located nearby in Horten. On KMS' request, Oswo receives the hull unit and dismantles it. The transducer unit, which is mounted on the hull unit, is routed back to KMS. Oswo performs a complete overhaul and refurbishing of all components and assemble it back together. Greasing components and removing rust are typical activities Oswo performs to restore the hull unit. The transducer is received at the warehouse and sent to a system test in the test pool. They assess the condition of the unit and drafts a report on what needs to be done and how much it will cost to restore it to a satisfactory condition for resale. Further, it is sent to the workshop in the production department. Here, the waterproof plastic coating is milled off and defect sensors are replaced, before a new layer of plastic coating is applied in the foundry. This process is also executed when no components are to be exchanged just to ensure waterproof coating. After this it is sent back to the test department for a check in the test pool to see if everything works properly and according to specifications. In some cases, it is decided not to repair the transducer if it is in bad shape and a brand new is issued instead. Then the transducer is sent back to Oswo where they mount it on the rest of the newly refurbished hull unit. Now the as-new restored hull unit is routed back to storage at KMS, ready to be combined with the other constituents of the sonar system. This is also illustrated in figure 13 below.

Regarding the electronics top side, the processors are scrapped and a new is mounted if it is an older model, otherwise it is refurbished and tested for function. The operating panels are also either replaced by a new one or refurbished. The

transceiver unit is sent to the test department for evaluation and a job description of what is needed to be done is drafted. It is then delivered to a subcontractor called Norautron who upgrades it according to the specifications. After the necessary upgrades have been conducted it is routed back to KMS where it is combined with the processor and operating panel. Eventually, a final test of the system is executed and if everything is in order it is sent to inventory ready to be sold in the second-hand market. Although most of the SX90 systems generally are refurbished or remanufactured back to a state of as-new since they are to be in operational state when they are returned, sometimes minor components or even larger parts of the overall sonar system is scrapped. This is done when the cost of restoring is considered to exceed the benefits or because it is not practically or technically feasible. The components that are found to be okay in a scrapped item are sent to spare parts inventory. Thus, these components are recycled and reused as inputs in other systems. The uncertainty regarding the condition of the returned sonars is a risk for KMS as they sometimes can take a loss when they need to scrap the system or parts of it because it was in worse shape than expected.

The supply chain and material flow in this circular BM is illustrated in figure 13 below. This is drafted by the author based on obtained information regarding this BM from the interviewees. It is a simplified depiction of the reality, and the various restoring processes are only indicated for each of the main components and not illustrated in detail. Also, the various departments involved at KMS and the detailed flow of materials here are not included in figure 13. Only the finished goods inventory for the new SU90 is depicted and all processes concerning development and production of a new product are not included either. The latter is considered to be on the borderline or outside the boundaries of the BM and thus deemed outside the scope of this thesis and will not be explored in detail here. The illustration is a simplified version intended to describe the fundamentals of the material flow and the relation between the involved parties. The solid lines indicate the flow of material and the dotted lines constitute the boundaries of the KMS and the subcontractors.

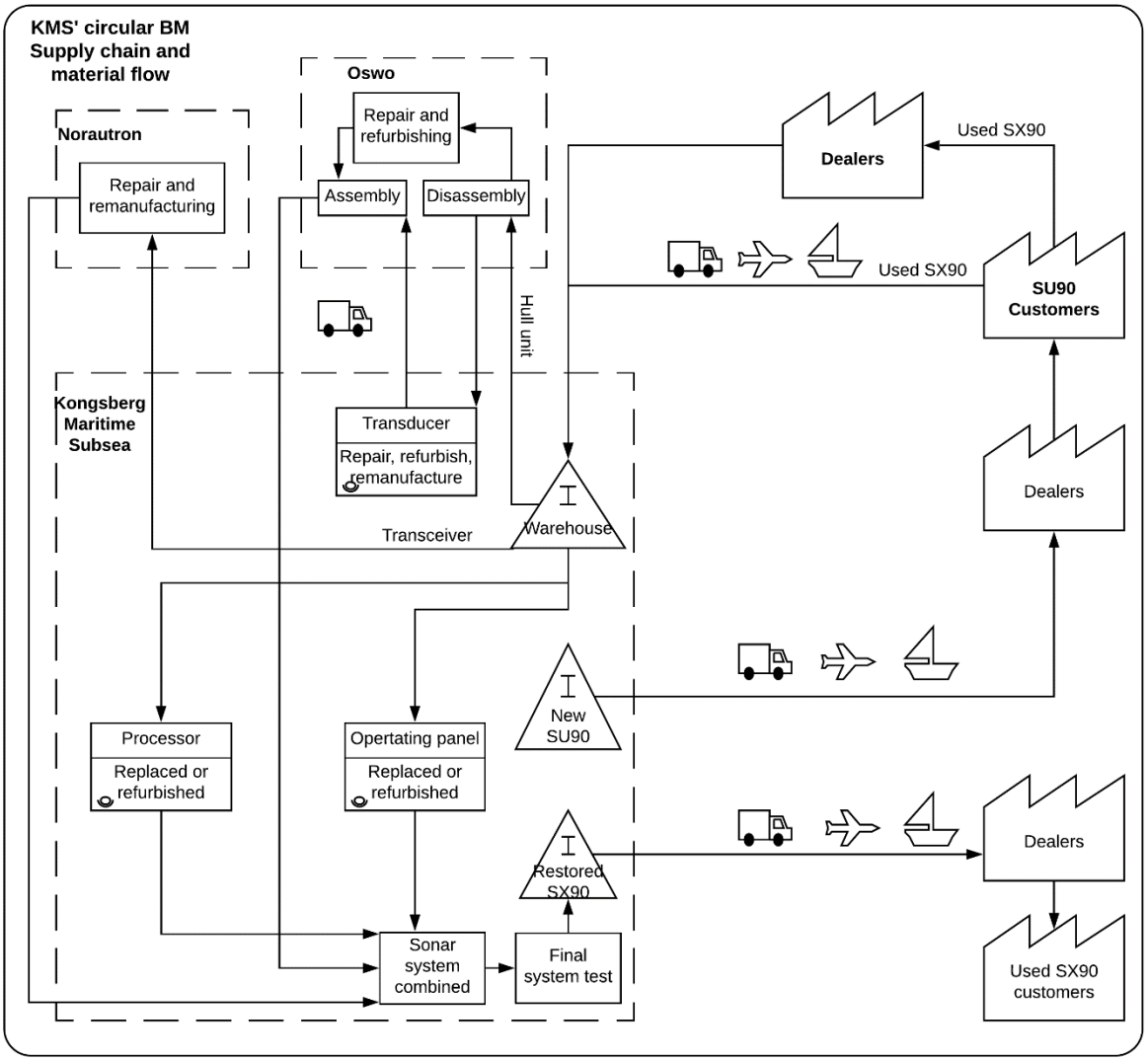

Figure 13: Circular business model supply chain and material flow.

As with the new sonars, most of the sales to the second-hand market goes through a retailer or agent. The dealers already have a buyer when they contact KMS and inquire about a used sonar. Often, a buyer is already standing by when the refurbishing, repairing or remanufacturing of the sonar is finished. I.e. the restored SX90s are often shipped to a customer upon completion of the restoration and not stored in inventory. This is made possible by the retailers and agents being notified that KMS either have or soon will have a used sonar for sale. As with any other sonar, it is then shipped to the retailer by ship or airplane, as described previously, and can be collected by the customer. The end-user pays the dealer, which again pays KMS.

According to interviewee 2 who manages the sales of these used sonars, they are generally sold within a day or two when he announces that they have used sonar on stock. The demand for KMS' sonars in the second-hand market has been very good

and they have sold all they have refurbished and remanufactured. The volumes could have been bigger if KMS supplied more (KMS Interviewee 2, 2018).

The BM has contributed to sales of new sonars and can thus be deemed a success merely by this. However, the endeavors in the second-hand market has also been a success, both when considering in relation to the BM, but also as independent venture. This has opened new markets and KMS have reached new customers that previously used sonars from other manufacturers. Thus, they have captured market shares on competitors' expense in new segments. Also, it has been profitable from a financial point of view (KMS Interviewee 2, 2018). However, there are currently no explicit plans of how and if to develop this further.

