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Circular- and Performance Economy in the Telecommunications sector

A study investigating Reuse, Recycling & Leasing of mobile phones

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Abstract

Telecommunication is one of the fastest growing sectors in the world and a critical infrastructure in today's society as individuals and firms are dependent on it to function. Meanwhile, emissions generated from the telecommunications sector are continuously growing and the sector is also accountable for environmental effects from waste phones and shortage of raw materials. These environmental impacts along with changing consumption patterns mean that manufacturers have to start taking responsibility and collect their products from downstream consumers to either reutilise or dispose of them correctly. Several other industries are adapting to a “new” type of economy to meet customer demand and increase sustainability. This, so called Performance Economy, is a part of the Circular Economy and makes use of renting or leasing products to sell goods as services. Thereby the ownership of products shifts from customers to manufacturers, making the manufacturer responsible for costs, risks, and waste. However, despite the fact that one of the main objectives for the Performance Economy is environmental sustainability, the model requires additional logistics which entail some environmental costs. Therefore, it needs to be made sure that the model is in fact sustainable for the telecommunications sector. Moreover, firms need to adjust to customers´ preferences for the business model to be a viable alternative.

This thesis will therefore investigate whether the Performance Economy model could be a possible way forward for the telecommunications sector when selling mobile phones. Specifically, with regard to the environmental costs of the logistics required for the reuse- and leasing model as well as customer preferences. This is done through a case study of the biggest telecommunication operator in Sweden, Telia Company AB, which includes a SWOT-analysis of implementing the Performance Economy model within the telecommunications sector. Finally, it is found that the Performance Economy could be a possible way forward for the telecommunication sector when selling mobile phones in terms of environmental sustainability and customer demand. However, these findings are dependent on some specific prerequisites.

Keywords:

Telecommunication, Circular Economy, Performance Economy, Supply Chain, Reverse logistics, Leasing, Reuse, Recycling, Customer preference, Environmental Sustainability and Environmental Cost.

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1. Introduction

The introductory chapter aims at giving the reader a background to why the chosen topic, reuse, recycling & leasing in the Telecommunications sector, is of relevance to explore. In addition, it demonstrates the problematisation of environmental sustainability and customer demand for telecommunications companies in changing to a reuse and leasing based business model. This problematisation leads us to the purpose and research questions of the thesis.

1.1 Background

Telecommunication is one of the fastest growing sectors in the world (Mohanty & Carrizo Moreira, 2014). Just as highways were the critical infrastructure in the 20th century, telecommunication is the critical infrastructure of today, as roads with cars and trucks are being replaced by virtual data and "voice freeways" (Moss, Kaufman & Townsend, 2006). As Moss et al. (2006) describes it, just about everything depends on telecommunication, it can be seen as the nervous system of today's modern society. Without access to phones and the internet, individuals and firms would not function (Moss et al., 2006). At the same time, attention regarding climate change and environmental impacts on water and air from industrial activities have increased. This has increased the interactions between operations and environmental management (Pacheco, Kubota, Yamakawa, Paladini, Campos & Cauchick-Miguel, 2018).

It is clear that the industrial sector has negative impacts on our climate, both on a local and regional level (Lu, Y., Lu, J., & Jia, 2011). Mohanty & Carrizo Moreira (2014) explain that, in 2007, the total carbon emissions from the telecommunications industry were almost two percent of the global emissions and the emissions generated from the sector are continuously growing. The telecommunications sector is also accountable for environmental effects from waste phones (Sutherland, 2016). Further, Khor, Udin, Ramayah & Hazen (2016) explain that advanced information infrastructures have increased the concern regarding human and environmental health, by wrongly handling and bad management of electrical and electronic equipment (EEE) waste. The consumption of EEE has increased to a level where manufacturers have to take responsibility and collect their products from downstream consumers to either reutilise the products or dispose of the products in the right way (Khor et al., 2016). Pacheco et al. (2018) further explain that another concern for the manufacturing of industrial products has been the shortness of raw material, organisations therefore look for methods that minimise the use of raw material. One example of taking this

responsibility is the European Union´s directive which pushes both consumers and companies to minimise the waste being landfilled (Khor et al., 2016).

The shown impacts that consumption has on our environment has further changed customers' consumption- and purchasing patterns to be more sustainable (Pacheco et al., 2018). The demand for more sustainable products has increased (Marsillac, 2008), which forces companies to take more responsibility and think of their products' environmental impacts, not only in production and distribution, but also in the end of the products and services life cycle (Pacheco et al., 2018). The dominating economic model in industrialised countries have for long been characterised by ownership and disposability. Although, in recent years this trend has shifted towards more emphasis on access to goods and services (Stahel, 2019). Teece (2010) further emphasises that customers want more than just products, they want solutions to their needs. For example, many young people have stopped caring about having a driver's license and owning a car, nor do they have the money to buy real estate and therefore rent an apartment. By doing so, people can be users without the need of capital to access goods. However, when renting you do not get the profit from capital gains. Stahel (2019) therefore means that it makes sense for individuals to own goods that increase in value over time. Thus, owning a smartphone does not make sense in terms of monetary value, but by renting, users can have flexibility in their use, know the cost of using and only pay when using it. (Stahel, 2019) Teece (2010) also explains that a well developed business model is needed to deliver innovations and seize the value from them.

The Performance Economy is a Circular business model that makes use of renting or leasing products (Stahel, 2019), the idea is to sell goods as services (Stahel, 2016) and thereby selling results rather than objects (Stahel, 2019). This way, the ownership is retained by the manufacturer, making the manufacturer responsible for costs, risks, and waste (Stahel, 2016; Stahel, 2019). Business models like this are therefore profitable, as well as ecologically and socially viable (Stahel, 2019). We can see that several industries in Sweden today are adapting to this “new” economy by taking an increased interest in leasing and reuse of products. *Volvo Cars* offers leasing (Volvo Cars, 2021), the Swedish company “*Svenska Diskbolaget AB*" rents out dish washing machines (Svenska Diskbolaget AB, n.d.) and companies like *Gina Tricot* and *Hennes & Mauritz (H&M)* are offering rental clothes (Miljö & Utveckling, 2019). Other industries that are familiar with selling services rather than goods are hotels and public transport (Stahel, 2016), and Stahel (2016) argues that

this needs to be the mainstream in the whole consumer realm. When it comes to mobile phones, reuse has gained interest from several companies (Apple, 2021a; Tele2, n.d.; Tre, 2021; Telenor, n.d.). Despite this, only 2.5 percent of phones are recovered (Valero Navazo, Villalba Méndez & Talens Peiró, 2014). Valero Navazo et al. (2014) therefore emphasises the potential to increase the number of recovered phones.

1.2 Problem Analysis

Within the Performance Economy, leasing and reuse are important phenomena. By leasing, we want to prolong the usage phase of the products by making it possible for an object to have several owners. However, as explained by Kissling, Fitzpatrick, Boeni, Luepschen, Andrew & Dickenson (2012), the product life spans are shortened in the leasing model, the case for increasing the number of reuse times of a product is therefore convincing. If the ownership is retained by the manufacturer, the manufacturer is responsible for the whole life cycle (Stahel, 2016; Stahel, 2019), increasing the incentives to make sure phones come back to be reused or recycled.

The question is whether this business model is a possible way forward for the telecommunications sector when selling mobile phones. As discussed in the first section, a shift towards more sustainable operations is inevitable. Some of the main objectives for leasing and reusing phones is to minimise the consumption of resources, transport, and packaging (Stahel, 2019). Still, the additional logistics required, such as physical locations, facilities, and transportation links to transfer used products from user to producer and finally into the market again (Fleischmann, Beullens, Bloemhof-Ruwaard & Wassenhove, 2001) also entail some environmental costs, such as environmental impacts from transportation; energy and water pollution; and disposal costs (Lu et al., 2011).

Moreover, according to Teece (2010), the global economy and new communication- and computing technology creates a shift in the traditional balance between customers and suppliers. As consumers get more choices, they also get more power, making firms more reliant on having a consumer focus (Teece, 2010). Telecommunications companies therefore need to adjust to customers´ preferences. This is necessary for the business model to be a viable alternative for companies to sell mobile phones. Today, there is not insufficient knowledge about how customers react to remanufactured products in repeated leasing contexts (Van Loon & Van Wassenhove, 2020).

1.3 Purpose

The purpose of this study is therefore to investigate whether the Performance Economy model could be a possible way forward for the telecommunications (from now on also referred to as “telecom”) sector when selling mobile phones. Specifically, with regard to the environmental costs of the logistics required for the reuse and leasing model and customer preferences. The aim is to analyse the possibilities to implement the business model in an environmentally sustainable way that customers are prepared to accept.

The results of the study will to some extent be generalisable for the whole sector. However, to anchor the result of the report to reality, a case study of the biggest telecom operator in Sweden, Telia Company AB (from now on also referred to as “Telia”), has been done. While this will partly limit the results to Telia, the majority of the findings can be applicable for other telecom companies as well. Application of the findings to other countries than Sweden can be more questionable as the sector's infrastructure and customer preferences can be anticipated to differ between different countries.

Telia has ambitious goals in terms of sustainability. To exemplify this, their goal is to have zero emissions and waste by 2030 (Telia Company, n.d. a) and is therefore anticipated to be open to finding new ways of operating to reach these goals.

