



CHALMERS
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Towards a Circular Use Phase

The Circular Economy Applied to Automotive Market Offerings

Master's thesis in the Management and Economics of Innovation Program

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Department of Technology Management and Economics
Division of Entrepreneurship and Strategy

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Abstract

The automotive industry faces challenges transitioning from a linear economy, based on the concept of take-make-waste, to a circular economy. This thesis examines how automotive market offerings can be designed to enable a circular use phase. It has been accomplished by first identifying the building blocks of circular use and which key characteristics within a market offering could help reach these building blocks. Second, some market offerings that would incorporate the key characteristics of a circular market offering have been suggested. Finally, the building blocks of circular use have been employed to evaluate existing market offerings and recommend areas that could be altered to reach higher levels of circular use. This work has been based on qualitative data collected through interviews with employees from the car manufacturer Volvo Car Group and circular economy experts. Secondary data from previous research then complemented the interviews. The first major finding was the identification of the three building blocks of circular use. These building blocks are 1) extend product lifespan, 2) increase the efficiency of use, and 3) close the loop. The building blocks then helped identify the key characteristics of a circular market offering. The key characteristics were identified as i) incentivize manufacturers to design for longevity, ii) incentivize careful use, iii) incentivize more extended use of the cars, iv) reduce unnecessary use v) minimize the inactivity of the cars, vi) maximize the filling rate of the cars during use, vii) incentivize manufacturers to design for closed loops, and viii) incentivize customers to return the cars after use. Then, four market offerings that would more or less incorporate these key characteristics were defined as; 1) carsharing, 2) car subscription, 3) car leasing, and 4) private ownership combined with a return system. These findings add to the existing research by bringing clarity to the definition of circular use and how it can be reached. It concludes that the transition to a more circular use phase in the automotive industry is achievable. However, more research must be conducted to evaluate the profitability of the circular market offerings.

Keywords: Circular Economy, Business Model Innovation, Circular Business Models, Automotive Industry, Product as a Service, Mobility as a Service, Car Manufacturer, Product Lifespan, Efficiency of use, Close the loop

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1

Introduction

Following is an introduction to the area of study, the rationale for why this thesis is worth conducting, and how it will provide valuable insights to stakeholders within the area. Further, the purpose of the thesis and its demarcations will be addressed.

1.1 Background

Both technology advancements and economic growth are providing a great outlook to the future. However, research shows that today's use of resources affects our earth and climate in a way that puts our very existence at risk if not changed (United Nations Global Compact, 2019). The climate crisis and increased environmental awareness among society demand companies and organizations to change (Newell, 2008).

Companies are pressured to find new ways of maximizing value while minimizing the use of resources. An economy that seeks to question and change the linear economy's take-make-waste concept is called the circular economy. The circular economy is a relatively new area but has quickly become a part of any sustainability strategy. In a circular economy, all materials and products represent both an environmental and an economic value. The main task of a circular economy is to preserve that value for as long as possible. While maintaining the value of materials and products, a circular economy aims to disconnect the concept of economic growth and the use of the earth's finite resources. The main principles of a circular economy are; design out waste and pollution, keep products and materials in use and regenerate natural systems. (Ellen MacArthur Foundation, 2019).

One of the many industries that have a history characterized by the linear economy is the automotive industry (Janik & Ryszko, 2017). Although many automotive manufacturers have ambitions to reach a higher level of sustainability, the fact that the automotive life cycle is linear persists. However, in recent years, a range of new automotive market offerings that are more in line with the circular economy concept has entered the market. These market offerings include ridesharing, leasing, carsharing, and subscription services. These offerings have in common that they move away from the traditional standard of owning a car to provide access to mobility instead. Shifting from ownership to access via mobility-as-a-service provides the manufacturers with more control over the product, increasing the circularity. (Ellen

MacArthur Foundation, 2019).

Although new automotive market offerings with a higher level of circularity are grabbing a foothold of the market, there is scarce research discussing what characteristics are needed in a market offering for a circular business model. Investigating what key characteristics drive circularity in business models within the use phase of the automotive industry will help evaluate and improve current offerings from a circular economy perspective and develop a more optimized circular automotive market offering. Understanding what circular use is and how it can be reached is an important step in slowing down the destruction of the earth and building a more sustainable future for our next generations.

1.2 Purpose

This thesis aims to explore how automotive market offerings can be formed to allow for more circular use. A combination of market offerings will be proposed that would be optimal in a circular economy perspective. The thesis explores both new, non-existing market offerings and existing ones. It also investigates how these existing offerings can be altered to contribute to a higher level of circularity. The goal of the thesis is to provide a greater understanding of how market offerings can be altered to help reach a higher level of circularity in the use phase of the automotive life cycle.

1.3 Demarcations

For the purpose of this report, a market offering will be defined as how the car is being offered to the user. Using the business model canvas by Osterwalder and Pigneur (2010) as a framework, a market offering will be defined as the value proposition. However, the value proposition cannot be discussed without considering other areas of the business model canvas. Hence, when discussing market offerings, the areas of the business model canvas that will be considered are the value proposition, the customer segment, and the revenue streams. This means that the market offers must be complemented by the associated cost structure, key activities, key resources as well as the customer relationships, and the channels to reach the customers before the market offering can be converted into a fully functioning business model.

Furthermore, another demarcation is that the suggested market offerings will be based on today's infrastructure. This means that models based on autonomous cars or vehicles or innovations which are not existing today will not be addressed in this thesis. Hence, the market offerings will concern how mobility by car can be provided to the users in a circular manner.

1.4 Specification of Issue under Investigation

To achieve the purpose of the thesis, the following research questions (RQs), displayed in table 1.1, will be addressed.

Table 1.1: An overview of the research questions

Order	Question
RQ 1	What are the building blocks of circular use and what are the key characteristics of a circular automotive market offering?
RQ 2	Based on the findings from RQ 1, what is a combination of market offerings that would be optimal from a circular economy perspective?
RQ 3	How can existing automotive market offerings be evaluated and altered to reach higher levels of circularity by using the findings from RQ 1?

2

Theoretical Framework

The following chapter presents an overview of the literature on which the thesis is based. It will review the literature on circular economy and business models, and then combining the two by reviewing the literature on circular business models.

2.1 Circular Economy

The circular economy has since the 1970s gained momentum and has in recent years increased in popularity among governments, businesses, and scholars (Geissdoerfer et al., 2017). The circular economy is both a crucial part of the solution to climate change and the destruction of our earth but also a way of forming more efficient operations and finding new revenue streams for companies.

The antonym of the circular economy, based on the take-make-waste concept, is the linear economy (Korhonen et al., 2018). The linear economic model is both traditionally and currently the globally dominant economic model (Rashid et al., 2013). However, the effect of the linear economy on our earth and its limited resources creates an immense need for change (Frosch & Gallopoulos, 1989; MacArthur, 2013; Meadows et al., 2004; Schulze, 2016). A recommended approach to achieve increased sustainability and cause less harm to our earth while still experiencing economic growth is the circular economy (Beaulieu, 2015; European Commission, 2015; Schulze, 2016).

Although the definition of the circular economy may vary, the key ambition is rather consistent in the literature - the use of material loops in all stages of the product's life cycle. The Ellen MacArthur Foundation (2012, p.7), a leading player in the establishment of the circular economy, defines the circular economy as “an industrial economy that is restorative or regenerative by intention and design”. The Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015) further present three principles of circular economy which are summarized in Table 2.1.

Table 2.1: Three principles of circular economy. Source: Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015)

Principles	Description
Principle 1	"Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows"
Principle 2	"Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles"
Principle 3	"Foster system effectiveness by revealing and designing out negative externalities"

Geissdoerfer et al. (2017) have analyzed the definitions of the circular economy by the Ellen McArthur Foundation and other scholars in an attempt to bring more clarity to the concept. Based on the analysis of the different definitions Geissdoerfer et al. (2017, p.759) define circular economy as:

“a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.”

Traditionally, the circular economy has primarily focused on the design and manufacturing phases of the product life cycle. The argument has been that using recycled material and designing products to allow for recycling, refurbishment, and remanufacturing has great potential in breaking the linear economic model (Korhonen et al., 2018). However, this thesis will focus on finding optimal market offerings and how mobility can be offered to customers in a way that allows for a more circular use phase. This means that other areas that also must be changed to reach circularity, such as the choice of material and the design and manufacturing of the product, will not be in focus throughout this thesis. Hence, the findings from the thesis need to be combined with and complemented by other theories and literature to reach a fully circular value chain.

2.1.1 Reaching Circularity

In order to reach circularity, a business must integrate the circular economy concepts into all functions of the firm and all stages of the product life cycle. MacArthur (2013) identified four building blocks that are needed in a circularity economy which

are:

1. Circular product design and production
2. New business models
3. Skills in building cascades and reverse cycles
4. Enablers to improve cross-cycle and cross-sector performance

All areas are important and affect each other. Therefore, emphasis must be put on all factors in order to reach circularity (MacArthur, 2013). However, for the purpose of this report, new circular business models are what is being investigated within the use phase of the automotive life cycle.

2.1.2 Circular Use

A range of business models and value propositions that allow for a more circular use have been published by scholars. However, there is less information available on what building blocks lay as the foundation for circular use of products.

In table 2.2, an overview of theories covering the building blocks of circular use is presented. The corresponding components of the theories have been grouped together to provide an understanding of their similarities and differences.

From table 2.2 three main building blocks for circular use can be identified: Extend product lifespan - Keep the product in use for as long as possible. Increase the efficiency of use - Increase the utility of each product by both minimizing the idle time and increase the efficiency while being used. Close the loop - Finding a second life for products, components, and material by repair, remanufacturing, resale, reuse, recycling, and by finding other areas of use for components and material after use.

It has been argued the last building block, closing the loop, correlates more to the last stage of the product life cycle, the end-of-life, than it does to the use stage (Bocken et al., 2016; Braungart et al., 2007; Stahel, 1994). However, Willskytt et al. (2016) as well as Nußholz (2017) argue that closing the loops is a building block in both the use phase and the end-of-life. How the product is offered and used will affect the ability to close the loop and reuse the products, components, and material.

Table 2.2: An overview of literature covering circular usage

Authors	Extend product lifespan	Increase the efficiency of use	Close the loop
Nußholz (2017)	Increase lifespan of products	Efficient use	Second-life of products
Willskytt et al. (2016)		More efficient use of products	Closing loops
Hopkinson et al. (2020)	Extend life	Intensify use	Reuse & recycle
Allwood et al. (2011)	Longer life	More intense use	Repair & resale
Bressanelli et al. (2018) building on the work of Ellen MacArthur Foundation and World Economic Forum (2016)	Extend product lifespan	Increased resource efficiency	Close the loop

2.2 Business Models

Although every company has a business model (Chesbrough, 2007), the definition of the term business model is not completely clear. The term gained popularity in the mid-90s during the advent of the internet (Amit & Zott, 2001) and soon became a buzzword that promised great profits and success if developed correctly. However, when the dot-com bubble crashed, so did the hype around business models (Magretta, 2002). A lot has happened since then, and now most people understand the great value of having a well thought out business model and several researchers have tried to set a definition for the term. Chesbrough and Rosenbloom (2002, p.529) defined it as “The heuristic logic that connects technical potential with the realization of economic value” while Teece (2010, p.173) stated that “A business model articulated the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers. It also outlines the architecture of revenues, costs, and profits associated with the business enterprise delivering that value”. Even though the exact definition of a business model varies between different authors (Zott et al., 2011), the consensus seems to be that the business model describes the logic behind creating, capturing, and delivering value (Amit & Zott, 2001; Chesbrough & Rosenbloom, 2002; Johnson et al., 2008; Magretta, 2002; Morris et al., 2005; Teece, 2010; Zott et al., 2011). Hence, this thesis is using the

definition “the rationale of how an organization creates, delivers and captures value” by Osterwalder and Pigneur (2010, p.14) as it closely resembles the common beliefs.

A widely adopted description of a business model was created by Osterwalder and Pigneur (2010) called the business model canvas. Practitioners and researchers such as Abraham (2013), Kaplan (2012), Massa and Tucci (2013), Nordic Innovation (2012), and OECD et al. (2012) are some examples that have adopted it during its early years. The business model canvas by Osterwalder and Pigneur (2010) (Figure 2.1) has nine building blocks that describe a business model.

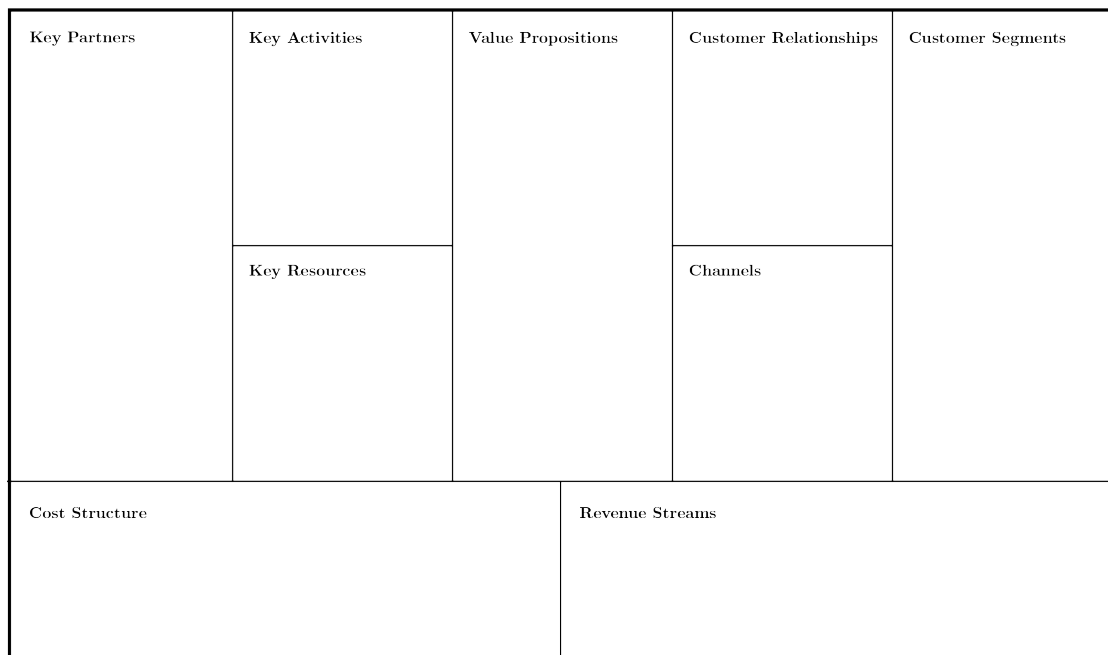


Figure 2.1: Business Model Canvas. Source: Osterwalder and Pigneur (2010)

1. **Customer Segments** – Defines the different group of people or organizations an enterprise aims to reach and serve.
2. **Value Propositions** - The organization provides its customers with value propositions to solve their problems and satisfy their needs.
3. **Channels** – Describes how a company communicates with and reaches its customer segments to deliver the value proposition.
4. **Customer Relationships** – Relationships are formed and maintained for each customer segment.
5. **Revenue Streams** – Represents the cash flows a company generates from each customer segment.

6. **Key Resources** – Describes the assets required to offer and deliver the previously described elements.
7. **Key Activities** – Covers the activities required to offer and deliver the previously described elements.
8. **Key Partnerships** – The network of suppliers and partners that make the business model work.
9. **Cost structure** – Addresses the costs incurred to operate a business model. The first item

2.3 Circular Business Models

Although increasing in popularity, the concept of circular business models has no clear common definition (Nußholz, 2017). A term based on circular economy and business models, two concepts that both lack a commonly established definition, leaves much room for interpretation and work from scholars. Attempts have been made to form a definition but as stated by Nußholz (2017), it varies between the different works, seemingly as a consequence of the lack of commonly accepted definitions of both circular economy and business models. However, many scholars seem to agree upon the fact that a circular business model can be defined by adding the concepts of circular economy to the different areas of a business model (Antikainen & Valkokari, 2016; Frishammar & Parida, 2019; Geissdoerfer et al., 2020). This means that a circular business model aims to create, deliver and capture value while incorporating loops in all stages of the product’s life cycle and all functions of the business. This understanding of a circular business model implies that it does not need to be a fully closed loop with no leaks. Rather, a business model can be more or less circular and the ambition of a circular business model is to achieve a higher level of circularity while maintaining or increasing value creation, value delivery, and value capture (Lewandowski, 2016).

Different frameworks for establishing a circular business model have been suggested. Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015) has suggested a framework which they called ReSOLVE. The ReSOLVE framework is based on the three principles of circular economy presented in Table 2.1 in section 2.1. The framework consists of 6 actions to reach a more circular business model and is presented in Table 2.3.

2.3.1 The Circular Business Model Canvas

Based on the ReSOLVE framework and an extensive literature review on circular business models, Lewandowski (2016) proposed a framework aimed to help businesses transition from a linear economic model to a circular one. By connecting the

Table 2.3: The ReSOLVE framework. Source: Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015)

RESOLVE	Description
RE (GENERATE)	<ul style="list-style-type: none"> • "Shift to renewable energy and materials" • "Reclaim, retain, and restore health of ecosystems" • "Return recovered biological resources to the biosphere"
S (HARE)	<ul style="list-style-type: none"> • "Share assets (eg cars, rooms, appliances)" • "Reuse/secondhand" • "Prolong life through maintenance, design for durability, upgradability etc"
O (PTIMISE)	<ul style="list-style-type: none"> • "Increase performance/efficiency of product" • "Remove waste in production and supply chain" • "Leverage big data, automation, remote sensing and steering"
L (OOP)	<ul style="list-style-type: none"> • "Remanufacture products or components" • "Recycle materials" • "Digest anaerobically" • "Extract biochemicals from organic waste"
V (IRTUALISE)	<ul style="list-style-type: none"> • "Dematerialise directly (eg books, CDs, DVDs, travel)" • "Dematerialise indirectly (eg online shopping)"
E (XCHANGE)	<ul style="list-style-type: none"> • "Replace old with advanced non-renewable materials" • "Apply new technologies (eg 3D printing)" • "Choose new product/service (eg multimodal transport)"

areas of the ReSOLVE framework to the components of Osterwalder and Pigneur (2010) business model canvas (see Table 2.4), Lewandovski was able to alter and add to Osterwalder and Pigneur's work and suggest his own framework called The Circular Business Model Canvas (Figure 2.2). Lewandowski's circular business model canvas has the original 9 components that Osterwalder and Pigneur suggest in their business model canvas. However, each of the components has been altered to reach circularity and two new components are introduced - the take-back-system and adoption factors.