5. Analysis

In this chapter, an analysis of the empirical findings will be given. The analysis will examine the case study in the context of the presented literature from chapter three. More specifically, KMS' circular BM will be broken-down to 11 building blocks from the framework presented in chapter 3 and analyzed. The objective is to provide a comprehensive overview of the BM by breaking it down to its basic components using the framework. Further, the purpose is to answer the problem statement and research question presented initially based on the examination of the BM. I.e. assess how circular economy principles has been incorporated.

The circular BM canvas will be applied to the case study in this chapter, and the 11 building blocks for KMS' circular BM will be presented and analyzed. RQ 2 will be answered based on the analysis of the BM here, together with the empirical findings from 4.4. How the CE principles have been adopted by KMS will be revealed in the following investigation and break-down of their circular BM.

5.1 Analysis of the business model

In this section the circular business model canvas by Lewandowski (2016) will be utilized as a framework to map and analyze the case company's BM in connection to CE. The 11 basic building blocks of the circular BM will be applied to the empirical findings to break down and systemize the BM to reveal how the case company has adopted the core CE principles. The building blocks will be presented separately, but since they are highly interconnected it is useful to describe them in connection to each other and the analysis will reflect this. All 11 building blocks will be analyzed, but emphasis will be on the ones that are most relevant in the context of the RQs and scope of the thesis.

5.1.1 Value proposition

The value proposition is the core component of the BM. Generally it is a product or a service, or a combination of the two (Lewandowski, 2016). In this case KMS offers value in form of products. Specifically, two products, the SX90 and the SU90. The two sonar systems are proposed to two different customer segments. These segments will be further discussed below. With this value proposition, KMS seeks to offer a sonar system for fish finding and thus fulfilling the need their customers have for a system on their fishing vessels to locate fish. A value proposition should be either different, superior or at a lower cost than competitors' to attract customers and generate revenue streams (Lewandowski, 2016). Generally, KMS have historically not competed on price with their products. The Simrad sonars are considered to be high quality products and either at the same level as or higher than competitor's competing value propositions in terms of price (KMS Interviewee 1, 2018). As they do not compete on price, they distinguish their value proposition from competitor's by offering superior or different value, or a combination of the two. The SU90, which is

sold brand new, offers superior value to the customers as it is according to KMS the best sonar on the market for its applications (Simrad, 2018). Further, it offers functionality and quality beyond most competing offers (KMS Interviewee 2, 2018). Whereas they do not compete on price for the SU90, the case is somewhat different for the used products in the second-hand market in terms of differentiation. The SU90s are value proposed to the most demanding customers who wants the very best and can afford the very best. The used SX90s are aimed at customers with less purchasing power, who can't afford or won't invest in a brand-new top of the line sonar. Thus, the value proposition of the SX90 to this customer segment is more price oriented. The value for these customers is that they can get a better sonar with a higher quality and better performance than they currently have, in a price segment they can afford. A restored SX90 offers superior value in terms of functionality and application compared other new sonars in this price segment. Also, KMS offer the same warranty on the used SX90s as the new sonars, which is a two-year warranty on parts and one year for work.

The value proposition also contains other aspects beyond the product itself. For one, the customers "by the brand". For the customers there is value in buying a product from KMS simply because it is a Simrad product with the outstanding reputation they have in the industry (KMS Interviewee 1, 2018). The customers who wants high quality and the very best knows he/she will get this when buying from KMS. KMS have a competitive advantage from their technology, high-quality products and standing in the industry. It can be said that the Simrad brand adds value to all their products and they can consequently profit from this by charging higher prices.

KMS is also recognized for their excellent after-sale service. They have presence all over the world and the customers are familiar with the service and repair possibilities KMS offer. This is part of the value proposition. For many customers it adds significant value to the offer knowing that KMS is at their service and available anytime anywhere in the world if there is an issue (KMS Interviewee 1, 2018). In this manner KMS utilize the CE principles by repairing and performing service on their products all over the world to extend product-life. The company's strategy of providing excellent service to their customers and being flexible in response to all requests is a competitive advantage and a source of added value in their value propositions to customers.

The circularity of products in this BM is also part of the value proposition. The option to trade in their used SX90 sonar and get a significant discount on a new SU90, makes the value proposition more desirable for these customers. When KMS sell a new sonar to a customer that do not have a sonar to trade in, they also propose the tack-back scheme (KMS Interviewee 2, 2018). They offer the customer the possibility to trade in the sonar at a later stage in exchange for a new or upgraded version, as part of the initial deal. For the customers that want to be updated and have the latest technology this adds value to the overall proposition. By offering this, KMS initiates a

further development and possibly upscaling the circular flow of products and materials in the years to come. KMS' full picture strategy can also be viewed as part of the value proposition of individual products and systems. Customers knowing that they do not have to deal with other manufacturers for complementary products or services perceives this as added value (KMS Interviewee 1, 2018).

In a CE the products should be designed in a way that facilitates the use CE principles like refurbishing and remanufacturing. This have up to this point not been considered in the design for the sonars in question here (KMS Interviewee 2, 2018). Though, as seen in chapter 3.3, the importance of this in a CE is stressed by the Ellen MacArthur Foundation (2012) and others, and should consequently be considered by KMS in the future. Also, the use of less and more environmentally-friendly materials should be promoted. CE encourage value to be offered as product-service systems where the manufacturer retains ownership and rent or lease the offer to customers instead of selling. This is not an option in this BM at this stage. Such value propositions entail a fundamental shift of their business practices, but according to the CE this is encouraged and the possibilities in this context should therefore be explored.

5.1.2 Customer segments

The value proposition in this BM are aimed at two main customer segments. KMS seeks to offer value to one customers segment with the SU90 sonar and taking their used SX90 in return. The used SX90 sonar is offered to another customer segment after necessary upgrades, refurbishing, repair and/or remanufacturing. These two customer segments have several distinguishing features. The segment for the new SU90s is generally customers they have served over several years as existing and returning customers. This segment has a need for high-quality and high-performance fish finding sonars, which KMS fulfills with the value proposition. Alignment of customer needs and the value proposition is paramount in any BM. As mentioned previously, these customers want the very best and latest technology for their fishing vessels, and they have the purchasing power to procure it. Thus, this customer segment constitutes demanding customers with significant purchasing power and they are generally operators of larger commercial fishing vessels.

The main distinguishing feature between the two segments is purchasing power. The value proposition of the used SX90 are intended for a customer base that can not afford or will not invest in a new sonar in this category. These customers generally have a cheaper fish finding sonar from another manufacturer and are offered an opportunity to upgrade to a more advanced sonar in the price range they can accept. Thus, if the customer is not discouraged by the fact that the sonar is used, he/she can get a more advanced sonar with better quality and performance than a new sonar from another manufacturer for the same price. Another differentiating characteristic is that whereas the SU90 proposition is offered to an existing customer base in a market they know and have operated in for a long time. The used SX90s

are offered to a new market and a new customer base. With this value proposition KMS reach a new customer segment that either can not afford a new Simrad sonar or who will not spend that much money. They have identified a market opportunity with a demand for their sonars in the second-hand market. Reconceiving of products and markets is one way of creating shared value, according to Porter and Kramer (2011). KMS have to some extent done this with the offering of used products to this new market. However, the motivation behind this effort is mainly to generate income and not SVC. Thus, it can be seen as “accidental” shared value creation.

As mentioned, the Simrad sonars are priced relatively high and aimed at the high-end market. However, KMS wants to seize market shares within the sonar market from competitors in the market segments they are currently not serving. More specifically, the segments that are currently served by less advanced and lower cost sonars. Although the offering of used sonars in the second-hand market contributes to this, the link here is not intentional and calculated. I.e. their stated desire to capture market shares in other segments did not guide or contribute in the decision to enter the second-hand market with the SX90s. KMS should realize the potential in further pursuing endeavors in the second-hand market as this is aligned with their strategic priorities and goals, and is an excellent opportunity to diversify their customer base and capture market shares in other segments.

5.1.3 Channels

This building block concerns the channels a company uses to communicate, deliver and sell their value proposition. Historically, KMS has relied heavily on their standing and reputation in the market to initiate contact with customers. Often the customers seek out KMS or their dealers themselves (KMS Interviewee 1, 2018). However, they also have presence at fairs to seek out and communicate with customers. The sonars are in most cases sold to customers via dealers and retailers. The new SU90s are in some cases sold directly to customers by sales representatives at KMS, but they generally go through dealers as the used SX90s always do.

