



Vaasan yliopisto
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Drivers and challenges of circular business models:

Comparative case study in textile industry

School of Management
Master's thesis in Economics and Business Administration
Strategic Business Development

Vaasa 2020

UNIVERSITY OF VAASA**School of Management**

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Title of the Thesis:	Drivers and challenges of circular business models: Comparative case study in textile industry		
Degree:	Master of Science in Economics and Business Administration		
Programme:	Strategic Business Development		
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Year:	2020	Pages:	78

ABSTRACT:

The aim of this research is to advance knowledge of circular business models and the drivers and challenges related to the implementation of these models. Textile industry is the world's second most polluting industry and the current linear "take-make-waste" model of this industry cannot continue. Circular economy and circular business models are solutions for the current unsustainable linear economic model. Circular economy bases on the idea of restorative and regenerative production and consumption systems. The aim of these systems is to keep materials and products as their highest utility for as long as possible. Despite the growing popularity of circular economy, it is still a poorly understood concept and the implementation of circular business model is even more uncertain. Thus, this thesis explores circular business models in textile industry as well as the factors which strengthen or hamper the implementation of a circular business model. This study is conducted as a comparative case study that reflects the circular business models of developing and established textile companies. The empirical research was conducted through four semi-structured interviews with Finnish textile companies. Furthermore, this research follows a deductive approach as the research continues from theory to empirical testing. The findings of this research explain different circular business models and the drivers and challenges related to the specific circular business model. The research results show what business actions each company operated to create a circular business model. Furthermore, this research analyzes the differences and similarities between developing and established textile companies. Circular business models of case companies varied with each other, but the main drivers and challenges were similar. The main drivers related to circular economy were social and cultural issues whereas the main challenges related to circular economy were the lack of technological development. The outcomes of this study will support textile companies to analyze different options of implementing circular economy and the things which will either strengthen or hamper the implementation.

KEYWORDS: circular economy, business models, sustainable development, product life cycle, textile industry

Contents

1	Introduction	7
1.1	Research gap	9
1.2	Objectives and research questions	10
1.3	Thesis structure	11
2	Circular economy	12
2.1	Circular business model	17
2.2	Implementing circular business model	19
2.2.1	Challenges of circular business models	20
2.2.2	Drivers of circular business models	23
2.3	Circular business model innovation	27
2.3.1	Degree of circularity	28
2.3.2	Six cycles	29
2.3.3	Closing, slowing and narrowing	30
2.3.4	Business model archetypes	30
2.3.5	ReSOLVE framework	31
2.4	Theoretical framework	34
3	Methodology	36
3.1	Research method	36
3.2	Case selection process	37
3.3	Data collection and analysis	39
3.4	Quality of the research	41
4	Findings	42
4.1	Circular economy: ideology of a company	42
4.2	Circular economy: rational choice of a company	46
4.3	Circular economy: business model for textile companies	50
5	Discussion and conclusion	57
5.1	Circular business models of textile companies	57
5.2	Circular economy drivers of textile companies	61

5.3	Circular economy challenges of textile companies	64
5.4	Managerial implications	67
5.5	Limitations and suggestions for future research	68
	References	70
	Appendices	78
	Appendix 1. Interview questions	78

Figures

Figure 1. Theoretical framework	35
Figure 2. Modified research framework	67

Tables

Table 1. Definitions of circular economy	13
Table 2. Challenges and drivers of circular economy (modified based on Jesus & Mendonça, 2018 and Rizos et al., 2016)	27
Table 3. Expanded ReSOLVE framework (Modified based on EMF, 2015; Lewandowski, 2016 and Ceptureanu et al., 2018)	34
Table 4. Summary of the case companies	39
Table 5. Summary of the interviewees	40
Table 6. Summary of the findings	51
Table 7. Summary of the business activities of case companies	61

1 Introduction

The main purpose of this study is to increase knowledge of circular business models in the textile industry. Our current unsustainable “Take-Make- Waste” model bases on a linear economic model, causes several environmental problems and will sooner or later reach a sustainability dead-end as Earth’s resources will be overloaded (Antikainen & Valkokari, 2016). A linear economy is characterized as converting natural resources into waste via production. This production of waste leads to the deterioration of the environment in two ways: by the removal of natural capital from the environment and by the reduction of the value of natural capital caused by pollution from waste. (Murray, Skene & Haynes, 2017.) Scientific evidence shows that the linear economy is unsustainable in terms of all three dimensions; economic, environmental and social. Deserts are expanding, sea level is rising, and per capita consumption is increasing. In other words, the global natural ecosystem is decreasing size and volume. A simple and logical answer to this challenge is to change the current linear model to circular. (Korhonen, Honkasalo, & Seppälä, 2018.)

Circular economy bases on restorative and regenerative production and consumption systems. These systems aim to keep materials and products at their maximum utility for as long as possible. (Ellen MacArthur Foundation [EMF], 2013). To stimulate and foster the implementation of the circular economy, comprehensive knowledge about designing circular business models is needed (Lewandowski, 2016). Circular business models have been identified as important enablers for companies moving towards circular practices (Nußholz, 2018). Furthermore, switching from a linear model to a circular one has attracted increased attention since circular business models are noticed as a novel way of creating, delivering and capturing social, economic and environmental value (Antikainen & Valkokari, 2016). Hence, circular business models are increasing their importance continually. Furthermore, when companies are implementing a circular business model, they must identify the drivers and challenges which they may confront. The drivers are factors that enable and encourage the transition towards a circular economy, while the

challenges are bottlenecks that obstruct transition towards a circular economy. (Jesus & Mendonça, 2018.)

To understand the concept of circular economy, it is necessary to explain its origins. However, the origins of the circular economy concept are unclear, and the term circular economy has thus been connected with different meanings and associations by different authors, but the concept of a cyclical closed-loop system is what these meanings generally have in common. (Murray et al., 2017.) Ecological economist Kenneth Bolding (1966) first presented the idea of a closed-loop economy where the circular system is seen as a prerequisite for the maintenance of the sustainability of human life on Earth (Ghisellini, Cialani, & Ulgiati, 2016). Perhaps the most influential background concept of circular economy is the cradle-to-cradle concept which is however highly idealized. It relies 100% on renewable energy and recycles all the material and thus it is not realistic. (Korhonen et al., 2018.) Circular economy offers a distinct approach giving a new life and more comprehensive meaning to these already well-known concepts of cradle-to-cradle and closed-loop system (Urbinati, Chiaroni, & Chiesa, 2017). Furthermore, the concept of circular economy provides an alternative model to understand and analyze consumption (Ranta, Aarikka-Stenroos, & Mäkinen, 2018).

The concept of circular economy has been able to attract attention since it makes common sense: it is more profitable to use value many times, not only once (Korhonen et al., 2018). Circular business model is supposed to lead to more sustainable development and harmonious society, and over the last decade, this concept has gained growing attention world-wide (Ghisellini et al., 2016). Ellen MacArthur Foundation [EMF] (2015) proposed that sector-by-sector analysis could deliver valuable understandings and address the main opportunities and challenges around the circular economy transition. The chosen industry for this study is textile industry. This is because textile industry, with its current linear model, is the world's second most polluting industry (Waste & Resource Action Programme, 2012). The necessity to move towards circular model is indicated by the textile industry experts. Textile industry must replace the take-make-waste model

with a circular one to mitigate the negative environmental impacts that the industry causes. (Koszevska, 2018.)

1.1 Research gap

In the last few years circular economy has received increasing interest worldwide (Ghisellini et al., 2016). The concept of circular economy is currently promoted by EU, by several national governments, and by numerous business organizations. The concept has been formed mostly by practitioners, the business community and policymakers. However, the scientific research of circular economy remains still quite unexplored. (Korhonen et al., 2018.) Practice is ahead of the academy and thus studying a real-life case is a valuable method of contributing to academic discourse (Bocken, Short, Rana, & Evans, 2014). Furthermore, scholars in the strategic management field are still struggling with a lack of framework describing how organizations that would like to become circular could implement circular business model to their existing business (Urbinati et al., 2017).

The circular economy has arisen as a key approach in the transition to a more sustainable economic model, but it is still a poorly understood notion (Jesus & Mendonça, 2018). There is a lack of information about the process of implementing the circular business models and the typologies which would clarify different circular business models (Urbinati et al., 2017). Implementing a circular business model requires identifying the factors that foster and hamper the transition towards circular business model, but these drivers and challenges are barely observed in the academic literature (Jesus & Mendonça, 2018). Furthermore, understanding is lacking concerning how the adoption of circular economy generates value in a business context even though the circular economy promises to create economic value alongside with social and environmental value (Ranta et al., 2018).

Even though there are success stories of circular economy implementation into business model (EMF,2013), there is still a lack of understanding of the concept comprehensively.

The adoption of circular economy requires new knowledge to fill in the gaps of business opportunities, drivers and challenges related to circular business models (Jesus & Mendonça, 2018). Further research is necessary in the field of circular economy implementation at the company level (Murray et al., 2017). Although there are studies about circular business models (Ceptureanu, Ceptureanu, Gert, & Murswieck, 2018; Heyes, Sharmina, Mendoza, Gallego-Schmid, Azapagic, 2018; Lewandowski, 2016) as well as the drivers and challenges of circular economy implementation (Jesus & Mendonça, 2018; Rizos, Behrens, Gaast, Hofman, Ioannou, Kafyeke, Flamos, Rinaldi, Papadelis, Hirschnitz-Garbers & Topi, 2016), the connection between drivers and challenges to circular business models is unclear. The lack of research might hinder the implementation of circular economy to business. Thus, this thesis seeks to fill in the gap of circular business models and their drivers and challenges by combining and analyzing these concepts through case studies at the company level.

1.2 Objectives and research questions

The main objective of this research is to study the circular business models in the textile industry and the drivers and challenges related to the implementation of circular business model. This research aims to deeper the existing literature about circular business models and identifies the main challenges and drivers related to a specific circular business model. These objectives will concentrate on Finnish companies operating in the textile industry. By following this road, the research aims to clarify the existing literature about circular business models and the effective implementation of these models. These research objectives are analyzed by answering the following research questions:

RQ 1. What are circular business models?

RQ 2. What are the drivers of implementing a circular business model?

RQ 3. What are the challenges of implementing a circular business model?

One key aim of this research is to clarify the context of a circular business model and increase knowledge about the business actions which circular business models comprise. To analyze the circular business models comprehensively, also the drivers and challenges are being analyzed. Despite the increasing popularity of circular economy, it is still relatively inadequately understood concept and the methodologies for the actual implementation of circular economy are even more uncertain (Jesus & Mendonça, 2018). To clarify the actual implementation of circular economy, the above-mentioned research questions were formulated.

1.3 Thesis structure

This research is structured in five main chapters. The thesis first introduces the background of the topic, discusses the needs in the field and raises knowledge about the studied topic. Furthermore, the research objectives and research questions are explained and presented. The second chapter presents the context of the study which is circular economy business models and the drivers and challenges related to the implementation of circular business models. The chapter begins with a deeper understanding of the terms circular economy and circular business model. The literature review covers the concepts of circular business model innovation, drivers and challenges of circular business models and different categories of circular business models. Last, the theoretical framework of the circular business model is introduced. The theoretical part is followed by the methodology that presents the research method, case selection, data collection, and analysis. Furthermore, these methodological choices are explained in detail, and the trustworthiness of this study is presented. The fourth chapter presents the analyzed data collected through empirical research. Furthermore, the last chapter compares the results to the theory, answers to the research questions and objectives, and presents managerial implications, limitations, and suggestions for future research.

2 Circular economy

As a term, circular economy has both a linguistic and descriptive meaning. Linguistically it is the opposite of a linear economy where natural resources are becoming waste via production. The descriptive meaning of the term relates to the concept of cycles which are biogeochemical cycles and the idea of recycling products. Biochemical cycles describe the circulation of natural resources such as water which evaporates from the ocean, forms clouds, rains down and flows back to the ocean. (Murray et al., 2017.) Circular economy should exploit nature's cycles for preserving materials, energy, and nutrients for economic use and limit the throughput flow to a level that nature tolerates (Korhonen et al., 2018). Circular economy aims to maintain materials in use for as long as possible and preserve or even upgrade their value through services and intelligent solutions (Antikainen & Valkokari, 2016). Keeping the resources in cycles for as long as possible will increase the overall resource efficiency and produce additional revenue from multiple cycles (Ranta et al., 2018). Several definitions of circular economy have been presented, and table 1. presents these definitions.