To fulfil the purpose of the report the two following research questions have been defined;

Q1: Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of environmental sustainability?

Q2: Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of customer demand?

1.5 Delimitations

As discussed, the aim of this thesis is to investigate whether the Performance Economy model could be a possible way forward for the telecom sector when selling mobile phones, in terms of the environmental sustainability and customer preferences. The study is therefore exclusively looking at this type of business model and if this model is believed to be a way of making the telecom sector greener. Other alternatives or methods of making the sector greener may of course exist. These could for example be affecting the consumer patterns to be more sustainable, or for the manufacturer to produce phones

with more sustainable characteristics. However, these aspects are not included in the scope of this thesis as the focus is on what retailers like Telia can do to push the sector in a greener direction.

Further, this thesis focuses on handling mobile phones at the end of their life cycle, where the business model implies that all phones are wanted back at the company for proper recovery. Therefore, the scope of this thesis in terms of reuse and recycling is not to handle the reverse logistics of wrong orders, customer regrets, damaged products, etcetera. The implication that this has on reverse logistics are slightly different and will be discussed further in "2.3.1 Network Design", as well as in the discussion.

1.6 Definitions

First, a definition of the telecommunication sector is of importance to clarify the scope of the industry that is researched. According to the Corporate finance institute (2021), telecommunications is defined as "communicating over a distance" and the origin of the industry can be traced back to postal courier services. Moreover, it is agreed that the companies included in the telecom sector are cable companies, internet service providers, satellite companies, and telephone companies (Corporate finance institute, 2021; Investopedia, 2021). In this thesis, the focus is on the mobile phone, which is the hardware that enables this communication.

Further, through the paper the terms rent and lease will be continuously used. What is meant by these terms is the action of paying the owner of the object a sum of money in return for using the object. For the purpose of this paper, both terms are defined in the same way, which is the action of regular payments for usage (Cambridge Dictionary, 2021a; Cambridge Dictionary, 2021b).

Other terms used throughout the paper are reuse, remanufacturing and recycling. In line with Kissling et al.´s (2012) definition, what differs the terms is at which level the product is reused. Recycling refers to the recovery of materials in a product while reuse and remanufacturing means that the product can be reused, either after some small touch ups or by switching some components in the product.

1.7 Structure of Report

The report is initiated with an extensive literature review of the theoretical framework and relevant theory about Performance Economy, customer preferences, and the Supply Chain activities required for the model to be implemented. Thereafter, the methodology of the study will be described in detail to give the report transparency and give the reader a clear view of what has been done. The analysis will consist of a SWOT-analysis divided into two steps. Firstly, a SWOT-analysis of implementing a Circular business model in the telecommunications sector is done. This is then supplemented with a SWOT-analysis of implementing a Performance business model in the same sector. The analysis will then be the basis of an open discussion held with respondents from the case company to anchor the analysis to reality. The results of this discussion will be presented in the empirical findings. The analysis and empirical findings will be discussed in section 6 to answer the research questions, and finally present the conclusions of the thesis in section 7.

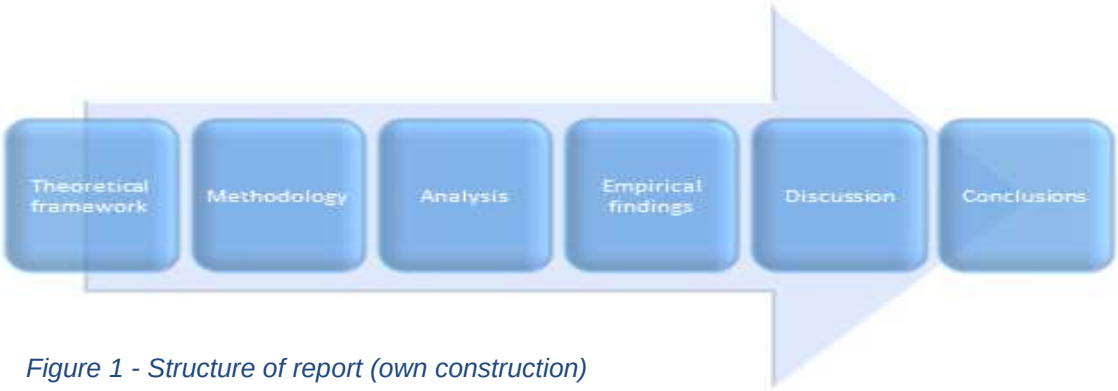

Figure 1 - Structure of report (own construction)

2. Theoretical framework

Chapter 2 presents the theory that will be used as background and support for the forthcoming analysis. The first section deals with theory about the Performance Economy, where the business model is explained, as well as phenomenon it includes, namely reuse, leasing and customer preferences. In section 2.2, the supply chain activities behind the new production of phones are explained, together with environmental costs that this entails. In section 2.3, the reverse network design to get phones back for recovery and disposal is explained. Lastly, section 2.4 illustrates a potential consolidation strategy that could be applied to minimise negative environmental externalities.

2.1 The Performance Economy

According to Stahel (2016), there are three different types of industrial economy: Linear-, Circular-, and Performance Economy. Stahel (2019) argues that within the Performance Economy, producers make use of renting or leasing their products. This, in combination with efficient return logistics, can lead producers to a leading role in the market. The Performance Economy is in this way profitable, as well as ecologically and socially viable. Moreover, innovation is induced. (Stahel, 2019)

Stahel (2016) describes the Linear Economy as consisting of value adding steps, and when products are sold the buyer takes over liability for risks and waste. This means that the buyer decides what to do with the product after they have used it. Unlike a linear economy, a Circular Economy is a closed loop that reprocesses goods and materials, generates jobs, and saves energy while reducing waste as well as the consumption of resources. (Stahel, 2016) Van Loon & Van Wassenhove (2020) further states that this is a key claim within the Circular Economy. The loop should be physically closed as this foster optimal recovery since the original producer knows the product best and can therefore optimise reuse (Van Loon & Van Wassenhove, 2020). Goods that are at the end of their life cycle are by this turned into resources for others. This changes the economic logic in the sense that production is replaced with sufficiency. Meaning; “reuse what you can, recycle what cannot be reused, repair what is broken, remanufacture what cannot be repaired”. (Stahel, 2016) The Circular Economy is, by this, a way of decoupling economic growth from negative environmental externalities by for example minimising resource consumption (Van Loon & Van Wassenhove, 2020).

Despite this, society today continues to “make, use, dispose”, which implies that we are stuck in the linear economy (Stahel,

2016). Though, there are pressures from for example the European Union to handle waste in a more sustainable manner. This pressure comes from their two directives, Waste Electrical and Electronic Equipment (WEEE) and the Restrictions of Hazardous Substances (RoHS), whose goal is to recycle electronic waste. Companies have on an international level started to establish more sustainable partnerships and redesign their supply chains, such as including reverse logistics. Environmental issues are one leading driver in the business world today, the practice also expands beyond many functions and processes in manufacturing, such as partnership in the supply chain. (Marsillac, 2008) To make the transition into the Circular Economy companies are faced with many challenges, to mention some you need to find a market for your already used products, set up a reverse supply chain to deal with product coming back to the company, as well as making sure the business model actually is sustainable (Van Loon & Van Wassenhove, 2020). Stahel (2019) clarifies that if you remarket or dismantle excess equipment and used goods that are at the end of their life cycle to sell them again, you are part of the Circular Economy. This is also the case if you sell broken components to someone who repairs or recovers the products (Stahel, 2019). Stahel (2016) argues that there are two groups that circular business models could belong to. The first is those who promote reuse and extend the life of a product through repair, remanufacturing, upgrades, and retrofits. The second is those who turn old goods into new by recycling materials. (Stahel, 2016)

Taking it one step further, we also have the Performance Economy. The idea here is to sell goods as services, which is done by renting, leasing, and shared business models (Stahel, 2016). With this, you sell results rather than objects (Stahel, 2019). Stahel (2019) further explains that this sold service should be maintained over an as long period of time as possible in order to maximise the profit being made. This way, the ownership is retained by the manufacturer, making the manufacturer responsible for costs, risks, and waste (Stahel, 2016; Stahel, 2019). The Performance Economy focuses on solutions rather than products and makes profit from sufficiency (Stahel, 2016). To make a shift towards practices like this has turned out to be difficult as companies are very dependent on external factors such as legislation, competition, and consumer behavior (Van Loon & Van Wassenhove, 2020).

Once again, this is clarified by Stahel (2019); if you sell your products as a service for the longest time possible you are part of the Performance Economy. With the Performance Economy, the role of the supply side as well as the demand side is redefined. The demand side goes from an ownership to

a usership when the object is no longer being sold but rented to the consumer. This is something that is not new, as Aristotle as early as two thousand years ago stated that; “real wealth lies in the use, not the ownership of goods” (Stahel, 2019, p. 67)

To make the shift from Linear- to Circular Economy happen, Stahel (2016) argues that business models that are based on full ownership and liability of the company should be promoted. This liability should be unlimited in time instead of offering a warranty of two years (Stahel, 2016). This is supported by Stahel (2019) as he argues that this type of business model is the most sustainable of the Circular Economy. The reason for this is that it internalises costs of product liability, risk, and waste as producers have a strong economic incentive to avoid losses and waste (Stahel, 2019). This could therefore be a way of keeping up with policies designed to reach a Circular Economy. Scheinberg, Nesić, Savain, Luppi, Sinnott, Petean, & Pop (2016) explain that The European Union has a well developed waste management system and also has an ambitious policy commitment to the Circular Economy. This in itself is an incentive for companies to work towards a Circular Economy. According to Stahel (2019), the Performance Economy improves sustainability in three main areas, which by Slaper and Hall (2011) is described as the *triple bottom line*, or the *3Ps* (people, planet, profit). These areas are;

- ❏ Profitable by utilising sufficiency, efficiency, and systems solutions. Also has less transactions and compliance costs as well as it is not subjected to carbon taxes or duties on import.
- ❏ Ecological by minimising the consumption of resources, transport, and packaging by utilising local reuse and lengthening the life of objects.
- ❏ Social as it is labor-intensive and internalises liability and costs for risk and waste instead of letting the society bear these costs. Stewardship is also rewarded which leads to users taking more care of the objects.