The logistic channels for international delivery of the value propositions are generally either by ships or airplanes. In the domestic market a majority is transported on the road by trucks. Delivery method usually depends on the level of urgency and distance. If there is no rush, shipping by ships are preferred, otherwise airplanes are chosen. Dealers can be either KMS sales offices or independent dealers. However, they have close interaction and cooperation with the independent dealers.

In a CE context, channels can be virtual. Since the value propositions contain physical products, virtual delivery is not relevant. However, some of the channels for communication are virtual. KMS communicate with customers online. They do not have a web-shop, but customers can find contact information for KMS or for their dealers on the homepage. A lot of these dealers also have web-sites, but few if any offer the opportunity to order online. A reason for this can be the complexity of the

equipment, cost and the guidance needed for installation and use. Thus, some communication is virtual, but nor the sale, product or delivery is virtual.

5.1.4 Customer relationships

KMS have a lot of recurring customers they do business with. Many of these even participate with feedback and input in innovation processes. Considering the entire customer base of KMS the relationship can be viewed as quite tight. However, the sonars and the other products in the Simrad product group are generally less customized, less complex and relatively lower cost items compared to other product groups. Consequently, the relationship between KMS and the sonar customers require less interaction and cooperation, and hence the relationship is less tight compared to other segments. Further, nearly all sonars are sold through dealers, entailing that KMS do not have direct contact with the customers. This intermediary link between the manufacturer and the customer puts a limitation on how tight the relationship can be. However, despite the lack of direct contact and the intermediary link the relationship can still be deemed good and to some extent tight, since the relation to the dealers are tight both from KMS and the customers. The most demanding customers who purchase the SU90 often have other KMS products and solutions as well, which entails direct customer contact and a closer relationship. As we saw in the analysis of the customer segments above, the second-hand market is new for KMS and hence the customer segment here is new to them. Naturally, the relationship with this segment is not as tight as those they have had dealings with for a long time. Also, the dealers as a third-party link between the customers and KMS hinders to some extent the relationship with the customers. Overall, KMS, with its high standing in the industry, have a good and to a certain extent a tight relationship with their customer. Although, the tightness of the relationships varies some between the segments and is affected by the intermediary link of the dealers.

5.1.5 Revenue streams

This building block relates to how corporations capture value and make money. In this case it mainly concerns how KMS generate cash from their customer segments as payment for the value proposition of the sonars. As mentioned, KMS primarily sells their sonars through dealers. The revenue stream follows as standard flow in this case; The customer (end-user) pays the dealer for the value proposition, and in return the dealer pays KMS. The dealers are invoiced by KMS.

Part of the value proposition for the SU90 is an offered discount if their used SX90 is sent in return. The revenue flow is generally generated two ways here. Either the customer pays the dealer a discounted price for the SU90, who again pays KMS. Or the customer pays full retail price and gets credited for the returned SX90. The latter basically entails that KMS sells a new sonar and buys back the used. Since the discounted or credited amount equals the same for both options, they generate the same amount of revenue for KMS in the end, it only affects how cash flow between the parties throughout the deal. The retail price on a new SU90 is approximately 2.2

million NOK. A used SX90 is typically sold for around 1 MNOK. KMS did not disclose the margins they operate with and how much profit each sale generates. However, they did reveal that the endeavors in the second-hand market are also profitable. For KMS to offer this substitution, a requirement is that the SX90 has been in operational use and that it is working. How much the customer gets in discount depends on the condition of the used sonar. This is communicated from the customer to the dealer, and the dealer also performs a test of the sonar to verify its condition. Based on this a deal is struct between the dealer and KMS. The dealer then proposes an offer to the customer.

The collected products are also a type of revenue stream as this is retrieved value KMS can resell after necessary refurbishing, repairing and/or remanufacturing. However, the retrieved value of the products is not transformed into cash before they are resold to new customers. The revenue stream from the customers in the second-hand market follows the same path as the new SU90s, where the customer pays the dealer and the dealer pays KMS. Thus, this BM generates new revenue streams for KMS through retrieved value, which is an important aim of the CE. Revenue streams oriented towards subscription-based renting or pay per use in product-service systems, is a possible CE configuration for revenue streams. This has not been the case in this BM as ownership of the product is transferred to the customers. However, as mentioned in 5.1.1, it might be something to look at and considerer in the future.

5.1.6 Key resources

The key resources concern the assets that are required to create, offer and deliver the value proposition. Essentially, all the key resources required for the BM to function. An essential resource in this BM is retrieved used products and the reusing of them. The reusing is enabled through key activities which will be analyzed in the next section. Their sales offices and dealers around the world are principal in maintaining and developing relationships with customers and necessary for the BM to function, and hence a key resource in this regard. They are also paramount in the value capturing and revenue stream generation since they act as an intermediate link between KMS and the end-users, and which the flow of cash to KMS goes through.

The employees at KMS, with their knowledge and expertise are a valuable intangible resource and essential for this BM to function. Especially interviewee 2 is a key resource for this BM as he is in charge of managing and following up the activities, channels and involved parties. Further, the technology and core competences KMS possesses can be viewed as a key resource. Customer loyalty and willingness of the second-hand market to accept the value proposition is also crucial. In a CE it is suggested that input choices should be considered and preferably come from circular material flows and/or environmentally-friendly materials. The input for the products sold in the second-hand market comes from returned products and is thus an input choice in line with the CE principles here. In some cases, virgin input in the form of

new components or manufacturing activities is combined with the returned material in the circular material flow. Though KMS have regulations to abide by concerning the use of possible harmful or hazardous materials, some of the materials are not environmentally-friendly. Possible alternative materials should be considered. However, for changes in material choice to be feasible the alternatives must have at least as good performance in terms of capability and durability as the currently used. Further, design changes to aid and ease in restoring processes like refurbishing and remanufacturing should be considered, as indicated in 5.1.1.

5.1.7 Key activities

This building block concerns the activities necessary for the BM to function. I.e. the required activities to create, offer and deliver the value proposition. The CE aspects and CE principles are very relevant for this building block of the BM. For this circular BM to function a lot of different activities takes place, including some core principles of the CE. However, not every minor activity will be considered here, only the activities deemed as key in the BM and those relating to CE.

For the delivery of the value proposition, KMS relies on logistics provided by external parties. These delivery activities include transportation by airplanes, ships and trucks, and consists of a range of activities performed by these logistics companies to ensure correct and timely delivery from KMS to their sales offices and dealers around the world. The author has not obtained detailed information about the activities concerning delivery performed by these third parties. However, the key activity here is the delivery of goods by plane, ships and trucks, and it is need deemed relevant to go into detail about all the sub-activities included here. The flow of materials between KMS and their subcontractors throughout the overall restoring processes are done by trucks. Though, these suppliers are located close by KMS.

Regarding the SU90, key activities are all the processes from research and development, manufacturing, testing, offering, selling and delivery. These activities and processes involved in production of a new product will not be analyzed in detail here, as it is considered on the borderline of the boundaries of the BM and does not contain key aspects of CE at current stage. Though, as mentioned, R&D, the design phase and material choices for development of new products in the future should consider CE aspects, to enable circularity and use of sustainable materials i.a. Emphasis in this section will be on the activities enabling the circular BM. I.e. the key activities concerning the returned SX90 to retain and add value to make it a desirable value proposition for the customers in the second-hand market.

After KMS' key resource, their sales personnel and dealers across the world, has struct a deal with an owner of a SX90 for the purchase of a new SU90 and returning the SX90, the reverse logistics activities for the return of the used sonar are initiated. This take-back system performs essential activities for this BM to function, but it will be analyzed as a separate building block in section 5.1.10 below and hence not

considered further here. When the SX arrives at KMS' headquarters it is received and registered by the logistics department at the warehouse, where the hull unit is routed to Oswo. The logistics department performs some key activities in this regard. They are responsible for the flow of materials in and out, recording and storing. An essential activity for this BM model is the administration and oversight of the processes, departments and suppliers involved at various stages. Interviewee 2 is the person in charge for the oversight and progress of all necessary activities, resources and partners. He also deals with the dealers regarding the sales process of the value proposition. Thus, as stated in the previous section he is a crucial part of this BM, performing vital activities.