Author	Definition of Circular Economy
Murray et al. (2017)	<i>“an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximize ecosystem functioning and human well-being”.</i>
Ghisellini et al. (2016)	<i>“More than a trend-based model, CE may rather be considered a way to design an economic pattern aimed at increased efficiency of production (and consumption), by means of appropriate use, reuse and</i>

	<i>exchange of resources, and do more with less.”</i>
Ellen MacArthur Foundation (2013, 2015)	<i>“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”</i>
Geng and Doberstein (2008)	<i>“a circular economy approach encourages the organisation of economic activities with feedback processes which mimic natural ecosystems through a process of ‘natural resources → transformation into manufactured products → byproducts of manufacturing used as resources for other industries.”</i>
Sauvé, Bernard & Sloan (2016)	<i>Circular economy refers to the “production and consumption of goods through closed loop material flows that internalize environmental externalities linked to virgin resource extraction and the generation of waste (including pollution)”</i>

Table 1. Definitions of circular economy

Murray et al. (2017) defined circular economy as an economic model where planning, resourcing, procurement, production and reprocessing are designed and managed to maximize ecosystem functioning and human well-being. However, circular economy should not be considered as a new trend-based growth model but rather a way to design an economic pattern aimed to increase the efficiency of production and consumption, through appropriate use, reuse, and exchange of resources. Thus, circular economy has the potential to help society to reach increased sustainability and wellbeing at low or no material, energy, and environmental costs by implementing radically new systems. (Ghisellini et al., 2016.) By replacing existing linear consumption economy model where raw materials are extracted, processed into finished products and become waste after they have been consumed, with new systems where resources are reused and kept in a loop of production and usage, allow to generate more value for a longer period (Urbinati et al., 2017). This is done by using cyclical material flows and renewable energy sources (Korhonen et al., 2018).

The most acclaimed definition which incorporates elements from various disciplines has been developed by the Ellen MacArthur Foundation (2013) which introduced the circular economy as an industrial economy that is restorative or regenerative by intention and design. Such systems focus to keep the products and materials at their highest utility within technical and biological cycles (EMF, 2013). Likewise, Geng and Doberstein (2008) described the circular economy as the realization of closed-loop material flow in a whole economic system, which encourages economic activities with feedback processes that mimic natural ecosystems by transforming manufactured products and byproducts into resources for other industries. Furthermore, Ellen MacArthur Foundation emphasized that products should be designed in such way that waste does not exist, this means that products should be designed and optimized for a cycle of reuse. Overall, the definition of circular economy by Ellen MacArthur Foundation (2013) rests on the following three principles; preserve and enhance natural capital, optimize resource yields and foster sys-

tem effectiveness. These three principles can translate into six different ways to be circular: regenerate, share, optimize, loop, virtualize and exchange – together the ReSOLVE framework (EMF, 2015).

So-called loops are a common way to describe circular economy. For instance, Sauvé et al. (2016) presented that circular economy refers to the production and consumption of resources by closed-loop material flows. This bases on the idea that products and materials continue to circulate in loops for as long as they can create value, while simultaneously promote activities that reduce the need for the material per unit of value produced (Ranta et al., 2018). These closed material loops are prerequisites which means that materials are reused again as products or components (Lahti, Wincent, & Parida, 2018). As stated in the research of Su, Heshmati, Geng and Yu (2013) the term circular economy is based on the analysis of the relationship between economic and natural systems which emphasize a closed-loop of material flows in the economy. A circular economy is understood as the realization of closed-loop material flow in the whole economic system (Geng & Doberstein, 2008). Resources are reused and kept in a closed-loop system to generate more value for a longer period (Su et al., 2013). Urbinati et al. (2017) presented four loops that underline the efficient use of products intending to maintain them into the economy through product-life extension, reuse, remanufacturing and recycling. Organizations must redesign the current economic system, largely based on linear resource flows, towards closed-loop resource flows that can preserve the embedded environmental and economic value in resources for as long as possible (Nußholz, 2018).

The circular economy mainly emerges in the literature through three main actions, the so-called 3R`s principles which are reduction, reuse and recycle (Ghisellini et al., 2016). Furthermore, the fourth principle” recover” has been added as one of the actions (Kirchherr, Reike, & Hekkert, 2017). The first principle “reduction” indicates to minimize the amount of raw materials, energy and waste by increasing efficiency through upgrading technologies, simplifying packaging and using more power-efficient machines (Su et al., 2013). The reduce principle has the most diverse practical implementation because

it addresses to eliminate the need of the following principals: reuse or recycle (Ranta et al., 2018). The second principle “reuse” refers to using the by-products and wastes from one organization as resources to another organization, and thus using the resources to its maximum capability (Su et al., 2013). The reuse of products is environmentally very beneficial as it requires less resources, energy, and labor (Castellani, Sala, & Mirabella, 2015). The third principle “recycle” refers processing the recyclable products back into materials and then into new products (Su et al., 2013) and the last principle “recover” refers to transforming waste materials or residual flows into energy by incineration and gasification (Kirchherr et al., 2017).

In addition, Bocken, Pauw, Bakker and Grinten (2016) defined characteristics of the circular economy as business model strategies that are slowing, closing and narrowing material and energy loops. Similarly, Nußholz (2018) presented the two circular strategies to reduce resource production by first slowing resource loops and the closing resource loops. “Slowing resource loops” can be done through the design of long-life goods and product-life extension such as repair and remanufacturing while “closing resource loops” is recycling where the loops between post-use and production are closed. These two approaches are distinct from a third approach which is “narrowing resource loops”, aimed at using less resources per product. (Bocken et al., 2016.) Based on these contributions about closing, slowing and narrowing Geissdoerfer, Savaget, Bocken and Hultink (2017) defined circular economy as a regenerative system in which resource inputs are reduced by slowing, closing, and narrowing material and energy loops which can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.

In this thesis, circular economy is defined by combining the above-mentioned definitions. The foundation of the definition bases on the principle of sustainability where circular economy aims to meet economic, social and environmental benefits (Lahti et al., 2018). This is accomplished by closing, slowing and narrowing energy and material loops (Bocken et al., 2016) which means that products and materials continue to circulate in

loops for as long as they can create value (Ranta et al., 2018). Additionally, circular economy is an industrial economy that is restorative and regenerative by intention and design (EMF,2013). In other words, circular economy contributes to all three dimensions of sustainability with considered actions that aim to keep the resources in closed loops to generate more value.

2.1 Circular business model

The concept of business model is a relatively new matter and it emerged for the first time in an academic article by Bellman, Clark, et al. in 1957. However, it first gained greater significance when the business model was no longer seen as only an operative plan for creating an information system. The business model first advanced technological development and created electronic businesses. At that time the importance of business models was understood as an organization`s contribution to the success of management in the decision-making process. (Wirtz, Pistoia, Ullrich, & Göttel, 2016.) Since the 2000s, the concept of business model has increased its popularity in the strategic management literature, but despite this evolution, the academic literature has not managed to provide a unified understanding (Maucuer & Renaud, 2019). Despite the lack of congruent definition, there are some agreements regarding the central characteristics of the term business model (Wirtz et al., 2016).

The literature introduces several perspectives about the business model concept. Zott and Amit (2010) conceptualized an organization`s business model as a system of interdependent activities of how an organization performs business. Teece (2010) described that a business model expresses how the company will transform resources and capabilities into economic value. More specifically, Osterwalder, Pigneur and Tucci (2005) described the business model as a view of the organization`s logic for producing and commercializing value. Their view also contained the value proposition, value creation, value delivery, and value capture. Although Zott and Amit (2010) emphasized the activity system as a key to understand organizations business model, they also defined that the

complete goal of a business model is to exploit a business opportunity by creating value for the stakeholders involved such as fulfill customer`s needs, create customer surplus and generate a profit for the organization and its partners. According to Teece (2010), a good business model will deliver significant value for customers and collect a profitable part of this in revenues.

To understand the idea of a circular economy one must first understand the current linear economy model. Existing linear consumption economy models base on the idea where raw materials are processed into finished products and after consuming, they become waste (Urbinati et al., 2017). This linear throughput flow model has caused serious environmental damage (Korhonen et al., 2018) and it is now losing its popularity, with non-renewable natural resources decreasing and becoming more expensive (Antikainen & Valkokari, 2016). The value creation of linear business models is based on a material flow where resources become waste when they are no longer working or no longer satisfy the organization`s needs (Urbinati et al., 2017). Transforming from a linear to a circular business model, with improved efficiency, recycling, and sustainability requires investment by all stakeholders involved in the company`s collaborative network (Lahti et al., 2018). However, the relationship between circular and linear business model is studied in the literature and researchers have noticed that every business model is both linear and circular to some degree because every company optimizes and virtualizes its processes on small scale, for instance, using e-mails in preference to traditional letters (Lewandowski, 2016).

Stakeholders are more and more requiring organizations to adapt sustainability issues for the total value chain and thus organizations are now facing new challenges to develop and maintain performance while transforming its business model (Joyce & Paquin, 2016). According to Richardson (2008), a repeated theme in the discussion of both business models and strategy is value. He mentioned how the business model framework is organized around the concept of value, the value proposition, the value creation, and the value capture. In addition, for the circular economy to increase as the new business

model it must deliver its value promises to deliver economic growth alongside sustainability (Ranta et al., 2018). The circular business model differs from the traditional one by creating value for a wider scope of stakeholders and concentrating on the benefits of also social and environmental perspectives (Antikainen & Valkokari, 2016).

A circular business model can be identified as a rational way of how the company creates, delivers and captures value in closed material loops (Antikainen & Valkokari, 2016). The creation of the circular business model is designed to create and capture value while helping to accomplish an optimal state of resource usage such as finding a model that comes close to achieving the complete cycling of materials (Lahti et al., 2018). Researches concentrating on the circular economy from a business model perspective have used the sustainable business model approach which compounds environmental, social and economic value perspectives (Ranta et al., 2018). Rather than focusing entirely on creating economic value, the literature about sustainable business, which can be regarded as a subgroup of circular business model, takes into consideration the benefits from social and environmental perspectives as well (Antikainen & Valkokari, 2016). Hence, the purpose of the business model changes from making profits via the sale of products to making profits via the flow of resources, materials, and products (Lahti et al., 2018).

2.2 Implementing circular business model

Despite the existing success stories of implementing a circular business model, a large scale of implementation needs radical changes and strong commitment from higher management (Lieder & Rashid, 2016). Circular business model must deliver its promises to provide economic growth and sustainability to succeed. However, if this business model is not capable to compete economically with the linear model, the implementation will be almost impossible. (Ranta et al., 2018.) Investing in implementation is important as organizations face multiple challenges in the adoption of circular business models. These challenges can involve uncooperative culture regarding ecological issues,

financial challenges, inadequate government support, administrative burden, insufficient information, and technical skills and insufficient support from the supply and demand network. (Heyes et al., 2018.) These challenges and drivers will be discussed in the next chapters.

2.2.1 Challenges of circular business models

Several challenges have been discovered in the existing research about the implementation of the circular economy (Geng & Doberstein, 2008; Su et al., 2013). Studying and understanding these uncertainties and challenges that exist for companies desiring to shift from the linear business model towards a circular business model is important for the success of this transition (Lahti et al., 2018). In some cases, the transformation towards a circular economy might destroy the usefulness of existing capabilities, networks and business models (Antikainen & Valkokari, 2016) which can cause significant costs because organizations must introduce radical innovations (Lahti et al., 2018). Different researchers have presented different categories of challenges. Jesus and Mendonça (2018) presented four categories of challenges related to the implementation of circular business models. These categories are technical factors, economic and financial factors, institutional and regulatory factors, and social and cultural factors. In addition, Geng and Doberstein (2008) categorized barriers and challenges into three groups which are policy, technology, and public participation. Furthermore, Rizos et al. (2016) identified challenges of circular economy business model implementation based on a broad range of studies and sources. These challenges were divided in this manner: company environmental culture, lack of capital, inadequate government support and effective legislation, lack of information, inadequate technical and technological know-how, and lack of support from the supply and demand network.

Challenges under company environmental culture relate to the organization's philosophy, habits as well as attitudes and personalities of the company managers and employees, all which have a deep influence on the behavior for developing a circular economy

(Liu & Bai, 2014). For example, in many SMEs, the manager may have significant authority over the strategic decisions and they all may not have a positive attitude for the circular economy (Rizos et al., 2016). Furthermore, operational employees may be skeptical of the new circular economy initiatives because there is a fear that these will increase the workload (Liu & Bai, 2014). In addition, consumer habits and business routines are changing very slowly because of insufficient knowledge regarding the concept of circular economy (Jesus & Mendonça, 2018). Also, strong risk aversion and resistance to change can hinder the implementation of circular economy. Decision-makers must estimate the actual value proposition before continuing to circular economy practices: to calculate the costs of circular procedures and considering the risks of change in the current business environment. (Rizos et al., 2016.)

The second challenge which was presented by Rizos et al. (2016) is the lack of support from the supply and demand network. The adoption of circular business model implies changes in product design, production, and logistics which will demand close collaboration within the whole supply chain (Jabbour et al., 2019). At the strategic level, organizations must embrace a systematic approach to understand where the value is created in the value chain (Urbinati et al., 2017). This may require changes to the entire value chain as organizations must establish and organize reverse value chain activities that cover all activities from product returns to the potential recovery of products maximum value (Lahti et al., 2018). Managing these changes in circular value chains can be time-consuming, expensive and require collaboration with new actors. Furthermore, suppliers and partners may be unwilling to participate in circular economy processes because of perceived risks to their competitive advantage or due to an attitude that does not prioritize circular economy principles. (Rizos et al., 2016.)