(Stahel, 2019)

Another central phenomenon in the Performance Economy is therefore the reuse of products. This is strengthened by Kissling et al. (2012), who argue that to successfully reuse a product you should expand its use-phase and initiate social, economic, and environmental opportunities as well as minimise waste. This is important as e-waste is a major concern in today's society (see 2.3.1.1 Disposal & E-waste).

2.1.1 Reuse

As mentioned, the European Union is one of the world's leaders within policy

commitment towards Circular Economy and waste management systems (Scheinberg et al., 2016). Reuse and recycling of products and raw materials, such as metal and glass recycling, is a phenomenon that has existed for a long time (Fleischmann et al., 2001). However, Scheinberg et al. (2016) claim that the existing informal recovery activities by reuse operators and recyclers in Europe has been denied until recently. With this, the need for informal sector legislation and integration has been denied as well, which is still a challenge for the European waste management sector (Scheinberg et al., 2016). Fleischmann et al. (2001) emphasise the increased attention and importance put on recovery of used materials and products, in both scope and scale. A modern example of this is the remanufacturing of electronics. Canon and Xerox Corporation are two examples of companies that remanufacture and sell used copy machines that they have received from their customers. The used machines need to be in a specific quality standard, which is inspected when the companies have collected the products. (Fleischmann et al., 2001)

A successful reuse operating model expands the using phase of a product or component, while also providing social, economic, and environmental opportunities and in the end avoid e-waste. Reuse is often considered as a phenomenon that can decrease the environmental impacts from electronic and electrical equipment. The reuse of products expands the using phase and increases resource efficiency, as products´ life span within this sector has become shorter which puts higher pressure on manufacturing and resources. (Kissling et al., 2012) Within the Circular Economy, this is referred to as the 'power of the inner circle'. It means that if you have a "tighter" inner circle (remanufacture instead of recycling) less changes are required in the recovery stage, making reuse faster and resulting in the highest savings in cost and environmental impact. However, this conclusion has been criticised as the importance of including the using phase of the products when assessing the environmental impact is highlighted, especially for products whose energy efficiency is increased with innovation. This implies a trade-off between products' extension of life through remanufacturing and the innovative products with a higher energy efficiency. Further, this trade-off can be used as a tool to determine which strategy is most environmentally beneficial for energy consuming products. (Van Loon & Van Wassenhove, 2020)

It is said that electronic products have an optimal life span which limits the number of life cycles that are environmentally preferable. Therefore, it is argued that recycling might be as good as reuse of components in the product to create multiple

life cycles. Van Loon and Van Wassenhove (2020) conclude that things are not as simple as they might seem and that circularity is not always better for the environment, companies should therefore do a thorough analysis before making transitions into business models like this. For example, in theory, a closed-loop system presents a framework where recovery of products reduces waste and the need for raw material. The framework emphasises how products can be remanufactured an unlimited number of times. However, Van Loon & Van Wassenhove (2020) describe how it is a bit different in reality. According to the two researchers, new products are needed and the number of times an item can be recovered is limited. (Van Loon & Van Wassenhove, 2020)

The reuse within the EEE-sector has had a steady increase over the last decade, despite challenges. A growing number of institutional users emphasises environmentally friendly practices, which is an opportunity for companies to improve their results by reuse, especially since product life spans are getting shorter. Many EEE-companies have successfully developed different models for operations, such as collection, preparation, redelivery, and reuse. In spite of this, the reuse industry has a lot of hidden potential, due to phenomena such as the growing popularity of leasing. (Kissling et al., 2012) This relationship between leasing and reuse will also be explored in "2.1.2 Leasing".

Three different aspects are of importance to understand the meaning of reuse. Firstly, reuse implies a change within ownership of the product or components and is a substitute for a new product or component. Secondly, reuse is applied on different levels, for the whole product level and on a component level. Lastly, the reuse of product/component should gain social, economic and environmental development, by expanding the using phase of it and substitute the manufacturing of a new product/component. (Kissling et al., 2012)

2.1.1.1 Examples from the industry

Telenor offers mobile networks that cover 99.9 percent of the Swedish population and has 2.3 million mobile customers. Telenor was designated as the most sustainable brand within the telecommunications sector in 2019, which is Europe's biggest trademark survey on sustainability. Telenor has an offer that is called "Telenor change", which according to Telenor is a sustainable offer that implies that after one year of use, their customers can change to a new phone without any extra cost. Moreover, a control is made before returning the phone where the company has a checklist on standards on the quality for the returned phones and an extra cost must be paid when changing the phone if it has been damaged. Later, an order on a

new phone is made and the recycled phone either gets reused by a new owner or is taken apart for spare parts. (Telenor, n.d.)

Tele2 wants to be the leader within sustainability and create maximum change with their services. Tele2 offers a service where customers can return their old phone and get a discount on a new phone. First, a valuation is made, where the value depends on the phone's model and condition. The return can be made in two different ways; either the customers bring their phones to one of Tele2´s physical stores where staff makes a valuation of it, or customers make their own valuation online and send the phone to Tele2 when they buy a new phone from their web shop. Later, the value of the phone gives the customer a discount on the new phone or accessories. Tele2 recycles all returned phones, where the type of method of recycling depends on the model and condition of the phone. The phone gets resold on another market if it is fully functioning, if not, it is taken apart and gets sold in spare parts or gets recycled. (Tele2, n.d.)

The Swedish mobile telecom company “Tre” has an offering where their customers can return their old phone in one of the company's stores and get a discount on their mobile subscription. First, Tre has an online service where customers that want to return their phone make a valuation of it before the physical return takes place. The valuation consists of a few short questions about the quality and condition of the phone. The customers get a preliminary exchange value right away and it is valid for two weeks. Later, customers take their phones to one of Tre´s physical stores where the staff makes a quick check to see if the customers online valuation is in line with the condition of the phone and determine the final value of the phone. Later, the customer gets a discount on their subscription in relation to the final valuation of the phone, the customers can also choose to donate the whole amount to charity. The returned phone is either resold or gets recycled in an environmentally friendly way if the phone does not have a resale value. (Tre, 2021)

2.1.2 Leasing

Increasing environmental concerns, a fast innovation cycle and flexibility are some of the drivers towards leasing smartphones. Moreover, there is a rapidly growing interest to move from a Linear Economy towards a Circular Economy and new business models are created for this transition. There is a shift towards using products instead of buying them, or towards offering product-as-a-service instead of selling products. Moreover, this shift has an important role in the transition. Leasing of smartphones implies that producers retain responsibility and ownership of the smartphone during its entire life cycle and consumers' right of usage of the smartphone in exchange for a

periodical fee. It is a use-oriented product-service system and is often considered as a business model that can reduce usage of material and negative environmental impacts of electronics such as smartphones. (Rousseau, 2020)

Stahel (2019) argues that people who value fashion and its continual pattern of change, could benefit from a renting business model as they would be able to rent different objects such as outfits, expensive cars and luxury handbags whenever they want to. Therefore, Kissling et al. (2012) explain that the product life spans can actually be shortened in the leasing model if products would not be reused and instead scrapped after the first customer. The case for increasing the number of times a product is reused is therefore convincing, especially for computer equipment. As already mentioned, leasing can therefore contribute to a higher usage of the hidden potential in reuse due to the increasing popularity of the phenomenon. (Kissling et al., 2012)

2.1.2.1 Examples from other industries

Volvo Cars has a service called private leasing, which is a service that includes monthly customer payments in three years in exchange for leasing a car and its mobility where road assistance, service, a mileage of 1,000 Swedish miles/year and a ten percent discount on car insurance from Volvia are included. (Volvo Cars, 2021)

The Swedish company "Svenska Diskbolaget AB" rents out dishwashing machines which are up to 50 percent chemical and energy efficient for people that want to rent the service but avoid machine repairs and disturbance concerning the hardware. (Svenska Diskbolaget AB, n.d.)

Renting is also a growing trend in clothing, as people want to decrease the consumption and expand the clothes´ life span. Examples of companies following this trend are H&M, who rents out clothes from their conscious collection and *Klädoteket*, which is a company in Gothenburg that rents out clothes and accessories from both designer brands, vintage and secondhand. Moreover, *Gina Tricot* has started a project called "Rent your party outfit" in Gothenburg. (Miljö & Utveckling, 2019)

2.1.3 Customer Preferences

As mentioned, customers today want more environmentally friendly products (Marsillac, 2008) and are more interested in solutions to their needs, rather than products (Teece, 2010). As customers today have more choices, they also get more power, making firms more reliant on adjusting to customers´ preferences (Teece, 2010).