Upon arrival of the sensor system, the hull unit is routed directly to their supplier Oswo. They dismantle the unit and sends the transducer unit back to KMS. The rest of the hull unit is refurbished and if necessary repaired. In most cases repairs are not required. The refurbishing often involves cleaning, lubrication and removing rust. This CE principle is effective as it can add significant value without too much cost or time spent. A remanufacturing process for instance, is generally more comprehensive in comparison and often associated with more processing and cost. The transducer is sent to the production department after an initial function-test and assessment of necessary work that needs to be performed. Here, the waterproof plastic coating is milled off. If no defect components are identified a new layer is applied in the foundry. The process of removing and applying a new layer of coating is performed on all transducers to ensure it is waterproof. The components and sensors inside the transducer must be protected from water, and since it is mounted on the hull of the vessel and will be underwater the layer of coating performs an essential function. Involving a production processes like milling, this process can be classified as remanufacturing. If there are any defect sensors identified, these will be replaced by new ones before the new coating is applied. Thus, virgin raw material in the form of new sensors are sometimes introduced in the circular material flow at this stage. By this, we can observe that the material flow in this BM is not fully circular, which is desired and one of the ultimate goals in a CE. If it is considered not profitable to restore the transducer, for instance if too many sensors are defect, a new transducer will be issued. However, the sensors that do function on these scrapped transducers are preserved and stored as parts. These functioning parts can be used as input when other transducers are restored at a later stage. Thus, they utilize reuse of components by feeding previously used components back into the circular flow of materials. Reuse is an important principle in the CE and applying this leads to reduced use of raw materials.

Refurbishing and if necessary exchange of components is also applied to the processor. That is, if it is not and older model, then a new is issued and the old is scrapped. It becomes evident that residual waste is generated in this BM. The current processor unit used with the sonar system is third generation. If the processer unit is first or second generation it is replaced by a new third generation. The transceiver

unit is restored by subcontractor Norautron according to specifications given by KMS. This generally involves refurbishing and changing defect components with new.

Many of the processes and key activities performed to restore the used SX90 to a proper-functioning and satisfactory state for reselling can be classified as refurbishing, repair, reuse and remanufacturing. However, since the overall process of restoring the sonar to as-new using a combination of new, reused, repaired and refurbished parts and components, it can also be viewed as remanufacturing.

5.1.8 Key partnerships

The key partners in a BM are the suppliers and other collaborating parties involved in how value is created, offered or delivered. They are particularly important in obtaining key resources and performing key activities in the BM. In a CE reliable and mutually beneficial partnerships are key, as close collaboration between parties and within networks is essential to achieve circularity.

As identified in the previous section, KMS rely on two subcontractors in this BM to perform key activities. Oswo for the hull unit and Norautron for the transceiver unit. Collaboration with these two partners are required for retaining and adding value to the value proposition. Thus, they are key partners. The activities performed by these subcontractors are fundamental CE principles like refurbishing and repairing and contributes to eventually offering the circular value proposition in the second-hand market. Both partners are located in Horten, approximately 2 km from KMS' headquarters. Proximity to partners can have many advantages. Short geographical distances obviously ease interaction, cooperation and transportation. As mentioned earlier KMS is part of a larger maritime cluster in the Oslo region, and a cluster in the Horten area of electronics and maritime companies. KMS, Oswo and Norautron are part of these clusters, and the three companies form a local cluster within this circular BM. Enabling local cluster development is one of the key aspects for corporations to consider for creating shared value according to Porter and Kramer (2011). KMS has certainly facilitated and supported this. A local cluster like in this circular BM can drive competitiveness, innovation and productivity (Porter and Kramer, 2011). Thriving businesses in this cluster also benefits the local Horten community. It can be said that through these key partnerships KMS has applied CE principles to enable a circular BM which contributes to CS and sustainable development. And they have enabled local cluster development which is a way of creating shared value that also contributes to CS and sustainable development.

Another key partnership for KMS is with their dealers and sales offices. Offering and delivering the value proposition in this BM would not be possible without them. They are identified as an important part of several of the building blocks of this BM, including the channels, revenue streams, key resources and key activities. Also, they are the link between KMS and the customers and thus a vital part regarding the customer relationships. Lastly, the logistical partners are a crucial partner in this

circular business model. They are paramount in both the delivery of value to customers in the forward supply chain and in the take-back system to collect used sonars from customers. KMS have two partners in this regard. Blue Water Shipping and Air & Road Transport AS handles shipment of sonars to locations all over the world for KMS, and they are key partners.

5.1.9 Cost structure

Together with the revenue streams, the cost structure describe how value is captured in a BM. According to the triple fit challenge proposed by Lewandowski (2016), the balance between the revenue streams and cost structure are particularly important and a key success factor for a BM. The biggest expense in this BM is the value creation of the value propositions. I.e. the costs related to the development and production of the new sonars. The activities and process related to development and production of the new SU90 was previously classified as outside the boundaries of this BM and scope of this thesis. However, when assessing this model, the cost related to this should be accounted for as long as the revenue streams from the value proposition of these sonars are included. The interviewees did not have any detailed information to provide regarding the cost here. The author has not been able to obtain relevant figures elsewhere. KMS did not wish to disclose the profit margins they take on the sonars either. What can be said regarding this however, is that the repair, refurbish and remanufacturing processes to add value, upgrade and restore the used SX90s are very small compared to the total cost of producing a new sonar system.

In addition to the cost related to value creation of the new sonars and restoring the used, is the logistical cost for transportation of goods. This can vary a lot dependent on location, the level of urgency of delivery and transportation method. Generally shipping by air is more expensive than by sea. Shipping a sonar system to Asia is estimated to around 15 000NOK by interviewee 2. If it is sent by air the costs are typically somewhere around 50 000NOK. Though, it can increase significantly if the delivery is urgent. The cost related to transportation are quite significant, but considering that the cost of a new sonar is about 2.2 million NOK, the shipping cost by ship is less than 1% of the retail price and a little over 2% for air transport. However, this is a cost that eventually is inflicted on the customer in the value offerings and not carried by KMS. The customer also must bear the cost for the return of the used sonars.

As seen throughout this analysis the dealers are an essential part of this BM. Apart from a few special cases mainly concerned building of new ships, all offering and delivery of sonar systems go through them. This entails added cost to the value proposition for the customer. I.e. The dealers charge a premium on the sonar systems to cover their costs and to make a profit. This is normal in these types of supply chains with and intermediary sales link between the manufacturer and end-user. This is not a cost KMS bear, but is a cost associated with offering and

delivering of value to the customers. Also, there is obviously the expenses internally in the organization regarding the processing of material for the necessary upgrading and repair and the cost of manhours for this work and administration of the BM. The subcontractors invoice KMS for the work they perform on the used SX90s which adds to the cost of value adding and creation.

5.1.10 Take-back system

Take-back systems are a fundamental part of CE and a necessity in a circular BM. Value must be retrieved from users through collection of products and material to enable a circular flow. Such systems involve some sort of reverse logistics to recover value from customers. The recovered value serves as input further back in other parts of the supply chain or as input in other supply chains. In this case value in form of a sonar system is recovered from the customer and delivered back to the manufacturer, KMS, to serve as a new value proposition for a new customer.

The reverse logistics in this case mainly follows the same channels as the forwards supply chain. That is, the method for transportation which is by ships, airplanes or trucks. As with the forward supply chain, international deliveries are carried out by airplanes and ships, and domestic deliveries are done by trucks. Although, trucks are involved in the transport to and from airports and docks on international shipments as well. KMS have logistics partners who deals with customs and declaration of the shipments when they arrive in Norway. After this they are taken by truck to the HQ in Horten. Domestic deliveries go straight to Horten. KMS generally uses either Blue Water Shipping or Air & Road Transport for organizing and handling the international shipments in the forward supply chain. Both can arrange transportation by truck, air and sea. These two actors also participate in the take-back system by handling customs clearance when the sonar systems arrive in Norway and transportation to KMS' HQ.