According to Rizos et al. (2016), the lack of capital is one of the most significant challenges related to the adoption of circular economy since transferring from a linear to a circular business model requires a significant amount of time and investment on the part of the organization. Jesus and Mendonça (2018) defined high capital requirements, large

transaction costs, high initial costs, asymmetric information and uncertain returns and profits as challenges concerning economic, financial and market issues. Implementing circular business model demands continuous improvement and monitoring which again requires a significant amount of resources (Rizos et al., 2016).

The fourth challenge of circular business model implementation is the lack of government support and effective legislation (Rizos et al., 2016). These include misaligned incentives, lack of encouraging legal system, and deficient institutional framework which all hinder the successful implementation of circular economy principles (Jesus & Mendonça, 2018). Competition legislation hampers collaboration between companies and reduces the understanding of the circular design and development of products. Furthermore, the environmental regulations are not completely effective, and this reduces companies' desire to pursue prospective buyers for their byproducts. (Rizos et al., 2016.) According to Korhonen et al. (2018) modern environmental policy and legislation have hampered the utilization of waste flows with permits that complicate to utilize the resource embedded in the waste stream. In addition, the resource taxes are quite low which encourages companies to buy cheaper raw materials instead of use recycled ones. Furthermore, companies can face administrative burden as one barrier. This means that monitoring and reporting environmental performance can be complicated and expensive for SMEs. (Rizos et al., 2016.) The adoption of circular business model requires effective production designing, production planning, and production controlling while simultaneously estimating a comprehensive analysis of costs and revenues derived from operation in a closed-loop supply chain (Jabbour et al., 2019). These actions demand more complex and costly management and planning processes that can be difficult to implement (Rizos et al., 2016).

In addition, lack of information is one challenge for the circular economy (Rizos et al., 2016). Information is required for effective planning about the scenarios of optimal reduction, reuse, and recycling, and here lack of reliable information is one of the key chal-

lenges (Geng & Doberstein, 2008; Su et al., 2013). According to Rizos et al. (2016) organizations have a lack of information about the advantages of the circular economy and lack of practical knowledge about circular practices. Improved communication, exchange of information and extensive interactions between stakeholders are critical requirements for successful circular economy implementation (Geng & Doberstein, 2008).

The last challenge of circular business model implementation is the inadequate technical and technological know-how (Rizos et al., 2016). Technological challenges are mentioned in many other studies as well (Geng & Doberstein, 2008; Korhonen et al., 2018; Jesus & Mendonca, 2018). For instance, implementing circular business model often requires advanced technology as the current technology is related to an existing linear system (Su et al., 2013). Changing business-as-usual operations require new sustainable production and consumption technologies concerning eco-design, clean production, and life cycle assessment, and furthermore competent professionals to manage these new technologies (Rizos et al., 2016). Additionally, Jesus and Mendonça (2018) presented inappropriate technology, the lag between design and diffusion and lack of technical support and training as technical challenges related to circular economy.

2.2.2 Drivers of circular business models

Researchers have identified different drivers and opportunities for implementing the principles of circular economy. The drivers are factors that promote the transition towards circular economy (Jesus & Mendonça, 2018). Drivers can be identified as direct solutions for clearing the remaining barrier or as favorable conditions when adopting circular economy (Rizos et al., 2016). According to Lieder and Rashid (2016), the feasibility of circular economy implementation is related to the following areas: legislation and policy, support infrastructure, social awareness, collaborative business models, information and communication technology, product design and supply chain. Rizos et al. (2016) named company environmental culture, networking, support from the demand

network, financial attractiveness, external recognition, individual knowledge, and government support as enablers for the successful adoption of a circular economy. Furthermore, Jesus and Mendonça (2018) divided drivers, as well as challenges, to four different categories which are technical, economic and financial, institutional and regulatory, and social and cultural.

Firstly, economic drivers are mentioned in many kinds of research on implementing a circular economy (Jesus & Mendonça, 2018; Korhonen et al., 2018; Rizos et al., 2016). The base is that circular economy is expected to provide economic growth and sustainable development (Ranta et al., 2018). Jesus and Mendonça (2018) studied the economic, financial and market drivers, and noticed that these drivers can be related to demand-side trends or supply-side trends. Drivers from demand-side are related to the rising resource demand and consequent pressures resource depletion which encourages organizations to improve resource performance and generate new solutions. Whereas drivers from the supply-side are related to the increasing resource price and volatility which encourages organizations to search solutions for cost reduction and stability. Trends related to increasing cost and resource consumption are emphasized as promoters for creating a new, more sustainable circular business model. (Jesus & Mendonça, 2018.) Furthermore, Rizos et al. (2016), noticed that the “green business model” can be financially attractive. By this, they meant that organizations may get special funds, such as specific start-up financing or local grants, which are available for businesses desiring to implement a circular economy. Korhonen et al. (2018) divided economic benefits to input-related and output-related. Input-related economic benefits for implementing circular economy are reduced raw material and energy costs, the value of resources which are used many times, reduced costs that arise from environmental regulation, taxes and insurances and increased green market potential. Output-related economic benefits are reduced value losses, reduced waste management, and emissions control costs and responsible business image that attracts investors. (Korhonen et al., 2018.)

Secondly, social and cultural drivers influence the adoption of a circular economy. For instance, social awareness, environmental literacy, shifting consumer preferences from ownership to service models and business perception of reputational advantages are considered social and cultural drivers of circular economy (Jesus & Mendonça, 2018). Additionally, if customers prefer “green” products or services, organizations motivate to adopt circular business model more easily. Furthermore, the company culture and the attitude and commitment of the staff are the most frequently mentioned drivers towards circular economy. (Rizos et al., 2016.) Also, Lieder and Rashid (2016) underlined the importance of social awareness for the successful transition from a linear to a circular economy. They argued that to implement a circular economy it is vital to raise awareness and thus change people’s mind-sets. Furthermore, the social dimension of a circular economy increases the sense of community, cooperation, and participation through the sharing economy (Korhonen et al., 2018).

The role of regulatory drivers in the implementation of circular economy is controversial. Some argue that regulations and governmental pressure are the key drivers for circular economy implementation (Levänen, 2015) and others see lack of government support as a barrier to implement circular economy but still do not see government support as a significant driver when moving towards circular economy (Rizos et al., 2016). Regulatory drivers can be related to increased environmental legislation, environmental standards, and waste management directives (Jesus & Mendonça, 2018). Govindan and Hasanagic (2018) argued that the government has a high impact regarding the implementation of circular economy as implementing the circular economy promises job growth. They argued that a significant part of job creation comes from greater labor needs which are associated with reuse, remanufacturing and repair. Also, Lieder and Rashid (2016) mentioned the importance of policy recommendations which aim to create jobs, boost economic growth and promote circular business models. Furthermore, legislation, such as the EU directives can motivate organizations to create business model innovation and differentiate the value proposition, and thus create a competitive advantage (Bocken et al., 2014).

Finally, technological development encourages companies towards circular economy (Mathews & Tan, 2011). New technologies offer better solutions and solve current problems related with reduction, reuse and recycle (Ghisellini et al., 2016). The availability of technologies that support resource optimization, remanufacturing, regeneration, as well as the development of sharing solutions, are important drivers towards circular economy (Jesus & Mendonça, 2018). In addition, the improved information sharing platforms facilitate the adoption of circular economy (EMF, 2013). Information and communication technology can be an enabler for product lifecycle management systems whereby organizations can for example monitor products in multiple lifecycles (Lieder & Rashid, 2016).

The aforementioned challenges and drivers are collected in table 2, in order to clarify the important aspects which may influence the implementation of a circular economy. These challenges and drivers have been categorized into four categories: regulatory and political, economic and financial, social and cultural and technological. Table 2 bases on the research of Jesus and Mendonça (2018) and Rizos et al. (2016).

	Challenges	Drivers
Regulatory and Political	<ul style="list-style-type: none"> • Lack of government support • Lack of effective legislation • Resource taxes • Administrative burden 	<ul style="list-style-type: none"> • Increasing environmental legislation, environmental standards, and waste management directives
Economic and Financial	<ul style="list-style-type: none"> • Large capital requirements • Uncertain return and profit 	<ul style="list-style-type: none"> • Demand and supply-side trends • Opportunity to get special funds
Social and Cultural	<ul style="list-style-type: none"> • Skeptical company environmental culture • Lack of support from the supply and demand network 	<ul style="list-style-type: none"> • Customer Preferences • Social awareness • “Green” company culture

Technological	<ul style="list-style-type: none"> • Lack of information • Lack of technical and technological know-how 	<ul style="list-style-type: none"> • Technological development • Improved information sharing platforms
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Table 2. Challenges and drivers of circular economy (modified based on Jesus & Mendonça, 2018 and Rizos et al., 2016)

2.3 Circular business model innovation

One of the key elements in business model designing is to figure out how to capture value from innovation (Teece, 2010). Innovating business models can take two forms which are the design of a completely new business model or changing the elements of the current business model (Zott & Amit, 2010). To get benefits from innovation, business pioneers must understand the business model options as well as customer needs and technological movements (Teece, 2010). Traditional business model innovation addresses the process of devising and realizing economic value (Linder & Williander, 2017) whereas circular business model innovation concentrates to meet the economic as well as social and environmental benefits (Lahti et al., 2018).

Pieroni, Mcaloone and Pigosso (2019) emphasized the importance of business model innovation for circularity because sustainability is converting essential to sustaining organizations' competitive advantage. As noted before, the circular economy bases on the foundation of closed production systems where resources are kept in so-called loops as long as possible (Urbinati et al., 2017). Closing these material loops often creates a necessity for re-designing existing value networks and business models, which require organizations to engage in the process of circular business model innovation (Antikainen & Valkokari, 2016). When an organization implements circular economy principles into business models, they need to generate innovations about how to create, deliver and capture value while simultaneously capture the environmental, social and economic advantages (Lahti et al., 2018). Furthermore, the principles of sustainability are acting as guidelines for creating circular business model innovation (Pieroni et al., 2019).

The triple bottom line value approach consists of environmental, social and economic dimensions that emphasize financial profits, however creating value for the planet and people as well (Elkington, 1994). Furthermore, Porter and Kramer (2006) defined the triple bottom line value approach as the principle of sustainability as it should secure economic performance in the long-term by avoiding socially harmful and environmentally wasteful behavior in the short-term. Nowadays, innovation activities that address to create a triple bottom line value are crucial (Weissbrod & Bocken, 2017). Sustainable circular business model innovation is the modern way of creating, delivering and capturing triple bottom line value that is achieved through a change of a business model (Antikainen & Valkokari, 2016).

Although business model innovation is identified as a key to deliver social and environmental sustainability, understanding the alternatives available for innovation seems limited at present (Bocken et al., 2014). There is a clear lack of conceptual consensus and consistency in sustainable business models (Evans et al., 2017) as well as in circular business models (Lahti et al., 2018). Scholars particularly in the strategic management field, are still struggling with a lack of a framework describing how companies can become circular and adapt circularity to their existing business model or create a new business model (Urbinati et al., 2017). Different authors have created different definitions for circular business models. Urbinati et al. (2017) created “Degree of circularity”, Renswoude, Wolde, and Joustra, (2015) presented “Six cycles”, Bocken et al. (2016) presented “Closing, slowing and narrowing the resource loops”, Bocken et al. (2014) created “Business models archetypes” and Ellen MacArthur Foundation (2015) presented ReSOLVE framework to categorize circular business models.

2.3.1 Degree of circularity

Urbinati et al. (2017) focused on the differences of circular business models emerging on two main aspects: customer value proposition and value network. They defined the

degree of circularity of the customer value proposition or the value network and created four available models of implementation of a circular economy: linear, upstream circular, downstream circular and full circular. In the downstream circular model, the value capture and delivery are formed through new revenue schemes and customer interface such as pay-per-use models. In the upstream circular model, the value creation systems are changed such as reverse logistics. (Pieroni et al., 2019.) The fully circular adoption model concerns organizations that implement principles of circular economy in their internal activities and relationships with suppliers, as well as in their customer value proposition (Urbinati et al., 2017).

2.3.2 Six cycles

Furthermore, Renswoude et al. (2015) presented six cycles that lead to nineteen existing business models. These cycles based on Ellen MacArthur Foundation's "four ways of circular value creation". These first four cycles are short cycles, long cycles, cascades, and pure cycles. Moreover, Renswoude et al. (2015) added fifth and sixth cycles which are dematerialized services and produce on demand. Based on these cycles the nineteen existing business models were created. The short cycle contains five business models which are pay pre-use, repair, waste reduction, sharing platforms, and progressive purchase. These short cycle models based on maintenance, repair, and adjustment of existing products and services. The second category is long cycle models which based on extending the lifetime of existing products and processes. The business models of long cycles are performance-based contracting, take back management, next life sales, resell and refurbish. The third category is cascades which refer to creating new combinations of resources, and the purchasing of upcycled waste streams. The business models of cascades are upcycling, recycling and collaborative production. The fourth category is pure cycles which means 100% reusing resources and materials in closed material loops. The fifth category is dematerialized services and the business models of this category are subscription-based rental and shifting physical products to virtual services. The sixth

and last category is produce on demand which contains three business models: produce on order, 3D printing, and customer vote design.