The automotive industry has for example developed diverse practices and programs that involve reverse logistics and

green supply chains, such as developing environmentally sustainable programs that improves the production performance by redesigns, recycling of materials and use of environmentally friendly products. Several of these practices were developed in response to the RoHS and European Union´s WEEE directives, which forces the automotive industry to return and recycle their products. Moreover, many of the practices were developed as a response to customer preferences. For example, Toyota´s environmentally sustainable practices resulted in one of the highest customer loyalty ratings within the environmentally friendly vehicle sector. (Marsillac, 2008) Ikea has also started to explore a more sustainable option, where the company wants to support their customer towards more sustainable lives. Ikea offers a solution called "Buy Back", where their customers can return their used items. This operates in 27 countries. Moreover, Buy Back has operated in Australia for more than a year, where more than 10,000 items have been returned to the company. (Hooker, 2021) Another example that speaks for a change towards more circular practices is the company Amazon´s trade in service called "Amazon Trade-In". This is a program where customers can return eligible products, such as Amazon Devices and mobile phones, in exchange for an Amazone.com gift card. (Amazon, n.d.)

Although, Van Loon & Van Wassenhove (2020) identify several challenges when making the transition into Circular business models. These are connected to keeping costs down and adapting to customer preferences. They claim that it is important to understand the market for products that have been recirculated to know how big the demand for these products is, which customer segment you should target, what requirements the customers have, what the customers expected behavior is, and what their alternatives are in the second-hand market for example. (Van Loon & Van Wassenhove, 2020)

Moreover, all consumers do not take care of products when they are not their own and when the financial consequences for themselves are small (Van Loon & Van Wassenhove, 2020). This is central in the Performance Economy as Stahel (2019) explains that there is "no sharing without caring". This is vital, as objects that are shared need to be cared for. Stahel (2019) puts emphasis on the impact that control has in this concept: If you control the objects in between the users, the one responsible for damage etcetera can easily be identified. If you remove this control factor and objects go straight from one user to another there is a greater need for trust, caring and shared responsibility. This type of "Shared Performance Economy" has been seen in car- and bicycle renting where it has failed due to

chaotic user behavior in some places and flourished in other places. (Stahel, 2019) Realistic assumptions on consumer behavior are needed as it is difficult to change this behavior (Van Loon & Van Wassenhove, 2020).

Rousseau (2020) has conducted a study that aims at determining the factors that influence millennials´ (age 15 to 30) willingness to lease smartphones. This study is conducted in Belgium and it is found that it cannot be taken for granted that customers will support the leasing model as most respondents are not open towards leasing their smartphone. Millennials' preferences are interesting to explore as they are the consumers of the future and are believed to be more concerned with the environment. Still, millennials are not keen to change their consumption patterns. Contradictory behavior like this makes their behavior when it comes to leasing smartphones hard to predict. Both drivers and barriers towards leasing are found in the study, however the barriers appear to be more prominent which lead the author to describe the attitude towards leasing smartphones as reluctant. (Rousseau, 2020)

The main barriers toward leasing concerns the consequences of entering a leasing agreement, financial concerns, and concerns about self-identity in smartphones. This includes a feeling of lacking control and clarity when it comes to insurance, defects and accidents, the final cost, and final ownership of the product at the end of the leasing agreement. The concerns about self-identity were in some cases driven by privacy concerns, but some also simply said that they want their phone to be theirs. (Rousseau, 2020) Welfens, Nordmann & Seibt (2016) also highlight the issue of mistrust due to non-transparent recycling processes. Welfens et al. (2016) mean people are afraid that their personal data will be misused. Moreover, Van Loon & Van Wassenhove (2020) describes that several researchers have concluded that customers most likely will not spend more money on a remanufactured item than they would on a new one.

Meanwhile, drivers for adopting a leasing model were found to be environmental concerns, financial concerns (predictable monthly charge), and the wish to have the latest smartphone model. In a more general sense, it has been seen that it is more likely that products with high innovation cycles have higher incentives for customers to lease rather than buy. (Rousseau, 2020) However, Welfens et al. (2016) argue that a high innovation speed is a challenge regarding the reuse of products as products go out of fashion and no longer suits customers preferences. Moreover, it has been seen that customers who are environmentally aware are more prone to lease, if the leasing is perceived as a green choice (Rousseau, 2020).

As mentioned, the financial concerns can act both as a driver and a barrier towards leasing. This is explained by the fact that some respondents in Rousseau´s study (2020) had separate views on whether leasing or buying would be the cheaper option, which in turn is dependent on the expected lifetime of a smartphone. The ones replacing their phones every, or every other year saw financial gains with leasing, while the ones expecting to have their phones longer than this saw that they would not have financial gains from the leasing model. (Rousseau, 2020) This is in line with Kissling et al.´s (2012) statement that the product life spans are actually shortened in the leasing-model. As the financial gain or loss for customers (when leasing) is dependent on the expected period that the phone will be used, this will probably drive the leasing model towards a short-term use of the mobile phone and be a barrier towards longer leasing periods. (Rousseau, 2020)

2.2 Supply Chain Activities

There are various definitions in the literature on Supply Chain Management (Panayiotou, Aravosis, Idowu & Louche, 2011). Wong, Tan, Lee, Ooi & Sohal (2020) emphasise that Supply Chain Management consists of different activities such as logistics, material and operation management and its ability to optimise quality and organisational performance.

Moreover, Elgazzar, Tipi, Hubbard & Leach (2012) describe supply chain management as a set of all activities within a company that is directly or indirectly interlinked with each other and produce outputs from inputs to be delivered to the final customer. This can be compared to Stahel (2016) description of the Linear Economy, as he means that this economy consists of value adding steps. When products are sold the buyer takes over liability for risks and waste, which means that the buyer decides what to do with the product after they have used it (Stahel, 2016). Coming sections are dedicated to different supply chain activities.

2.2.1 New Production

The iPhone manufacturer Apple Inc. (Apple) relies on outside manufacturers to make the components (Petrova, 2018) and purchases materials and components from several different suppliers (Lu, 2020). Apple publishes a list of all their suppliers every year, but they do not specify what component comes from which supplier (Apple, 2019). However, according to Petrova (2018), Apple often uses more than one supplier for a part of the same model. Moreover, Apple works with suppliers in 43 countries and 6 continents to make their products. For example, chip manufacturing is outsourced to a manufacturer in Taiwan. Thereafter, the

chip has its final tests and gets packaged in the Philippines. The next step applies to the process of the chip being assembled into the iPhone in China or Pegatron in Taiwan. (Petrova, 2018) Further, the material and components get shipped to assembling facilities in China. Later, the products get transported to Apple's warehouse in California. From this point, the products are transported to other distributors such as retailers. (Lu, 2020) An overview of this supply chain can be seen in figure 2.

In figure 3, some of Telia´s warehouses are displayed. According to Telia (personal communication, 8th of March, 2021), the mobile phones are delivered by airplane from China to Arlanda, Sweden, which by far is the most polluting mode of transportation in terms of CO_2 emissions per tonne-km (International Chamber of Shipping, n.d.). After this, the phones are transported to Telia´s central warehouse in Ljungby. This transportation can be done on a daily basis but depends on the needed volume. Additionally, Telia has smaller warehouses closer to their final customers in Stockholm, Luleå, Norrköping and Gothenburg. Telia delivers to customers and stores through cars with Postnord´s distribution network, where about 60% of the deliveries are sent to final customers and 40% are sent to Telia´s stores. (Telia, personal communication, 8th of March, 2021)

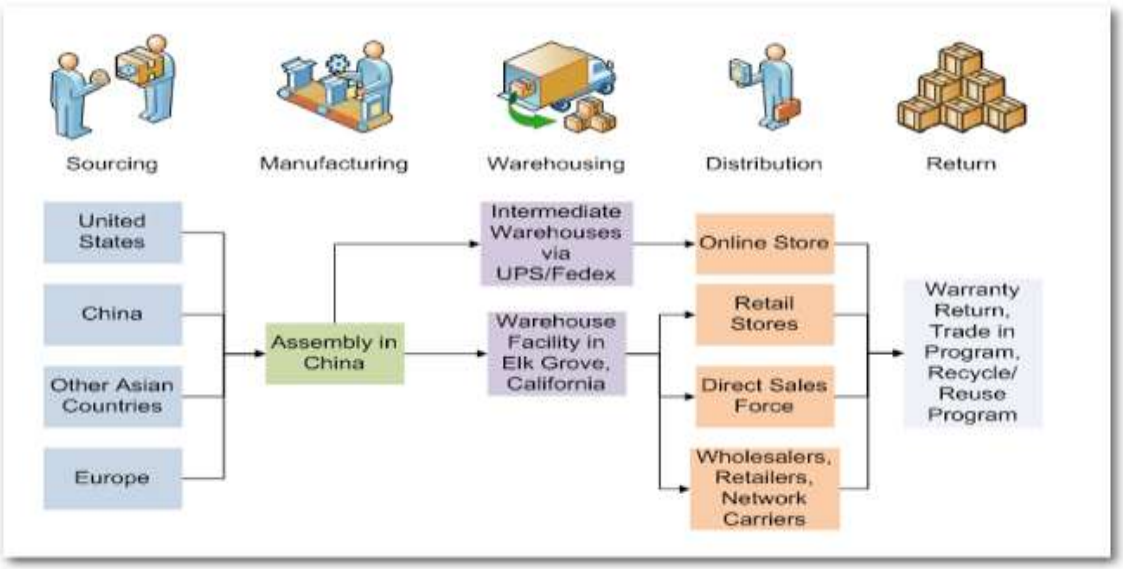

Figure 2 - Apple's supply chain (SupplyChain247, 2013)