Table 2.4: How the ReSOLVE framework apply to the components of business model. Source: Lewandowski (2016).

Business Model Components	Regenerate	Share	Optimize	Loop	Virtualize	Exchange
Partners		X		X		
Activities	X		X	X	X	
Resources	X		X	X	X	
Value proposition and Customer segments		X		X	X	
Customer relations						
Channels					X	
Cost structure	X		X	X		X
Revenue Streams		X		X		
Circular Business Model Components						
Take-back system				X		
Adoption factors	X	X	X	X	X	X

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
	Key Resources		Channels	
			Take-Back Systems	
Cost Structure		Revenue Streams		
Adoption Factors				

Figure 2.2: Circular Business Model Canvas. Source: Lewandowski (2016)

1. **Value proposition** – The value proposition offers a product, product-related service, or a pure service to fulfill customers’ needs, reduce customer inconveniences and offer additional benefits while incorporating circular economy principles. Circular value propositions may concern product-service systems where a company retains the ownership of the product but offers access to it, virtual services, circular products, or incentives for customers to bring back used products.
2. **Customer segments** – Directly linked with the value proposition component. Same ideas as in the original business model canvas.
3. **Channels** – Channels could be strongly shifted towards a circular business model by virtualization.
4. **Customer relationships** – A key component in eliminating waste in a circular business model. By producing on order, waste can be reduced.
5. **Revenue streams** – There are several revenue streams associated with circular value propositions such as input-based, availability-based, usage-based, performance-based, and from the value of retrieved resources.
6. **Key resources** – Choosing the right suppliers that enhance closed loops and virtualization of materials.
7. **Key activities** – Good housekeeping, better process control, equipment mod-

ification and technology changes, sharing and virtualization, lobbying, and improving the design of the products are key activities that can make it more eco-friendly.

8. **Key partnerships** – Collaboration enhances obtaining key resources and performing key activities.
9. **Cost structure** – Reflects financial changes in other components.
10. **Take-Back system** – Enables material loops by reverse logistics. May require different partners, channels, and customer relations.
11. **Adoption factors** – The shift towards circular business models should be supported by internal and external factors.

As described in the demarcations, for the purpose of this report, value proposition, customer segments, and revenue streams are the elements that are being investigated. Defining these three areas of a business model correlates to answering the following questions: “what?”, “to whom?” and “how to earn money?” (Osterwalder & Pigneur, 2010).

2.3.2 Value Proposition Canvas - What to Whom?

Finding a fit between the value proposition and the customer segment is key in any business model. Without achieving that fit, the other areas of the business model become irrelevant (Osterwalder et al., 2014). Osterwalder et al. (2014) developed a framework that helps highlight the areas of the customer segment and value proposition that are needed to answer the question: “what, to whom?”. The tool came to be called the value proposition canvas and describes the customer profile and the value proposition, see Figure 2.3. All areas of the value proposition canvas can be seen below.

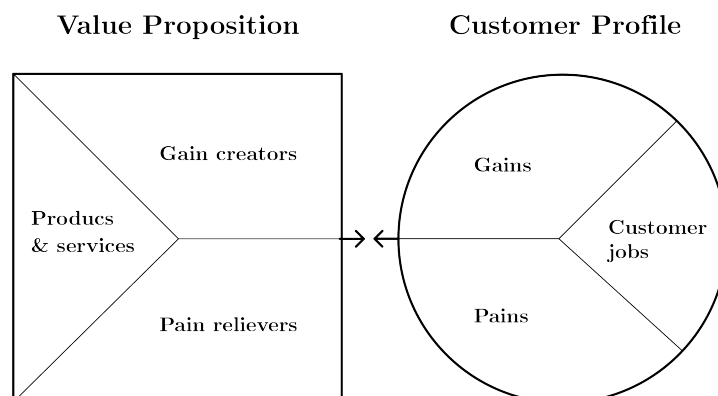


Figure 2.3: Value Proposition Canvas. Source: Lewandowski (2016)

1. **Customer jobs** - The things or tasks the customers need to get done (jobs-to-be-done). The jobs-to-be-done, which all vary in importance, are divided into three main categories;
 - (a) Functional jobs - Performing a certain task or solving a problem like moving from point a to b.
 - (b) Social jobs - Concerning how the customers want to be perceived by others. Looking good, showing status, or expressing power.
 - (c) Personal/emotional jobs - Looking for a certain emotional state like feeling secure or feeling relaxed.

2. **Customer pains** - Everything that annoys or disturbs the customers before, during, or after performing a job or imposes a risk while performing the job. Just like the jobs themselves, the customer pains vary in severity and the most severe pains must be prioritized to solve. The customer pains are divided into three categories:
 - (a) Undesired outcomes, problems, and characteristics - Pains can be categorized as:
 - i. Functional - A solution does not work or works poorly
 - ii. Social - Looking bad while performing a task
 - iii. Emotional - Feeling bad while performing a task
 - iv. Ancillary - Feeling that the task is annoying or boring
 - (b) Obstacles - Things that hinder the customers from performing the task. Lack of time or money are two examples.
 - (c) Risks - Things that can go wrong which would have bad consequences while performing a task.

3. **Customer gains** - The customer benefits and positive outcomes related to the performance of the job. The gains vary from nice-to-have to essential. The customer gains can be categorized in one of the four following categories:
 - (a) Required gains - The most essential gains that are needed for any solution. Being able to make a call with a phone is an example.
 - (b) Expected gains - What the customers expect from any solution although they are not completely required.
 - (c) Desired gains - This goes beyond what the customers expect but are still areas they would like to have.
 - (d) Unexpected gains - Gains that your customers do not yet know they desire. Before being suggested as a gain, customers would not ask for it.

4. **Products and services** - A description of the entire offering. A list of all areas of the product or service. The offering may contain a mix of the following types of products or services :
 - (a) Tangible - physical manufactured goods
 - (b) Intangible - copyrights or services
 - (c) Digital - i.e. online music services or online recommendations
 - (d) Financial - i.e. investment funds or insurance

5. **Pain relievers** - How the product or service can reduce customer pains. All customer pains will not be solved by any value proposition but solving the most extreme pains will add value to the customer segment.
6. **Gain creators** - How the product or service creates customer gains. All categories of customer gains are preferably covered. However, as with pain relievers, not all gains will be achieved but rather focusing on the most essential gains will create the most value.

Developing a business model around the needs of a customer segment is an iterative but sequential process. Osterwalder et al. (2014) suggest that three kinds of fits are needed to develop a successful business model. The first fit is between the customers' problem and the proposed solution to that problem, the problem-solution fit. The problem-solution fit takes place when knowing the customers' needs and jobs and addressing them with potential solutions. The next fit is about proving that the customers care about the proposed solution and that it creates value for the targeted customer segment, the product-market fit. After the product-market fit is achieved, the next fit aims to prove that the value proposition can be used in a profitable and scalable business model, the business model fit. For the purpose of this thesis, value propositions based on customer jobs and needs will be suggested with the goal of achieving problem-solution fit with as high levels of circularity as possible.

Incorporating the concept of circular economy to the fit between the customer problems and a value proposition means helping a customer group perform their jobs by offering a circular value proposition. By adding Lewandowski (2016) theories to the value proposition canvas, a circular value proposition means offering a product or service with correlating gain creator and pain reliever that follows the principles of the circular economy.

2.3.3 Revenue Streams - How to Earn Money?

In close relation to the value proposition lies the revenue streams. Choosing between different revenue streams will not only affect the value proposition but also the customers. Osterwalder and Pigneur (2010) list several ways of creating revenue streams which include asset sale, usage fee, subscription fee, lending/renting/leasing, and licensing. Lewandowski (2016) builds on the work by Osterwalder and Pigneur (2010) and argues that revenue streams are one of the most important components of a business model when transforming from a linear economy to a circular economy. Lewandowski names a number of circular revenue streams which are mainly based on product-service systems:

1. **Input-based product-service system** - Pay-per-product or pay-per-service.
2. **Availability-based product-service system** - A subscription service which gives access to the product for a period of time.

3. **Usage-based product-service system** - Pay-per-use. Pay to use the product or service once.
4. **Performance-based product-service system** - Paying for the outcome like paying for light instead of paying for lamps.
5. **Value from retrieved resources** - Companies collect back the products, components or raw material and restore the value from them to resell.

Lüdeke-Freund et al. (2019) agrees that the value capture strategy and revenue models have a great effect on the level of circularity. Charging price premiums, generating additional revenues from co-products, and shifting from selling goods to service-based pricing models are some examples they bring up to shift to more circular revenue streams. Tukker (2004, 2015) agrees that circular revenue streams should come from the result and use of the product instead of the product itself. He also stresses the importance of finding a revenue stream from additional services connected to the product to increase the utilization of each product in use. Utilization is in this thesis defined as the time the product is used.

3

Methodology

The following section presents and discusses the methodology used in the thesis. First the research strategy and sampling will be addressed, followed by a discussion on how the data is being collected and analysed. Finally, the research quality will be discussed, including the research's validity and ethics.

3.1 Research Strategy

Edmondson and McManus (2007) present a continuum with three categories of management research. Nascent Theory and Mature Theory form the ends of the spectra with Intermediate Theory in between. Mature Theory represents well-developed concepts and precise models that have been supported by extensive research by a variety of scholars. Nascent Theory, in contrast, is a topic in which little, or no previous theory exists. Intermediate Theory, positioned in between, presents a new explanation to existing phenomena, often by introducing new relationships between established constructs. (Edmondson & McManus, 2007).

As described in the purpose section, the aim of the thesis is to present automotive market offerings that are optimal from a circular economy perspective. Hence, the ambition is to present a new relationship between market offerings and circular economy which defines our thesis as Intermediate Theory research. However, due to the lack of research in the interplay between circular economy and market offerings in the automotive industry, the thesis is closer to the Nascent end of the continuum. An exploratory stance is preferable when there is limited research in the field (Bryman & Bell, 2015).

The chosen strategy for the research is a case study due to the focus on depth and context to provide a detailed picture of the subject. A case study is characterized by studying a single instance while focus on depth, natural setting, relationships and processes, and multiple sources and methods (Denscombe, 2018; Johannesson & Perjons, 2014). According to Denscombe (2018), a case study is appropriate when investigating an issue in-depth and when dealing with the complexity and subtlety of real-life situations, which supports our choice of research strategy.

3.2 Research Sampling

A qualitative study was conducted to research conclusions about the research question. The choice of conducting a qualitative study was based on the appropriate type of data to be collected and is further discussed under section 3.3. According to Bryman and Bell (2015), a common sampling method for qualitative research is theoretical sampling. In a theoretical sampling method, a sample of potentially suitable participants are initially selected by the researchers. The path forward for the empirical findings is then conducted upon the data gathered from the initial participants (Bryman & Bell, 2015). Ellram (1996) stated that a purposive sampling technique, also called judgmental sampling, may be used when choosing the case to study. The chosen case is then determined fully based on the researcher's knowledge and judgment. This technique is appropriate in situations where the target population is judged to have a limited number of people with the qualities desired (Ellram, 1996). The technique is also recommended by Bryman and Bell (2015) to secure that the interviewees have relevant knowledge for the purpose of the study. As this study is conducted in the area of Gothenburg, Sweden, in collaboration with Volvo Car Group (Volvo Cars), and since it primary aims to reveal information about that specific context, a single case study was found appropriate.

Initial interviews were conducted with appropriate employees at Volvo Cars to gain a better understanding of the topic of circular economy and circular use in particular. The results of the first interviews were twofold in terms of the ongoing sampling. First, the knowledge gathered in the interviews provided guidance for the researchers to conduct further research upon specific topics discovered and helped the researchers identify people with appropriate qualities. Second, the interviewees shared contact information to other appropriate candidates to interview from their personal network.

3.3 Data Collection

The type of data collected and the illustrative methods for collecting the data varies depending on the type of research. In a Nascent Theory, qualitative open-ended data should initially be collected whereas in the Mature theory, the data should be quantitative. A hybrid approach with both qualitative and quantitative data is suggested by Edmondson and McManus (2007) for Intermediate Theory research. This study heavily emphasized the qualitative data due to the study's position on the continuum and the limited time for the study.

The research was performed through interviews and was complemented by material obtained from field sites relevant to the circular economy phenomena and market offerings for car manufacturers in accordance with the methods presented by Edmondson and McManus (2007) for intermediate theory research.

3.3.1 Interviews

Interviews have great potential when exploring complex subtle phenomena. Two of the advantages of interviews are that they are good at producing depth and detailed data, and gives the researchers valuable insights (Denscombe, 2018). Interviews were held with field experts within the circular economy and the automotive industry to increase the knowledge and understand the different aspects of a circular marketing offering.

Both unstructured and semi-structured interviews were conducted to encourage the creation of new ideas as described by Denscombe (2018). This was judged to be suitable for the purpose of innovating new market offerings. Unstructured interviews was also useful as a tool to increase the knowledge of the researchers and to discover new areas to study.

Three different types of interviews were held during the process, each type aiming to collect data related to corresponding research questions. The first type of interviews aimed to collect data regarding the foundation of circular economy and circular use to answer the first research question. These interviews were unstructured to ensure that the interviewee was not affected by the interviewers and had the freedom to fully determine their definition of circular use, how it is achieved and what matters that are important to discuss within the subject. The second type of interviews was aiming to address the second research question to find appropriate market offerings. These interviews could be divided into two parts where the first part consisted of semi-structured questions to gather data about the customer profile in the automotive industry. A semi-structured interview is a common interview type in qualitative research (Newcomer et al., 2015) and has the advantage of giving the interviewer the option to easily adapt the process in accordance with the input given by the interviewee (Bryman & Bell, 2015). The major disadvantage on the other hand is that the interview is generating more unstructured notes that is more time consuming to go through for the interviewer (Newcomer et al., 2015). The advantages were judged to outweigh the disadvantages in this case, which lead to the conclusion that semi-structured interviews were appropriate in this phase of the study. The second part was held with a more unstructured approach where the interviewee could more openly elaborate about potential value propositions and corresponding revenue streams that enabled a circular use. Finally, the third interview type was aimed to collect information about current market offerings to answer the last research question. A semi-structured method was judged to be suitable for the purpose. All the interview templates can be found in Appendix A.

For the semi-structured interviews, the interview questions were sent to the interviewee via email beforehand together with a short description of the aim of the thesis. The purpose of the action was to allow time to prepare for the interview to ensure the answers held as high quality as possible. The interviews were held online due to the restriction caused by COVID-19. Visual interviews were conducted as facial expressions could reveal additional information about the answers provided. The interviews were recorded, for the purpose of validating the notes that were written

during the interviews.

There are no clear guidelines on how many interviews that should be conducted in qualitative research. Bryman and Bell (2015) state that one condition that indicates theoretical saturation is when no new or relevant data seem to be emerge. Theoretical saturation was therefore considered to be achieved after conducting interviews with 15 different interview subjects. An overview of the interview subjects can be found in table 3.1.

3.3.2 Documents

Documents are useful as an alternative to interviews and are to be used to strengthen the knowledge and provide deeper insights about the topic. The documents used in the study are government publications and official statistics, magazines, and website pages. Denscombe (2018) states that some of the advantages of using documents are cost-effectiveness and the increased accessibility to data.

Table 3.1: Interviewed subjects, consisting of original equipment manufacturer (OEM) employees, researchers and consultants.

Interviewee	Research Question	Date	Duration
(1) OEM employee	RQ1, RQ2	2020-02-23	51 min
(2) OEM employee	RQ1, RQ2	2020-03-02	45 min
(3) Researcher	RQ1	2020-03-09	50 min
(4) OEM employee	RQ1, RQ2	2020-03-18	57 min
(5) Sustainability consultant	RQ1	2020-03-24	41 min
(6) OEM employee	RQ2	2020-03-25	57 min
(7) Researcher	RQ1	2020-03-26	64 min
(8) Researcher	RQ1	2020-03-26	34 min
(9) Sustainability consultant	RQ1	2020-03-29	27 min
(10) OEM employee	RQ2	2020-03-30	47 min
(11) OEM employee	RQ2	2020-04-07	42 min
(12) Mobility provider	RQ3	2020-04-19	60 min
(13) Mobility provider	RQ3	2020-04-20	54 min
(14) OEM employee	RQ2	2020-04-21	56 min
(15) Mobility provider	RQ3	2020-04-23	59 min

3.4 Research Analysis

The research analysis started by compiling the collected data, in accordance with the first step in the methodology to analyze data presented by Burnard (1991). All the field notes were read through and compared and complemented with the audio recordings from the relevant interview to validate their accuracy. Burnard (1991) highlights the importance of going through all the notes at the early stage of the analysis.

Both Bernard (2017) and Burnard (1991) state that the next step of the data analysis is to develop categories from the data collected. One way of doing so, presented by Miles and Huberman (1994), is to base the categories on existing notes. The structure could be developed from a theoretical theme so that the empirical findings is connected to accepted concepts in literature (Miles & Huberman, 1994; Miles et al., 2018). For the first research question, the interview data gathered was divided into three categories, being the building blocks of circular use, defined in the theoretical framework. The additional category, *other*, was then added consisting of the small amount of data that did not fit into the main categories. For the second and third research question the categories were naturally developed to consist of the categories and subcategories of the value proposition canvas. Fawcett et al. (2014) explains that the use of theoretical themes from the literature is a good way to foster a good data structure.