2.3.3 Closing, slowing and narrowing

Bocken et al. (2016), created an approach that emphasized that the models of circular economy aim to slow, close or narrow the loops of resources. These models boost resource efficiency and effectiveness by narrowing and slowing energy and resource loops and ultimately closing energy and resource loops by changing the way the economic value of products is made (Pieroni et al., 2019). Bocken et al. (2016) presented circular business model strategies for slowing, closing and narrowing resource loops. Slowing resource loops includes access and performance model, extending product value, classic long-life model and encourage sufficiency whereas closing resource loops includes extending resource value and industrial symbiosis. Narrowing loops means reducing resource use associated with the production process. This approach is different from slowing and closing as it does not influence the speed of the flow of products and does not involve any service loops. (Bocken et al., 2016.)

2.3.4 Business model archetypes

In addition, Bocken et al. (2014) developed eight business model archetypes that are formed and grouped according to the main types of business model innovations: technological, social and organizational oriented innovations. The technological grouping includes archetypes with dominant technical innovation components such as manufacturing processes and product design, the social grouping includes archetypes with a dominant social innovation component such as innovation in consumer offering and changing customer behavior whereas organizational grouping includes archetypes with dominant organizational innovation change component. These eight archetypes are: maximize ma-

terial and energy efficiency, create value from waste, substitute with renewable and natural processes, deliver functionality rather than ownership, adopt a stewardship role, encourage sufficiency, repurpose for society and environment, and develop scale-up solutions.

2.3.5 ReSOLVE framework

As previously stated, different authors have suggested different categories of circular business models. These categories typically contain the same models which are however named a bit differently. ReSOLVE framework by Ellen MacArthur Foundation (2015) consists of six business activities that are regenerate, share, optimize, loop, virtualize, and exchange. Heyes et al. (2018) argued that Bocken's et al. (2014) sustainable business model archetypes and the ReSOLVE framework address almost all the same aspects. Furthermore, Lewandowski (2016) designed business models for circular economy and exploited the ReSOLVE framework as these business actions represent the major circular business opportunities. In addition, Ceptureanu et al. (2018) argued that most of the business actions specific to circular business models are covered by the ReSOLVE framework. The ReSOLVE framework cannot be referred to as a true categorization, but it identifies different ways to be circular and thus supports companies during the implementation of circular economy principles. In different ways, the actions of this framework increase the utilization of physical assets, lengthen their life and shift resource use from limited to renewable sources. (EMF, 2015.) Many experts have used this framework as an opening for developing their classification methods (Rosa, Sassanelli, & Terzi, 2019) and due to the great popularity also this research uses the ReSOLVE framework as a classification for different circular business models.

The first business action of the ReSOLVE framework is called "regenerate". This means shifting to renewable energy and secondary materials. Reclaim, retain and regenerate the health of ecosystems as well as return recovered biological resources to the bio-

sphere (EMF, 2015). This business action can be divided into five different circular models which are energy recovery, circular supplies, efficient building, sustainable product locations and chemical leasing (Lewandowski, 2016).

The second business action of the ReSOLVE framework is “share”. This refers to keeping the product loops speed low and maximizing the utilization of products by sharing them among different users, by reusing them through their whole technical lifetime and by extending their lifetime through maintenance, repair, and design for durability (EMF, 2015). Sharing can be divided into several models which are; maintenance and repair, collaborative consumption, product lease, availability-based product-service system, performance-based product-service system, incentivized return and reuse, upgrading, product attachment and trust, and hybrid model (Lewandowski, 2016).

“Optimize” is the third business action in the ReSOLVE framework. This means improving the performance or efficiency of a product and removing waste in production and supply chain without changing the actual product or technology (EMF, 2015). Lewandowski (2016) divides this business action into four models which are asset management, produce on-demand, waste reduction, and outsourcing.

The fourth business action of the ReSOLVE framework is “Loop”. This action refers to keeping the components and materials in closed loops. For renewable materials, this means anaerobic digestion and extracting biochemicals from organic waste and for limited materials, this means remanufacturing products and recycling materials. (EMF, 2015). Business models of “loop” are remanufacturing, recycling, upcycling and circular suppliers (Lewandowski, 2016).

The fifth business action is called “virtualize”. This action means delivering utility virtually instead of materially (EMF, 2015). Lewandowski (2016) presented only one business model for this action which is dematerialized services.

The last business action of ReSOLVE framework is “exchange”. This action means replacing old materials, processes, resources with advanced non-renewable materials with applying new technologies and choosing new products and services. (EMF, 2015). Also, this action includes only one business model which is using new technology (Lewandowski, 2016). All of the above-mentioned business models are collected to table 3. Furthermore, the more precise definitions of these business models are offered.

BUSINESS ACTION	BUSINESS MODEL	DEFINITION
REGENERATE	Energy recovery	<i>Using conversion of non-recyclable waste materials into energy</i>
	Circular supplies	<i>Using renewable energy</i>
	Efficient building	<i>Establishing business activities in efficient buildings</i>
	Sustainable product locations	<i>Establishing business activities in sustainable manufacturing locations</i>
	Material leasing	<i>The producer sells products/services functions, and thus minimizes the environmental effects</i>
BUSINESS ACTION	BUSINESS MODEL	DEFINITION
SHARE	Maintenance and Repair	<i>Expanding product life cycle through maintenance and repair</i>
	Collaborative Consumption and Sharing Platforms	<i>Enable sharing use or collaborative consumption between businesses</i>
	Product Lease	<i>Privileged use of a product without being the owner</i>
	Availability-Based PSS	<i>Product or service is accessible for the consumer for a certain period of time</i>
	Performance-Based PSS	<i>The revenue is generated based on the solution or result achieved</i>
	Incentivized Return and Reuse	<i>Permission to return used products for a pre-established value</i>
	Upgrading	<i>Replacing components with better quality ones</i>
	Product Attachment and Trust	<i>Creating product or service that is trusted</i>

	Hybrid Model	<i>Durable product based on short-lived consumables</i>
BUSINESS ACTION	BUSINESS MODEL	DEFINITION
OPTIMIZE	Asset Management	<i>Internal collection, reuse and re-sale of used products</i>
	Produce on Demand	<i>Optimize produce on demand</i>
	Waste Reduction	<i>Waste reduction during and before the production</i>
	Outsourcing	<i>More effective use of resources via outsourcing</i>
BUSINESS ACION	BUSINESS MODEL	DEFINITION
LOOP	Remanufacturing	<i>Restoring products or components to required quality</i>
	Recycling	<i>Recovering resources out of disposed products or by-products</i>
	Upcycling	<i>Reusing of materials and upgrading their value</i>
	Circular Supplies	<i>Using bio based or fully recyclable supplies from material loops</i>
BUSINESS ACTION	BUSINESS MODEL	DEFINITION
VIRTUALIZE	Dematerialized Services	<i>Shifting physical products, processes or services to virtual</i>
BUSINESS ACTION	BUSINESS MODEL	DEFINITION
EXCHANGE	New Technology	<i>Using new manufacturing technologies</i>

Table 3. Expanded ReSOLVE framework (Modified based on EMF, 2015; Lewandowski, 2016 and Ceptureanu et al., 2018)

2.4 Theoretical framework

Definitions and classifications of circular economy business models have been described in previous sections of this thesis. Furthermore, the implementation is been described concerning the challenges and drivers related to the implementation of a circular business model. According to the literature, there is no consensus about circular business models (Lahti et al., 2018). Scholars are lacking information about explaining how companies can become circular and adapt circularity to their existing business model or create a new circular economy based business model (Urbinati et al., 2017). However, the ReSOLVE framework (EMF, 2015) covers most of the business actions specific to circular

business models (Ceptureanu et al., 2018). The case companies of this study are being analyzed based on the ReSOLVE framework and business actions of the case companies are being compared to the business actions of the ReSOLVE framework. Furthermore, the drivers and challenges related to circular business models and circular economy implementation are being analyzed based on the classification by Jesus and Mendonça (2018). They divided drivers and challenges into four different categories which are technological, political, social and financial. Based on these aspects, the theoretical framework presented below was constructed in figure 1.

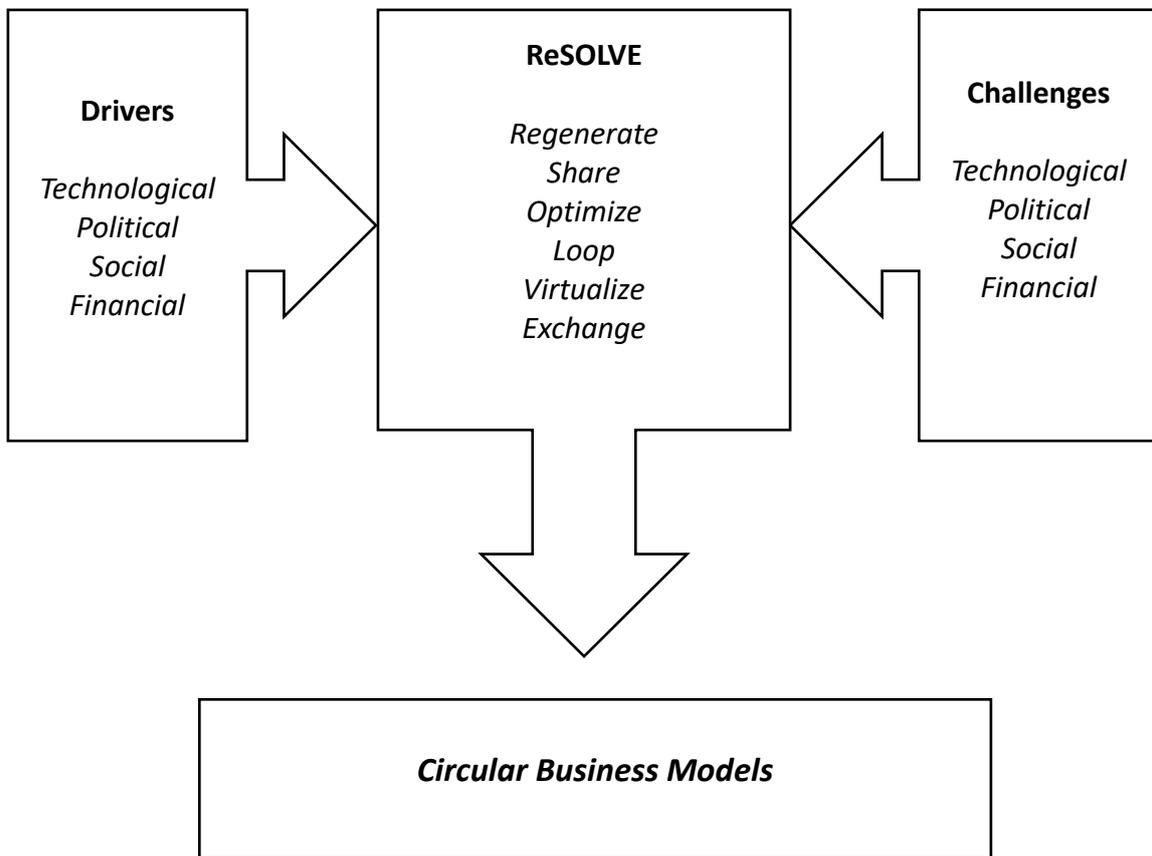


Figure 1. Theoretical framework

3 Methodology

This chapter presents and explains the choices regarding the research methodologies. First, the research method of the study is presented. Thereafter the case selection process, data collection, and data analysis are covered. At the end of the chapter, the trustworthiness of the study is discussed.

3.1 Research method

One of the key elements in the research conducting is the decision about the research design. The chosen research design should supplement the research question and thus fulfill the research objectives in the given constraints. (Ghuri & Gronhaug, 2002.) This study seeks to understand circular business models in the textile industry, what drives organizations to implement these as well as what barriers and challenges organizations face when they are implementing circularity in their business. A qualitative research methodology is often used when the intention of the research is on understanding and uncovering a specific phenomenon (Ghuri & Gronhaug, 2002). Qualitative research aims at understanding the holistic picture of the phenomenon, rather than different parts separately (Yin, 2009).