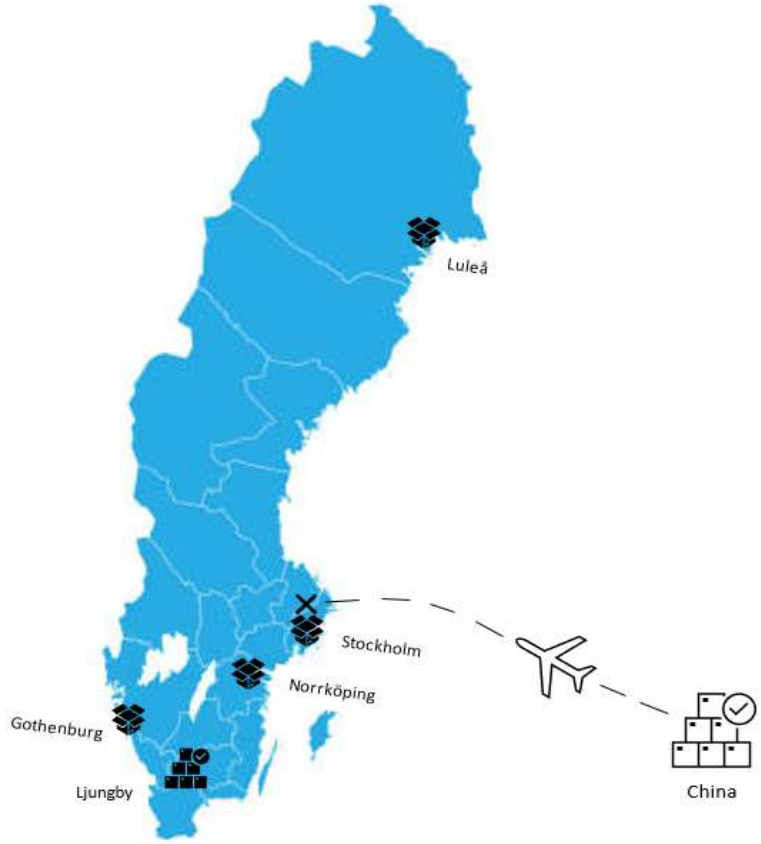

Figure 3 - Telia´s warehouses (own construction)

2.2.1.1 Environmental footprint

An iPhone consists of a lot of different materials, such as Tin (Sn), Silicon (Si), Phosphorus (P), Gold (Au), Silver (Ag), Copper (Cu) and the materials come from almost every continent. Apple does not investigate and publish exactly where these materials come from, as this information is hard to track. However, if we look at the largest mineral producers (for the year of 2017), it gives an idea of where the minerals come from. Silver (Ag) from Mexico, Copper (Cu) from Chile, and Phosphate Rock from China. (Petrova, 2018)

The amount of carbon dioxide (CO_2) that is consumed when manufacturing new components includes several processes in the supply chain such as raw materials, assembling of components, manufacturing, transportation to the suppliers' factories and transportation to customers (Van Loon & Van Wassenhove, 2020). As mentioned, transportation entails environmental costs, such as energy usage as well as air and water pollution (Lu et al., 2011). However, there are ways of trying to minimise transported miles, such as consolidation. This phenomenon and the impacts of transportation will be further explored in the section "2.4 Consolidation". When a product

has reached its end of life, it can either be remanufactured, recycled, or put into landfill. Further, depending on how the product is handled, it will result in a negative or a positive CO_2 value, where a negative CO_2 value implies environmental benefits from recycling. (Van Loon & Van Wassenhove, 2020)

Apple wants to reduce their environmental footprint and has set a goal to one day use 100 percent recycled materials (Petrova, 2018). The company's work is going in the right direction as Apple now uses 100 percent recycled tin in the logic board of their newest iPhones (Petrova, 2018). Moreover, the company has a new program called "Apple Trade In", where consumers can turn in their devices and get a credit towards their next purchase or get a gift card they can use anytime. If the phone is in good condition it may go to a new owner, otherwise it will be sent to Apple's recycling partner. (Apple, 2021a) Apple has several different recycling facilities, placed in several different countries such as Argentina, Azerbaijan, Brazil, Bulgaria, Cambodia, etcetera (Apple, 2021b). Moreover, iPhones can be sent to the Daisy robot for recovery (Apple, 2021a). Daisy is an innovation made by Apple and can recover 1900 kg Aluminum, 0,97 kg Gold, 710 kg Copper, 0,10 kg, Palladium, 42 kg Tin etcetera from every 100,000 iPhone devices (Petrova, 2018). Daisy is placed in Apple´s Material Recovery Lab in Austin, Texas as well as at an Apple site in the Netherlands (Apple, 2020)

As mentioned, the Supply Chain activities do not end at the end customer in a Circular Economy as the loop should be closed (Stahel, 2016). Much like in his article from 2016 (Stahel, 2016), Stahel (2019) illustrates that there are two return logistics loops, one back to the manufacturers of goods for used objects; and one back to the materials producers for used molecules. Although, Stahel (2019) illustrates that these two groups can be combined to enable a zero-waste operation. Xerox Corporation has successfully made use of this strategy mix since the early 1990s, where they remanufacture used equipment in regional factories; and return material from components that cannot be remanufactured to the original producers (Stahel, 2019; Fleischmann et al., 2001). Another company using this business model is Canon (Fleischmann et al., 2001). Further, Stahel (2016) explains that Michelin, who sells tires "by the mile", sends their worn tires to a regional plant for reuse. This phenomenon of reverse logistics is further investigated in the next section.

2.3 Reverse Logistics - Closing the loop

As landfill and waste has become a big concern in industrial countries and product recovery has gotten bigger attention, this calls for the need of implementation of proper logistics infrastructure to be able to proceed the flows of recovered and used products (Fleischmann et al., 2001). Further, it is crucial for companies to propose methods for the returned goods (Daaboul, Le Duigou, Penciuc & Eynard, 2014). However, reverse logistics also has environmental impacts, such as water & air pollution, made by transportation (Lu et al., 2011). Reverse logistics is a part of supply chain management but has in terms of priority and analysis been ignored. Reverse logistics is often considered as the movement of items from the customer back to the manufacturer, with the purpose to reuse, recycle or dispose of it. (Marsillac, 2008; Pacheco et al., 2018) Moreover, reverse logistics is also considered as a closed loop supply chain, as the product stays within the same supply chain from the manufacturing to its end-of-life (Marsillac, 2008). As explained by Pacheco et al. (2018), reverse logistics closes the life cycle of products and materials. Pacheco et al. (2018) further elaborates this by explaining that reverse logistics can be divided into two areas, after-sales and after-consumption reverse logistics. After-sales logistics is about controlling the destination of unused products while after-consumption considers used products at the end of their life cycle that are to be reused or disposed (Pacheco et al., 2018). The green supply chains try to erase or minimise the environmental impacts and should therefore include reverse logistics by handling waste and returns (Marsillac, 2008).

However, the main goal of reverse logistics is to optimise after-sales activities and make them more efficient (Pacheco et al., 2018). This is agreed by Marsillac (2008), who explains that the initial focus is the environmental savings, which separates reverse logistics from green supply chains where the main focus is on sustainability. Therefore, not all reverse practices are green. If all reverse practices were green, the main aim of reverse logistics would in that case be to handle products' life cycles, including the handling of products after the end-of-life, in an environmentally sustainable way. (Marsillac, 2008)

Daaboul et al. (2014) state that environmental impacts should be implemented as decision criteria, meaning that reverse logistics networks should be as green as they can possibly get. Further, Marsillac (2008) describes that reverse logistics consists of four main standards and all four standards focus on environmental issues. The standards include erasing environmental hazardous materials and products, such as better management that

limits returns of products; use of material within the system that can be reused, such as containers; use of environmentally sustainable materials and products and not non-sustainable product materials, such as packaging with cardboard instead of polystyrene; and recycling the materials within the system and collect the product materials from customers (post-consumer collection). (Marsillac, 2008) The shown negative impacts from the industrial sector, such as water and air pollution, have increased the interest of reverse logistics (Lu et al., 2011; Pacheco et al., 2018; Daaboul et al., 2014). Reverse logistics is one way to advance in the cooperation between industrial operations and environmental management. (Pacheco et al., 2018; Lu et al., 2011). According to Daaboul et al. (2014), the main forces for working with reverse logistics are threefold; regulations and legislations, social responsibilities towards the environment, and customer awareness. For example, the implementation of reverse logistics in networks that reuse, recycle and reduce waste from other processes within companies can give organisations an image of being corporate. (Daaboul et al., 2014)

Reverse logistics is a vital phenomenon within the telecommunications sector as the climate is in need of change, as it is not sustainable to manufacture products that later will be disposed of in landfill. The climate requires more sustainable solutions such as recycling and reuse, which the telecommunications industry has an opportunity to do as it is well known that telecom equipment consists of ferrous and non-ferrous metal and precious metals, which are materials that could be recycled through reverse logistics. (TXO Systems, 2017) This is discussed in the next sections. However, reverse logistics is one component in Supply Chain Management that is lagging behind, as recent literature indicates that research on logistics environmental issues is exploratory and inconsistent. The development and design of reverse logistics has to account for the environmental issues that it brings. Yet, many of the intentions to address the environmental issues remain preliminary. Reverse logistics does not only mean putting companies at risk, but it also creates a lot of opportunities for improvement and can create a competitive advantage. (Marsillac, 2008) Next, the reverse logistics network design is explored to see what steps it entails.