It is the customers that are responsible for the reverse logistics and the return of the sonars in this BM and they also bear the cost. That is, they either administer and organize the shipment themselves or the dealer does it in their behalf. The author has not been able to gain insight into detailed specifics of these return channels and which partner companies the customers and dealers use, as this is not administered by KMS, and customers or dealers have not been available to inquire about this. Since individual customers and dealers organize this, there are no permanent channels or key partners who participate in the reverse logistics, but several distinct channels and actors. It depends on each customer's or dealer's choice and they will have their preferred partners and channels for the reverse logistics in this case. Thus, it is not deemed a significant limitation to not have detailed information about this part of the take-back system. Also, when considering that the generals are known, and further aspects of the take-back system will be analyzed below.

In addition to the channels required for the reverse flow of products, an important aspect of a take-back system concerns the customer relations. As seen previously the customer relationships are considered good, but not very tight as KMS generally do not interact directly with the customers in this BM. Though, KMS interact closely with the dealers, which again interact with the customers. It is not considered a drawback or limitation of the take-back system that KMS do not have a very tight relationship with the customers since the dealers do and KMS have a cooperative relation with them. Also, the customers have strong incentives for returning the products and hence the need for a tight and direct relationship between the manufacturer and customer is not too prominent. Incentives for return is a common issue in take-back systems. Since the CE depends on the collection and return of materials, the users must have some incentives to participate in this. If the collection and return is managed by the manufacturer or a partner the incentives need not be too prominent compared to a system where the customer must provide more effort like in this BM. When the customer does not need to engage or be involved in activities, strong incentives are often not necessary. However, if the customers must organize, manage and pay for the return of materials, they obviously must have some benefits from this. In this circular BM, the customers are incentivized to return through the new sonar they will get as part of the deal and the discount they get on it. The benefits and gains outweigh the cons and cost for them and hence they are incentivized to return the used sonars. As this recovery and return of products are organized by each individual customer or dealer and part of a deal for the sale of a new sonar, there are no standardized processes and channels in this take-back system. A deal is struck between the parties for the return, but KMS does not manage the system for collection.

5.1.11 Adoption factors

The final building block of a circular BM is the adoption factors. This relates to the organizational capabilities and external factors which supports the transition towards a circular BM and application of CE principles. According to Lewandowski's (2016) triple fit challenge, the changes a company implements towards CE and a circular BM must fit the organizational capabilities and the external factors. In this case it is important to note that this BM was not developed to facilitate or enable a transition to a more CE. Also, KMS do not consciously refer to it as a BM they developed, more as something they started to do as a side business when they saw an opportunity and developed a strategy to seize this opportunity. In this thesis it is classified as a BM based on its features and characteristics and how a business model is defined. And as a circular BM with the circular economy characteristics, utilization of CE principles and the circular BM definition by Linder and Williander (2017). Though, the concept of CE itself was not given much attention and consideration in the development and application of the model and its processes. The main driver behind this BM was the opportunity to increase sales and earnings, and the sustainability aspects are merely a positive side effect that is not given much consideration. Thus, the shared value creation and sustainable development contributions from this can

be considered accidental. To develop this BM further or applying CE principles more in the business, a conscious focus on CE is necessary. To improve CS, they should also consider the TBL approach and address more consciously the social and environmental aspects.

KMS have experienced turbulent times in the industry with declining sales and revenue in recent years. They have been forced to lay people off and perform restructurings. They have successfully managed and executed change processes and have for instance been awarded as Lean business of the year in 2017 (Lean Forum Norge, 2017). KMS, are through their parent organizations KM and KG are committed to CS and sustainable development. Though, there are no clear goal of making a transition towards a CE to the author's knowledge. The experiences from the organizational changes and the transition procedures make KMS capable of handling such a process as the transition towards CE if they did decide to embark on this. Further, KMS is a very capable organization with capable people that are highly oriented towards change and continuous improvement. They have a culture for being efficient, optimizing and seizing opportunities, which the lean business or the year award is testimony of. Good change management is important in a transition towards CE and the experience they have with change is considered as an advantage. Further, KG and KMS are considered to be provident and change-oriented companies which is a good starting point for a CE transition.

The characteristics of KMS' products might be a challenge for CE implementation. Technological aspect and high-cost low volume items can be a hinder for becoming more circular and fully circular. The value creation requires advanced engineering and technology. Consequently, this entails difficult and possibly costly value capturing and adding processes like remanufacturing to circular products. A large portion of KMS' products are also low volume items and customized to individual customers which can discourage a CE transition.

Political incentives are an important enabler and facilitator in CE and sustainable development. More incentives and imposed requirements from politicians and rule-makers might be necessary to facilitate a CE transition in KMS. The successful endeavors with this BM and the added economic profit it has provided should be an eyeopener for KMS to the possible benefits such systems and configurations can provide. Further challenges and opportunities related to this circular BM will be discussed in the next chapter.

5.2 Summary of analysis

In this analysis, Lewandowski's (2016) circular BM model canvas has been utilized to break down KMS' circular BM to its 11 basic building blocks. Each of these building blocks has been evaluated, described and analyzed for the BM. By this, the BM in question has been explored, mapped and analyzed, and hence fulfilling the overall

objectives and purpose for this thesis according to the problem statement. This analysis, together with the empirical findings from chapter four, has revealed how the case company has adopted some of the key CE principles. Thus, RQ 2 has been addressed and answered.

As stated and clarified earlier, the CE principles involved in this circular BM have been in focus for the exploration and analysis here to answer RQ 2. In this BM, the CE principle reuse has been most prominently applied, when classifying according to the 3R definition of the core CE principles. Further, in order to enable and foster reuse of products and systems, KMS performs repairs, refurbishing and remanufacturing of used sonar systems to get them in an “as new” condition, and offer them as a value proposition to a new customer segment in a second-hand market. However, the material flow in the supply chain are not fully circular, which is one of the ultimate goals of CE. New parts and components are fed into the loop and residual waste in form of scrapped components are generated. By this, it resembles an economy with feedback loops, as described by Van Buren et al. (2016), presented in 3.3. Also, there are no strategies or processes for handling or recover value after the second-time use of the sonar systems Though, as the BM utilizes key CE components to promote reuse of products it can be deemed as circular.

The BM does not clearly fit any of the archetypes by Bocken et al. (2014) given in table 1 in section 3.4.2, but according to its characteristics it can be grouped as technological. Lewandowski (2016) outlines an overview of approximately 30 different circular business model types. These are not presented in the conceptual background, but the circular BM in question here bears most resemblance to the three models called incentivized return and reuse, asset management and remanufacture.

The literature review revealed in 3.3 that the core principles of the CE, the “Rs” are defined in several ways. Repairing, refurbishing and remanufacturing are in the 3R categorization “subcategories” or means to promote reusing, but still considered key principles (Kirchherr et al., 2017). In other variations of 4R and 5R they are included on the principal level as core CE principles. Regardless of definition and categorization, repairing, refurbishing, remanufacturing and reusing are fundamental and key in the CE to retain and add value. Thus, in short summary to answer RQ 2, KMS has adopted the CE principles reuse, refurbish, repair and remanufacture to their business.

6. Discussion

In this chapter RQ 3 will be addressed in addition to discussion of important aspects of this thesis. The chapter contains three parts. In 6.1 the challenges and opportunities for further growth in the context of corporate sustainability for the case company related to their circular BM will be discussed based on the empirical findings and the analysis in the previous section. Thus, this part addresses RQ 3 and seeks to answer it. In 6.2 reflections on the limitations of this thesis will be discussed. This will be a synthesis of the various limitations mentioned throughout this study, but also additional limitations not mentioned previously. Lastly, topics for future research is discussed in 6.3

6.1 Challenges and opportunities

As mentioned, this section will address RQ 3 and seeks to identify challenges and possibilities for further growth in the context of corporate sustainability for KMS. As per the problem statement and focus of this thesis, the discussion will have basis in and center around their circular BM. Thus, potential aspects of CS related to other parts of the business and other initiatives have not been investigated extensively and will not be addressed here. This limitation will be further discussed in 6.2 and possible interesting topics to investigate in this regard will be deliberated in 6.3.

As seen in the literature review presented in chapter three, sustainable development when incorporated by corporations, can be called corporate sustainability (Baumgartner et al., 2010). CS involves integrating and addressing both economic, ecological and social aspects for businesses (Amini and Bienstock, 2014, Morelli, 2011, Dyllick et al., 2002, Hahn et al., 2015). For corporations to truly be sustainable they need to have a holistic perspective on all of these three dimensions and their interrelations and impact (Engert et al., 2016). Thus, by addressing these three pillars of sustainable development by using the TBL approach, corporations can be sustainable and make their contribution to the general sustainable development in the world.