Furthermore, multiple case study was chosen as a methodology to have comparable and rich information about the circular economy in different organizations. Case studies are rich and empirical descriptions of a phenomenon that are usually based on a wide range of data sources (Yin, 2009). The two principal forms of case studies are single and multiple case study research, and for this research, the chosen form is multiple case study because single case study would lack the diversity of views in terms of circular economy business models. Single case studies can well describe the existence of a phenomenon (Siggelkow, 2007), while multiple case study provides a greater base for theory building (Yin, 2009) and shed light on a phenomenon by comparing different cases (Eriksson & Kovalainen, 2008). The literature review has shown that the existing theory of circular

economy business models has gaps that need further elaboration. Thus, multiple case study can enable a broader exploration of the research question, and by sampling and studying several Finnish companies, it is expected to construct a broader understanding of circular business models.

Research can be approached from three different approaches: deductively, inductively or abductively. In the deductive approach, a theory that is usually drawn from former academic research is formulated and then the established framework is tested in its respective environment. In contrast, the inductive research process begins with data collection and continues with the identification of patterns. Finally, based on these findings the theoretical framework is formulated. The third approach is abductive which moves back and forth between theory and data. (Eriksson & Kovalainen, 2008.) This study follows a deductive approach where existing theory is tested in its respective context. The goal is then to deepen the understanding of a particular phenomenon (Saunders et al., 2019). The deductive approach can be applied for this research because of this research bases on the choice of already existing theories that are tested in the empirical part. Thus, it is important to acquire as much information about the circular economy business models as possible before the research itself.

3.2 Case selection process

The cases for this thesis were selected in a non-random way, through purposeful sampling method. Yin (2009) defines purposeful sampling suitable when cases are chosen because they are rich in information and they provide valuable manifestos of the phenomenon of interest. Thus, the chosen cases are selected due to their relevance to the thesis` aim. Purposeful sampling was used in this thesis as cases would need to have rich information about circular business models in the textile industry, and hence random sampling method would not be suitable. Furthermore, four cases were chosen based on their size, age and given that they have implemented characteristics of a circular economy. Regarding the sample size, Eisenhardt (1989) recommends limiting the amount of

cases to the point where the contribution of extra cases is minimal, and adding more cases only if necessary, in order to maintain the flexibility. According to Eisenhardt (1989), a number between four and ten cases is suitable as less than four could be unconvincing and over ten could be too complex. Patton (1990) argued that there is no stable rule for sample size and the appropriate sample size depends on the scope, resource at disposal, and the purpose of the study. In this thesis, four cases would deliver an ideal balance for the study. This amount would provide information and variation enough in terms of circular business models. It ensures a wide perspective of the studied phenomenon while keeping the process controllable.

To analyze relevant cases, a set of criteria were identified. First, the cases must suit within the selected context which is Finnish companies operating in Finland. Second, the case companies within the textile industry should differentiate to some extent (e.g. company size and age) to get rich information. Third, case companies should have implemented at least some of the circular economy principles into their business model. Furthermore, the selected case companies must carry the potential to light the research questions and thus help the research to achieve its objects. The selected case companies were organized into two clusters based on their business life cycle. Case companies of the first group were microenterprises with less than ten employees. These companies were founded in the 2000s and this category was thus named "Developing companies". Case companies of the second group were small and medium enterprises (SME`s) which were founded in the early 20th century and this category was named "Established companies". However, all selected companies operate in the textile industry and their business model included elements of the circular economy. These two categories were selected for this study to get a deeper knowledge of circular business models in different circumstances. Developing companies and established companies may confront different drivers and challenges in circular business model implementation. Exploring different companies gives a more complete picture of the phenomenon, and thus it is the choice of this study. Table 4 below will clarify the categories.

Developing companies		Established companies	
Case A	Case B	Case C	Case D
<i>Operating in textile industry</i>	<i>Operating in textile industry</i>	<i>Operating in textile industry</i>	<i>Operating in textile industry</i>
<i>Circular economy as part of business</i>	<i>Circular economy as part of business</i>	<i>Circular economy as part of business</i>	<i>Circular economy as part of business</i>
Microenterprise	Microenterprise	Small and medium enterprise	Small and medium enterprise
Founded in the 2000s	Founded in the 2000s	Founded in the early 20 th century	Founded in the early 20 th century

Table 4. Summary of the case companies

3.3 Data collection and analysis

To gather data for the study, interviews were conducted. Very structured interviews can be described with closed questions where the interviewee must answer all questions in a structured manner. By contrast, unstructured interviews consist of open questions that let the interviewer and the interviewee to talk about the subject on a general level however including the most important notions in the conversation during the interview. (Maylor & Blackmon, 2005.) In this thesis, semi-structured interviews were conducted. Semi-structured interviews can include both what and how questions. The data collection is systematic but at the same time allows the discussion to be conversational and casual. (Eriksson & Kovalainen, 2008.) In this way, an interview can bring out a more comprehensive picture of the studied phenomenon and allow to pursue additional themes during the interview (Saunders et al., 2019). Furthermore, open questions, which are used in a semi-structured interview, are appropriate when the researcher does

not know what answer will be given, or when the researcher is looking for new information and ideas (Fisher, 2007).

According to Eriksson and Kovalainen (2008) in semi-structured interviews, themes and questions are prepared in advance, however allowing to pursue more questions during the interview. In this research, semi-structured interviews were conducted with three principal themes. These themes were: circular business models, circular economy drivers and circular economy challenges. These themes were selected based on research questions and the theoretical framework. After the primary data was collected, semi-structured interviews were planned, and the main questions were prepared (Appendix 1). Interviews were performed with four interviewees demonstrating the different case companies involved in the case study. Three-quarters of the interviewees were CEOs and all interviews were recorded and carried out with a phone. The basic information of each interview is summarized in table 5. In qualitative research the difference between data gathering and data analyzing is unclear. These are interconnected and closely related to each other (Eriksson & Kovalainen, 2008.) This study also represented the intertwined data collection and data analysis as the ideas for organizing interview data rose already in the data collection. At first, the recorded interviews were transcribed in order to handle data easier. Then the data was classified into themes based on the research questions. Thereafter, the theoretical data which was formulated from the literature were compared with the empirical data to test the findings and eventually remodel the theoretical framework.

	Company	Role	Duration	Date of interview	Channel
Developing companies	Case A	CEO/Founder	25 min.	10.01.2020	Phone
	Case B	CEO/Founder	38 min.	21.01.2020	Phone
Established companies	Case C	CEO	35 min.	22.01.2020	Phone
	Case D	Vice President, Quality	45 min.	29.01.2020	Phone

Table 5. Summary of the interviewees

3.4 Quality of the research

Validity and reliability are the most ordinary standards to evaluate the quality of the research (Saunders et al., 2019). Hence, the research design, data collection, and data analysis should be thoroughly performed to deliver the highest possible quality (Yin, 2009). The reliability of research indicates that the study techniques are documented in a way that if another researcher afterward conducts the same study, the findings and conclusions should be the same (Yin, 2009). Whereas the validity of the study refers to the generalizability of the findings and whether the results are about what they supposed to be (Saunders et al., 2019).

First, the reliability of this research is confirmed with systematic and transparent procedures. The semi-structured interview questions, empirical data, and the theoretical model are well-documented, and all interviews were recorded. Furthermore, reliability is achieved with a consistent process of data collection. Interviews were conducted with the same communication channel and during the interviews, questions were clarified if needed to reduce the risk of misunderstanding the interview questions and topics. Furthermore, data collection through interviews was treated anonymously and confidentially.

The second aspect of the trustworthiness is the validity which can be defined as whether the results are about what they intended to be (Saunders et al., 2019). The generalizability of the findings is quite low in qualitative case studies with one or a few cases (Saunders et al., 2019). However, to improve the generalizability of the findings this study was conducted as a multiple case study and thus the findings are more generalizable. Furthermore, validity refers to the extent to which the research findings could be replicated to other environments. For example, the results of this study could be transferred to other industries. Validity also indicates to the credibility and quality of the study (Saunders et al., 2019). This was ensured by presenting a theoretical background of the research, by applying a variety of references and deeply investigating former studies and literature about the circular economy.

4 Findings

In this chapter, the studied cases are presented. First, each case is explored individually and thereafter cases are compared with each other. Within-case analyses intend to deliver a comprehensive picture of how each case company has implemented a circular economy and the drivers and challenges related to these circular business models. Thereafter the idea of the cross-case analysis is to compare the case companies.

4.1 Circular economy: ideology of a company

Case company A: Functional products from recycled material

The case company A is based fully on circular economy. This company was founded for philosophical reasons; there is too much material in the world. The company purchases production surplus material and waste material, and then redesign them into functional products such as bags and accessories. Their products are good quality, ecological as well as esthetic. These products are sold both in the store and online. CEO and founder of the company highly emphasizes that as the consumption is growing and we only have limited natural resources, we must use the existing material and turn it into products we need. Case company A is founded and based completely on the circular economy.

“The business has been set up following the principles of a circular economy. It is not a separate issue but a corporate background and identity.”

As noted before, the drivers of case company A towards the circular economy are mainly philosophical. The interviewee mentioned how even their stakeholders become stakeholders because they advocate a similar way of doing things. Actors that are obligated to respect the ecological and sustainable way of doing business become stakeholders, and actors that think differently don't become stakeholders. Furthermore, the interviewee mentioned that technological development improves the functioning of the circular economy and the achievement of resource efficiency. In addition, the more we

have information about resource inadequacy, the more our operating environment will mentally be in advocacy of circular economy.

“There are only limited natural resources in the world and yet consumption is increasing, and this equation does not work so we must act.”

“Our stakeholders are “one big family” who respect the same values as we.”

Barriers and challenges for implementing the principals of the circular economy were also discussed. The interviewee mentioned how political decision-making doesn't regard the acts that would promote the circular economy. On the contrary, disposable and nonecological products have the same VAT as sustainable and ecological products have. Interviewee considered how taxation could be an efficient mechanism to regulate the production of disposable consumables and thus customer behavior. Furthermore, the interviewee mentioned how technological development is somehow inadequate and thus acting as a barrier to implementing new practices in the circular economy.

“Disposable, unethical, nonecological and high resource consuming products` VAT is the same as sustainable, ethical and ecological products` have.”

“There are no specific policy decisions that impede the implementation of the circular economy but neither decisions that would encourage people towards circular economy.”

According to the interviewee, innovations are constantly evolving which will help to recycle the material, to sort the material and to purify the material more efficiently. However, the world is changing too slowly and especially the textile industry is changing too slowly as fast fashion is still acceptable. Interviewee highlights that circular economy should take root in every industry but especially in the textile industry as it is one of the most polluting and consuming industries in the world.

“It is opening up a whole new world to the circular economy as technology advances. Unfortunately, development happens painfully slowly.”

Case company B: Receiving material regardless the condition

In addition, case Company B is fully based on the circular economy. Their business model contains two different aspects which are both following the principles of a circular economy. They receive old clothes whether they are usable anymore. Broken clothes leave for Germany and Poland where these fabrics are sorted and processed into a mass. This new material is thereafter utilized in the car industry and other industrial sectors. Furthermore, clothes in good condition are sold at their store.

“Our ideology is that all clothes, whether they are dirty or broken, are valid for us. Our only criteria are that clothes can’t be wet or smell strong. With this model, we can utilize fabrics as much as possible.”

Such as the drivers of case company A, also the drivers of case company B are largely ideological. The founder of the case Company B said how it was brutal to see how big masses of textiles were thrown into an incinerator. This gave an idea that we must utilize and sort the textiles more efficiently and thus case Company B was founded. Furthermore, as the popularity of the circular economy has increased, and people have more knowledge about sustainability also the popularity of the case company B has increased.

“People who understand the circular economy and recycling have brought old clothes more than 50 kilometers away. There is motivation to recycle and act ecologically.”

In addition, the founder of the case company B emphasizes the importance of the stakeholders. All their stakeholders are interested in circular economy as well as sustainability. The social dimension of the circular economy and caring about nature brings people together. The interviewee also noticed how cooperation with other companies has taught them valuable information and thus he highlights the importance of collaboration. This collaboration motivates every actor to be more sustainable and ecological.

According to the interviewee of case company B, challenges related to circular economy are multi-dimensional. Firstly, he mentioned how collecting unusable textiles can cause a big carbon footprint itself and how the cost of collecting may become too big and thus

unprofitable. Secondly, Finland`s legislation doesn`t support circular economy and there are no tax reliefs related to circular business models. Also, the utilization of waste flows has been burdened by legislation. The “owner” of the waste is unclear, and this hinders the utilization of waste flows. Furthermore, the interviewee mentions how there is “fiber level technology” but people don`t have enough drivers and courage to develop these in the textile industry.

“National collecting of unusable textiles is tricky as Finland is sparsely populated and oblong country. This increases the logistical costs and carbon footprint.”

“You must consider all the time about what makes sense and what is profitable from many angles. For example, the short-term effects of a circular economy can be different from the long-term ones and this requires a deep and comprehensive analysis of the circular economy.”

Founder of the case company B emphasized the power of the cooperation and how even logistical costs would be decreased with better cooperation. Companies should build better networks whereby e.g. capacity of empty vehicles could be exploited more effectively. This would make the collecting of unusable textiles easier and decrease the cost and carbon footprint of it. Also, the interviewee emphasized how consumers have the power to define with their consumer behavior what are the future trends of the textile industry.