Harding and Whitehead (2013) present three ways of analyzing qualitative data, either by first collecting all the data and later on start the analysis, collect all the data for a particular type, e.g. interview or forms, and then start the analysis before collecting data from a new type of source, or by constant comparative analysis of the collected data. Due to the exploratory stance of the research, the constant comparative analysis method seemed most suitable for the study as previously held interviews were used as guidance to find complementary data and to increase the knowledge of the researchers.

Furthermore, due to the interconnection between the research questions and that the analysis of later research questions was built upon earlier findings, it was considered appropriate to simultaneously collect and analyse the data. The ongoing findings were predicted to affect the required data to be collected and used as guidelines for what is relevant to investigate further. A benefit of approach is that it makes it less overwhelming for the researchers (Suter, 2011).

3.5 Research Quality

This section will discuss the quality of the research regarding validity of the results and the ethics considered during the entire process of the thesis. Only measurements applicable for qualitative research and assumed to be relevant for the thesis will be discussed.

3.5.1 Validity

Validity is concerned with the conclusions generated in a research study and defines the integrity of the results (Bryman & Bell, 2015). Validity can be divided into several subcategories - measurement validity, internal validity, external validity, and ecological validity. In this section, internal validity and external validity will be discussed as they represent the most relevant forms of validity for a qualitative study (Bryman & Bell, 2015).

Internal validity refers to the causality in the conclusion of the study. It means that the relationship between two or more variables should be examined in order to prove that one variable is directly affected by the second variable or if something else is producing the apparent causal relationship (Bryman & Bell, 2015). To strengthen the internal validity of the study the results have been conducted based on data and discussions gathered from several independent interview subjects. The causation of different subject matters have been discussed with experts to ensure the internal validity. The data from the interviews have further been complemented by data from other sources to strengthen the conclusions of the thesis. Lastly, the analysis of the data has consistently been presented to two independent supervisors with different expertise, to increase the validity of the study.

External validity is concerned with whether the conclusions of the study is applicable in settings other than the one conducted in the study. With other words, external validity refers to whether the conclusions of the study can be generalized beyond the specific research context (Bryman & Bell, 2015). The analysis has been performed based upon data judged to be general for all car manufacturers to increase the external validity. Nevertheless, the external validity could not be fully guaranteed as specific circumstances could affect the result of the study and the conclusions have not been tested elsewhere.

3.5.2 Ethics

Diener and Crandall (1978) divide the ethical principles into four main areas; whether there is harm to participants, whether there is a lack of informed consent, whether there is an invasion of privacy, and whether deception is involved. These areas are in line with the four principles presented by Denscombe (2018) as guidelines for good ethics where the researchers shall protect the interest of the participants, they should ensure that participation is voluntary and based on informed consent, avoids deception and operates with scientific integrity, and complies with the laws of the land.

All of the mentioned aspects above were considered during the entire research process and especially during the arranged interviews. It is vital that the interviewees are treated with respect and that no harm will occur to them neither during the interview nor in a late stage. Confidential information received from participants in the study is also handled with care and may under no circumstances be publicly disclosed. The interviewees were properly informed about the circumstances of the

3. Methodology

interview and the subjects that are to be discussed. To ensure the privacy of the interviewee, the interview questions did not touch upon information regarding their own privacy.

When evaluating current market offerings, the analysis is dependent on information from the companies being evaluated. This can lead to a conflict of interest and possibly biased data. To limit the conflict of interest and gather reliable data, the thesis did not criticize any of the involved parties but rather suggested areas of improvement and provided actionable data that may help all stakeholders.

4

Empirical Findings

The following chapter presents the empirical findings from the study. First, findings from RQ 1 will be presented where the building blocks of circular use are being validated together with the key dimensions of a circular market offering. The findings regarding the customer profile, value propositions, and revenue streams will then follow.

4.1 The Building Blocks of Circular Use

In order to present market offerings that would enable circular use, the definition of circular use must be fully determined. In the theoretical framework, three building blocks of circular use were presented as extending product lifespan, increasing the efficiency of use, and closing the loop. These three proposed building blocks have been validated with circular economy experts throughout the study. The findings are summarized in Table 4.1 below.

Table 4.1: An overview of the data gathered during the interviews regarding the building blocks of circular use

Interviewees	Extend product lifespan	Increase the efficiency of use	Close the loop	Other
Circularity expert 1 (Researcher)	“[...] to get the product to live longer”	“The core is to achieve slow resource flow. To achieve slow resource flow you could use the product more efficiently [...]”	“The last aspect is closed material loops [...]”	
Circularity expert 2 (OEM employee)	“One should try to design and produce long-lasting products [...]”	“[...] and get them to be used as efficiently as possible”	Agreed upon when brought up by the interviewer	
Circularity expert 3 (OEM employee)	“[...] we should keep what we have put into the usage phase for as long as possible”	Agreed upon when brought up by the interviewer	“When it is no longer possible to use the product, it should get back to our production phase”	
Circularity expert 4 (Sustainability consultant)	“The component that relates to the usage phase is the product lifespan [...] It is desirable to have an as long product life cycle as possible”	Agreed upon when brought up by the interviewer	“It is partly about what happens after the product being used. Can the product be reused or recycled?”	“Flexibility of use; When you want to upgrade, you should not need to buy a new product, you should have the option to improve what you already have”

Table 4.1: Continuation of table on previous page

Interviewees	Extend product lifespan	Increase the efficiency of use	Close the loop	Other
Circularity expert 5 (Researcher)	Agreed upon when brought up by the interviewer	Agreed upon when brought up by the interviewer	“In the end, you want it to come back somehow, it should be a cycle”	
Circularity expert 6 (Researcher)	“Minimize the ratio between the amount of virgin material and a functional unit such as driven distance”	“Minimize the ratio between the amount of virgin material and a functional unit such as driven distance”	“The utopia is that you reuse all the material in the product”	
Circularity expert 7 (Sustainability consultant)	“In the optimal case, it should [...] run forever”	“[...] preferably a high utilization rate”	“In the optimal case, it should be 100% recycled [...]”	
Circularity expert 8 (OEM employee)	Longer use - Source: PowerPoint material	More intense use - Source: PowerPoint material	Agreed upon when brought up by the interviewer	Value Control - Source: PowerPoint material

In all of the interviews, all three building blocks identified in the literature were either brought up by the interviewee as a building block of circular use or agreed upon when it was brought up as a building block by the interviewer. In addition, two other building blocks were mentioned, the flexibility of use and value control. These two were only mentioned during one interview, as seen in Table 4.1.

4.2 Customer Profile

The following sections present the data gathered regarding the customer profile in the traditional ownership model in the automotive industry to help identify *to whom* the car is currently being sold. The section follows the structure of the value proposition canvas where the data is sorted between the customer jobs, gains, and pains a customer experiences before, during, and after the ownership of a car. An overview of the findings described in the upcoming subsections can be seen in Table 4.2.

Table 4.2: An overview of the data gathered during the interviews regarding the customer profile.

Business Model Component	Subcategory	Data
Customer Profile	Jobs-to-be-done	<ul style="list-style-type: none"> • Functional jobs <ul style="list-style-type: none"> – Transport: <ul style="list-style-type: none"> * People and items * Shorter and longer trips – Other functions for the owner <ul style="list-style-type: none"> * E.g. In-car delivery drop-off. • Social Jobs <ul style="list-style-type: none"> – Showing your success and prestige – Showing your contribution to a better society by the choice of your car • Personal/emotional jobs <ul style="list-style-type: none"> – Feeling the freedom to move

Table 4.2: Continuation of table on previous page

Business Model Component	Subcategory	Data
Customer Profile	Customer Pains	<ul style="list-style-type: none"> • Buying/selling the car <ul style="list-style-type: none"> – Expensive to buy – The effort to find the right car or buyer – Time consuming • Owning the car <ul style="list-style-type: none"> – Costs: <ul style="list-style-type: none"> * Insurance cost * Repair cost * Garage or parking spot * Service cost * Taxes – Effort: <ul style="list-style-type: none"> * Repair * Service * Change winter/summer tires * Washing the car – Storage: <ul style="list-style-type: none"> * Car * Tires – Emotional pains <ul style="list-style-type: none"> * Feeling and looking bad when the car gets older and worn • Using the car <ul style="list-style-type: none"> – Costs: <ul style="list-style-type: none"> * Gas * Parking * Taxes – Finding parking in urban environments – Being stuck in traffic – Bad consciousness from environmental effects – Social judgment from using a car when not absolutely necessary – Walking distance to the car
	Customer Gains	<ul style="list-style-type: none"> • Required gains <ul style="list-style-type: none"> – Ability to move efficiently from point A to point B – Ability to move whenever required • Expected gains <ul style="list-style-type: none"> – Feeling safe during the transport – Having a pleasant experience – Long lifespan of the car • Desired gains <ul style="list-style-type: none"> – Personalization – Good air – Knowing that the car is environmentally friendly – Having a premium experience • Unexpected gains <ul style="list-style-type: none"> – Additional functions: <ul style="list-style-type: none"> * E.g. Navigator, music system, call, remote engine, heat start

4.2.1 Customer Jobs

Starting with the functional jobs, the main and most obvious one in the automotive industry is transporting oneself from point A to point B. A related job that is common for customers is transporting family and friends, and transporting items. Depending on how often and how long the trips are, and what is brought in the car during the transportation, the jobs-to-be-done require different solutions. Another functional job for the car customer is in-car-delivery, a function that enables the car to be a safe drop-off spot for deliveries. Furthermore, a few potential jobs-to-be-done from a society perspective were mentioned. The cars could be used to store energy in their batteries, surveillance of the area, burglar alarm, and as a weather station that gathers data about the weather and temperature outside.

Some customers acquire a car to perform social jobs. A car could be a symbol of success and could also be prestigious. It is a social signal that indirectly provides information about the owner. For some people, a social job could be that they want to show that they are contributing to the environment by driving an electric car.

For personal/emotional jobs, the car could be an enabler of freedom. That means that owning a car could create the emotional feeling of having the freedom to move wherever, whenever and however desired.

4.2.2 Customer Pains

The process of buying the car includes numerous pains. The first one is the price. Purchasing a car takes a hefty investment. Add to that the struggle of finding the right car. The amount of car brands and models, both new and second-hand, available on the market makes it a challenge to find the right option to invest in. When finding the desired car it often takes weeks if not months before the car is in the buyer's possession. The same struggle often goes for selling the car. Finding the right buyer takes time and it is oftentimes challenging to agree upon a reasonable price.

Owning a car can make demands on the owner which could be the source of various customer pains. Economic pains include operational costs, insurance costs, repairs, parking costs, and parking tickets. Further pains include the time and effort the owner has to put in to take the car to the regular service inspection, following up on any flaws from the inspection, changing between and store winter and summer tires, washing the car, and making sure it stays in good shape. In addition, a car is a large object that needs a storage location which is a potential pain for the customer. Personal/emotional as well as social pains may occur when the car is getting older and worn.

When it comes to using the car, the customer pains include economic pains in the form of gas, parking costs, wear, and taxes. Further pains from using the car include finding parking in urban environments, being stuck in traffic, and the fact that the

car might break and road assistance is needed. There are further emotional/personal pains related to having bad conscience from the environmental effect of the trip. The same goes for social pains as society moves more towards an opinion that car trips should be avoided if possible.

4.2.3 Customer Gains

In the automotive industry, the required outcome for the customer is mobility. Another related gain is to quickly and efficiently arrive at point B from point A. For some customers, having access to mobility in all situations is also a required gain if they want to perform an emergent task. Two expected gains are feeling safe during transportation and having a pleasant experience. In addition, car owners may have expectations of the life length of the car.

For the desired gains, the study has shown that one desired outcome is getting a premium experience. Customers also desire to be safe in the case of an accident. It is also desired that the product/service is environmentally friendly. However, some interviewees speculated that it in the future could be an expected feature. A further desired gain is the car's immediate availability. If using an electrified car, the option to charge it at home overnight to have it fully charged by the morning is one example. It is also preferable if the walking distance to the car is minimal to save both time and for better comfort. This desired gain increases if the weather is bad or if heavy things need to be transported to the car.

Some unexpected gains mentioned during the interviews were navigator, music services, call, remote engine, heat start, safety features such as auto brake, in-car-delivery, personalization, and good air conditioning.

4.3 Value Propositions

According to the findings on the building blocks of circular use, a value proposition that would allow for circular use is a value proposition that extends the product lifetime, the efficiency of use, and helps to close the loop. The findings from the study on how these building blocks can be reached by the value proposition are presented below. An overview of the collected data can be seen in Table 4.3.

4. Empirical Findings

Table 4.3: An overview of the data gathered during the interviews regarding the value proposition.

Business Model Component	Building Block	Data
Value Proposition	Extend product lifespan	<ul style="list-style-type: none"> • Incentivizing Manufacturers to Design for Longevity <ul style="list-style-type: none"> – Manufacturer owns and controls the cars for the entire lifecycle <ul style="list-style-type: none"> * Leasing * Subscription models * Car sharing – Third-party owns and controls the cars for the entire lifecycle <ul style="list-style-type: none"> * Could provide the same offerings as manufacturers • Incentives for customers to return the car <ul style="list-style-type: none"> – A refundable fee when buying the car • Incentivize use of older cars <ul style="list-style-type: none"> – Repair systems – Maintenance – Providing different offers – Flexible use – Dematerialization, more focus on software – Guaranteed performance to customers. <ul style="list-style-type: none"> * Manufacturer or third party takes risk responsibility • Incentivize careful use <ul style="list-style-type: none"> – Fines and cost for damages – Discount for reparation – Insurance • Reduce unnecessary use <ul style="list-style-type: none"> – Smart allocation of cars
	Increase the efficiency of use	<ul style="list-style-type: none"> • Reduce inactivity <ul style="list-style-type: none"> – Car sharing – Use the car for other purposes than transportation when parked – Easy access to the car that the customer needs – A wide range of offerings to match all needs at all time • Increase utilization for each trip <ul style="list-style-type: none"> – Ridesharing/Carpooling – Appropriate car for the right occasion.
	Close the loop	<ul style="list-style-type: none"> • Manufacturer owns and controls the cars for the entire lifecycle <ul style="list-style-type: none"> – Leasing – Subscription models – Car sharing • Incentives for customers to return the car <ul style="list-style-type: none"> – A refundable fee when buying the car

4.3.1 Extend Product Lifespan

The interviewees seem to agree that the core of extending the lifespan of products is to design and manufacture for longevity and have an established system for repairing and maintaining the cars. The study has found that there are multiple ways of achieving this but one of the keys is to have one actor being responsible for the entire lifecycle of the cars. If the car manufacturer owns the cars during their entire lifetime it incentivizes design for longevity and provides the cars in a way that would maintain the value for as long as possible. If the manufacturer owns the car instead of the user, the study has shown multiple value propositions that would provide a user with access to a car. These include leasing, subscription models, and carsharing. Another alternative is to have a third party own and be responsible for the cars over their entire lifespan. Although it would not create the same efficiency in the control of materials as if the manufacturer would be the owner, the third party could make demands on the manufacturer to design for longevity. Another way to increase the incentive for manufacturers to design for longevity was identified as establishing a return system for customers who buy a car. If the customers who have bought a car hand it back to the manufacturers after use some interviewees suggest that the incentives to design for longevity increases.

Another identified key in extending the lifespan of cars was to make the customers want to use the cars longer. This is done by continuous repair and maintenance and providing multiple different offerings in different price ranges. The flexibility of use, indicating that the cars are upgraded and altered to fit new needs that may arise in the future is a way to achieve this that was brought up during the interviews. The flexibility of use can more easily be achieved by building the market offering more around software and less around the physical product. The characteristics of software compared to the physical product makes it easier to improve, upgrade, and change without producing any new products. Another way to make customers more comfortable with using a car longer is to guarantee the performance of the car. A major reason that cars are being sold is to reduce the risk of the car breaking and having to pay for repairs etc. Some interviewees argue that if someone other than the user holds the risk, more users would be willing to drive older cars.

The third aspect of extending the product lifespan that was suggested during the interviews was to incentivize careful use of the cars. The data has shown that as the ownership is transferred from the user back to the manufacturer, the incentives to use the cars with care are lowered. To extend the product lifespan, the value proposition should therefore increase the incentives for the user to not do any damage to the product and increase the incentives for the owner to repair any damage that occurs. The interviewees suggests that this could be done through fines and costs for damaging the product and through discounts for the owner to repair the product. Another way to increase the incentives for repairing the car is to include insurance that covers all the repair cost which is a possible added value for the customer.

The last aspect that was suggested to affect the product lifespan is to reduce unnecessary use. If unnecessary use or non-value-adding use is decreased, the potential

lifespan should be increased and the overall value-added output will also be increased. A factor that could minimize unnecessary use found during the interviews is the allocations of the cars. They should be as close to the user as possible to minimize unnecessary driven distance.

4.3.2 Increase the Efficiency of Use

Two aspects of increasing the efficiency of use were addressed throughout the interviews. The first was to increase the proportion of time that the car is being used, hence reducing the complete inactivity, and the second to increase the efficiency while being used, hence getting more output from each use.

The data collected during the interviews has shown that one way of reducing the inactivity via the value propositions is to allow for sharing the cars. Sharing services can be structured in numerous different ways ranging from providing cars that anyone can use to incentivize car owners to lend their cars to others. Another way is to use the cars for other purposes than just transportation. If the manufacturer owns the cars the incentives to use it for example as data collectors, energy storage, or measurement station will increase.