It appears to still be some confusion in practice regarding what the concept of CS fully entails and how to apply and incorporate it (Engert et al., 2016, Hahn et al., 2015). The main objective of CE is sustainable development (Ghisellini et al., 2016, Kirchherr et al., 2017) and it is closely interrelated with CS as shown in chapter three. It is viewed by many as the best way to approach sustainable development (Murray et al., 2017, Ghisellini et al., 2016, Kirchherr et al., 2017, Geissdoerfer et al., 2018). Thus, CE can be viewed as a tool, approach or a strategy to use for achieving CS for corporations. According to Murray et al. (2017) circular economy has been the most recent and best attempt to conceptualize the integration of environmental wellbeing and economic activity in a sustainable way. With the reasoning above as foundation, KMS can achieve growth in the context of CS by further adopting CE principles,

develop their circular BM and transition towards a CE. In accordance with RQ 3 the challenges and opportunities for this will be discussed below.

KMS is committed to CS and CSR as it appears in their sustainability report discussed previously in this thesis in 4.3.5. However, it has been revealed that the circular BM investigated in this thesis did not emerge from sustainability considerations or as part of a transition towards CE. They recognized a business opportunity and the motivation behind was solely increased sales and economic profit, and not grounded in sustainability efforts. Environmental and social aspects where not directly considered or motivational factors for this model. Though, this BM fosters the use of CE principles and contributes to reusing products and materials, and hence contributes to sustainability. The SVC in this case can thus be deemed accidental or a positive side effect. A critical aspect for KMS to develop this further and for it to contribute to CS is to have a more conscious approach to the sustainability elements of this BM and the application of key CE principles in general. Currently only one employee, interviewee 2, is working part-time with the administration of the processes and partners in the associated supply chain. Obviously, a lot of people are involved in this BM, but only interviewee 2 is administering the offering of value and sales to the second-hand market and he is spending much more time on sales of new sonars. Further, the focus in the organization is generally on new sales and after-sale service and the endeavors in the second-hand market with this BM is not prioritized (KMS Interviewee 2, 2018). KMS should recognize the potential benefits and the contribution to CS an expansion of this model and applying CE principles can entail. Such extension and increased focus can also be grounded in the possibility of generating increased income as this model has proved to generate profit in the second-hand market. This implies allocating more time and resources to the managing of the model and its processes and to further develop it. For this to be feasible managers at KMS must provide a strategic focus on this and allocate resources.

In addition to the current emphasis on selling new products and after-sale service, another hinder for growth is possibly the low volumes KMS operates with. Currently, the return of sonars, upgrading and repair and reselling to the second-hand market is something that happens from time to time and not a continues process on a daily or weekly basis. This is due to the relative low volumes of sonars sold and in circulation. The demand in the second-hand market for used Simrad sonars are currently higher than the supply (KMS Interviewee 2, 2018).Thus, allocating resources must consequently entail an up-scaling of the products involved and possibly to further incentivize customers to return used sonars. The other products groups besides Simrad constitutes generally even lower volumes than the sonars. This can prove to be a challenge if expanding this BM to other product groups is applied. The high level of customization on some of the products in other product groups also entails challenges for reuse and selling in second-hand markets. However, to transition towards a CE and to be sustainable, KMS should explore other products and

solutions that can be included in this BM and utilize key CE principles. Exactly which products that are best suited and feasible in this context requires a detailed exploration, but the author suggest the products in the UMAP and UPM product group might be best suited as they are closest related to the Simrad sonars. In addition to including other product groups, the value proposition of offering customers to trade in used products that are resold, should also be applied to the other Simrad sonars. Such development of the model with inclusion of more products and scaling it up in the business can prove to create new markets and generate more income and increase competitiveness in the long-run.

The analysis in the previous chapter revealed that this BM have more resemblance to and economy with feedback loops, than being fully circular. Currently, value is only retained once and there are no strategies, processes or plans to recover value after it has been used in the second-hand market. Though, as with their entire product portfolio they do offer repairs to extend product-life, which is a key aspect of the CE. In addition to considering expanding this BM by applying the same strategies and processes to other products, they should study how the BM can become more circular by recovering value multiple times instead of just once. This will likely have several implications and challenges, but an initial assessment should at least consider if such a value proposition – a product which has had two, three or four previous owners – is desirable to any customer segments, which is a necessity for this to be feasible. The upgrading processes by key CE principles will probably have to be more comprehensive and costly for even older products, and the room for profit might be reduced due to misalignment of the revenue streams and cost structure in a such case.

As mentioned this BM emerged as managers saw an opportunity to increase the sales of their newly developed SU90 sonar. And as identified in the analysis, the offering of collecting the sonars at a later stage in return for a new sonar is part of the value proposition and well-received by customers. Thus, this model contributes to increased sales of new sonars, and the author sees no profound reason why this same model should not be able to contribute in such a regard to advance sales for other products and in other product groups, especially for newly developed products. This can be a huge incentive for KMS to further explore the development and up-scaling of this model. It can also be applied by the parent organizations KM and KG on their products. They can learn from the experiences and knowledge KMS has gained, and apply this knowledge in other parts of the KG Group. This thesis has contributed in that regard with a comprehensive exploration and analysis of KMS' circular BM, which can be beneficial to study for learning and ideas by other parts of the organization. Thus, this BM – and this thesis if its findings and suggestions are considered – can contribute to a transition towards CE for both KM and KG, and ensuring that the parent organizations become more sustainable. KG can include this as part of their operations and communicated commitment to CS and sustainable development.

The opportunity to expand this BM to other sonars, product groups and other parts of the KMS, KM and KG organizations also makes sense when considering their key strategic focus areas presented in 4.3.1. In their *Annual and Sustainability Report* (2017) they highlight continuous focus on innovations as a key area to ensure profitable growth and healthy business operations. This should not just apply to product innovation, but also to business model innovations. The circular BM in this case, though not deliberately developed as a specific BM, is an example of such innovations. Thus, such development and further growth in this context is aligned with this strategic focus area and should thereby be acknowledged with increased recognition and attention. The further development and expansion of this BM is also aligned with the strategic focus areas; at all times have an organization tailored to the markets and its demands; and positioning towards new markets and opportunities. The latter can be said is exactly what this circular BM has done and does. KMS seized an opportunity and positioned itself towards a new market in the second-hand market as a result of pursuing this opportunity. With this, they reached a new market and customer segment they previously did not supply. Also, both interviewees mentioned the progressive competition in the industry and the fear of being outcompeted as possibly the biggest threat. Diversification in value propositions, serving several markets and customer segments, which this circular BM has contributed to, can mitigate this threat. And a further expansion and up-scaling of the model can be a way to tackle the intensifying competitive landscape. Interviewee 1 pointed out that as they historically have focused on the high-end market, they now as a result of intensifying competition have a desire to capture market shares in other markets and also move “down” into the mid-range market. This is exactly what has been done in this case in the second-hand market. With the used SX90s they have a value proposition to a different customer segments in a lower price-range where there are other competitors they can capture market shares from. If they wish to continue this pursuit and diversify from only focusing on the high-end market, they can do this by offering used high-quality products in the second-hand market, and hence they should develop and scale-up the circular BM. This can be a lot cheaper and more profitable than developing new lower-cost sonars or other products to reach these markets, and at the same time a more sustainable way of doing business. The opportunity to capture value and generate income from it as this BM does can if expanded in the organization also contribute to reach the financial ambitions of a “double digit” EBITDA-margin. .

As seen above, the opportunities related to the development and further application of the circular BM can be argued to be directly congruent with three out of five stated key strategic focus areas. This alone should raise attention for managers at KMS, KM and KG, and strongly encourage further exploration into how the organization can profit from this and ensure growth in the context of CS. This thesis can provide topical and interesting insight in that regard.