2.3.1. Network Design

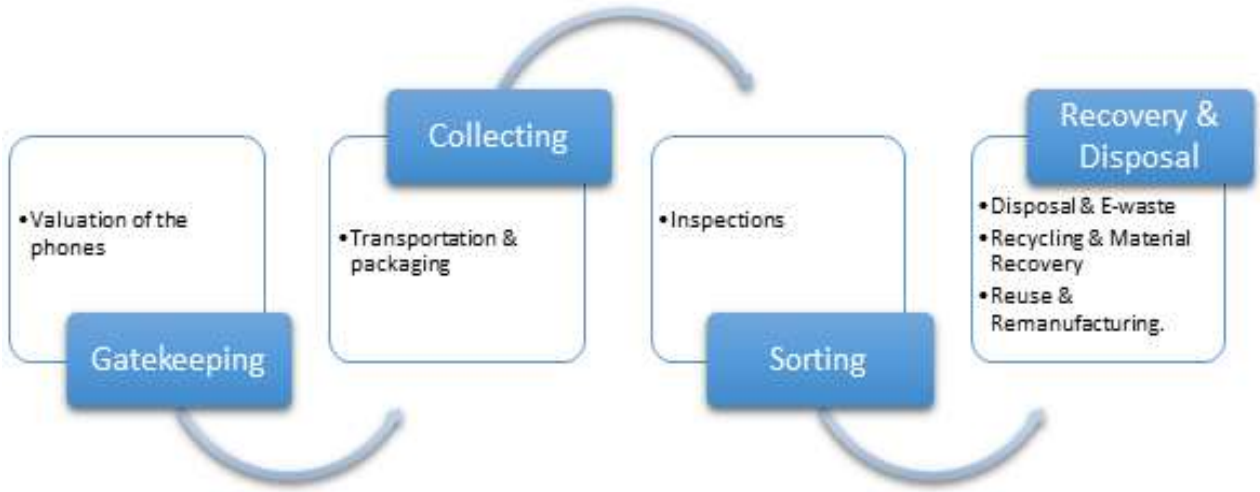

Figure 4 - Reverse logistics network design (own construction)

Several authors (Cullinane, Browne & Karlsson, 2017; Daaboul et al., 2014; Lambert, Riopel & Abdul-Kader, 2011) agree that reverse logistics consists of four fundamental activities. These activities are also agreed by Kissling et al. (2012) to be a part of the value chain within the EEE-sector to in the end, at least ideally, form a closed loop. There is somewhat a variation among the specific names on the activities, although, the basis of the implications is practically the same. The activities can be concluded as Gatekeeping, Collecting, Sorting, and Recovery or Disposal and will be explained below as well as displayed in figure 4.

The *Gatekeeping* system introduces the product return and reverse logistic and takes place when a customer wants to return a product (Cullinane et al., 2017; Lambert et al., 2011). Moreover, it is the phase before the possible physical returnment (Lambert et al., 2011). Further, the step implies the decision regarding the product's fate: if it is allowed into the reverse logistics system or not (Cullinane et al., 2017; Lambert et al., 2011). This decision is handled by technical assistance, i.e. return policy, where the company tries to determine whether the product should be returned or not (Lambert et al., 2011). However, the decision as to whether products are allowed into the system is not of importance for the scope of this thesis, as Van Loon & Van Wassenhove (2020) and Stahel (2016) explain that all phones should be returned to the company to foster optimal recovery within Circular- and Performance Economy.

Still, the gatekeeping system implies decisions regarding the product's fate, which is of relevance for this thesis. Similar to how Lambert et al. (2011) explain how the decision regarding the product's fate is

handled by technical assistance by return policy, valuation policy could be handled by technical assistance as well. But in this regard, the decision is not about if the product is allowed back or not, but to what destination the phone should be sent. This type of valuation policies can be found in Tre, Telenor and Tele2´s technical assistance, where the companies have valuation steps in their reverse logistics where consumers make a valuation of their phone before the physical return (see "2.1.1.1 Examples from the industry"). Therefore, the gatekeeping system in this thesis is a process where a valuation of the phone is made, to decide where the phone should be transported. For example, phones that are in good condition could be sent directly to its right destination for remanufacturing, while phones in poor condition could be sent to a recycling center. Without proper valuation the phones could be sent to wrong destinations, leading to unnecessary transportation. By this, the gatekeeping system involves office space, personnel and office automation (Lambert et al., 2011)

The *Collection* system implies collection of returned products from end customers (Daaboul et al., 2014; Lambert et al., 2011). Moreover, this system implies the transportation of the returned units. This can be handled by the company itself, the customers and a third-party, the decision lean on several factors such as reason for return and the product's complexity. Further, if the customer is responsible for returning the product, clear instructions are required such as return address and packaging. Depending on the reason for returning, the product may be sent to different destinations. Further, the collected products get preliminary grouped based on the product's subsequent operations, such as recycling or remanufacturing and reuse. (Lambert et al., 2011)

The *Sorting* system implies the decision on what to do with each collected unit, such as type of recovery treatment (Daaboul et al., 2014; Cullinane et al., 2017). The company must do inspections and test the products current conditions to decide how the product should be treated, after standards and criteria for accepting a returned product that it decided upon in the Gatekeeping phase. (Lambert et al., 2011) The preparation for reuse implies recovery of the function that the product or component was designed for. Moreover, the preparations involve cleaning, testing the function, electrical safety, repair, component exchange and installation regarding products software. (Kissling et al., 2012)

The last step, *Recovery or Disposal*, is about the choice of disposal, or the destination of the product. This implies two possible destinations, renewal, or removal. (Lambert et al., 2011) The recovery system implies activities such as remanufacturing,

recycling, reselling, landfill etcetera (Daaboul et al., 2014; Lambert et al., 2011). Three main destinations have been identified in this last step, Disposal & E-waste; Recycling & Material Recovery; and Reuse & Remanufacturing. These will be presented and explained under the next three headings.

2.3.1.1 Disposal & E-waste

E-waste is the sector with the fastest growing domestic waste in the world, due to short life cycles and few repairing options (ISWA, 2020). Rousseau (2020) describes that the characteristic of a smartphone implies rapid replacement due to technological innovations and digitalisation which makes the typical life span for a smartphone between two to three years. In addition, Robinson (2009) argues that phones are normally considered as the electronic items with the shortest life span. Further, the design of a smartphone is often reported to become rapidly outdated due to several different things such as limited software compatibility that makes it impossible to use old phones as it will not support the newer software; that the material it consists of has a much shorter life cycle compared to other alternatives; stimulate a perceived feeling of obsolescence due to involvement of fashion trends; usage of expensive parts; and making the smartphones hard and impractical to upgrade and repair. (Rousseau, 2020) Buchholtz (2021) also emphasises that the characteristics of appliances are rarely being built to last. Moreover, the author describes that another factor contributing to the growing e-waste is appliances that are getting cheaper. In addition, higher living standards around the world make it possible for more people to afford these appliances. Therefore, the growth of e-waste might be hard to stop which makes it even more important that recycling and safe disposal grow at the same pace as the e-waste. (Buchholtz, 2021)

2019 was a record year in terms of e-waste production: 53.6 million tons (Mt) was produced globally (ISWA, 2020; Buchholz, 2021), 17.4 percent was recycled and most of it was dumped or burned (ISWA, 2020). E-waste implies disposal of electronic items, such as computers and mobile phones. Further, e-waste consists of valuable metals such as Cu, (platinum group). (Robinson, 2009) Which means that high value metals such as gold, silver, copper etcetera valued at US $57 billion, were burned or dumped instead of being gathered, treated, and reused (ISWA, 2020). Moreover, Diouf, Pode & Osei (2015) explain how mobile devices are exponentially increasing. Therefore, the amount of e-waste from mobile phones, together with computers (the item with second shortest life span), are overrepresented compared to other types of e-waste (Robinson, 2009). The overproduction of mobile electronic devices and its short life cycle contributes to

environmental pollution and global warming (Diouf et al., 2015). As there is also a shortness of raw materials in the industrial sector, there is a need to find new techniques and methods to decrease the consumption of such products (Pacheco et al., 2018).