To increase the utilization, availability was suggested as a key factor. This means both geographic proximity to the cars but also that there are cars and offers that match all needs. A user does not want to buy or lease a car for a month just to go to the shop and pick up groceries. At the same time, she does not want to pay a price per hour when using the car for a two-week trip. Hence the availability of offers was assumed to be just as important as the availability of cars close by. Another way to minimize the parking time for a car without enhancing unnecessary use is to have financial incentives for customers to rent out their cars when they are not used.

To increase the efficiency during use, a value proposition that incentivized ridesharing is suggested. The way of doing so is primarily by choosing a pricing strategy that would make it beneficial to share the ride with others. A price related to the number of people using the car with scale benefits could give incentives for ridesharing. A pay-per-use system could also in the long run contribute to more efficient use, due to the possibility of choosing the appropriate car for the trip. When buying a car for a longer time period, interviewees argue that the customers many times choose a car based on the worst-case scenario where they need the biggest and most powerful car they could afford.

4.3.3 Close the Loop

The essential of closing the loop is that the cars, components, and materials get back to the manufacturers after being used. The study has shown that having the manufacturer own the car would help to close the loop since the manufacturer can control the cars, components, and materials easier and they will retain possession of the cars after their lifespan. The same value propositions that were suggested in

previous sections are applicable for the purpose of closing loops, including leasing, subscription models, and carsharing. Another way for manufacturers to get the cars back after use is as mentioned in the extending lifespan section, to have a deposition when buying the car that is refundable when the car is returned.

4.4 Revenue Streams

The findings suggest that the revenue streams are an important factor for affecting the behavior of the customer and achieving a more circular use phase. The revenue streams that have been identified during the study can be divided into three segments based on how they eventually enable circular use - revenue streams for extending product lifespan, revenue streams for increased efficiency of use, and revenue streams for closed loops. An overview of the findings can be seen in Table 4.4

4.4.1 Extend Product Lifespan

As mentioned earlier in this chapter, the study suggests that one main way for extending the product lifespan is to have one actor responsible for the entire lifecycle of the car. Several revenue models were suggested that could be matched with such value proposition, for instance revenues from a subscription-based rental fee that gives the customers access to the car for a period of time, revenue model based on customers paying for the time the car is being used, and revenue model based on customers paying for the distance the car is being driven. These last two approaches could be combined in a payment model where you both pay for the time and the distance using the car which would help reduce unnecessary use. In addition, having both a fixed starting cost and a variable cost is suggested to further minimize unnecessary use to extend the product lifespan.

4.4.2 Increase the Efficiency of Use

The revenue streams for increased efficiency of use include different ways of minimizing the time that the product is not used and increasing the efficiency of product use by for example having more passengers during a trip. The choice of revenue streams can affect these parameters by a system that charges a customer when they use the car and makes it available for others when it is parked. Two different approaches have been suggested. Paying for the time the car is being used or paying for the distance the car has been driven.

4.4.3 Close the Loop

Having one actor responsible for the entire lifecycle of the car is also enabling closed loop as mentioned previously in this chapter. Therefore is the aspect discussed under the section of extend product lifespan regarding having one actor responsible, also applicable for close the loop. In addition, the study suggests that taking back ownership of products, components, and material for manufacturers to resell is an

4. Empirical Findings

Table 4.4: An overview of the data gathered during the interviews regarding the revenue streams.

Business Model Component	Building Block	Data
Revenue Streams	Extend product lifespan	<ul style="list-style-type: none"> • One actor responsible for the entire lifecycle of the car <ul style="list-style-type: none"> – Subscription-based rental fee – Pay for time the car is being used – Pay for the distance driven • Reduce unnecessary use <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven – Fixed starting cost and a variable cost
	Increase the efficiency of use	<ul style="list-style-type: none"> • Minimizing the time that the product is not being used <ul style="list-style-type: none"> – Pay for time the car is being used – Pay for the distance driven – A combination of the two above. • Increasing the efficiency of product usage <ul style="list-style-type: none"> – Pay for time the car is being used – Pay for the distance driven – A combination of the two above.
	Close the loop	<ul style="list-style-type: none"> • One actor responsible for the entire lifecycle of the car <ul style="list-style-type: none"> – Subscription-based rental fee – Pay for time the car is being used – Pay for the distance driven • Additional revenue streams from retrieved products and components

additional revenue stream that achieves a more circular use. Returned products, components, and materials could also be used to reduce costs when maintaining other vehicles.

5

Discussion

In the following section, the findings from the study will be analyzed and discussed. By combining the empirical findings with the literature and using the framework for the thesis, four circular market offerings will be presented which aim to solve as many customer jobs as possible. First, the market offering will be described in detail followed by an analysis of the degree of circular use that can be achieved by the presented offer. A comparison of the different market offerings will then be addressed.

5.1 Circular Use

As can be seen in Table 4.1 in the empirical findings chapter, all three building blocks of circular use that were suggested in the theoretical framework have been validated in the study. Both extending the product lifespan and closing the loop were suggested by almost all interviewees. Increasing the efficiency of use however, was not always mentioned directly. It was nevertheless agreed upon by all interviewees when brought up as a suggested building block of circular use. Two additional building blocks were mentioned during the interviews - value control and flexible use. The concept of value control builds on the fact that the manufacturer should retain control over its product throughout its lifetime. However, in this thesis, value control has been identified as a tool to help extend the product lifespan and close the loop rather than a building block itself. Flexible use indicates that the products must be able to be updated and upgraded to meet needs that may arise in the future in order to not be outdated. Similar to the argument with value control, flexible use is to be considered as a tool to extend the product lifespan rather than being a separate building block. Hence, the result from the study implies that extending product lifespan, increasing the efficiency of use, and closing the loop will remain as the three building blocks of circular use for the purpose of this thesis. This implies that a circular market offering is one that achieves as high levels of extended product lifespan, increased efficiency of use, and closed loops as possible. Comparing these findings to previous literature, the findings from this study should not be considered controversial. Previous publications from Allwood et al. (2011), Bressanelli et al. (2018), Hopkinson et al. (2020), and Nußholz (2017), as well as Ellen MacArthur Foundation and World Economic Forum (2016) all addressed these three building blocks in different ways. However, the building blocks of circular use have not been present as structured and approachable previously. Hence, the academic contribu-

tion regarding circular use lays in the clarity of its building blocks and how they can be reached within a specific industry.

A major concern of converting to a more circular economic model that has been apparent both in the study as well as in previous literature is that companies must find a way to transition to a more circular model without giving up profit (Bocken et al., 2016). One main objective of almost all companies that exist is to maximize profit and hence the transition will not take place unless a way of aligning monetary incentives with the more circular approach is found. Supported by previous publications (Antikainen & Valkokari, 2016; Frishammar & Parida, 2019), one interviewee suggests that this can be done in one of three ways; 1) policymakers change the legislation to force a transition, 2) customers start valuing sustainability higher and are willing to pay more for a sustainable offering, or 3) finding a business model which would maintain or increase profits while transitioning to the circular economic model. To align these findings with the scope of this thesis, an in-depth discussion on business model innovation will follow. More specifically, how business model innovation can be used to find a circular business model which meets the needs of today's customers while maintaining or increasing the profit. Hence, possible legislation changes and how the car manufacturers can affect this will not be addressed. Furthermore, how the manufacturers can affect the sustainability awareness and appreciation amongst their customers will not be in focus, however, is still somewhat addressed in the discussion.

5.1.1 Extend Product Lifespan

The study presents numerous ways to extend the lifespan of the cars. However, it also shows that the market offering itself will not directly affect the lifespan. Instead, the market offering can provide the right incentives for each actor which in turn will enable a prolonged lifespan. Compared to the previous research on which this thesis' framework for circular use is based (Allwood et al., 2011; Bressanelli et al., 2018; Hopkinson et al., 2020; Nußholz, 2017; Willskytt et al., 2016), this thesis investigates not only what the building blocks of circular use are. It also thoroughly investigates and suggests what components of the building blocks must be fulfilled in order to reach the building blocks. The prolonged use of cars is primarily affected by three things. First, the design and manufacturing of the car. The car manufacturer must be incentivized to design and manufacture for longevity. Second, wear of the cars while being used. Hence, the users must be incentivized to minimize the wear of the cars during use. Third, the willingness to use older cars. Customers must be incentivized to use older cars instead of getting newer ones.

Incentivizing Manufacturers to Design for Longevity

Today, manufacturers primarily earn money from selling the cars to their customers. The more cars they sell, the more they earn. This type of business model does not incentivize design for longevity. The study has shown two main ways to flip the incentives around and align them with circularity. Both of them are based on the principle that one actor should own and be responsible for the cars during their

entire lifetime which is backed by the Ellen MacArthur Foundation and World Economic Forum (2016) among others. The first option is for the car manufacturer to own the cars and then apply a business model where they provide the cars to the customers while retaining ownership and control over the cars the whole time. This implies that if the manufacturer owns the car during its entire lifetime they are highly incentivized to build a car that maintains its value for as long as possible. The second option found in the study was to have a third party buy the cars from the manufacturers and then own and control the cars throughout their entire lifetime and distribute them to the end-user via different market offerings. Since the longevity of the cars would be of high importance for the third party, the price they would be willing to pay the manufacturer is likely to be strongly affected by its lifespan. Hence, the car manufacturer would be paid more for a car with a longer lifespan and have an incentive to design for longevity. However, the incentives are likely to be stronger if the manufacturer owns the cars themselves since their revenue is more closely tied to the lifespan of the cars.

If either the manufacturer or a third party owns the cars throughout its lifetime, the study has shown a number of circular market offerings that would provide users access to the cars which are further backed by the Ellen MacArthur Foundation and World Economic Forum (2016). These market offerings can be seen below:

- Carsharing - cars are available to use for the public for a pay-per-use price based on either time, distance, or a combination of both.
- Car subscription - a more flexible hire agreement often with shorter terms where the user can swap between different cars as desired.
- Car leasing - an agreement to hire a car for a certain period of time.

One additional way of extending the lifespan of the cars which does not require the manufacturer or a third party to own the car for its entire lifetime has been identified in the study. This market offering allows the manufacturer to sell the car to a user but incentivizes the user to return the car to the manufacturer after use. This can be done using either carrots or sticks. Either the manufacturer can charge an extra amount when selling the car which is later refunded to the customer after the car is returned. This arrangement however would require the customers to pay more without getting any additional value which would jeopardize sales for the manufacturer. The other option is to provide a discount to any customer who returns their old car when buying a new one. That way customers could retrieve money for their old car and the manufacturer incentivizes the customer to stay loyal to their brand when buying a new car. However, this system would not guarantee that the cars are returned. The user may desire to switch to another car brand or they may have found a buyer who is willing to pay a higher price than the value of the manufacturer's discount. When the probability of getting the car back decreases, so does the incentives to design for longevity. Hence, this market offering falls behind the other presented options in regards to providing incentives for the manufacturer to design for longevity. In fact, previous literature which suggests circular mobility offerings tends to not mention this model (Ellen MacArthur Foundation & McKinsey

Center for Business and Environment, 2015; Ellen MacArthur Foundation & World Economic Forum, 2016; Kiørboe, 2015). However, in this thesis, since it is judged to be more circular than today's dominating offering, it will be addressed and discussed further.

Incentivizing Careful Use to Minimize Wear

When customers buy a car, they have a strong incentive to minimize the wear. If the car's condition is worsened, numerous pains arise while the monetary value of the car decreases if the user intends to sell it. These incentives are needed in order to extend the car's lifespan. However, as established in the previous segment, *Incentivizing Manufacturers to Design for Longevity*, having the users own the car does not encourage the manufacturers to design for longevity. Hence, finding a way where the manufacturer or a third party owns the car while encouraging the users to minimize wear is optimal from a circular economy perspective. The study has found that in order to align the users' incentives with the circular ambitions the market offering must make the users liable for the wear of the car. If any damage has been made to the car that is a direct effect of the way it was used the user should be liable to pay for the damages.

In the results of the study, it was found that carsharing models should have a pay-per-use system based on time, distance, or a combination of both. To increase the incentives for users to use the vehicle in an eco-friendly and more circular way to minimize wear, a pay-per-wear system could be introduced. The pay-per-wear system could be based on carbon dioxide emissions, engine work, or something similar that measures relevant factors for the circular economy. That way the users' incentives would be aligned with the ambition to limit the depreciation of the car which is crucial in order to achieve a more circular use (Geissdoerfer et al., 2018).

Increasing the Willingness to Use Older Cars

Ceteris paribus, any user would prefer driving a brand new car over an old one. This creates a force that works against the circular ambitions. Once again, incentives have to be aligned to make it beneficial for users to drive older cars. The study has found a number of pain points that occur when the car gets older that need to be reduced. These include functional pains such as increased operational costs, time and effort to maintain the car, and social/emotional pains which include increased risk of failure which could lead to expensive repair and not being able to use the car during a period of time. Further social and emotional pains include loss of status, feeling less successful, feeling unsafe, and feeling like the car has unnecessarily bad effects on the environment.

The increased risk of failure that comes with driving an older car was identified as one of the main reasons customers wanted to get rid of an older car and get a new one. As discussed in the previous section, *Incentivizing Careful Use to Minimize Wear*, the user must be liable for any damage caused to the vehicle. However, if the damage is not caused by the user but rather a result of normal use, the car user

should not be held liable. The study has found that in order to increase the willingness to use older cars, the risk must be moved to the car owner, in this case, the car manufacturer or a third party owning the cars for its entire lifetime. If failure were to happen and the car needs to be repaired the user should, as problem-free as possible, have their car replaced and experience as little pain as possible.

Another way of reducing the pains associated with using older cars is to disconnect the concept of older cars with poor performance as much as possible. Designing and building cars for longevity is one way of achieving this. The study also showed the importance of establishing efficient repair systems. No car can be designed to live eternally. Hence, when certain components and parts of the car start malfunctioning, they must be easy and effective to replace. If the manufacturer owns and controls the cars and is also responsible for the repair systems, they would benefit from designing a modular car that is easy to repair.

Another simple way of increasing the demand for older cars is to provide a multitude of offerings where some offerings use older cars for a cheaper price and some use newer more expensive cars. The study indicates that the prestige and status of driving the newest car will decrease if cars are shared and used for a shorter period of time than if the car is bought and owned for a longer period of time. This means that offerings in which the car is not owned by the customers can use older cars without causing too much inconvenience for the users.

Minimize Unnecessary Use

As stated in the empirical findings, unnecessary use will reduce the overall potential for the product to deliver value. Depending on how output or performance is defined, this aspect will not only increase sustainability but also, circularity. The ReSOLVE framework by Ellen MacArthur Foundation and McKinsey Center for Business and Environment (2015) identifies optimizing by increasing performance and efficiency of the product as action towards the circular economy. If performance is measured as generated value, minimizing unnecessary use becomes a natural part of achieving circularity.

Many customers that own a car, or have persistent access to mobility, have few incentives to minimize unnecessary use. A customer wants to take advantage of the opportunity to use mobility when they have heavily invested in it. Today, the cost for a single trip is usually significantly lower than the investment of buying a car, which affects the customers' behavior. There is arguably a correlation and even causation between the price of the investment and the amount of use as when the initial payment increases, customers' desire to take advantage of the car increases correspondingly.

The study has shown that the revenue streams of the business model have to increase the incentives for customers to minimize unnecessary use in order to reach a higher level of circularity. If they are formed incorrectly, the implications could be devastating in terms of circular use. As an example, a pricing strategy based on

customers paying for a predetermined time could result in customers being encouraged to use the car for a longer time than required. The data gathered during the study suggest that both an initial cost and a variable cost are needed to reduce unnecessary use. The solution is nevertheless to some degree complex. Several aspects have to be considered. The initial cost has to be sufficiently high so that customers do consider their choice of getting access to mobility for that specific occasion. At the same time, the variable cost for the trip has to further be significant in order to minimize the duration of the trip.

Another aspect to consider found in the study is a hybrid of pay for the time the car is being used and pay for the distance the car is driven. Both of the concepts are in line with the circular revenue streams by Lewandowski (2016), but a combination could achieve a higher degree of circularity. If the customers only have to pay for the time the car is being used the incentives to park the car during a weekend trip are lost and the customers are instead encouraged to use the car as much as possible during that period as discussed earlier. On the other hand, if the customers are only paying for the distance the car is driven, it increases the encouragement to take the car for shorter trips that possibly could be managed with other forms of mobility.

5.1.2 Increase the Efficiency of Use

To increase the efficiency of use the study presents two fundamental ways to do so which are aligned with the arguments presented by Willskytt et al. (2016). Firstly, by minimizing the time the product, in this case the car, is not being used for any purpose, and second, by maximizing the filling rate, defined as the amount of capacity used of the car relate to the maximum capacity of the car, when the car is being used. These two aspects could be achieved in numerous ways. The first aspect, minimizing the time the car is not being used, could be achieved through maximizing the amount of time it is used for its primary function, to transport people and items from point A to B, or by maximizing the use functions for the car. The second aspect, maximizing the filling rate, could be achieved by either get as much out of any given trip as possible or by using as few resources as possible for a certain job.

Minimizing Inactivity

Minimizing inactivity is primarily solved by limiting the time the cars are being parked. Given that each user does not start to use their car more, the way to limit the parked time is to share cars amongst different users. This can be performed in different manners. A car can be shared between a family, a company, between neighbors, or amongst an entire city. Depending on the way the car is offered to the customers, different ways of enabling sharing of the cars are possible. However, the most efficient way of using the car in terms of reducing the parked time is a carsharing model where customers only pay and control the car during the time of its use. The car is then available for other users when nobody is using it. This enables the car to be used for more tasks compared to cars owned and used by a

single person or family.