“Consumers must learn how to identify good quality material and let go of disposable culture. If consumers do this, the textile industry will eventually follow these trends and start to invest in good quality and develop a circular economy further.”

Furthermore, the interviewee emphasized the opportunities of technological development. Recycling textiles and using recycled textiles to new textiles causes multiple problems related to the quality of the new textile. As textiles are recycled, the length of the fiber is shortened which causes lint on the textile. However, the opportunities of recycled materials are great if companies figure out where to exploit these shortened fibers.

“We must start to think about how to exploit the “side-flows”, how to extend the product or material life cycle and how to exploit some synergy effects.”

“Back in the 80s, people have used clothes as insulation and yet the textile industry is lacking knowledge about exploiting recycled material properly. This means that we have the knowledge, but we just haven’t exploited it in the textile industry.”

4.2 Circular economy: rational choice of a company

Case company C: High quality and timeless textiles as a part of circular economy

The business model of case company C isn’t fully based on the circular economy, however, the elements of a circular economy are strongly present. This company produces timeless and high-quality textiles for consumers, offers a recycling option for their customers at their store, and uses industrial cutting waste to manufacture some of their products. Furthermore, they are favoring renewable materials where possible. These products are sold both at the store and online. Their core business model is to produce high-quality textiles for consumers, but they have implemented elements of a circular economy to their business model as responsibility is one of their core values.

“Our products are designed to be timeless as well as high-quality. Our message for consumers is that the greatest eco-statement that they can do is to buy high-quality products and maintain them as much as possible.”

The interviewee of the case company C mentioned how responsibility is one of their core values that guide the business. Thus, the company culture drives towards sustainability and the circular economy. The interviewee mentioned how he feels that they are committed to bringing sustainable options for customers. Consumers, as well as B2B buyers, are creating a positive driver as they have shown great interest in sustainable products. Nowadays, a circular economy is a rational choice of a company operating in the textile industry.

“Our B2B buyers are interested in sustainable products as thus they can offer something new and sustainable for their consumers. However, I believe that responsibility and sustainability are becoming something that is necessary for every company rather than a competitive factor.”

“Also customers are acting as drivers because they are more aware of the disadvantages of the textile industry. This motivates us to find more sustainable solutions.”

The interviewee mentioned how one of their biggest challenges is that recycled materials are not as good quality as virgin materials. One of their core values is to make timeless, good quality products and consumers' quality expectations are high. When clothes are made of recycled materials it always contains some impurities as the fiber is shorter. Interviewee emphasized how they would like to try more new recycled material, but partners can't offer these for a reasonable price. This challenge refers to the lack of technological development. Furthermore, the lack of technological development influences the recycling process where different materials should be dissolved from each other. However current mechanical processing cannot perform this dissolving effectively.

“From our point of view, we have the motivation to try more recycled materials but there is a lack of commercial solutions for us.”

In addition, although customers' attitudes are acting as drivers, those are also acting as challenges. The interviewee mentioned how he has noticed that the customers' attitude towards sustainable options and consumption are contradictory. Customers would rather buy four new t-shirts made of organic cotton than one high-quality t-shirt and maintain this carefully. It is difficult to communicate this responsibility perspective and the benefits of buying one high-quality garment for customers.

“Consumers would like to have forgiveness for buying four t-shirts made of organic cotton, rather than buying one timeless, high-quality t-shirt. It is difficult to communicate this perspective for consumers and change their attitudes.”

Furthermore, the interviewee mentioned how recycling, sustainability as well as circular economy are multi-dimensional and the effects of these are not always so simple. For example, organic cotton is in principle more responsible from a social and environmental point of view but if all textile companies would start to use this, the environmental impacts would be unecological as the area under cultivation would need to hack from the rain forest. Thus, one of the biggest challenges of a circular economy is its complexity and long-term effects which may differ widely from short-term ones.

The interviewee mentioned how circular economy will be even better implemented and exploited when technology develops. For example, the chemical dissolving of fibers offers a great opportunity for a circular economy and when this is developed it opens a whole new world where recycled materials are better quality. Furthermore, chemical dissolving can be a solution to the textile industry worldwide. In addition, the interviewee mentioned how he believes that recycling becomes more regulated and companies as well as consumers need to take responsibility for this. However, when recycling becomes more regulated there will be more material in the material cycle which will affect positively the circular economy. This way companies can more easily utilize the recycled material.

“Car tires have long been recycled and this same regulation certainly comes to the textile and clothing industry as well. It is just logical continuum that someone must take responsibility for textile recycling.”

Case Company D: Extending product life through service model

The interviewee of the case company D told how circular economy is part of their business model as they are a textile service company. They own the textiles that they rent for their B2B customers. The company participates in the designing process where they emphasized lifetime design and durable materials. Thereafter the company rents its textiles and takes the responsibility of textile maintenance. Extending product life and bringing service elements into the business model are part of an effective circular economy.

“We define in our mission that we are a textile service company, and this strongly determines our approach to the circular economy. Textiles that we provide for our customers contain service elements such as creating protection for its user or process.”

Furthermore, the interviewee mentioned an interesting example of their “quality rating” which also promotes circularity in their business model. This quality rating extends the textiles' life cycle and enables the most efficient use of the product. Furthermore, they recycle old textiles and utilize these for another purpose.

“The product may be downgraded for different purposes, but not removed from the circuit. We have defined different user categories for example waiter who is working with customers needs to have clean intact clothes all the time but someone who works in a kitchen can use a little bit low-grade shirt as long as it is comfortable and protective.”

The interviewee of case company D mentioned how the drivers towards the circular economy come from the company's basic values. First, the interviewee mentioned how the owners of the case company D have created a state of will to grow profitably and be a forerunner in the textile industry. This means that company needs to stay up to date on trends and develop sustainable solutions for its customers. Continuous improvement is one of the company's basic values and improving a business's circular economy is one of the core areas of improvement. Furthermore, the interviewee mentioned how their mission is to develop deep long-term relationships with their customers. Case company D wants to continually listen to their customers and bring added value to customers' business. Circular economy is one of the things that does not only bring value for the company itself but its customers as well.

“We want to enable our customers to grow their business responsibility. Circular economy enables us to deliver a message that adds value to our customers' responsibility.”

“Enthusiasm and the joy of learning is one of our core values which means that we are passionate about continuous improvement. On a larger scale, this means that we want to improve our company's circular economy and therefore sustainability.”

The challenges of circular economy were also discussed. The interviewee mentioned how the impacts of circular economy may seem good in the short-term, but the long-term consequences are problematic. It is difficult to estimate the long-term consequences as it requires visioning the overall impacts of circular economy. For example, the impacts of textiles made of 100 % recycled fibers can be negative if the technology isn't developed enough. The textile may end up being uncomfortable, cause allergic reactions or some other unpredictable consequences.

“A metric to evaluate responsible decisions should be balanced. This metric should view the end-to-end process of business. It should evaluate manufacturing related

issues, logistic issues, issues happening during the use, and issues happening at the end of the cycle.”

Another challenge that the interviewee mentioned was the insufficient development of technology. Interviewee emphasized that if the materials` wear resistance develops, the lifetime of the textiles will increase. However, with the current technology, the lifetime of textile is too short which is challenging for textile service companies.

According to the interviewee, the greatest opportunities arise when technology develops. The company would benefit from material development as thus it could extend the service life of rental textiles. Furthermore, technological development would help to utilize the textile when it is no longer applicable for rent. An interesting example which the company has already implemented is the “quality rating” and “product downgrading”. When the textile isn’t applicable for its original use, the company can downgrade it to lower quality class and thus textile can get a new life.

“Technological development enables material development where textiles` wear resistance improves and thus lifetime extends. However, companies must still estimate what comes when the life cycle ends.”

4.3 Circular economy: business model for textile companies

There are both similarities and differences between circular business models and the observed drivers and challenges between different clusters. These similarities and differences are collected in table 6 below.

	Developing Companies		Established Companies	
	Case A <i>“There are only limited natural resources in the world and yet consumption is increasing,</i>	Case B <i>“Our ideology is that all clothes, whether they are dirty or broken, are valid for us.”</i>	Case C <i>“Our message for consumers is that the greatest eco-statement that they</i>	Case D <i>“We define in our mission that we are a textile service company, and this</i>

	<i>and this equation does not work so we much act."</i>		<i>can do is to buy high-quality products and maintain them as much as possible."</i>	<i>strongly determines our approach to the circular economy."</i>
Business model	<i>Functional products from recycled material</i>	<i>Receiving material regardless the condition</i>	<i>High quality and timeless textiles as a part of circular economy</i>	<i>Extending product life through service model</i>
Drivers	<ul style="list-style-type: none"> ▪ Philosophical reasons ▪ Increased knowledge of carbon footprint ▪ Stakeholders 	<ul style="list-style-type: none"> ▪ Philosophical reasons ▪ Increased knowledge of carbon footprint ▪ Stakeholders 	<ul style="list-style-type: none"> ▪ Company culture ▪ Customers` preferences 	<ul style="list-style-type: none"> ▪ Company culture ▪ Customers` preferences ▪ The desire for continuous improvement
Challenges	<ul style="list-style-type: none"> ▪ Political challenges ▪ Lack of technological development 	<ul style="list-style-type: none"> ▪ Political challenges ▪ Lack of technological development ▪ Adequate assessment of the overall impacts 	<ul style="list-style-type: none"> ▪ Lack of technological development ▪ Adequate assessment of the overall impacts ▪ Consumers` attitudes 	<ul style="list-style-type: none"> ▪ Lack of technological development ▪ Adequate assessment of the overall impacts
Future opportunities and trends	<ul style="list-style-type: none"> ▪ Opportunities of technological development 	<ul style="list-style-type: none"> ▪ Opportunities of technological development ▪ Enhanced networking of recycling 	<ul style="list-style-type: none"> ▪ Opportunities of technological development ▪ More regulated textile recycling 	<ul style="list-style-type: none"> ▪ Opportunities of technological development ▪ More organized product downgrading

Table 6. Summary of the findings

Firstly, the business model of each company exploits the elements of a circular economy. Developing companies A and B were both based on the idea of a circular economy. Company A purchases discarded materials and redesigns them into new esthetical, good quality and functional products. These products are sold both at the store and online. Company B receives old clothes whether they are usable or not. This company either sends these to the factories where they are processed into mass and thus utilized, or it sells these at their shop.

“We purchase production surplus and waste material which we redesign into functional products.” (Case Company A)

“Our ideology is that all clothes, whether they are dirty or broken, are valid for us.” (Case Company B)

Established companies C and D also exploited the elements of circular economy in their business model. Company C focuses on producing high-quality textiles, offers recycling option and uses industrial cutting waste in the manufacturing process. Furthermore, they favor renewable materials where possible. Their products are sold both in the store and online. Company D also participates in the designing process by emphasizing lifetime design and durable materials. The company also recycles materials and utilizes these in other purposes. This company is purely a textile service company as it rents its textiles and takes care of textile maintenance. Furthermore, the company uses quality rating which extends the product life cycles.

“Our products are designed to be timeless and high-quality.” (Case Company C)

“As a part of sustainability, we have offered a recycling option for our customers. Thereby we can also exploit the recycled material.” (Case Company C)

“We define in our mission that we are a textile service company, and this strongly determines our approach to the circular economy.” (Case Company D)

Secondly, both drivers and challenges of circular economy were studied. Developing companies, A and B both mentioned how philosophical reasons are their greatest drivers towards circular economy. Philosophical reasons can be seen as a subcategory of social

and cultural drivers. Furthermore, both A and B mentioned how stakeholders and increased knowledge about the sustainability and textile industry's carbon footprint are encouraging the transition towards circular economy. Case company A also mentioned how technological development has helped them to implement a circular economy as their business model.

"There is too much material in the world and consumption is constantly increasing. However, there is only one natural resource in the world. This equation does not work, we are forced to use existing material and convert it into the products we need." (Case Company A)

"It is brutal to see how much material goes into incinerators and this gave an idea of a service which receives all material, regardless of condition." (Case Company B)

Drivers of established companies C and D were also studied. These both mentioned how company culture is an obvious driver towards circular economy as sustainability is one of their core values. Furthermore, both companies mentioned how customers (consumers and b-to-b customers) are emphasizing sustainability which drives them towards more sustainable solutions. Case company D also mentioned how one of their core values is continuous improvement which also drives towards circular economy.