Most manufacturers generally tend to focus on selling new assets, which is also the case in KMS. A common concern related to CE and the sale of used products in second-hand markets is the fear of cannibalization. I.e. manufacturers believe that offering repaired, remanufactured or refurbished products will negatively affect sales of new offerings (DLL Group, 2015). This is also the perception at KMS. They author deems the risk associated with this as low in the case of KMS and should not be a concern. The two value propositions of the two sonar systems in this circular BM has significant differences, and they serve two different customer segments which also has significant differences. It is unlikely that the customers who wants the very best, which is who the value proposition of the SU90 is aimed at, suddenly would favor a used sonar system of an earlier version. These customers trade in their used sonars so they can get a new top of the line sonar, which implies it is highly unlikely they would favor used products from earlier system generations. However, cannibalization from other new sonar systems in a lower price-range is much more likely. Though, as all Simrad sonars currently can be said to be in the high-end market and the customer segment in the second-hand market does not have the budget to acquire new Simrad sonars, this risk is not deemed significant either. Regarding the use of the principles and characteristics from this circular BM on other products in other groups, the risk of cannibalization must be evaluated for the specific case. This will not be further discussed here, but it is very likely that the same reasoning as for the sonars will also apply to other product groups and optionally for other solutions in KM and KG. Additionally, the DLL Group (2015) found in their study of manufacturers engaged in second-life businesses that none of them had experienced any explicit negative impact on their sales of new offerings. The reasoning above and this evidence should convince KMS that the fear of cannibalization is needless and should not be an argument against further pursuit of CE and value propositions utilizing repaired, refurbished and remanufactured products to the second-hand market.

As mentioned, the flow of materials in this BM does not happen continuously on a very regular basis. This, in combination with a low degree of priority in general, has resulted in issues with the material flow from the lack of standardization of process and activities. Interviewee 2 has to micromanage the material flow and activities related to restoring and upgrading the sonars at KMS' and subcontractors facilities. As he is often occupied with the sales of new sonars, the CE activities like repair, refurbishing and remanufacturing to restore and add value to the used sonars are given less priority. As a result, the material flow is halted and waiting time often occurs between processes. More standardized processes for the flow of materials in the supply chain should be developed. This would contribute to reduce waiting time and unnecessary stops in the material flow, and significantly lower the degree of micromanagement required for the value adding processes and the moving of the parts and components between departments and actors. As pointed out earlier in this discussion, allocating more time and resources to this BM and the development of it

is key to overcome challenges and facilitate a growth of this BM and consequently growth in the context of CS for KMS.

6.2 Limitations

In this section the limitations of this thesis will be discussed. The limitations mentioned throughout in the earlier chapters will be revisited, together with some additional reflections. The research in this thesis has been conducted as a single-case study. As mentioned in chapter two, this will affect the level of external validity and inherently have limitations in transferability to other cases. Though, the findings can provide learning for similar cases and be ground for future research. This thesis has shown how the circular business model canvas can be utilized to explore, map and analyze a circular business model and has thus contributed to empirical verification of the framework's practical applicability, which was called for by the creator of the framework. The level of achievement in this regard has to be evaluated by others, but the author considers the framework to have been an effective tool for mapping and analysis in this case. Though, the analysis of some of the building blocks were limited due to lack of empirical information. This especially applies to the fact that some important stakeholders have not been available for inquiries. It was desired by the author to obtain information from at least some of the relevant stakeholders, but this has not been accomplished. Particularly, the customers and dealers would have been interesting to inquire about the circular BM and their role. The subcontractors and logistical partners could also have provided noteworthy information and insight. The fact that these stakeholders have not been inquired and consulted can be viewed as a limitation.

The empirical findings mainly rely on the information provided by two managers at the case company. It could have been useful to inquire other employees and managers, but these two where the ones made available to the author. Not having a broader set of informants for the data collection can be deemed as a limitation as the collected data is based on accounts from only two informants. However, in-depth interviews were conducted with these two informants in addition to a follow-up interview with one of them at a later stage. Also, the two interviewees where particularly relevant to query in this case as they both are involved in the BM from a managerial position. Interviewee 2 is the one directly in charge of managing this circular BM, and hence no one could have provided more relevant information and knowledge in this context than him. Additionally, the collected data has been collaborated and supplemented with documentation from other sources and online research by the author.

There are aspects which are relevant in this case that has not been given much room or investigated or evaluated. This is partly due to time and resource constrains, but also the chosen scope, boundaries and focus of the thesis. RQ 2 and RQ 3, quite broadly addresses the case company KMS, with how CE principles have been

applied by the company and the challenges and possibilities for further growth in the context of corporate sustainability. With the investigation of the specific circular BM they have, that utilizes key CE principles, other CE principles which might are utilized in other parts of the organization and by other means has consequently not been investigated in this thesis. By this, it can be argued that the RQs are not answered fully, but for a MNC like KMS a lot of different aspects can be linked to CE. Instead of loosely identifying a broad range of relevant aspects, an in-depth investigation of a circular BM that have emerged was chosen. This is also clearly accounted for in the defining of scope and boundaries in chapter one and 4.4.1. Regarding RQ 3, it was also clarified that the growth in context of CS will be discussed with basis in the BM in question. How they have applied the key CE principles to their business with this BM is thoroughly identified and investigate. The reason for choosing an in-depth exploration of this particular BM instead a broader approach to all 3 R's of CE in KMS is also because the case company desired a study and comprehensive mapping of the said BM, and the author found this to be a very interesting topic to study. Though the RQs can be interpreted as having a broader scope than what is actually studied, the focus and scope of the thesis is completely in line with the overall problem statement, and the scope, delimitations and boundaries are deemed sufficiently stated and clarified.

If another approach was taken or another focus applied, relevant aspects in the context of CE and the 3 R's are especially the extensive after-sales service operations KMS have around the world. As identified earlier, but not further treated, they perform repairs on products and systems both at their facilities and at the customer's location. Such repairs contribute to extend product-life, which is highly encouraged in CE. Recycling activities are also key in CE. The author is familiar with the fact that KMS do have recycling programs for waste and waste-collection, but have not been given much space or thought in this study. Development and production of the new SU90 sonar was classified as outside the boundaries of the BM and scope of investigation in this thesis. This was mainly done for delimitation purposes as it can be considered to be on the borderline of the model and the fact that it currently does not contain any key aspects from the CE. However, it is underlined in the analysis that the costs in relation to development and production of the new sonar must be considered when evaluating this model's profitability in terms of balance between the revenue streams and cost structure. Also, development and manufacturing should consider the design of products to enable use of CE principles like repair and refurbishing at a later stage. The fact that these aspects related to the creation of the value proposition of the new SU90 was not further considered in this thesis can be viewed as a limitation. As mentioned, this was considered less relevant and interesting to investigate, but if more time was available the author could have looked further into this.

Generally, an even more thorough investigation could have been performed if the author had more time and resources. This includes both the aspects treated and

investigated, but also other aspects not evaluated or investigated. Still, the author deems a lot of interesting aspects has been investigated and analyzed, and that interesting and topical findings and results has been obtained without profound limitations.

6.3 Future research

In this section the areas and aspects which can benefit from further research will be highlighted. It will be linked to some of the limitations discussed in the previous section, the findings in 6.1 and additional areas the author deems relevant and interesting to further pursue. Firstly, the future research in the context of the case company will be discussed. Secondly, the future research in the broader context for the key concepts and field of research in this thesis will be addressed.

In 6.1 the possibility to further expand and scale up the circular BM to other parts of the business to promote a CE transition and to foster growth in the context of CS is discussed. If this are to be desirable for KMS, how such an expansion should be done must be further investigated. This includes a detailed exploration and analysis of which products are best suited for inclusion in a circular BM, and how it is to be carried out with the necessary key partners and key activities among other things. If a transition towards a CE is decided, developing a completely new BM by BM innovation, perhaps with inspiration from the current circular one, should also be considered instead of just adjusting and scaling up the existing. This will require additional research and analysis. The design phase of products should also be addressed and investigate with the intention of identifying possibilities for using more environmentally-friendly materials and designing products in a way that foster circularity and CE restoring processes. A possible limitation of this study mentioned in the previous part was that key stakeholders and parties in the circular BM's supply chain had not been inquired about this model or their role. Thus, further exploration and investigation of this BM should include these parties and query them.