Carsharing models could also have customers control the car and then enable them to rent out their car when it is not being used. The important issue is that the potential added value for the customers should extend the potential pains that could arise. The additional value for the customers identified in the study is financial incentives to rent out their car, either bringing in revenues to the customers or reducing renting costs if they rent their car. Other potential incentives that could affect customers to rent out their car are other kinds of benefits and emotional or social gains from contributing to a more environmentally friendly society. The downside of this model is that some customers are going to be locked to use the same car in comparison with when car manufacturers or third parties control all the cars. The upside on the other hand is that this model could potentially attract other customer segments that value controlling their own car.

No matter how the cars are being offered there will still be times when the cars are not being used and are left in a parking spot. In order to decrease inactivity in those cases, the car might be able to be used for other tasks than transportation. The purpose of additional car functions is to make use of the car even when it is parked and as argued by Bocken et al. (2014) may create additional revenue streams for the car owner. The additional functions are limited to how the car is designed and the expertise of the car manufacturers. Some suggestions found in the study are data collection, energy storage, surveillance, and as a weather station. An important issue to consider when finding other functions for the car is that it many times is difficult to find new functions that take advantage of the entire car due to the fact that the car is not primarily designed for that purpose. As an example, if an electric vehicle is being used for the purpose of energy storage while it is parked, it is only the battery that has the desired efficiency of use while other parts of the vehicle are being inactive.

Maximizing Filling Rate During Use

The other way to increase the efficiency of use is to increase the filling rate of the car during transport. One way of doing so is to fit more passengers or more luggage in the car for the trip. Then the output is increased while the input remains constant. This can be achieved by enabling and incentivizing carpooling. Carpooling can also be designed and reached in a multitude of different ways. Although increasing the efficiency of use and overall circularity, carpooling, or ridesharing could cause inconvenience for the users. Therefore, the customers' experienced additional value needs to exceed the pain related to this inconvenience. Some pains to consider for the users are potential time costs and reduced privacy. For carpooling to work it is then important that the travel time for each customer should be minimized and that the privacy in the car could be optimized. Furthermore, customers should have financial incentives to use carpooling in addition to environmental incentives.

While carpooling increases the output with constant input, another way to maximize the filling rate is to reduce the input while achieving the same output. This can

be done by using smaller cars that take less material to produce for trips with few passengers without much luggage. This is hard in today's linear model characterized by private ownership. However, if cars are shared amongst a bigger population and the cars come in different sizes and models, a user can choose the right car for the right job. This will therefore have the potential to increase the filling rate for the cars. With this aspect in mind, car subscription models are more beneficial relative to car leasing models as it is easier for users to change vehicles in subscription models.

5.1.3 Close the Loop

The third and last identified building block of circular use is to close the loop. To close the loop means to strive towards a circular flow of resources to get as much out of each piece of material as possible as stated in previous literature (Nußholz, 2017). In the same way that products must live for as long as possible, so should the components and materials of the product. In theory, if closed loops are achieved, no virgin material is needed to create new cars. Rather, components and material from old cars are reused, refurbished, and remanufactured. However, loops are practically not fully closed. The ambition is rather to reduce the virgin material to an as high extent as possible.

As argued in the previous sections, having the manufacturers or a third party owning the car for its entire lifetime provides a basis for the most circular offering. This also creates the best foundation for reaching closed loops. If the manufacturer owns and controls the cars and repair systems, the material and components would naturally return back to the manufacturer. Even if a third party were to own the cars it would help to return the material although in this case, having the manufacturer own the cars would provide the swiftest circular flow. This goes hand in hand with previous literature on the subject (Bressanelli et al., 2018; Ellen MacArthur Foundation & World Economic Forum, 2016; Willskytt et al., 2016).

In order for the manufacturer to be willing to take this role, there must be some business opportunity in the returned material and components. The obvious answer is that the manufacturer does not need to buy any virgin material if the material and components can be used in the new cars. Furthermore, the study also shows the opportunity to find additional revenue streams even for the components and materials that are not good enough to be used in a new car. Collaborating with other industries that are not in the need of high-quality components and are willing to buy used car components could create business opportunities aligned with the circular economy as Lewandowski (2016) argues.

5.2 The Foundation of a Circular Market Offering

Based on the analysis of the empirical findings presented above, a framework regarding how to reach a more circular use has been derived. This framework adds a new dimension to the academic literature and will be used in the following parts of

this thesis both to develop new market offerings but also to evaluate and existing offerings design the market offering in a way to reach the highest possible levels of circular use. The framework can be seen in Table 5.1.

Table 5.1: The foundation of circular use

The building blocks of circular use	Incentives alignment to reach the building blocks	Actions to establish the incentives
Extend Product Lifespan	Incentivize manufacturers to design for longevity	Have the manufacturer or a third party own the cars for its entire lifetime
	Incentivize careful use	Hold customers liable for damages/excessive wear
	Incentivize more extended use	Owner possess the risk for normal wear/damages Repair systems
	Minimize unnecessary use	Multiple offerings with cheaper use of older cars Revenue streams designed to minimize unnecessary use
Increase the efficiency of use	Minimize inactivity	Reduce parking time by sharing the cars Find other areas of use
	Maximize filling rate	Incentivize ride sharing Offer the right car for the right job
Close the loop	Incentivize manufacturers to design for closed loops	Have the manufacturer or a third party own the cars for its entire lifetime
	Incentivize customers to return the products	Make sure the cars are returned

5.3 Market Offering 1 - Carsharing

A market offering based on carsharing has great potential to reach high levels of circularity. If designed correctly, all building blocks of circular use can be reached. The biggest challenge lies in finding the customers who are willing to move away from ownership to sharing the cars amongst the whole city. A discussion of how the value proposition can be shaped to reach the highest level of circularity will be followed by the revenue stream needed to complement the value proposition. Then a discussion regarding the customer profile will follow and how this market offering will affect the customers in accordance with the value proposition canvas by Osterwalder et al. (2014).

5.3.1 Value Proposition

The first market offering is based on a carsharing service using cars owned by the manufacturers. A customer can book and use a car during a period of time. When the customer is done using the car, it shall be returned to a spot specified by the manufacturer. As soon as the car is returned, it is available for other customers to book and use. The manufacturer has to offer a large number of cars in different locations to meet different customers' needs. The following discussion will regard how the sharing service should be formed to reach the three building blocks of circular use. An overview is presented in Table 5.2.

Table 5.2: An overview of the value proposition of the car sharing model

Business Model Component	Building Block	Detail
Value Proposition	Extend product lifespan	<ul style="list-style-type: none"> • Incentivizing Manufacturers to Design for Longevity <ul style="list-style-type: none"> – Manufacturer owns and controls the cars for the entire lifecycle • Incentivize careful use <ul style="list-style-type: none"> – Pricing model based on wear – Bonuses or rewards – Inspection system – Surveillance • Incentivize use of older cars <ul style="list-style-type: none"> – Manufacturers guarantee liability – Offering different cars at different prices – Reduced social pain associate with driving older cars • Reduce unnecessary use <ul style="list-style-type: none"> – Smart allocation of cars

Table 5.2: Continuation of table on previous page

Business Model Component	Building Block	Detail
Value Proposition	Increase the efficiency of use	<ul style="list-style-type: none"> • Reduce inactivity <ul style="list-style-type: none"> – Optimal number of car – Use the cars for other purposes than transportation when parked • Increase utilization for each trip <ul style="list-style-type: none"> – Ridesharing/Carpooling – Appropriate car for the right occasion – Price related to the size of the car
	Close the loop	<ul style="list-style-type: none"> • Manufacturer owns and controls the cars for the entire lifecycle • Regular service checks

Extending Product Lifespan

One of the benefits of a sharing market offering from a circular point of view is that the car manufacturers own the cars, which gives them incentives to design for longevity. The longer the cars can last and be used in the sharing model, the more money the manufacturer earns.

A challenge in this value proposition, however, is to incentivize users to minimize wear. Since users' time of control over the car is minimal, their willingness and motivation to keep the car clean and minimize wear are limited. This could be solved in one of two ways. Either by establishing a pricing model based on wear, by instead of paying for time or distance base the price on parameters that has a direct effect on the wear of the cars, or by giving other bonuses or rewards if the car is used in an eco-friendly way. Both options put some requirements on the car to be able to measure emissions, engine work, or other wear aspects.

Another way to help make sure the car is being used with care and cleaned after each use is to have users inspect the car before use to help identify damages from the previous user. However, since damages may occur to the car in between being used, while being parked, the inspection system is not waterproof. A potential solution is to have surveillance in the car or at the parking spot although that would be at the expense of users' privacy.

Another aspect of extending the car's lifespan is to increase the willingness amongst the customers to use older cars. Since the manufacturer owns and controls the cars

in a sharing model, they can also maintain control over their condition. By doing so, the manufacturer takes responsibility for the liability and guarantees the car's functionality before every use. This lowers the risk related to driving older cars for the customer, which has been identified as one of the main reasons the customer is not willing to use old cars. Another way to do so is by offering the cars at a more affordable price.

When the users only hire a car for a one-time trip, the study has shown that the use of the car as a symbol for prestige and status may decrease. Buying an expensive car may show that one has money in the bank but hiring an expensive car for a short trip may not have the same effect. This phenomenon provides a great opportunity to use older cars in a sharing model since it would not create the same pain for a user as owning an older car would. Therefore, enabling longer use of cars by providing new cars for a premium price while keeping the older cars in the fleet for a cheaper price is a great way of increasing the circularity in a sharing model. It is also of importance that the manufacturer allocate the cars at optimal locations to further reduces unnecessary use and reduce driven distance for each trip.

To summarize, carsharing enables longer use of cars in almost all dimensions. Manufacturers are incentivized to design for longevity and the willingness to use older cars may increase if the older cars can be offered at a lower price to be attractive to some users. The challenge regarding longer use is to ensure that the cars are used with care.

Increasing the Efficiency of Use

As discussed in earlier sections, a carsharing service will minimize the time that the cars are not being used. Furthermore, a carsharing service will enable users to choose the right car for the right job. This means that a user does not have to use a huge car with a large trunk for a shorter trip to the dentist. All of which increases the efficiency of use. However, in order to maximize efficiency, the provider of the cars needs to find the right balance of the number of cars offered. Enough cars need to be offered to meet different customer needs and ensure availability. At the same time, offering too many cars in relation to the demand will increase the overall inactivity of the cars. Finding the right balance is therefore critical in a sharing service. Furthermore, the study indicates that the network effects in a carsharing model are strong, meaning that the derived value for any user is correlated to the number of total users of the service. A greater number of users would mean that more cars could be offered by the providers, resulting in a higher probability that a car that matches a customer's specific need is available. This implies a challenge for the car manufacturers that want to provide a carsharing market offering. They need to raise a large number of users quickly to increase the value for customers.

Furthermore, as discussed previously, in a carsharing model where the manufacturer owns the cars, the cars can be used for other purposes than transport. The purposes for which the cars can be used have been discussed previously and can vary depending on geographical location, the manufacturing company, the surrounding

legislation, and demand for data and information. Hence, no further discussion on what exactly the cars can be used for will be conducted and is left as a question for the manufacturing company to answer.

Regarding the degree of filling during use, the carsharing model does not naturally enable a much higher degree of circularity. In order to enable more people in every car during transport, functionality to integrate carpooling in the market offering should be offered. This could be done in many ways. One way is to allow users to publish an intended trip on a platform for others to see. If another user wants to join the same trip the car can be shared. Furthermore, if different car models are offered, some smaller with fewer seats and potentially no trunk, etc., and some bigger cars, the filling rate can in theory increase. If the smaller cars are used by users who do not need the space and extra seats offered in the big cars, less material is needed to provide the same value to those customers. However, the users then need to be incentivized to choose the right car. For example by offering the smaller cars at a lower price.

The study of this thesis has found that in order to maximize the efficiency of use in a sharing model, the installed base should be as large as possible. The logic behind this reasoning is that the larger the customer group, the easier it gets to predict demand and therefore offer the right amount of cars at all times. Having a larger customer group also allows the car provider to offer more cars in different locations which would increase the proximity for users. Hence a larger installed base would not only be economically beneficial for the car owner but also beneficial from a circularity perspective. In order to increase the installed base, customer pains must be limited and gains should be maximized while achieving as many customer jobs as possible.

One potential pain for the users, in relation to the other market offerings where the customers maintain possession of the car for a longer time period, is the loss of personalization. To attract a larger customer group that values personalization, a solution for the problem could be the digitalization of the car that enables users to save a user profile with different settings to the app where they book the cars. These settings could for example be chair, temperature, mirror, or music settings.

To summarize, compared to other market offerings addressed in this thesis, the sharing model allows for more efficient use of the cars. Partly because it helps reduce inactivity, but it also enables other areas of use and possibly also higher filling rate during transport.

Close the Loop

What the study has found regarding enablers for closing the loop is to have the manufacturers own the cars. This happens naturally in the proposed sharing model. Regular service checks on the cars should be performed to identify any problems while they still can be fixed easily. Hence, a sharing model would allow for closing the loops rather naturally.

5.3.2 Revenue Streams

The main revenue streams in this market offering will come from customers renting a car during a specific time period. Car manufacturers will receive payment continuously for each trip when the car is being rented instead of the upfront payment they will receive if they sell the car. This is in line with the findings of the study regarding revenue streams for more circular use.

A challenge in this value proposition is to incentivize users to minimize wear due to the change of ownership from traditionally privately owned cars to cars owned by corporations. Users lose incentives to use the cars with care as they are not directly affected by the value loss caused by wear. A possible solution is related to the revenue streams. Incentivizing users to minimize wear could be done by either having a price model based on wear, for example, paying for fuel consumption as a complement to paying for time or distance, or by giving other bonuses or rewards if the car is used in an eco-friendly way. Both options put some requirements on the car to be able to measure emissions, engine work, and other wear aspects. Paying for wear could be seen as a hybrid version of the usage-based product-service system and performance-based product-service system suggested by Lewandowski (2016). Paying for the time the car is being used and for the distance the car is driven contributes, as discussed earlier, to reducing unnecessary use and increasing the utilization rate. To further reduce unnecessary use, both a starting cost and a variable cost should be implemented.

The empirical findings also showed that an important factor is to retain the product and components, making them available for resell to generate additional revenue streams. This is in line with one of the circular revenue streams presented by Lewandowski (2016) and is fully achievable in this market offering due to the car manufacturers owning the cars during their entire lifecycle. As discussed in the value proposition segment, this market offering has great potential to be combined with additional services connected to the product. Tukker (2004, 2015) stresses the importance of finding revenue streams related to use for other purposes, in order to increase the utilization of each product. An overview of the revenue streams aspects affecting the circularity could be seen in Table 5.3.

5.3.3 Customer Profile

This section will present the customer profile for the market offering. Finding the fit between the value proposition and the customer segment is essential for a business model to work (Osterwalder et al., 2014). First, jobs-to-be-done will be discussed and then customer pains and gains will follow. The aspects will be discussed regarding similarities and differences relative to the traditional market offering presented in the empirical findings section. However, a comparison with other forms of mobility will not follow but is left to the reader to keep in mind to fully understand the benefits and disadvantages for the customer segment. An overview of the discussion can be seen in Table 5.4 at the end of this section.

Table 5.3: An overview of the revenue streams of the car sharing model

Business Model Component	Building Block	Detail
	Extend product lifespan	<ul style="list-style-type: none"> • Incentives users to minimize wear <ul style="list-style-type: none"> – Pricing model based on wear • Reduce unnecessary use <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven – Starting cost and a variable cost
Revenue Streams	Increase the efficiency of use	<ul style="list-style-type: none"> • Minimizing the time that the product is not being used <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven
	Close the loop	<ul style="list-style-type: none"> • Additional revenue streams from retrieved products, components and material

Jobs-to-be-done

Although the jobs-to-be-done for the sharing market offering is unique relative to other market offerings, there are some similarities to the traditional market offering provided by manufacturers. Many of the essential jobs such as transporting yourself from A to B, transporting family and friends, and transporting items remain. Nevertheless, some jobs could be achieved more or less effectively with a carsharing model.

The positively affected jobs-to-be-done are jobs related to other purposes than transportation and social jobs related to a more environmentally friendly transportation service such as the feeling of showing how you contribute to a better society. Jobs such as energy storage are more valuable and easier to control when the ownership moves from private individuals to corporate firms. As for other jobs related to data gathering, the change of ownership will facilitate the collection of data due to the firm's increased control of the vehicles.

There are also some negatively affected jobs-to-be-done that will be more challenging to achieve. The first one is having the freedom to move whenever and wherever. Users will still have a high degree of freedom to move, however, it will be reduced in contrast to owning your own car that is parked in your garage. The challenge for the service provider is to make the reduction of freedom as minimal as possible. Although, it could be argued that this aspect will be positively affected for some

people as it eliminates the need for an upfront investment to purchase a car, and therefore it will enable more individuals to have the freedom to move. Another less effective job is to use the car as a symbol of success and prestige. It will be less impactful to drive a car that is rented in contrast to a car owned by the driver. In addition, there are some services that are reliant upon users owning the car that will become impractical such as personal storage.

Customer Pains

As with the jobs, some pains remain the same relative to the traditional market offering, while other pains will be decreased or increased. The ones that remain the same include pains related to using the car and social judgment from using the car when it is not necessary. Users will still need to find parking spots for the car while driving it, if not the service provider offers parking all across the city for the car. Also, the risk of being stuck in traffic remains the same. You could argue though that in the long run, the number of cars needed in society would decrease if more people would use carsharing services which might reduce the traffic in the cities.