In 2019, Europe produced 12 Mt e-waste, making Europe the third largest e-waste producer, while China and America had the highest amount of produced e-waste in 2019. However, according to the Global e-waste monitor 2020´s key findings, Europe had the highest e-waste disposed per capita, 16.2 kg, while China and America produced 5.6 kg per capita and 13.3 kg per capita, respectively. The amount of e-waste has increased by 21 percent between the years of 2014 and 2019. To put it into perspective, the weight of the e-waste produced in 2019 is a lot heavier than the weight of all the adults living in Europe. Further, 2019´s e-waste per capita was averaged at 7.3 kg for every human on earth, both children, women, and men. It is estimated that e-waste will reach 74 million tons by 2030, which is close to a doubling in 16 years. (ISWA, 2020)

Most Electronic waste is disposed of in landfill (Robinson, 2009), the space available for landfill is decreasing as the population is growing. While landfill continues to expand at an exponential rate, spatial limitation has forced the governments to act by stringent waste management. (Marsillac, 2008) Wealthy countries export e-waste to poor countries in an unknown quantity, even if it is illegal, where the e-waste gets handled with poor techniques that dissolute strong acids and does not protect the environment nor the humans. This results in extreme local pollution and pollution of food chains and water as the wide community obtains contaminants through smoke, eating food, drinking water and dust in the air. (Robinson, 2009) Valero Navazo et al. (2014); ISWA (2020); and Robinson (2009) agree that e-waste is a danger for both humans and the environment as it consists of toxic substances such as mercury which pollutes the environment if it is landfilled or handled improperly. The toxic substances can damage humans' brains and the coordination system (ISWA, 2020). Evidence also shows that pollution from e-waste can be present in exported manufactured and agricultural products. Therefore, rich countries have an interest in decreasing e-waste, as it will affect the quantity and the quality of the imported manufactured goods and food from these poor countries. (Robinson, 2009)

Moreover, the chemical architecture of e-waste is changing as environmental organisations and new technologies pressures firms to find alternatives that are more environmentally friendly. For example, technology that in an effective way with minimal environmental impacts, reprocesses the e-waste which recovers the valuable

materials. (Robinson, 2009) According to The Global E-waste Monitor 2020´s key findings, proper management regarding e-waste helps to minimise global warming (ISWA, 2020). Lastly, there are regulations and legislation on how companies must properly dispose of their telecommunication equipment to be sustainable, such as proper processing and treatment of the equipment. (TXO Systems, 2017)

2.3.1.2 Recycling & Material recovery

Devices are often discarded in a non-responsible manner which may lead to an irreplaceable loss of resources as smartphones consist of many precious and rare metals, such as gallium, indium, and neodymium (Rousseau, 2020). The recovery of metal waste is made by major primary metal manufacturers as the primary production and the process of recycling metals are very similar, one of the world's best examples of this is placed in Boliden in Sweden. Recycling in a proper manner is important for our environment, as it reduces a major amount of hazardous waste. (Valero Navazo et al., 2014) At the University of Plymouth, some researchers have made a study to analyse and see what an iPhone 4S is made of. The results of this can be found in Table 1.

Material	Grams in an iPhone 4S
Iron (Fe)	33
Silicon (Si)	13
Chromium (Cr)	7
Copper (Cu)	6
Carbon (C)	4
Nickel (Ni)	2.7
Aluminium (Al)	2.5
Calcium (Ca)	1.6
Tin (Sn)	0.7

Table 1 - Materials in an iPhone 4S

Figuratively speaking, a hole equivalent to around 10-15 kilograms is left in the ground to extract all the metals and minerals needed for each produced iPhone 4S, what is startling about this is that this iPhone only weighs 140 grams. (Williams, 2019) The main refining industrial processes in general recover between 80-99% of the copper, silver, lead, gold, nickel, antimony, PGMs (platinum group metals), and tin. This means that 1 ton of recovered mobile phones recovers 128 kg of copper, 3.63 kg of silver, 6 kg of lead, 0.347 kg of gold, 15 kg of nickel, 1 kg of antimony, 0.15 kg of palladium and 10 kg of tin. (Valero Navazo et al., 2014)

Moreover, besides usage of material, energy is important in producing and using smartphones (Rousseau, 2020). The consumption of energy in the production of a mobile phone is 60-80% of the total energy

consumption in a mobile phone´s life cycle. Recycling and recovering of the metals that a mobile phone consists of could reduce this amount as it consumes a lower amount of energy as it has lower energy requirements. (Valero Navazo et al., 2014) For example, to produce 1 ton of aluminum, almost 19,000 kilowatt hours (kWh) of electricity and 10,000 kWh of fossil fuel is required. However, a theoretical energy gain of around 1,100 kWh of fossil fuel and 15,000 kWh of electricity per ton can be made if you recycle aluminum instead of extracting energy. (Stockholmsregionens Avfallsråd, 2007) More than 90% of the energy is saved when recycling aluminum and the process of recycling can take place almost any number of times. The process of recycling aluminum includes melting down the aluminum and recycling it into aluminum ingots. (Återvinning Stockholm, 2021) Moreover, when recycling iron, around 2000 kWh energy/tons can be saved (Återvinningscentralen, 2007)

The recovery of copper from mobile phones consumes around half of the amount of energy that is crucial for primary production (22,007- 23,125 Megajoule (MJ) per ton in comparison to 45,000- 46,800 MJ/ton). Greater or similar savings of energy is reached in the recovery process for more precious metals. As the precious metals are typically only found in quantities less than 0.01% on Earth, the extraction of these requires more energy as the ore grades decrease due to exploitation of these resources. In addition, the extraction is cause for forced migration, conflicts to access minerals, landscape destruction, contamination from dust, and leaks of poisonous substances. (Valero Navazo et al., 2014)

Today, only 2.5% of mobile phones are returned to industrial recovery facilities for recovery and 50% are kept in the drawer in people's homes (Valero Navazo et al., 2014). Six years later, the study by Rousseau (2020) in Belgium found that 73% keep their phone at home as a spare. Moreover, it was found that 12% own a reused phone and 15% offered their phone for reuse in different ways (Rousseau, 2020). Valero Navazo et al. (2014) strongly emphasise how there is great potential to increase the number of recovered metals, which would increase the resource efficiency and minimise the consumption of energy. The authors (Valero Navazo et al., 2014) therefore hope that their study will enhance the efforts placed on increasing the recovery of used mobile phones. Furthermore, Wilhelmsson (2019) emphasises the importance of reuse by selling it again and recycling of “old” phones, instead of leaving the phones at home in the drawer.

"We hope that they [consumers] can now look at their phone in a different light, not just as a high-tech gadget, but also as an item that is manufactured from raw materials, that are mined. So every new phone leaves a whole in the ground the size of 10-15 kg of rock—in fact it is a whole series of little holes all around the world. That is, unless it is made from recycled materials."

- Arjan Dijkstra, one of the researchers at the University of Plymouth (Wilhelmsson, 2019)

Kissling et al. (2012) stress that there is a distinction between the activities of recycling and reuse within the EEE-sector. They mean that recycling is the recovery of materials in a product, while organisations that work with reusing products first and foremost see if the product can be sold again (Kissling et al., 2012). This will be discussed below.

2.3.1.3 Reuse & Remanufacturing

According to Van Loon & Van Wassenhove (2020) remanufacturing is about returning the product to the same quality level of a new product, this entails the most rigorous recovery process. As seen in figure 5, it includes disassembly to component level, careful inspection, and testing of the components, and lastly assembly of approved parts. The initial separation between components that are to be further processed and components that are to be scrapped takes place in the inspection part of the process. Although, it is common that more components are identified as not reusable also later in the process in industries like automotive and appliances. (Van Loon & Van Wassenhove, 2020) In other words, that a component is identified as reusable at the inspection stage is not a guarantee that it is reusable.

Kissling et al. (2012) clarify that reuse and recycling does not compete against each other on being an end-of-life solution. Instead, the two phenomena optimise ecologic and economic efficiency by expanding the using phase of the product and thereby the product's whole life cycle (Kissling et al., 2012). For example, Diouf et al. (2015) mention that when a mobile device is sent to recycle the battery that powers the mobile phones still have more than half of its life left and could therefore be given a second life. If the equipment is firstly handled by a recycling-oriented operator, the reuse value might be destroyed, as the product is not used to the definite end of its life cycle before being recycled. Therefore, it is of importance that reuse companies have a great management regarding proper reuse, recycling, and disposal. Reuse organisations may therefore also offer recycling services, but these mostly consist of disassembly before sending the material to a recycler. The

two activities, recycling, and reuse, contain different logistical arrangements. (Kissling et al., 2012) The remanufacturing can be done within the same manufacturing facilities as the original products are made, and with the same equipment. If a product cannot be wholly used, companies can reuse separate parts as spare parts, and send the rest of the product to a third party for manufacturing recycling. (Fleischmann et al., 2001) Daaboul et al. (2014) further emphasise that the different facilities of collection and remanufacturing etcetera does not have to be owned by one company itself.