"Also customers are acting as drivers because they are more aware of the disadvantages of the textile industry which motivates us to find more sustainable solutions." (Case Company C)

"We want to enable our customers to grow their business responsibility. Circular economy enables us to deliver a message that adds value to our customers' responsibility." (Case Company D)

Between two clusters, developing companies and established companies, there are similarities as well as differences in drivers towards circular economy. Both clusters emphasized social and cultural drivers as one of the key matters. Developing companies mentioned philosophical reasons and established companies mentioned the company's culture where sustainability is one of the core values. Furthermore, developing companies are founded on the idea of circular economy and thus sustainability is the core value. Another similarity between these two clusters is that both clusters emphasized the stakeholder's role. However, developing companies mentioned especially partners and

subcontractor's role as a driver whereas established companies emphasized the role of consumers and B2B customers. Developing companies also mentioned how collaboration and cooperation with other companies encourage them towards a circular economy. This was not mentioned by established companies. Furthermore, increased knowledge about sustainability was mentioned as a driver towards circular economy by developing companies but not by established companies.

Also, challenges and barriers were studied. The first cluster, developing companies, mentioned how politics, legislation, and taxation creates challenges for the circular economy. The VAT of nonecological and ecological products is the same. Furthermore, both A and B case companies mentioned how a lack of technological development is one of the greatest challenges towards the circular economy. Company B also mentioned how logistical problems as well as evaluating the long-term overall impacts of circular economy are challenges for efficient circular economy. Furthermore, the "owner" of the waste is unclear which affects negatively the business of case company B.

"Political decisions have not yet sufficiently considered actions that would promote a circular economy. Disposable, unethical, nonecological and high resource consuming products VAT is the same as sustainable, ethical and ecological products have."
(Case Company A)

The challenges and barriers which were mentioned by established companies concerned mainly the lack of technological development. Both C and D case companies mentioned how the quality of recycled materials isn't yet good enough for them. Furthermore, the dissolving techniques are not fully developed which decreases the quality of the textile and complicates the utilization of the recycled textiles. The second cluster also emphasized how evaluating the long-term overall impacts of circular economy is hard. The interviewee of the case company C also mentioned how changing consumers' habits and attitudes can be difficult as consumers would rather buy four shirts made of organic cotton, rather than one high-quality shirt which would be more sustainable purchase.

"From our point of view, we have the motivation to try recycled materials more but there is a lack of commercial solutions for us." (Case Company C)

There are similarities and differences in the challenges related to the circular economy of two different clusters. The greatest similarity that both clusters mentioned is the lack of technological development. For example, the chemical soaking isn't developed enough which challenges the efficient exploiting of recycled materials. Furthermore, both clusters mentioned how it is hard to evaluate the long-term overall costs and impacts of circular economy. Some decisions may seem sustainable in the short-term, but the long-term impacts are unsuitable. The greatest difference between these two clusters was that developing companies emphasized the political decision making, taxation and legislation as the greatest challenge of circular economy whereas established companies emphasized the lack of technology and consumers' changing attitudes and habits as the greatest challenge of circular economy.

Case companies also mentioned opportunities and future trends of circular economy. The first cluster, developing companies, discussed the opportunities of technological development. According to the A and B, innovations would improve the material recycling, material sorting, and material purifying. Both companies emphasize the opportunities of recycled materials if the textile industry learns how to improve the shortened fiber effectively. Furthermore, case company B mentioned how the carbon footprint of material recycling could be reduced with better cooperation among different companies. Companies could network more efficiently and thus decrease the number of empty vehicles. These empty vehicles would collect their nearest recyclable textiles and thereafter drop these to the sorting station.

*“Back in the 80s, people have used clothes as insulation and yet the textile industry is lacking knowledge about exploiting recycled material properly. This means that we have the knowledge, but we just haven't exploited it in the textile industry.”
(Case Company B)*

The second cluster, established companies, also mentioned the opportunities of technological development. For example, the opportunities of chemical dissolving were discussed as well as the development of material quality. The interviewee of the case company C also mentioned how he believes that textile recycling will become more regulated which will affect the whole textile industry. However, more regulated textile recycling

will create new opportunities for existing businesses as well as new players. In addition, the interviewee of the case company D mentioned how they have already implemented the quality rating and product downgrading which will more likely to be utilized even more in the future.

“Technological development is a prerequisite for deeper utilization of the circular economy.” (Case Company D)

There are many similarities between developing companies and established companies in circular economy opportunities and future trends. The greatest similarity between these two clusters is that both clusters emphasized the importance of technological development. Technological development will have a great impact in utilizing recycled material. This will change the whole industry and create new opportunities.

5 Discussion and conclusion

The aim of this thesis is to analyze circular business models in different companies operating in the textile industry. Furthermore, the drivers and challenges of different business models are discussed. This thesis aims to raise awareness about the implementation of the circular economy as a business model. Specifically, this thesis set as its objective to answer these three questions:

1. *What are circular business models?*
2. *What are the drivers of implementing a circular business model?*
3. *What are the challenges of implementing a circular business model?*

In this chapter, the findings and the literature review are compared and analyzed. This chapter focus on three main themes of this study which are different circular business models, drivers towards circular economy and challenges of circular economy.

5.1 Circular business models of textile companies

The first research question is “What are circular business models” and the answer to this question is discussed in this paragraph. There is no clear consensus in the literature about circular business models. However, different categories from different authors usually include almost the same models which are only named differently (Ceptureanu et al., 2018; Heyes et al., 2018; Lewandowski, 2016). The business models of this study`s case companies are being analyzed based on the ReSOLVE framework by Ellen MacArthur Foundation (2015). This framework consists of six different ways to be circular and these ways are: regenerate, share, optimize, loop, virtualize and exchange. Many authors have admitted that the ReSOLVE framework covers most of the circular business opportunities and it fits well for analyzing different circular business models (Ceptureanu et al., 2018; Heyes et al., 2018; Lewandowski, 2016). Thus, this study uses the categories of the

ReSOLVE framework and examines if there are same elements in the literature review and the case companies' analyses.

The first business action of the ReSOLVE framework is called "regenerate". This means shifting to renewable energy and materials (EMF, 2015). One of the case companies, Established company C, uses and favors renewable materials in their textiles whenever it is possible and profitable.

The second business action of the ReSOLVE framework is "share". This refers to maximizing the utilization of products by sharing them among different users, by reusing them through their entire technical lifetime and by prolonging their lifetime through maintenance, repair, and design for durability (EMF, 2015). This business action was mentioned by both developing companies and established companies. The business model of case company B bases on recycling and second-hand store. With a second-hand store, the company shares the textiles among different users and thus maximizes the utilization of materials. "Share" business action was also noticeable from the case company D's business model. Case company D is a textile service company and it extends its textiles' lifetime through maintenance and "product downgrading". Furthermore, its core idea is to rent textiles and thus offer a privileged use for its customers without them being the owner. Also, Heyes et al. (2018), emphasized providing physical products on a cost-per-use basis, i.e. services as one of the most potential circular business actions.

The third business action of the ReSOLVE framework is "optimize". This means improving the performance or efficiency of a product and removing waste in production and supply chain without changing the actual product or technology. (EMF, 2015). This business action was also mentioned by developing companies as well as established companies. Case companies A, C and D all mentioned how they design their products to be high-performance. Companies invest in practicality, timelessness and the quality of products. Thus, the business action "optimize" is being exploited by case companies. Some studies emphasize "optimize" as the most relevant business action (Ceptureanu et al., 2018) but

this was not noted as the most relevant business action among case companies of this study.

The fourth business action of the ReSOLVE framework is “Loop”. This refers to keeping the components and materials in closed loops. (EMF, 2015). “Loop” is the only business action from the ReSOLVE framework which can be seen from all case companies` business models. Developing company A uses recycled materials to manufacture products, developing company B receives, separates and recycles materials as their core business, established company C receives old textiles to their stores and established company D recycles discarded textiles for new utilization. Thus, every case company exploits “loop” business action in their circular business model. Rosa et al. (2019) also highlighted the relevance of “loop” action and especially recycling as the most common type of circular business model. Furthermore, they emphasized that this is strategically one of the most potential action towards the circular economy.

The fifth business action is called “virtualize”. This action means delivering utility virtually instead of materially (EMF, 2015). Developing company A and established company C sell their products in addition to their regular store through an online store. Mendoza et al. (2018) mentioned the importance of “virtualize” when it is combined with another business action. For example, “loop” combined to the “virtualize” can lead to radical change at the product and supply-chain levels, improving to deliver the circular economy principles successfully.

The last business action of the ReSOLVE framework in “exchange”. This action means replacing old materials, processes, and resources with advanced non-renewable materials by using new technologies and selecting new products and services. (EMF, 2015). Developing company A, established company C and established company D uses recycled materials either fully or partly. Developing company A uses only discarded materials and established companies C and D use these materials whenever it is an efficient solution for them. Also, Heyes et al. (2018), studied the relevance of each business action

and found that “exchange” was not mentioned by any of their case companies. However, these companies did not have direct control over the manufacture of better-performing technologies, products, and material and thus they felt that “exchange” did not apply to their business. Developing company B did not fulfill the requirements of this business action because neither this company did not have direct control over the manufacturing process. However, all case companies mentioned that they look forward to technology development which will help them to apply and utilize new technologies. Thereby, this business action will be even more significant in the future.

The aforementioned business actions are collected in the table below (Table 7). As we can notice from the table, “regenerate” was only mentioned by one of the case companies. All case companies encourage recycling, but only one uses renewable materials. However, this business action will be more significant in the future when technology develops, and materials improve. Furthermore, we can notice from the table that “loop” was the most often mentioned business action. Based on this analysis, the circular business model consists of different elements. Companies combine different business actions that create a circular business model, and thus there is no clear definition for the term circular business model. However, using renewable or waste material, sharing the products among more than one user, producing high-performance products, recycling textiles and offering the value virtually are according to this research the main business actions of circular business models.

		Regenerate	Share	Optimize	Loop	Virtualize	Exchange
Developing Companies	Case A			<i>High-performance products</i>	<i>Use of recycled materials</i>	<i>Online store</i>	<i>Use only discarded materials</i>
	Case B		<i>Second hand store</i>		<i>Separates and recycles materials</i>		
Established Companies	Case C	<i>Use of renewable materials</i>		<i>High-performance products</i>	<i>Receives old textiles</i>	<i>Online store</i>	<i>Use partly discarded materials</i>
	Case D		<i>Textile rental service</i>	<i>High-performance products</i>	<i>Recycles discarded textiles</i>		<i>Use partly discarded materials</i>

Table 7. Summary of the business activities of case companies

5.2 Circular economy drivers of textile companies

The second research question is “what are the drivers of implementing a circular business model”. The drivers of the circular economy presented in the literature review were divided into four different categories based on Jesus and Mendonca (2018). These categories are technological factors, political factors, social and cultural factors, and economic and financial factors. Drivers can be identified as favorable conditions when adopting a circular economy (Rizos et al., 2016) or factors that are encouraging the transition towards circular economy (Jesus & Mendonça, 2018). Furthermore, Rizos et al. (2016) named company environmental culture, networking, support from the demand network, financial attractiveness, external recognition, personal knowledge, and government support as enablers for the successful adoption of a circular economy. Some of these drivers were also identified from the case company analyses.

The first category of drivers is technological development. Technological development encourages companies towards circular economy (Mathews & Tan, 2011), and improved

information sharing platforms facilitate the adoption of circular economy (EMF, 2013). According to Ghisellini et al. (2016), new technologies solve current problems related to reduction, reuse and recycles, and according to Jesus and Mendonça (2018), technological development supports resource optimization, remanufacturing and regeneration. However, only one of the case companies, case company A, mentioned that technological development has helped them to implement circular economy to their business model. The literature review indicated that technological development would be a great driver for circularity, but the case company analysis doesn't agree with this. However, all case companies emphasized the opportunities of technological development and this will be a great driver towards a circular economy in the future.

The second category is political and regulatory drivers. These are increased environmental legislation, environmental standards, and waste management directives (Jesus & Mendonça, 2018). In the literature, political drivers are controversial. Some argue that regulations are the main drivers for circular economy implementation (Levänen, 2015) and others see that government support is not a significant driver for circular economy (Rizos et al., 2016). The case companies of this study didn't mention political and regulatory matters as drivers and developing companies even mentioned these as one of their challenges when implementing circular economy. However, the interviewee of the case company C mentioned how the textile industry will be more regulated in the future which will create new opportunities for all the players in the industry. Thus, political matters can be significant drivers towards circular economy in the future. The importance of political matters is also noticed in the literature. According to Bocken et al. (2014), legislation and EU directives can motivate organizations to innovate more circular business models and thus create a competitive advantage. Furthermore, Lieder and Rashid (2016) emphasized the importance of policy recommendations which aim to create economic growth as well as promote new more circular business models.

The third category is social and cultural drivers. This category contains social awareness, environmental literacy, reputational gains, and shifting consumers' preferences from

ownership to service model (Jesus & Mendonça, 2018). Furthermore, consumers' increased preference for green products and services as well as company culture drive organizations towards a circular economy (Rizos et al., 2016). Both developing companies and established companies mentioned social and cultural matters as the most significant drivers. Furthermore, according to Rizos et al. (2016), this is the most frequently mentioned driver towards circular economy. Developing companies emphasized the philosophical reasons and established companies emphasized the company's values and culture. In addition, all case companies mentioned stakeholders' positive impact on the circular economy. Developing companies emphasized the role of partners and subcontractors and established companies emphasized the role of consumers and B2B customers. In both cases, stakeholders are valuing sustainability which encourages companies towards a more sustainable business model. The literature also mentions the importance of social awareness (Lieder & Rashid, 2016). The increased knowledge about the textile industry's carbon footprint was also mentioned by developing companies. They mentioned this as a driver towards the implementation of circular economy.