A lot of customer pains become different when looking at the carsharing market offering compared to the traditional market offering. Especially since the users no longer own and control the car. This is mostly due to the reduced pains related to taking care of the car. In a carsharing service, the users do not have to put in the time and effort to do regular service inspections, repair the car, wash the car, and change tires for example. Other reduced pains are related to buying and selling the car. When the user no longer owns the car there is no need to struggle to find the right car or buyer and it will save a lot of time and effort related to the process. A requirement for buying a car is also that the user pays an initial price which will be eliminated in the carsharing market offering. In addition, bad consciousness from environmental effects would also decrease for a user of a more circular market offering.

Looking at the increased pains, an aspect such as walking long distances to the car is for many users increased in a carsharing model. Depending on where the cars are being provided this could potentially be an inconvenient task for users. This could be an important factor for providers of the car to take into consideration when implementing the market offering. One benefit mentioned in earlier sections for a carsharing marketing offering is that the user could choose the right car for the right occasion. As a consequence, users will drive different cars for different tasks which, depending on the design of the cars, could imply that they have to learn how to drive the specific car every time they change vehicle. This could potentially be experienced as a pain that requires time and effort. The task of finding and choosing a car for each trip could also be a pain.

Customer Gains

There are a lot of customer gains that remain the same. All gains related to aspects that originated from driving a specific car model will remain the same such as

feeling safe during a trip, having a premium experience, ability to listen to music, call, navigator, and so on. The upside of a carsharing market offering looking from the perspective of customer gains is that the users could have a better conscience that the cars are environmentally friendly. The downsides, on the other hand, could be that their ability to move whenever they want is reduced and that the car would have less personalization.

Table 5.4: An overview of the customer profile of the car sharing model

Business Model Component	Subcategory	Detail
Customer Profile	Jobs-to-be-done	<ul style="list-style-type: none"> • Jobs remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Transport: <ul style="list-style-type: none"> * People and items * Shorter and longer trips • New or more effective jobs relative the traditional market offering <ul style="list-style-type: none"> – Showing your contribution to a better society by the choice of your car – Other jobs for the car provider • Less effective jobs relative the traditional market offering <ul style="list-style-type: none"> – Feeling the freedom to move – Other functions for the customer – Car as a symbol of success and prestige
	Customer Pains	<ul style="list-style-type: none"> • Pains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Pains related to using the car <ul style="list-style-type: none"> * Finding parking in urban environments * Being stuck in traffic – Social judgment from using a car when not absolutely necessary • Remaining but reduced pains relative the traditional market offering <ul style="list-style-type: none"> – The effort to find the right car – Bad consciousness from environmental effects • New or increased pains relative the traditional market offering <ul style="list-style-type: none"> – Operational costs – Walking distance to the car – New learning curve for each car
	Customer Gains	<ul style="list-style-type: none"> • Gains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Feeling safe during the transport – Having a pleasant experience – Additional functions: <ul style="list-style-type: none"> * E.g. Navigator, music system, call, remote engine, heat start • New or increased gains relative the traditional market offering <ul style="list-style-type: none"> – Feeling free from responsibilities – Knowing that the car is environmentally friendly • Remaining but reduced gains relative the traditional market offering <ul style="list-style-type: none"> – Ability to move efficiently – Ability to move whenever required – Personalization

5.4 Market Offering 2 - Subscription-Based

Forming a business model around a subscription model lays a good foundation for circular use. All building blocks of circular use can be reached. The question is how they can be reached to as high extent as possible in a subscription model. A discussion of how the value proposition can be shaped to reach the highest level of circularity will be followed by the revenue stream needed to complement the value proposition. Then a discussion regarding the customer profile will follow and how this market offering will affect the customers.

5.4.1 Value Proposition

As explained earlier, a subscription model is herein defined as a flexible renting model in which the user is provided with access to mobility over a period of time. The user can swap cars depending on their needs and can also terminate the subscription with relatively short notice. Compared to a carsharing model, in a subscription model, the user maintains control over the car even when it is not being used. Compared to a leasing model, the car subscription has more flexible terms, a shorter termination period, and the ability to swap cars. The following discussion will regard how the subscription model should be formed to reach the three building blocks of circular use. An overview can be seen in Table 5.5.

Table 5.5: An overview of the value proposition of the subscription-based model

Business Model Component	Building Block	Detail
Value Proposition	Extend product lifespan	<ul style="list-style-type: none"> • Incentivizing Manufacturers to Design for Longevity <ul style="list-style-type: none"> – Manufacturer owns and controls the cars for the entire lifecycle • Incentivize careful use <ul style="list-style-type: none"> – Pricing model based on wear – Bonuses or rewards • Incentivize use of older cars <ul style="list-style-type: none"> – Manufacturers guarantee liability – Offering different cars at different prices
	Increase the efficiency of use	<ul style="list-style-type: none"> • Reduce inactivity <ul style="list-style-type: none"> – Optimal number of car – Use the cars for other purposes than transportation when parked • Increase utilization for each trip <ul style="list-style-type: none"> – Ridesharing/Carpooling – Appropriate car for the right occasion – Price related to the size of the car

Table 5.5: Continuation of table on previous page

Business Model Component	Building Block	Detail
Value Proposition	Close the loop	<ul style="list-style-type: none"> • Manufacturer owns and controls the cars for the entire lifecycle • Regular service checks

Extending Product Lifespan

As with the sharing market offering, one of the circular benefits is that the car manufacturer owns the cars for its entire life while owning the risk and liability of repairs and updates.

Having the customers using the car over a longer period of time than in a sharing model but shorter than in a leasing model can create some of the benefits from both mentioned models. However, it can also cause some issues. The users are more likely to use the car with care than in a sharing model since they maintain ownership of the car for a longer time. However, careful use is still less likely in a subscription model than in a leasing model with longer terms or compared to private ownership. In order to incentivize careful use of the cars, customers will be held responsible for damages to the car during use. Similar to the sharing model, if the pricing model can be based on a combination of the time of use and the wear of the car that would optimize the circularity.

Longer periods of use for the car also increases the use of the car as a status symbol. Although the prestige of driving a new car is less than if the car was owned, it could still be emotionally and socially preferable to subscribe to a newer car. In order to increase the willingness to use older cars, the subscription model must disconnect older cars from the concept of poor performance and being outdated as stated before. It must also offer older cars at a cheaper price. Hence, both new and older cars should be included in the subscription fleet where the user can choose from paying more for a new car or pay less for an older one. However, since the pains and gains related to the age of the car are larger than in a sharing model, the price difference between the older and newer cars most likely has to be larger than in the sharing model.

To summarize, car subscription enables for longer use of cars in all dimensions. Manufacturers are incentivized to design for longevity and the willingness to use older cars may increase if the older cars can be offered at a lower price to be attractive to some users. Furthermore, the users have incentives to use the cars with care if they are kept liable for damage to the car.

Increasing the Efficiency of Use

Maintaining ownership and control over the cars for their entire lifetime enables the manufacturer to use the cars for other purposes than transportation such as data collection, energy storage, surveillance, etc. Hence, increasing the efficiency of use as with both the sharing and leasing models.

Since users can swap vehicles from a range of different models the owners need to control a large fleet of cars. This can increase the filling rate during use. An individual customer can subscribe to a small car with only two seats and then swap to a larger car if needed for a period of time. However, there is a problem in regards to efficiency with the swapping too. A balance needs to be found between having enough cars, to ensure availability to swap between cars for the users, and not having too many cars, which would decrease the overall efficiency. The pricing strategy need to encourage customer to use smaller cars when there is no need for a large vehicle.

Since the car owner needs to keep a number of cars available for swapping, a large installed base is desirable from a circularity perspective. The larger the installed base the less variation in demand and the more predictable that variation gets. Hence, a challenge that comes with both the sharing model and the subscription model is to attract a large customer group. Lastly, similar to the car sharing service a carpooling service would increase the filling rate and therefore the efficiency of use.

Close the Loop

This reasoning is the same as for both the sharing model and the leasing model. By owning the car, the manufacturer will maintain control over the cars when the cars are not being used and see if any repairs or updates should be performed to maintain the value of the car.

5.4.2 Revenue Streams

In this market offering, car providers receive scheduled consecutive payments from the customers. The payment gives the customers the ability to use a car of their choice. However, in contrast to the carsharing market offering, the customers will pay for all expenses related to their specific trip such as fuel, parking tickets, taxes, etc. This revenue stream model was both mentioned in the literature by Lewandowski (2016) and in the empirical findings and could be seen as a circular revenue stream.

The model could be combined with a usage-based or performance-based system to increase the circular benefits from the model. The occurred cost depending on the time and distance the car is being used could help reduce unnecessary use and provide the cars a longer lifespan. This market offering has also great potential for enabling additional revenue streams from the value of retrieved resources in

accordance with the theory by Lewandowski (2016). All of the factors could be seen in Table 5.6.

Table 5.6: An overview of the revenue streams of the subscription-based model

Business Model Component	Building Block	Detail
	Extend product lifespan	<ul style="list-style-type: none"> • Reduce unnecessary use <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven – Starting cost and a variable cost
Revenue Streams	Increase the efficiency of use	<ul style="list-style-type: none"> • Minimizing the time that the product is not being used <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven
	Close the loop	<ul style="list-style-type: none"> • Additional revenue streams from retrieved products, components and material

5.4.3 Customer Profile

This section will present the customer profile for the subscription-based market offering in order to find a fit with the value proposition (Osterwalder et al., 2014). The customer profile has some similarities with the customer profile of the carsharing market offering and therefore will jobs-to-be-done, customer pains, and customer gains be discussed regarding similarities and differences relative to the traditional, private ownership market offering, but also, be compared to the carsharing market offering. An overview could be seen in Table 5.7.

Jobs-to-be-done

The jobs-to-be-done in the subscription-based market offering has some similarities to the traditional market offering where cars are being sold. The essential jobs are the same as in the carsharing model. There are also a lot of similarities in positively and negatively affected jobs to market offering where the provider of the car owns the car. The difference lies in aspects related to the control of the car, such as energy storage, which remains unchanged relative to traditional market offerings just like the aspect of freedom to move.

Due to the fact that the providers own the car, it should be easier for them to perform jobs-to-be-done related to data gatherings and surveillance. The difference to a carsharing service however is that they do not control the car and could therefore not choose where the data gathering should take place in the same amount.

The negatively affected jobs-to-be-done on the other hand is the ones related to owning a car. A social job identified earlier is the car as a symbol of success and prestige. This could still be achieved by subscribing to a premium car, nevertheless, due to the fact that the users do not have to pay an upfront cost as high as when they want to purchase the car, this job would not be achievable to the same degree as in traditional market offerings.

Customer Pains

For the customer pains, this market offering could be seen as optimal. Many customer pains related to taking care of a car are being reduced while there are likewise no customer pains related to not controlling an own car. However, the one related to using the car will remain the same such as finding parking spots and being stuck in traffic.

The pains reduced in this market offering are as mentioned earlier aspects related to the ownership of the car. Customers will no longer have to put in the same effort to do regular service inspections, repair the car, and change tires, as some of the responsibility will shift to the owner. The pains related to buying and selling the car will also be decreased or removed completely. Due to the possibility to change cars easily, it becomes less important to do qualitative and quantitative research before purchasing the car and a lot of effort and time could be saved. The investment will also be significantly reduced which is beneficial for the customers. For the aspect of selling the car, all pains will be completely removed except for the time and effort to return the car to the provider.

On the other hand, potential increased pains for the customers are related to receiving the car, changing the car, and returning the car. Nevertheless, putting this aspect in contrast to the pain of buying and selling a car, it could be argued that it is still more convenient for the customers to subscribe to a mobility service.

Customer Gains

With the same argument as for the carsharing marketing offer, most customer gains will remain the same as for the traditional model. All the gains related to driving a specific model will remain unchanged such as feeling safe during transportation, getting a premium experience, navigator, the ability to listen to music, etc. The ability to move efficiently and whenever also remains the same. The customer gain that will decrease, however, is in some cases personalization. A privately owned car has a higher potential to be personalized exactly as the customer wants. In addition, another potential downside for the customers is that they lose the chance of making revenues from the cars by for example selling the car to a higher price than what

5. Discussion

they purchase it for, or at least for a higher price than what the car is worth. Lastly, an additional gain for the customers is the reduced amount of responsibilities for having a car.

Table 5.7: An overview of the customer profile of the subscription-based model

Business Model Component	Subcategory	Detail
Customer Profile	Jobs-to-be-done	<ul style="list-style-type: none"> • Jobs remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Transport: <ul style="list-style-type: none"> * People and items * Shorter and longer trips – Feeling the freedom to move – Other jobs for the car provider – Other functions for the customer • New or more effective jobs relative the traditional market offering <ul style="list-style-type: none"> – Showing your contribution to a better society by the choice of your car – Other jobs for the car provider • Less effective jobs relative the traditional market offering <ul style="list-style-type: none"> – Car as a symbol of success and prestige
	Customer Pains	<ul style="list-style-type: none"> • Pains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Pains related to using the car <ul style="list-style-type: none"> * Finding parking in urban environments * Being stuck in traffic – Storage – Social judgment from using a car when not absolutely necessary • Remaining but reduced pains relative the traditional market offering <ul style="list-style-type: none"> – The effort to find the right car – Bad consciousness from environmental effects – Service • New or increased pains relative the traditional market offering <ul style="list-style-type: none"> – Operational costs – Returning the car
	Customer Gains	<ul style="list-style-type: none"> • Gains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Feeling safe during the transport – Having a pleasant experience – Additional functions: <ul style="list-style-type: none"> * E.g. Navigator, music system, call, remote engine, heat start • New or increased gains relative the traditional market offering <ul style="list-style-type: none"> – Having less responsibilities – Knowing that the car is environmentally friendly • Remaining but reduced gains relative the traditional market offering <ul style="list-style-type: none"> – Personalization

5.5 Market Offering 3 - Leasing

A third option to offer mobility in a more circular manner is car leasing. The leasing model provides the customer with close to private ownership of the car while still having the manufacturer own the cars for its entire lifetime. A discussion of how the value proposition can be shaped to reach the highest level of circularity will be followed by the revenue stream needed to complement the value proposition. Then a discussion regarding the customer profile will follow and how this market offering will affect the customers.

5.5.1 Value Proposition

Leasing is herein defined as a market offering in which a car is rented over a few years for a monthly license fee. Compared to a subscription model, leasing often includes a set time for which the car is rented and one specific car is leased and the customer does not have the same option to swap cars within the leasing time. Compared to buying a car, the manufacturer still owns the car in a leasing model, and the car is handed back to the manufacturer after the leasing period is over. Furthermore, additional services such as service, insurance, and repairs may be included in the monthly leasing fee. The following discussion will regard how the sharing service should be formed to reach the three building blocks of circular use. A summarize can be seen in Table 5.8.

Table 5.8: An overview of the value proposition of the leasing model

Business Model Component	Building Block	Detail
Value Proposition	Extend product lifespan	<ul style="list-style-type: none"> • Incentivizing Manufacturers to Design for Longevity <ul style="list-style-type: none"> – Manufacturer owns and controls the cars for the entire lifecycle • Incentivize careful use <ul style="list-style-type: none"> – Pricing model based on wear – Bonuses or rewards • Incentivize use of older cars <ul style="list-style-type: none"> – Manufacturers guarantee liability – Offering different cars at different prices
	Increase the efficiency of use	<ul style="list-style-type: none"> • Reduce inactivity <ul style="list-style-type: none"> – Use the cars for other purposes than transportation when parked • Increase utilization for each trip <ul style="list-style-type: none"> – Ridesharing/Carpooling – Price related to the size of the car

Table 5.8: Continuation of table on previous page

Business Model Component	Building Block	Detail
Value Proposition	Close the loop	<ul style="list-style-type: none"> • Manufacturer owns and controls the cars for the entire lifecycle • Regular service checks

Extending Product Lifespan

Similar to the previous market offerings, both sharing and subscription, the manufacturer owns the cars in a leasing model. This provides incentives to design for longevity. In the leasing model, however, where the time of possession over the cars is much longer for the customers, the manufacturer might lose some control over the cars. Regular service inspections and repair are not as natural as in a sharing or subscription model. Hence, offering free service inspections and repairs for the customers every year might help maintain control over the cars and their conditions.

Careful use is already rather incentivized in a leasing model. Since the customers possess the cars for years, maintaining the condition of the car is of importance to the users. If the motivation is combined with a final inspection when the car is returned to the manufacturer where the customer is held liable for damages, careful use will not be a major problem in a leasing model.

Leasing a car is likely to encourage using the car as a status symbol. Keeping possession of the car over a few years is similar to buying a car in this aspect and hence, the willingness to lease older cars is likely to decrease. Also, signing up to possess the car for years, the users must ensure that the car is going to keep its condition for the whole leasing period. This also increases the motives to lease a newer car. Hence, a leasing model contains a bigger challenge to incentivize the use of older cars compared to sharing and subscription models. Solutions to these challenges include offering the older cars at a lower price, including insurance and guaranteeing performance over the leasing period as well as including service and repairs in the leasing fee.

To summarize, a leasing model can enable a longer use of the cars if formed properly. Manufacturers have incentives to design for longevity although the maintenance and regular service is not as easy to perform as in sharing and subscription models. The incentives for the customers to use older cars are larger than if the car is bought but still likely to be lower than in the previously discussed market offerings. However, the incentives for careful use are stronger in this market offerings than in sharing and subscription models.

Increasing the Efficiency of Use

In a leasing model, the customers maintain possession of a car over a longer period of time while the manufacturer still owns the car. Since the manufacturer owns the car, the possibility to use the cars for other purposes still exists. However, in a leasing model, the car is more tied to one customer than for example in a sharing model. Hence, some areas of data collection and surveillance, etc. might not be appropriate in a leasing model. This depends on the legislation, culture and norms, and the customers' preferences. Therefore, the car owner has to evaluate what possible other areas of use of the cars are possible.