As mentioned, the focus in this thesis has been on the circular BM in question, and this was used as a foundation when challenges and opportunities for further growth in the context of CS was discussed. Future research should investigate other aspects which can take KMS, KM and KG towards CE and/or contribute to their CS. An interesting topic in this regard may be life-cycle analysis, which is a technique to assess the environmental impact of their products throughout their life cycle. Such assessment can be further used in decision-making to reduce environmental impacts.

The author suggests that KMS, with their stated strategic focus to position towards new markets and new opportunities, should investigate possibilities for radical changes in application for some of their products. Can KMS' hydroacoustics technology and competence by utilized to contribute to sustainable development by

other means than currently, for instance to tackle the rising issues regarding plastic waste in the oceans?

RQ 1 and the conceptual background presented in chapter 3 revealed that CS, CE, SVC and sustainable BMs are interrelated, and all connected to sustainability. The author has sought present these concepts in a structured and orderly manner to clarify some of the confusion associated with these concepts and how they are connected to each other and to sustainability. The lack of consensus regarding definitions, what the concepts entail and how to apply them in practice can hamper development in these fields of business and delay and obstruct sustainable development in business and the world in general. Thus, the author supports some of the views of Crane et al. (2014), Strand et al. (2015), Kirchherr et al. (2017), Engert et al. (2016) and Hahn et al. (2015) regarding this, and that how corporations best should approach and adapt these concepts to be sustainable and contribute to sustainable development should be a field of research with particular focus. Specifically, the author believes that CE will become increasingly topical and applied by corporations in the years to come, consistent with the views of Urbinati et al. (2017), Lieder et al. (2017), Stewart and Niero (2018), and Masi et al. (2017). CE is by many viewed as the solution to address sustainable development (Murray et al., 2017, Ghisellini et al., 2016, Kirchherr et al., 2017, Geissdoerfer et al., 2018), and they author supports the call by Lieder and Rashid (2016), Pan et al. (2015), Lewandowski (2016), Merli et al. (2018), Urbinati et al. (2017) and Masi et al. (2017) for more research on the concept, its application, implementation and effects. And the role of new sustainable business models and business model innovation is paramount in this context.

7. Conclusion

This master's thesis investigates and explores how a Norwegian maritime equipment supplier has adopted circular economy principles to their business. It was initially revealed that the case company have developed a strategy with accompanying processes and activities that utilized key circular economy principles, which could be defined as a circular business model. The objective and purpose has been to provide a comprehensive overview of this circular business model and how circular economy principles has been incorporated, and identify challenges and possibilities for further growth in the context of corporate sustainability.

The findings from a comprehensive literature review has been given in this thesis, together with a framework for circular business model. This framework has been utilized to explore, map and analyze the case company's circular business model to provide a thorough overview of the model and assess how circular economy principles has been adopted. In short, the main findings here was that this model foster reuse of materials and products by utilizing the circular economy principles repairing, refurbishing and remanufacturing. Thus, research question 2 has been addressed and answered.

It has also been explained and outlined how the concepts of corporate sustainability, shared value creation, circular economy and sustainable business models are interrelated and connected to sustainable development, to answer research question 1. They are all highly interrelated and have different roles and functions in relation to sustainable development for corporations. For instance, the main objective of circular economy is sustainable development and it is by many viewed as the best way for corporations to approach sustainable development and hence achieve corporate sustainability.

As per the problem statement and research question 3, the challenges and possibilities for further growth in the context of corporate sustainability for the case company has also been considered and identified. The case company can achieve growth in the context of corporate sustainability by further adopting circular economy principles, develop their circular business model and transition towards a circular economy. To achieve this, it is important for managers to allocate resources and strategic focus to this. One of the major challenges for further growth is the low priority this circular business model and the associated sustainability aspects currently have.

With the answers to research question 3 together with research question 2 the objectives and purpose of this thesis is considered fulfilled, and the problem statement has been investigated and answered. Since this is a single-case study, the external validity, transferability and implications for others will inherently be limited.

However, the findings in this thesis can be highly relevant and topical for similar cases. The findings from RQ 1 can on itself be informative and transferable, but also the findings from RQ 2 and 3 can provide valuable insight and learning for other managers. With the comprehensive exploration and analysis of the case company's circular business model, this thesis can provide managers at the case company and parent organization valuable information and groundwork, if it is decided to improve and further develop the model in question or associated aspects. The researched topics in this thesis are also highly topical and relevant in today's economy and is increasingly being applied by practitioners and gaining attention. This thesis has given a minor contribution to the field of research in this context by exploring and analyzing how a specific manufacturing company has adopted circular economy principles to their business, which can be interesting for scholars and managers to study. Also, this thesis has also contributed to the field of research with empirical verification of the framework by conducting this study and applying the framework.

As a final concluding remark, one of the findings from exploring this business model was that it has been a source of increased income generation and competitiveness for the case company, by incorporating CE principles and sustainable aspects. This supports the claims of Porter and Kramer (2011) that shared value creation promotes the increase of economic value for the company as well as societal value, and the claims that sustainability considerations and incorporating sustainable practices will lead to success in the long-run by Amini and Bienstock (2014), Ameer and Othman (2012), Eccles et al. (2014) and Baumgartner et al. (2010). Even though sustainability was not a key driver in the development of this strategy and business model. Thus, this study has contributed with additional empirical evidence supporting that it is beneficial for corporations to engage in sustainable development initiatives and transition towards CE, even if this is solely motivated by economic performance. The author considers propagating this realization throughout the world of business and to managers as crucial part of driving sustainable development. Though, it is even better if corporations and managers follow the integrative view of CS and the TBL approach and realizes the benefits of equally addressing and focus on all three pillars of sustainability to ensure sustainable development in business and the world.

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9. Appendixes

9.1 Interview guide

The interviews were conducted in Norwegian. Thus, the original interview guide was compiled in Norwegian. A translated version is given below. As the intention of a interview guide is to help guide the interviewer in the interview, some of the questions are formulated in a short and concise way without full sentences. Follow-up questions that arose naturally during the interviews to clarify or inquire further based on the answers are not included here.

Interview guide for interviews with employees at Kongsberg Maritime Subsea

Information to the interviewee:

Before we start the interview, I can tell you a little about myself and what I am working on. I am writing a master's thesis in strategy and international business development with the theme strategies for sustainable business models, at NTNU in Trondheim. I am conducting a single-case study with Kongsberg Maritime Subsea as the case company. In this interview I wish to inquire you about KMS in general and the specific business model you have, which I have been briefly informed about by you earlier. In short, the objectives for my thesis is to explore, map and analyze this BM, and identify challenges and possibilities. Emphasis will be on circular economy principles and aspects.

Feel free to include your personal opinions and reflections where this relevant or asked for. Just let me know if there is something we talk about that you do not wish to be quoted on. Do you have any questions before we start?

Questions to be answered:

General information regarding the interviewee and the case company.

- What is your role at KMS and for how long have you worked here?
- What and how is the company's business model? (value proposition, construction, partners, channels, customers etc.)
- In your opinion, what have been the key factors for success for KMS?
- In your opinion, what are the biggest challenges in the years to come for KMS?

Regarding the specific BM for recovery of value and sale of used products in the second-hand market, which I (the interviewer/author) was informed about beforehand.

- What and how is this specific BM?
- What is the strategy?
- What is the motivation behind it? (Business opportunity for generating income? Sustainability?)
- How was it developed?
- For how long has it existed?
- Can you explain the supply chain for this BM? All internal and external parties, products processes and activities involved.
- Has this BM worked well? Has it generated revenues and/or affected other aspects like growth, new partners, new customers, competitiveness?
- What are the challenges with this model and everything associated with it?
- Do you plan to continue with this model in the years to come?
- Do you have any plans to develop this model further in any way? If so, what and how? What are the opportunities here?
- In your opinion, what can be improved regarding this model and everything associated with it?
- How is the market for used products?
- Can you describe the customer segments for new and used products? What distinguishes these segments?

Additional information regarding the company, the industry, competitors and customers:

- Is there a focus on sustainability and/or circularity in the company? Which initiatives are there? What are the drivers and motivation for this?
- Are there other forms of circularity in Kongsberg Gruppen, to your knowledge?
- Who are your main competitors?
- To your knowledge, do any of these have similar BMs regarding sustainability and circularity, or are involved in second-hand markets?
- To your knowledge, is sustainable development, circular economy, corporate sustainability and/or shared value creation on the agenda in the industry? If so, how?