The last category of drivers presented in the literature review is economic and financial matters. The basic assumption is that circular economy is expected to provide economic growth along with sustainability (Ranta et al., 2018). Rizos et al. (2016) mentioned that the "green business model" can be financially attractive as organizations can get special funds that are available for businesses desiring to implement a circular economy. Furthermore, the literature mentioned several economic drivers such as increased resource cost which encourages organizations to improve resource performance and look for new solutions for production (Jesus & Mendonça, 2018). Even though literature emphasized the effect of economic and financial drivers, these were not mentioned by case company interviews. None of the case companies didn't mention that economic and financial issues would have driven them towards the implementation of circular economy.

5.3 Circular economy challenges of textile companies

The third research question concerned the challenges related to the circular business model implementation. This research question is “what are the challenges of implementing a circular business model”. The challenges of circular economy presented in the literature review were divided into four different categories based on Jesus and Mendonca (2018). These categories are technical factors, institutional and regulatory factors, social and cultural factors, and economic and financial factors. The more concrete examples of these challenges were presented by Rizos et al. (2016), and these are company environmental culture, lack of capital, lack of government support and effective legislation, inadequate information, administrative burden, inadequate technical and technological know-how, and lack of support from the supply and demand network. Some of these challenges were also discovered from the case company analyses.

The first category of challenges contained technological barriers and a lack of information. Information is vital for effective scenario planning about optimal reduction, reuse, and recycling (Geng & Doberstein, 2008; Su et al., 2013). All case companies of this study mentioned how one of the challenges is the adequate assessment of the overall impacts. Companies lack information about long-term overall impacts, and thus the evaluation of different alternatives is difficult. Practical knowledge of circular practices would help organizations to implement these (Rizos et al., 2016). Lack of technological development is mentioned in many studies as one of the main challenges (Rizos et al., 2016; Geng & Doberstein, 2008; Korhonen et al., 2018; Jesus & Mendonca, 2018). These challenges were also mentioned in every case interview. Both developing companies and established companies saw this as the greatest challenge of a circular economy. Case companies mentioned how dissolving techniques are not developed enough and how the quality of recycled material isn't adequate. Similar challenges were also mentioned by Su et al. (2013). They noticed how circularity in a business model often requires advanced technology. Furthermore, the implementation of circular economy requires new sustainable production and consumption technologies concerning eco-design, clean production and life cycle assessment (Rizos et al., 2016).

The second category of challenges contained regulatory and political barriers such as lack of government support and lack of effective legislation (Jesus & Mendonça, 2018; Rizos et al., 2016). These challenges were mentioned by developing companies but not by established companies. Developing companies mentioned how political decision making and legislation do not encourage companies towards circular economy. Furthermore, they mentioned that the VAT of nonecological and ecological products is the same but the price of the nonecological product is often cheaper as these are cheaper to produce which encourages companies towards nonecological products. Also, Rizos et al. (2016), discovered in their analysis that the resource taxes are quite low which encourages companies to use cheaper raw materials instead of recycled ones. Furthermore, case company B mentioned how the utilization of waste flows is difficult because of legislation and permits. Case company B mentioned how textile waste could be utilized more efficiently if the legislation would not restrict this that much. Korhonen et al. (2018) also stated how modern environmental policy and legislation have hampered the utilization of waste flows and thus the resource embedded in the waste streams.

The third category which was mentioned in the literature review is social and cultural challenges. Barriers under company environmental culture refer to an organization's philosophy, habits, and attitudes of the company's managers and employees (Liu & Bai, 2014). These company environmental culture related challenges were not mentioned by case companies' interviews of this study. On the contrary, these were the greatest drivers towards the circular economy. The social and cultural challenges of the literature review also contain a lack of support from the supply network. Suppliers and partners may be unwilling to participate and support the circular economy processes because of perceived risks to their competitive advantage or due to a mentality that does not prioritize sustainability. (Rizos et al., 2016.) Lack of support from the suppliers and partners was not mentioned by the case companies of this study. Especially developing companies emphasized how it is important that suppliers and partners share the same interest towards circular economy and sustainability, and thus they have not accepted partners

that don't share the same set of values. The last part of social and cultural challenges is the lack of support from the demand network and consumers. Consumers' habits are changing slowly because of inadequate information about sustainability (Jesus & Mendonça, 2018). This was also mentioned by case company C. Case company C mentioned how customers' attitudes towards sustainable solution and consumption are contradictory. Consumers don't fully understand how buying shirts made of organic cotton is unsustainable and a better option would be minimizing consumption. Rizos et al. (2016) mentioned in their study lack of support from the supply and demand network as the greatest barrier of SMEs transitions towards a circular economy. However, in this study, the lack of support from the supply and demand network was not noticed as a great challenge among case companies.

The last category of the literature review is economic and financial challenges. According to Rizos et al. (2016), lack of capital is the second-largest challenge to the implementation of the circular economy since shifting from a linear to a circular business model requires a substantial amount of time and investment. However, lack of capital was not mentioned by any of this study's the case companies. Developing companies were both founded based on circular economy and thus these companies didn't shift from linear to circular and time and investment were invested already in the early stage. Established companies were not fully based on circular economy and they increased circularity to their business model over time. However, either these case companies didn't mention the economic or financial things as challenges.

Figure 2 on the next page presents the modified framework of circular business models and the drivers and challenges related to these models. The modified framework bases on the findings and analysis of the interviews. The business models as well as the business actions of case companies are additions to the previously presented theoretical framework. The most frequent business actions, drivers and challenges according to the interviews, analysis, and findings are **highlighted**.

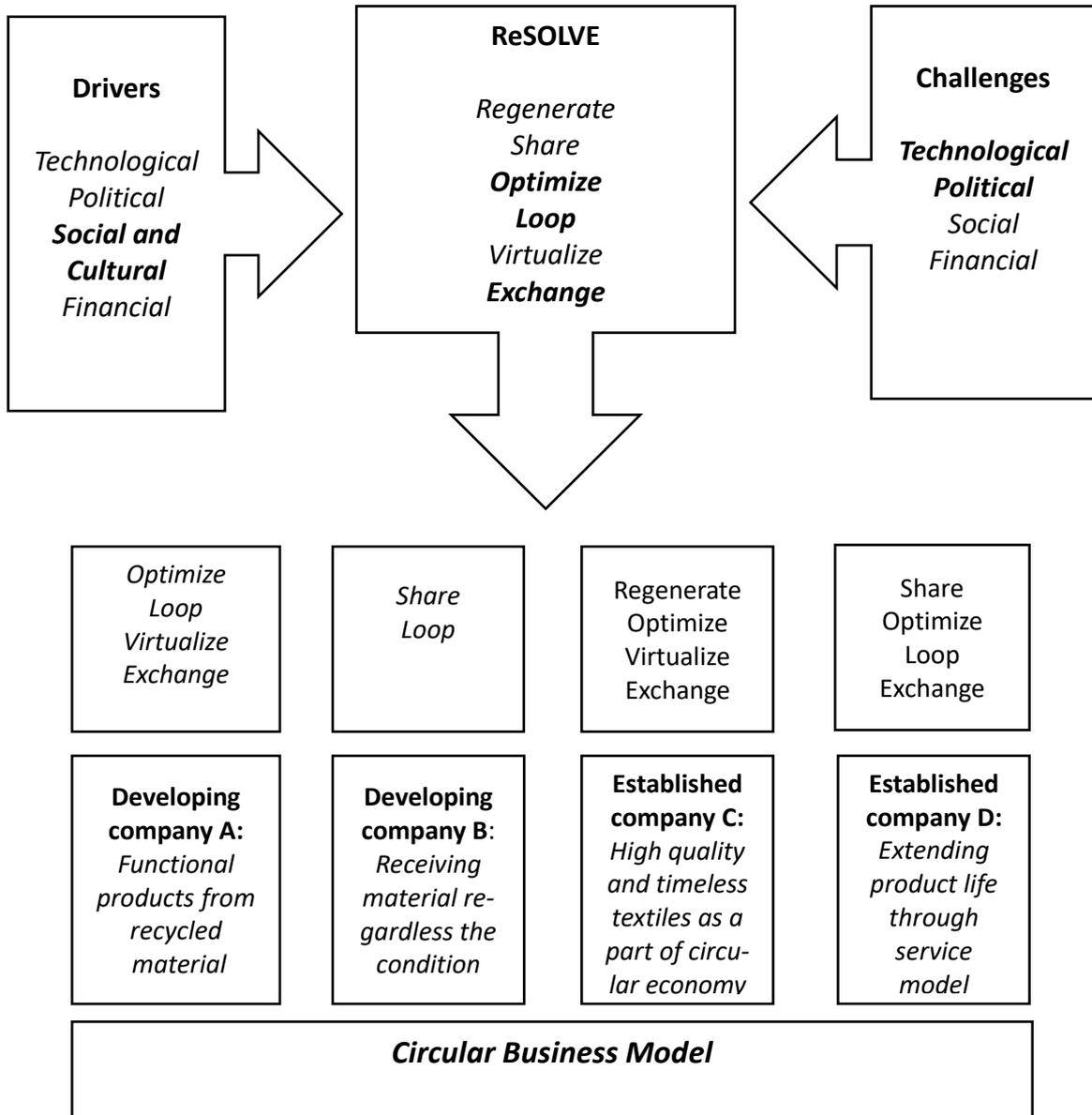


Figure 2. Modified research framework

5.4 Managerial implications

Managerial implications of this study concern the implementation of the circular economy as the company's business model. First, this study offers understanding and

knowledge about circular business models and business actions which will lead to circular economy. Comprehensive knowledge of circular business models is necessary to encourage and foster the implementation of the circular economy (Lewandowski, 2016). Linear economic models cause many environmental problems (Antikainen & Valkokari, 2016) and in this sense, it is vital to raise awareness and knowledge about the business actions which will facilitate these problems.

Secondly, to compare these models and business actions, companies need to have information about the potential challenges and drivers regarding these. This study offers to understand how circular business models are affected by different challenges and drivers. When companies are implementing circular business model, it is important to explore different challenges which companies are confronting (Heyes et al., 2018) as well as the favorable conditions which facilitate the circular business model adopting (Rizos et al., 2016). With this study, managers can examine different options whether they are developing companies or established companies.

5.5 Limitations and suggestions for future research

The limitations of the research align with the suggestions for future research. The methodological choices employed in this thesis have posed certain limitations. Because of the nature of this study, the results cannot be generalized to the larger population without further study. The sample size of four case companies is relatively small and including more companies into similar studies may provide more generalized results. Furthermore, this study is conducted based on a limited sample in one industry and therefore the results cannot be generalized, without wider analysis, into other industries. In addition, this study analyzed Finnish companies, operating in Finland and thus results cannot be generalized into other countries. Future research is recommended to be conducted in more geographically and industrially versatile contexts. The sample could contain companies from different industries and different countries in order to get more generalized results about the circular business models as well as the drivers and challenges related

to the implementation of these models. The structural differences between industries will certainly have an impact on the implementation of a circular business model.

Furthermore, future research could study how organizations have overcome the challenges related to the implementation of a circular economy. This study focused on identifying the different challenges but did not take a stand on overcoming them. Overcoming the challenges of circular economy is an essential matter when companies are implementing circular business model. Additionally, future research could study how organizations have strengthened the drivers of circular economy implementation. For instance, this research identified social and cultural matters as one of the greatest drivers towards circular economy. Thus, it would be interesting to study how organizations can strengthen these drivers to improve the implementation of circular business model. However, identifying the current drivers is the first step of strengthening them, and thus the data gathered of this research could be exploited in future research as well.

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Appendices

Appendix 1. Interview questions

1. Background information

What is your current position?

How long have you worked in this company?

Do you have personal interest in sustainability or circular economy?

2. Circular economy as a business model

How your company creates value for its customers?

Why this particular business model is chosen?

How circular economy is related to your business model?

How circular economy affects company`s competitiveness?

3. Circular economy drivers

Have you faced financial drivers related to circular economy? What kind of?

Have you faced political drivers related to circular economy? What kind of?

Have you faced technological drivers related to circular economy? What kind of?

Have you faced social/cultural drivers related to circular economy? What kind of?

What other issues are acting as drivers towards circular economy?

4. Circular economy challenges

Have you faced financial challenges related to circular economy? What kind of?

Have you faced political challenges related to circular economy? What kind of?

Have you faced technological challenges related to circular economy? What kind of?

Have you faced social/cultural challenges related to circular economy? What kind of?

What other issues are hindering implementation of circular economy?