In a leasing model where the customers only have access to one car each, the opportunity to choose the right car for the right purposes is lost. Even as an individual customer, choosing a car with only one or two seats without a trunk might be very limiting. Hence, many customers are likely to choose to lease a larger car to be able to use it for all purposes which will lower the filling rate. The same goes for the fact that the car can only be used by one customer. This is likely to increase the rate of inactivity to the same as when a car is bought. This issue can be solved by allowing the leased car to be used by others when the customer who has leased the car is not using it. Allowing the customer to rent out the car to others to create a market offering which is a combination of leasing and sharing could create a combination and high efficiency and more control. The customers must be incentivized to allow others to use its leased car. This can be done by reducing the monthly fee when the car is shared.

To summarize, the efficiency of use is not naturally much higher in a leasing model than in private ownership. However, by maintaining ownership of the car, the manufacturer can use the car for some other purposes than transport. The filling rate during transport is likely to be similar to private ownership. So is the time of inactivity. However, since the car is still owned by the manufacturer, there is a possibility to allow for sharing the cars when it is not being used by the customer.

Close the Loop

Using the same logic as for both the sharing model and the subscription model, the manufacturer can maintain control over the cars, their parts, and their materials. Since the car will be returned after the leasing period the manufacturer will naturally receive the cars after use. However, since the manufacturer has less control over the cars compared to sharing and subscription models, the material flow is likely to not be as effective in a leasing model. However, establishing service inspections and free repairs of routine flaws will help to return parts and materials to the manufacturer.

5.5.2 Revenue Streams

The pricing model for this market offering (see Table 5.9) is similar to the subscription-based model and the availability-based product-service system by Lewandowski (2016). The customers pay monthly for renting a car which is the main revenue

stream for the car provider. The difference however lies in the price that car providers could take for the service as the subscription model offers more value and flexibility for customers and therefore could offer the cars to a higher price. Similarly, in both models, the customer has to pay for expenses incurred during the use of the car.

The same principles of combining the revenue stream model with a usage-based or performance-based system are applicable in this market offering, as to subscription-based market offering. Further, to increase the circularity of the market offering, the car manufacturer should resell retrieved resources (Lewandowski, 2016).

Table 5.9: An overview of the revenue streams of the leasing model

Business Model Component	Building Block	Detail
Revenue Streams	Extend product lifespan	<ul style="list-style-type: none"> • Reduce unnecessary use <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven – Starting cost and a variable cost
	Increase the efficiency of use	<ul style="list-style-type: none"> • Minimizing the time that the product is not being used <ul style="list-style-type: none"> – A combination of pay for time the car is being used and pay for distance the car is driven
	Close the loop	<ul style="list-style-type: none"> • Additional revenue streams from retrieved products and components

5.5.3 Customer Profile

This section will present the customer profile for the leasing market offering in accordance with the value proposition canvas developed by Osterwalder et al. (2014). First, jobs-to-be-done will be discussed and then customer pains and gains will follow (see Table 5.10). The discussion will be emphasized on the similarities and differences relative to the traditional market offering but also cover some similarities and differences with previously discussed market offerings.

Jobs-to-be-done

The leasing-based market offering is not an exception, it also has the same essential jobs-to-be-done such as transporting yourself from A to B, transporting family

and friends, and transporting items. The difference, however, lies in that the car is rented over a few years and that the customers have the same car for the entire period. This implies that the control of the car is similar to traditional market offerings where customers have the same freedom to move and car manufacturers have the same ability to use the car for other purposes such as energy storage.

However, similar to the previous market offerings, both sharing and subscription, jobs-to-be-done related to data gathering will be easier to achieve for the car provider due to the fact that they own the car. The negatively affected jobs will also be similar to the previous market offerings and the car will not have as high of a symbol of success for the users as to when they own the car.

A leasing model differentiates itself from a subscription model in the area of not offering a customer a short-term solution for mobility, unlike the subscription model, the customers have to commit for a longer period.

Customer Pains

Just like the subscription model, from the perspective of the customer pains, this market offering is very beneficial for the customers. The responsibilities to take care of the car is fewer than in traditional market offerings at the same time as the customers control their own car and could reduce potential pain related to finding a new car for each trip. A customer pain that occurs dissimilar to the other models discussed is taking care of the car, and the pains occurred during the process of getting a car as the customer has the car for a longer time period.

The reduced pains are once again related to the ownership of the car as some responsibilities lay on the car provider and owner. Another aspect is the customer pain related to paying an upfront cost, which will be significantly smaller. The pains related to selling the cars will be reduced as the customers only have to return the car.

Customer Gains

The customer gains are almost identical to the traditional market offering. A potential downside for some customers is the reduced amount of personalization in the car. It will still be more personalized than in a carsharing market offering, but the users will not have the same ability to make greater changes to the car due to the fact that they have to return it. An added gain on the other hand is the reduced responsibility for the car. Lastly, the customers who want to sell the car for a higher price than the market value to gain profit from their investment, will lose the opportunity to do so.

Table 5.10: An overview of the customer profile of the leasing model

Business Model Component	Subcategory	Detail
Customer Profile	Jobs-to-be-done	<ul style="list-style-type: none"> • Jobs remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Transportation – Feeling the freedom to move – Other jobs for the car provider – Other functions for the customer • New or more effective jobs relative the traditional market offering <ul style="list-style-type: none"> – Showing your contribution to a better society by the choice of your car – Other jobs for the car provider • Less effective jobs relative the traditional market offering <ul style="list-style-type: none"> – Car as a symbol of success and prestige
	Customer Pains	<ul style="list-style-type: none"> • Pains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Pains related to using the car <ul style="list-style-type: none"> * Finding parking in urban environments * Being stuck in traffic * Service/repair * Change winter/summer tier * Washing the car – Storage – Social judgment from using a car when not absolutely necessary – The effort to find the right car – Operational costs • Remaining but reduced pains relative the traditional market offering <ul style="list-style-type: none"> – Bad consciousness from environmental effects – Service • New or increased pains relative the traditional market offering <ul style="list-style-type: none"> – Returning the car
	Customer Gains	<ul style="list-style-type: none"> • Gains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Feeling safe during the transport – Having a pleasant experience – Additional functions: <ul style="list-style-type: none"> * E.g. Navigator, music system, etc. • New or increased gains relative the traditional market offering <ul style="list-style-type: none"> – Feeling free from responsibilities – Knowing that the car is circular • Remaining but reduced gains relative the traditional market offering <ul style="list-style-type: none"> – Personalization

5.6 Market Offering 4 - Return System

A market offering based on private ownership of the cars is less likely to reach a high level of circularity. However, if private ownership is demanded, circularity can still be increased by establishing return systems to ensure that the cars, their components and materials are returned to the manufacturer after use. A discussion of how the value proposition can be shaped to reach the highest level of circularity will be followed by the revenue stream needed to complement the value proposition. Then a discussion regarding the customer profile will follow and how this market offering will affect the customers.

Table 5.11: An overview of the value proposition of the return system model

Business Model Component	Building Block	Detail
Value Proposition	Extend product lifespan	<ul style="list-style-type: none"> • Incentivizing Manufacturers to Design for Longevity <ul style="list-style-type: none"> – Return system • Incentives for customers to return the car <ul style="list-style-type: none"> – A refundable fee when buying the car • Incentivize use of older cars <ul style="list-style-type: none"> – Guaranteed performance to customers. <ul style="list-style-type: none"> * Manufacturer or third party takes risk responsibility – Efficient second-hand market • Incentivize careful use <ul style="list-style-type: none"> – Customers own the car
	Increase the efficiency of use	<ul style="list-style-type: none"> • Reduce the time each car is parked <ul style="list-style-type: none"> – Use the cars for other purposes than transportation when parked • Increase utilization for each trip <ul style="list-style-type: none"> – Ridesharing/Carpooling
	Close the loop	<ul style="list-style-type: none"> • Manufacturer collects the car at its end-of-life <ul style="list-style-type: none"> – Return system • Incentives for customers to return the car <ul style="list-style-type: none"> – A refundable fee when buying the car

5.6.1 Value Proposition

In the traditional linear model, which is dominant today, manufacturers sell their cars and then often lose control over them after the first sale. Without maintaining control and responsibility no one can ensure that the cars are being part of a circular flow of resources. However, if the manufacturer can ensure that the cars are being

returned after their customer is done using the car, some control and responsibility will be maintained. Ensuring that the cars are returned after being sold and used by the customers is herein referred to as a market offering with a return system. The following discussion will regard how the sharing service should be formed to reach the three building blocks of circular use. An overview of the value proposition can be seen in Table 5.11.

Extending Product Lifespan

When the manufacturer does not own and control the cars over their entire lifetime, the incentives to design and manufacture for longevity decreases. If, however, the cars are eventually being returned, the value of the returned car is higher if the cars have been designed to last longer. This could give some incentives to design for longevity. However, since the manufacturer has to buy back the car from its customer, the price they pay to have the car returned would also be increased if the value is higher which would lower the gains from the longevity. In conclusion, establishing a return system would create some incentives to design for longevity, although the motives and potential gains from a longer-lasting car are rather small.

Regarding the customers' willingness to use older cars, the return system model would not be particularly beneficial for the first customer. If, however, the manufacturer can own the liability for any breakdowns and failures not caused by the customer, this would decrease the risk amongst the customers and increase the willingness to use older cars. Taking this liability would also create some incentives to design for longevity.

A benefit from the return system in regards to the longer use of cars is if a high number of cars are returned to the manufacturer, the second-hand market for cars could be more efficient. Customers who are interested in buying cheaper used cars could now get a refurbished, repaired, and potentially remanufactured car directly from the manufacturer. This could make the buying and selling process for the second-hand market much smoother. If the cars are being refurbished and repaired before being sold again it could also decrease the risk for the customer of buying a used car. Hence, increasing the willingness to use older cars.

Incentivizing careful use of the cars would not be a problem in this model. Since the cars are owned by the customers, the incentives to not wear and damage the car are already high.

To summarize, the market offering based on private ownership and established return systems could help enable a somewhat extended lifespan of the cars. However, the prolonged use is more related to additional services such as repair systems and a transfer of liability than to the return system itself. Hence, this market offering is not very efficient in extending the lifespan.

Increasing the Efficiency of Use

When the cars are not owned by the manufacturer, the possibilities of using the cars for data collection and surveillance and other additional purposes are limited. Since the cars are privately owned, legislation limits what is possible in terms of this type of additional areas of use.

Since this market offering is based on private ownership, the efficiency of use is likely to be low. And the study indicates that users are probably less likely to be willing to share their own privately owned car with others than they would be sharing a leased car for example. This fact limits the options of sharing the cars in this model. In addition, due to the loss of ownership and control relative to previously discussed market offerings, it is more challenging for the car providers to incentivize customers to carsharing or ridesharing. A potential way is offering solutions enabling the customers to rent out their cars more smoothly like digital keys and other relevant software applications. Another drawback in terms of the efficiency of use with this market offering compared to sharing and subscription is that the option to choose the right car based on the job to be performed is nonexistent. To summarize, the efficiency of use is low in this market offering.

Close the Loop

Since the cars are eventually returned to the manufacturer they will have some control over the flow of material. This will help close the loop. The drawback with this market offering in terms of closing the loops is that the manufacturer's control over the cars when the cars are owned by the customers is limited. This will cause a less efficient material flow than if the manufacturer were to own the cars for their entire lifetime.

The fact that manufacturers expect to eventually repossess the car at its end-of-life, incentivizes them to design the car for more closed loops. Car manufacturers will then directly benefit from using beneficial material and design for disassembly to mention a few aspects that contribute to more closed loops.

5.6.2 Revenue Streams

The main revenues in this model are received when the car is being sold. The difference however to traditional market offerings is the price of the car. Car manufacturers could arguably price the car at a higher level based on the guarantee of an end-of-life value. Alternatively, they could offer the car at a lower price with the requirement that some parts of the car have to be returned after use. As the product is eventually getting back to the manufacturers, a performance-based pricing system could be implemented where the final price of the car could be based on the end-of-life value.

To increase the circularity of the revenue streams in this model, car manufacturers have to restore the value of cars, components, and raw material to resell

(Lewandowski, 2016) as seen in Table 5.12.

Table 5.12: An overview of the revenue streams of the return system model

Business Model Component	Building Block	Detail
Revenue Streams	Close the loop	<ul style="list-style-type: none"> • Additional revenue streams from retrieved products, components and material

5.6.3 Customer Profile

This section will present the customer profile for the market offering. The similarities of the market offering with the traditional market offering result in a few differences regarding the customer profile. They will, nevertheless, be discussed in order to gain a better understanding of the matching customer segment and value proposition, following the theory by Osterwalder et al. (2014). An overview could be seen in Table 5.13.

Table 5.13: An overview of the customer profile of the return system model

Business Model Component	Subcategory	Detail
Customer Profile	Jobs-to-be-done	<ul style="list-style-type: none"> • Jobs remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Transport: <ul style="list-style-type: none"> * People and items * Shorter and longer trips – Other functions for the customer <ul style="list-style-type: none"> * E.g. In-car delivery drop-off. – Showing your success and prestige – Showing your contribution to a better society by the choice of your car – Feeling the freedom to move

Table 5.13: Continuation of table on previous page

Business Model Component	Subcategory	Detail
Customer Profile	Customer Pains	<ul style="list-style-type: none"> • Pains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Buying/selling the car <ul style="list-style-type: none"> * Expensive to buy * The effort to find the right car or buyer * Time consuming – Owning the car <ul style="list-style-type: none"> * Costs: <ul style="list-style-type: none"> · Insurance cost · Repair cost · Garage or parking spot · Service cost · Taxes * Effort: <ul style="list-style-type: none"> · Repair · Service · Change winter/summer tires · Washing the car * Storage: <ul style="list-style-type: none"> · Car · Tires * Feeling and looking bad when the car gets older and worn – Using the car <ul style="list-style-type: none"> * Costs * Finding parking in urban environments * Being stuck in traffic * Bad consciousness from environmental effects * Social judgment from using a car when not absolutely necessary * Walking distance to the car • Remaining but reduced pains relative to the traditional market offering <ul style="list-style-type: none"> – Getting rid of the car
	Customer Gains	<ul style="list-style-type: none"> • Gains remaining the same relative to the traditional market offering <ul style="list-style-type: none"> – Ability to move efficiently from point A to point B – Ability to move whenever required – Feeling safe during the transport – Having a pleasant experience – Personalization – Knowing that the car is environmentally friendly – Additional functions: <ul style="list-style-type: none"> * E.g. Navigator, music system, call, remote engine, heat start

Jobs-to-be-done

Due to the similarities between this market offering and the traditional market offering jobs will be unchanged and therefore not be covered in this discussion. It is nevertheless of interest to highlight that jobs related to data gathering and other purposes that are beneficial for the car provider will be more challenging to accomplish in relation to market offering where the car ownership stays with the corporate firm. With the same argument will other purposes beneficial for the customer, such as In-car-delivery, be easier accomplished.

Customer Pains

Correspondingly to jobs-to-be-done, customer pains will also remain relatively unchanged in this market offering. One aspect worth mentioning is the reduced pain regarding getting rid of the car. In this market offering the customers can benefit from the reduced effort and time to sell the car as they can return it to the manufacturer for an already negotiated deal.

Customer Gains

Customer pain is many times related to customer gains. A pain experience is sometimes required to be able to earn the benefits. As a consequence of the reduced pain of not having to put the time and effort to sell the car, the customers will miss the opportunity to gain additional financial benefits from the process. The return system is assumed to have beneficial deals for the car provider as they have the majority of the risk, and in return, customers will receive convenience.

5.7 Market Offering Comparison

In this thesis, sharing services, subscription models, leasing models, and private ownership complemented by a return system have all been identified as market offerings with the potential to be more circular than today's linear model. However, all mentioned market offerings possess different potentials to achieve the different building blocks of circularity. In this section, a comparison of the suggested business models will be conducted. The comparison will be based on how well the market offering can reach the building blocks of circular use and how it affects the customers.

Looking at the first building block of circular use, to extend the product lifespan, all suggested market offerings showed at least some potential to achieve this. The more control and ownership the manufacturer has of the cars and the more its revenue streams are connected to the use of the cars, the higher the incentives the manufacturer has to design for longevity. On the contrary, the less ownership and the shorter periods of use the user has, the lower the incentives for careful use is. Hence the sharing model would create the greatest incentives for designing for longevity while the lowest incentives for careful use while the opposite is true for private ownership with return systems. Both subscription models and leasing models are in between these two endpoints on both these aspects. When it comes to incentivizing longer

use of cars, the study indicates that the less ownership the user has and the more responsibility and liability the manufacturer owns, the higher the willingness is to use older cars. This aspect once again speaks in benefit of the sharing model with short periods of use and possession, and low risk for the users. Also this time the subscription model and leasing model give good opportunities for enabling a higher willingness to use older cars while the return system market offering falls behind. To add to this discussion, the incentives to use the cars with care is most likely the easiest aspect to reach by tweaking the offering and making users responsible for damages and wear. Hence, the conclusion is that the aspect of increasing the product lifespan speaks in favor of the sharing model. The subscription model and leasing also have good potential while the private ownership with return system falls far behind the other offerings.

The second building block of circular use regards increasing the efficiency of use. Higher efficiency of use can be achieved in two ways, by reducing the time of inactivity and by increasing the filling rate during transport. The study has found that in order to reduce inactivity, the cars should be shared as much as possible. Furthermore, if the manufacturer owns and controls the cars to a high extent, the cars can also be used for many other purposes than just transport which also lowers the complete inactivity. Hence, market offerings that enable as much sharing of each car as possible are the most circular from this perspective. Of course, the sharing model would come out on top followed by the subscription model where cars can be swapped. Furthermore, the study indicates that customers prefer sharing their car with others if the car is leased to sharing a car that is privately owned. To increase the filling rate during use, ridesharing must be enabled, or that users should be able to choose the right car for the right job. Ridesharing could be enabled in all market offerings. Either if it is integrated into the service or if it is performed by an external part. However, the option to choose the right car for the right job is improved when the time, money, and effort it takes a user to swap between cars is reduced. In a sharing model, this is done naturally since the user can use new cars for every trip, while in private ownership, a new car has to be bought. The subscription model which allows swapping cars provides some opportunity, however, it is not close to as quick and efficient as in a carsharing model. To conclude, the efficiency of use is the highest in a sharing model, followed by the subscription model which allows users to share and swap their cars. The leasing model is more efficient than the return system if it can allow for sharing the cars and the terms are not too long.

Close the loop is the last building block of circular use. In order to achieve more closed loops, the study has found that the manufacturer should repossess the cars after they have been used. The more control and ownership the manufacturer has during the car's lifetime and the shorter the periods in which the car is without the manufacturer's control the better. All market offerings presented manage to return the cars to the manufacturer eventually. However, in the return system market offering, the manufacturer may be left without control over the cars for many years. This limits their control and their possibility to perform checks on and repair the cars which is a drawback in terms of the circular economy. Hence, the conclusion is

that in the sharing model, where the use periods are short and the manufacturer's control is high, the potential to close the loop is the highest. The subscription service, where the cars can be swapped and the time of use is often shorter than in a leasing model provides better opportunities to close the loop than both leasing models and return system models. Once again, the private ownership with return systems ends up in the last place. The business models ability to fulfill each building block have been plotted in a radar chart as seen in figure 5.1

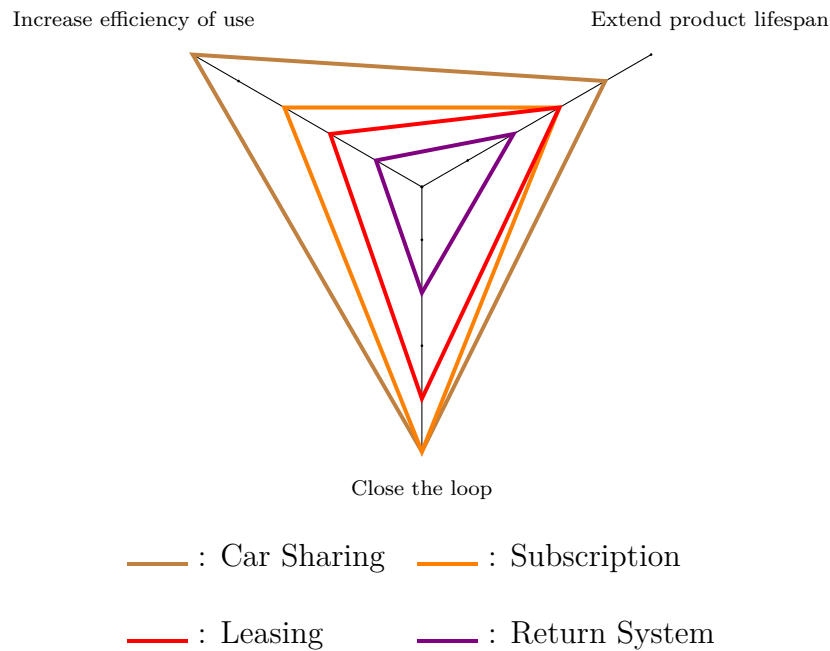


Figure 5.1: Radar Chart - Buisness models

The revenue streams for each model are different and are also affecting the level of circularity in different ways. The key however, is to use revenue streams to encourage customers to use the vehicle carefully and incentivize them to share their rides and share their cars. The study has shown that it is accomplishable in all market offerings with different methods, but in the model based on the return system the car provider loses incentives to be a part of the solution.

Beyond achieving a high level of circularity, a market offering has to fulfill customers' needs and attract a large customer segment to be functional and realistically implemented by the car manufacturers. In all four models, almost all of the same jobs-to-be-done could be achieved, the difference however, lies in how effectively different jobs could be performed. Starting with the most essential job, transporting yourself, other people and items from point A to point B, the study has shown that it is accomplished by all the value propositions, it is nevertheless most beneficial for the customers if they have high control of the car in the market offering due to them being able to determine where the car should be parked. This leaves us with all market offerings except the sharing-based model to be equally favorable from this aspect. It is however arguable that this aspect is more effective if the customers

have the ability to change cars and choose a car that is better required to perform the task and transport a certain amount of items or people, a certain distance in a certain time. From that point of view is the sharing model more favorable, followed by the subscription model. For other jobs-to-be-done, the study has shown that there is a link between for whom the job is performed and the level of control the part possesses of the car. Jobs-to-be-done for the car provider such as gathering data and storing energy benefits if the ownership and control lie with the car provider. On the other hand, jobs-to-be-done like in-car-delivery and other services for the customer could potentially be more easily performed if the control of the car is the customer's responsibility. Lastly, there are also numerous emotional and social jobs. This study has mainly focused on the ones related to prestige and car as a symbol of success, or contributing to an environmentally friendly solution. This aspect could be argued is negatively correlated due to them both being affected by the ownership of the car and being more favorable on each side of the spectrum.

Taking a look at the customer pains, all the market offerings have a variety of potential pains for the customer. Pains related to driving a car are somewhat identical, with the potential of some pain occurring for carsharing services if the customers are not familiar with the new car. The notable difference however, could be found in pains related to owning and controlling a car. When the control is decreasing, the amount of responsibilities decreases simultaneously and customers do not have to take care of reparation, service and maintenance of the car at the same level as when they fully control the car. There are also some increased pains related to the loss of control such as a higher probability of having a longer walking distance to the car. Stating that a certain market offering causes the most pain is misleading as it depends on personal preferences. With that being said, market offering with less control for the users eliminates many of the largest identified pains and could arguably be favorable for a large portion of the customer segment.

As previously discussed, gains are many times related to the pains. In the market offering where the car ownership shifts to the car manufacturer, a loss of personalization is many times inevitable and a decrease in freedom to move could be hard to avoid in some models. Looking only at the gains created for the customers, a carsharing model could be seen as less attractive than leasing, subscription, and ownership models. However, the major gain in a sharing model can be assumed to be the reduction of all the pains that comes with owning, controlling, and storing the car. Hence, the conclusion is that the gains and pains can not be evaluated in isolation as the correlation between the two is rather strong. And in terms of deciding which model creates the most pains and gains, it all depends on the customer preferences. Some customers will value the freedom to move at any time while others will value not having to take responsibility for maintenance and service. Hence, to offer a number of different options to reach a wide range of customers with different needs and preferences is a key to start a transition to a more circular use.

6

Practical Implications

When applying the building blocks of circular use as a framework for evaluating existing market offerings a number of interesting findings were made. It was noted that none of the evaluated offerings performed really well in all three dimensions. An offering that did a great job of extending the product lifespan did not achieve the desired efficiency of use while another offering that had a very efficient use did not manage to increase the product lifespan. Some aspects of the building blocks may be considered to help one building block while impeding another. One example is incentivizing careful use, which can be achieved by longer periods of use. This helps to increase the product lifespan while decreasing the efficiency of use. This tradeoff explains a small part of the finding that no offering performed great in all building blocks of circular use. However, the findings further showed that all offerings had the potential for improvement. The possible tradeoffs between the building blocks were not concluded to be strong enough to hinder an increased circular use. Instead, the major obstacle and reason that the offerings showed lower levels in some of the building blocks of circular use were concluded to be either monetary or a lack of knowledge of how the level of circularity could be increased.

A major reoccurring problem that was found was that although the offerings showed great potential in reaching high levels of circular use, the cars left the offerings rather soon. If the cars contribute to a higher level of circularity only during a few years and then re-enter the traditional private ownership model, much potential is left unmet. Hence, many of the evaluated offerings could benefit from maintaining the cars in their offering for a larger part of the car's lifespan and incentivize the users to drive the older cars in the offering.

This section of the thesis concludes that even the offerings which are the most circular today show potential for improvement. A key in initiating the transition to a more circular use phase for these offerings has been concluded to be spreading the knowledge of what circular use means and what it takes to reach it. A further step that has to be taken is to validate the profit levels while transitioning into a more circular offering. If that can be done, the step from the offerings that have been evaluated in this thesis to optimal circular market offerings is not too large.

7

Conclusion

The purpose of this thesis has been to explore the building blocks of circular use and the key characteristics of a market offering that would enable circular use in the automotive industry. The key characteristics were further employed to suggest four different market offerings, which would all help move towards a more circular use phase.

The thesis developed a theoretical framework containing the three building blocks of circular use established as 1) extend product lifespan, 2) increase the efficiency of use, and 3) close the loop. The framework was then validated through unstructured interviews with circular economy experts and is assumed to be collectively exhaustive. The thesis has also identified customers' current needs and pain points within the automotive industry, presented in the empirical findings and shown in Table 4.2. The customers' needs were then further mapped using the value proposition canvas to find several value propositions to solve the customers' needs. The mapping of customer needs and value propositions was then further complemented by appropriate revenue streams for each specific market offering. The results are shown in Table 4.3 and Table 4.4

Furthermore, the findings of the thesis have shown several aspects that would help achieve the building block of circular use. These aspects encompass, but may not be limited to, i) incentivize manufacturers to design for longevity, ii) incentivize careful use, iii) incentivize more extended use of the cars, iv) minimize unnecessary use, v) minimize the inactivity of the cars, vi) maximize the filling rate of the cars during use, vii) incentivize manufacturers to design for closed loops and viii) incentivize customers to return the cars.

Actions to reach the aspects mentioned in the previous paragraph have further been identified. These actions include, i) have the manufacturer or a third party own the cars for its entire lifetime, ii) hold customers liable for damages and excessive wear, iii) owner should own the risk for everyday wear and damages, iv) well-established repair systems, v) offer multiple offerings with cheaper use of older cars, vi) reduce parking time by sharing the cars, vii) find other areas of use, viii) incentivize ridesharing, ix) offer the right car for the right job, x) make sure the cars are returned.

Transferring the ownership from the user to the manufacturer was identified as a good foundation of a circular market offering. From that, three market offerings

were suggested. A fourth market offering was further added, in which the users maintained ownership but returned the car to the manufacturer after use. The four suggested market offerings were:

1. **Sharing model** - Customers book and use the car during a period of time and then it is returned immediately after use.
2. **Subscription model** - A flexible renting model in which users are provided with access to mobility over a period of time. Customers could easily change cars.
3. **Leasing model** - Car rental over a few years and then the car is returned to the owner.
4. **Private ownership complemented by a return system** - A traditional market offering complemented by incentives for customers to return the car to the manufacturer after use.

The market offerings above could if managed and designed correctly, reach high levels of circularity. However, the study has shown that the different value propositions solve different jobs and needs for the customers. One of the thesis's conclusions is that no one market offering can single-handedly transform the automotive industry into a circular use phase. As stated in the discussion, the transition can happen in three ways. 1) policymakers can force the change by legislation, 2) customers change their preferences and appreciation of circular models, and/or 3) business model innovation to maintain profit levels while solving the same customer needs more circularly. Hence, before customers have changed their preferences or the legislation has changed, the car manufacturer can help initiate the transition by offering circular market offerings that solve the customers' needs of today. Although the very most circular offering identified in the thesis would be to allow the entire city to share cars owned and controlled by the manufacturer, the gap from today's structure of the industry may be too big. Hence, the manufacturer would best initiate the transition by offering several different offerings, all of which are more circular than the model based on private ownership that dominates today. As the transition has been initiated, more steps can be taken in the right direction until the customers and society are ready for large-scale shared mobility to replace today's linear model.

This thesis provides a theoretical contribution to the definition of circular use and the building blocks to reach it. Furthermore, the thesis offers practical contribution by establishing aspects that affect the building blocks and suggests actions that appropriately address these aspects. Interestingly, the models for circular use are already somewhat available on the market. However, the current offerings could still be altered to reach even higher levels of circular use.

7.1 Future Research

A conclusion that has been drawn in the thesis is that circularity tends to increase when the manufacturers' ownership, risk, responsibility, and control increases over the entire lifecycle of the cars. All of which increases the cost for the manufac-

turer. Furthermore, the manufacturer is recommended to no longer sell the cars to its customers for a large, one-time charge, but instead, provide access to the car and getting paid first when it is being used. This also contains an economic risk. Hence, transitioning to a more circular market offering comes with a risk for the manufacturer.

As the characteristics and key components of circular market offerings are now more transparent and understandable, further research and calculations are now needed to understand better how the manufacturers can earn more money from this model than by selling the cars. Some answers that have been identified both within the thesis and previous research (Tukker, 2004; 2015) lies within the additional services that the manufacturer can perform. Taking responsibility for service, maintenance, insurance, upgrades, and sometimes even parking can help reduce the customers' pains. Together with the increased possibilities to use the cars to collect data, the manufacturer can create new revenue streams from additional services that did not exist before. Furthermore, maintaining ownership of the cars means that components and materials can be reused to lower the input cost for the manufacturer. And as the components have lost too much value to be used in new cars, revenue streams can be created from selling components to other industries. However, more thorough research on how this can be done while ensuring profitability is needed.

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A

Appendix 1

This appendix will present the interview templates used during the study. First, the interview template used for research question 1, second, the interview template used for research question 2 and last, the interview template used for research question 3.

A.1 Interview Template 1 - Research Question 1

This interview is based on an unstructured nature, meaning that the topic was presented to the interviewee and the discussion was mainly based on the interviewee's thoughts rather than asking a number a predetermined questions. However, the following questions were used as a help for the interviewer if the discussion faded out.

1. What does circular use mean to you?
2. What are the challenges with creating a circular market offering?
3. Looking from a circular perspective, what is your utopia in terms of automotive market offerings?
4. What barriers and obstacles are there against circular market offerings?
5. The transition involves not only companies, but also customers. What are the challenges of changing customers' mindset and behaviour?
6. Is there anything unknown or any knowledge we lack today that we have to figure out in order to succeed with the transition towards a circular use?
7. Customers are a central part of the user phase. Do you think that the customer segment will change with the transition?
8. What do you think the pricing model will look like in a circular market offering?
9. Is there any vital external factors needed to succeed with the transition?

A.2 Interview Template 2 - Research Question 2

Customer segments

1. What are the jobs-to-be-done for the customers in the automotive industry?
 - (a) What are the functional jobs-to-be-done?
 - (b) What are the social jobs-to-be-done?
 - (c) What are the personal/emotional jobs-to-be-done?

2. What are the potential customer pains for the customers in the automotive industry?
 - (a) What are the potential undesired outcomes, problems and outcomes?
 - i. What are the potential functional undesired outcomes, problems and characteristics?
 - ii. What are the potential social undesired outcomes, problems and characteristics?
 - iii. What are the potential emotional undesired outcomes, problems and characteristics?
 - iv. What are the potential ancillary undesired outcomes, problems and characteristics?
 - (b) What are the potential obstacles for the customers that can hinder them from performing the task?
 - (c) What are the potential risks for the customer while performing the task?

3. What are the potential customer gains for the customers in the automotive industry?
 - (a) What are the required/most essential benefits and outcomes for the customers?
 - (b) What are the expected benefits and outcomes for the customers?
 - (c) What are the desired benefits and outcomes for the customers?
 - (d) What are the unexpected benefits and outcomes for the customers?

Value Proposition

1. Can the value proposition extend the product lifespan?
 - (a) How can the value proposition extend the product lifespan?
 - (b) How should the market offering look like to help extend the product lifespan?

2. Can the value proposition increase resource efficiency?
 - (a) How can the market offering increase resource efficiency?
 - (b) How should the market offering look like to increase resource efficiency?

3. Can the value proposition help close the loop?
 - (a) How can the market offering help close the loop?

- (b) How should the market offering help close the loop?

Revenue Streams

1. Can the pricing model extend the product lifespan?
 - (a) How can the pricing model extend the product lifespan?
 - (b) How should the pricing model look to extend the product lifespan?
2. Can the pricing model increase resource efficiency?
 - (a) How can the pricing model increase resource efficiency?
 - (b) How should the pricing model look to increase resource efficiency?
3. Can the pricing model help close the loop?
 - (a) How can the pricing model help increase the amount of remanufacturing of products and components?
 - (b) How should the pricing model look like to increase the amount of remanufacturing of products and components?

A.3 Interview Template 3 - Research Question 3

1. How would you describe your market offering?
 - (a) How is the customer getting access to mobility?
 - (b) What do your revenue streams look like?
 - (c) Who is your customer?
2. Do your cars have a longer lifespan than average?
 - (a) Who owns the cars?
 - i. What are the incentives to design the car for longevity?
 - (b) How do you minimize wear during use?
 - i. What incentive does your customer have to minimize wear?
 - ii. Are the customers responsible for excessive wear and damages?
 - (c) How do you incentivize users to use older cars?
 - i. Do you have different offerings for older cars?
 - (d) What does your pricing model look like?
 - i. What are the incentives to drive eco-friendly (Carefully)?
 - (e) How could you increase the lifespan of the cars you use?
3. Are your cars being used more efficiently than average?
 - (a) What is the utilization rate for your cars?
 - (b) What possibilities do the customers have to use the right car for the right purpose?
 - i. What incentives do the customers have to choose the right car for the right purpose?
 - (c) Do your customers have any incentives to share the car with someone?
 - i. How do you affect the customer's incentives to share the car with someone?

- (d) For what purposes is your car being used for other than transportation?
 - i. What incentives does the manufacturer have to design for other purposes in your market offering?
 - (e) How could you achieve a higher efficiency of use for your cars?
4. Are your cars being reused and remanufactured more than average?
- (a) How is maintenance performed for the cars?
 - i. How often is maintenance performed?
 - ii. Who is responsible to perform maintenance?
 - iii. What are the incentives to do maintenance?
 - (b) What happens to the car after use?
 - (c) How could you achieve a more closed-loop (Higher amount of reused products and components)?

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