Van Loon & Van Wassenhove (2020) have assessed the environmental impacts of a manual remanufacturing process. Here the environmental impacts are mainly related to materials and resources that are used in the production and Van Loon & Van Wassenhove (2020) therefore conclude that the remanufacturing has a positive environmental impact as components are reused and their life span extended. The saved CO_2 emissions suggests that the number of remanufactured products should be maximised in order to minimise the environmental impact. However, it is important to remember that these conclusions come from the assessment of a manual remanufacturing process where the amount of energy used in the disassembly and assembly is insignificant. The case might be different with an automated remanufacturing process. (Van Loon & Van Wassenhove, 2020)

Figure 5 - The remanufacturing process (modified from Van Loon & Van Wassenhove, 2020)

2.4 Consolidation

The modern manufacturing practice, increased demand, and the need for good service quality from customers has led to the need for higher delivery frequencies and larger quantities of freight shipments from, to or transiting through urban areas. This increased traffic competes with passenger vehicles for parking space and road capacity, and therefore takes part in congestion and other environmental problems such as emissions and noise. According to the U.S Department of Energy, 27.2 % of the total highway transportation energy consumption and 66.4 % of total highway vehicle PM2.5 (particulate matter with particle diameter no more than 2.5 micrometers) emissions come from heavy vehicles. (Lin, Chen & Kawamura, 2016)

Urban consolidation centers (UCC) can be defined as a facility closely located to a specific area, that receives deliveries from carriers and is thereafter responsible for the last part of the transportations, for example into the city. This transportation is done in a consolidated manner, with minimal frequency and shortest route possible, and often with environmentally friendly vehicles. To better utilise shipping capacity and storage space, some European countries have deployed urban delivery consolidation by setting up cooperation between suppliers, carriers, and customers. (Lin et al., 2016) The implementation of this consolidation approach can decrease the environmental impacts (Zhang, Lin, Huang, & Hu, 2021). Specifically, consolidation could reduce congestion and vehicle emissions in urban areas if it is set up properly. Consolidation can also benefit companies with activities within logistics and the environment, such as improving efficiency, lower costs, reducing congestion, emissions, and energy due to vehicle utilisation and eliminating unnecessary trips. (Lin et al., 2016) That consolidation offers better vehicle utilisation and efficiency gain is also emphasised in Venkatadri, Krishna, & Ulku`s (2016) study.

Lin et al. (2016) examine the effectiveness of urban delivery consolidation on reducing vehicle emissions and energy use. This is done by comparing direct delivery with delivery using UCC to retail stores in urban areas. In terms of load factor, it is found that the benefits of using UCC decreases as the load factor in direct delivery increases. This means that when the direct delivery approach has almost full loads (82%), the UCC approach does not provide fuel or emissions savings as direct delivery is more efficient. However, it is argued that the truck load level needed for this to happen is almost never reached in reality. So, a higher load factor can be expected by using UCC, which implies that UCC can actually reduce energy consumption and emissions. (Lin et al., 2016) This is agreed by Mesa-Arango &

Ukkusuri (2013), who emphasise that high usage of consolidation in Less-Than-Truckload (LTL) imply positive impacts on the transportation network as consolidation can reduce the number of truck-miles driven. This is because consolidation offers a more efficient use of the vehicles and thereby mitigate negative impacts such as traffic congestion, destruction of infrastructure, accidents, and emissions. This explains the fact that public agencies and researchers have recommended consolidation policies to increase the utilisation of truckload. (Mesa-Arango & Ukkusuri, 2013)

The LTL presents an issue as there is a trade-off between more transportations required and less emission and energy consumption per vehicle. This is one explanation why large chain stores are not likely to use UCC (they can fill their shipments themselves). In terms of customer density and customer demand, they found that the energy consumption, PM2.5, and cost decreases as the customer density increases. This suggests that the benefit of UCC is higher. An explanation for this might be the economics of scale, as high customer density and customer demand leads to more potential users of UCC as well as more direct delivery trips. (Lin et al., 2016)

Lin et al. (2016) concludes that the logistics costs and the environmental impact of using UCC do not always trend in the same direction. Nevertheless, what can be seen from the study is that when there is an economy of scale or high customer density, both economic and environmental sustainability can be possible outcomes. Meaning that certain conditions are required to achieve both monetary and environmental benefits of UCC, compared to direct delivery approaches. The general belief that UCC reduces truck trips and therefore truck vehicle miles driven, congestion, and emissions is therefore not always applicable. (Lin et al., 2016)

Consolidation of freight by 3PL companies is used to maximise wagon utilisation and to minimise cost of transportation by combining different products with different times windows and locations into one transportation wagon. A consolidation approach could therefore benefit the operational effectiveness. (Baykasoglu & Kaplanoglu, 2011)

3. Methodology

The following chapter describes and motivates the choice of methods for the thesis. The choice of case company, collection of data, and analysis method is explained and motivated. Further, aspects of research quality and research ethics are gone through.

3.1 Research Design

The purpose of this thesis is to investigate whether the Performance Economy model could be a possible way forward for the telecommunications sector when selling mobile phones in terms of environmental sustainability and customer preferences. To fulfil this purpose, a qualitative case study of the company Telia Company AB, Sweden's biggest telecom operator and part of the Telia Company AB Group, has been conducted. As the aim is to explore a single phenomenon to get deep knowledge of the subject, which is how Collis & Hussey (2014) define case studies, this is seen as a relevant approach for this type of study. Detailed information about the Performance Economy, the activities required for this model and customer preferences in regard to leasing and reuse of mobile phones has been collected. This is to emphasise patterns and experiences related to the phenomenon of Performance Economy, which is how Collis & Hussey (2014) define a qualitative research approach. Further, the study is within the interpretivism paradigm, meaning that the world and reality is seen as dependent on people´s subjective views and interpretations (Collis & Hussey, 2014). As explained by Bryman & Bell (2011), focus is on understanding the world through examining the interpretations participants have of that world, in this case a reality where people lease and reuse their phones.

After the focus area was determined, literature searches were made to gather information on earlier research on the subject. Literature has been gathered through search engines such as Google Scholar, the university of Gothenburg “super search”, ordinary google searches, Retriever Business, etcetera. The searches were made with key words such as; Circular Economy, Performance Economy, telecommunication, supply chain management, reverse logistics, environmental costs, customer preferences, leasing, reuse, and recycling. As there are few or none earlier studies conducted that map the activities and environmental impacts included in the Performance Economy within the telecommunications industry, this was done in an exploratory manner as this is recommended by Collis & Hussey (2014). The aim is therefore to look for patterns and ideas to obtain insights into the phenomenon (Collis & Hussey (2014).

To investigate whether the Performance Economy model could be a possible way forward for the telecommunications sector when selling mobile phones, the environmental gains and costs of the business model have been evaluated. This is done to explore if the sustainability incentive to use this business model is valid within the telecommunications industry. Further, customer preferences have been explored to see if customers are prepared to adopt leasing and reusing of their phones. The aim is to get a deep and subjective understanding of the phenomena of environmental costs; and customer preferences within the Performance Economy, to answer questions such as why and how these phenomena are impacted and impact the use of a Performance Economy model. This emphasises patterns of meanings and experiences, which is how Collis and Hussey (2014) define qualitative research. Existing theories and concepts have been assessed to see if they can be applied to answer the research questions, if new theories need to be developed (Collis & Hussey, 2014), and how they can be combined/compared to empirical findings of the case company. Pros and cons with the business model have been analysed to get a sense of what environmental impacts leasing and reuse of mobile phones entail. To exemplify, there might be a different need for transport for reuse than for new production. The empirical data was collected through a discussion with the case company to get a sense of what problems and opportunities they see with the economic model.

Per definition, the exploratory research used in this study is rather open and aims at gathering a wide range of information and impressions. The objective of the study is to guide future research on the subject. (Collis & Hussey, 2014) Moreover, the study should guide companies in what aspects that need to be considered before implementing this type of business model. According to Collis and Hussey (2014) there are two main types of research that determine the logic of the research, these are inductive and deductive research. Inductive research means that theory is developed from empirical reality, thereby you move from individual observations to general statements. Deductive research, on the other hand, moves from the general to the particular. Here, a theoretical structure is developed and later tested through empirical observation. (Collis & Hussey, 2014) Further, Collis & Hussey (2014) argue that these different kinds of research can be combined and that the study should not be too constrained in using just one. Therefore, this study uses both a deductive and an inductive research design. First; a theoretical structure has been developed with general theory on Performance Economy and Supply Chain activities. This theory has been analysed and

then tested through empirical observation within the case company in line with a deductive research design. Secondly; the similarities and differences from the analysis and empirical findings will help to develop conclusions that can be applied within the specific field of the telecom sector, in line with an inductive research design. To simplify; the study goes from deductive, to inductive in the sense that it starts general, moves into the detail of the telecommunications sector and Telia and then goes on to make general statements based on empirical findings from the case company.

3.2 Case Company

Initial contact with the case company, Telia Company AB, was made in April 2020 by one of the writers as she worked and is still working for the company. Interest was raised by both a representative for the company and the writer to collaborate in a future Master Thesis. Contact was resumed in December 2020 when a supervisor, Annika Wennberg (Head of Logistics Operations), from the company was assigned to the Thesis project. Telia Company AB was also chosen as an appropriate case company as it is the largest telecom operator in Sweden and partly government owned (Wikipedia, 2020). Therefore, the company is considered as a suitable representative for the telecommunications sector in Sweden. Moreover, Telia Company AB has ambitious goals in terms of sustainability, for example their goal is to have zero emissions and waste by 2030 and want their suppliers and customers to be part of this journey (Telia Company, n.d.a).

> *"By being connected, people all over the world can explore, invent and share. And this is our business - to connect and include even more people through technology. The customers are our champions in everything we do. They determine our purpose."*
>
> (Telia Company, n.d.b)

The environmental aspects in Telia´s own organisation consist mainly of energy, greenhouse gas emissions, and electronic waste. Although, the biggest environmental impact lies in the value chain, in the manufacturing of for example mobile phones. For Telia to reach their goals, they say it is crucial that they work with the whole value chain, as suppliers also need to reduce their greenhouse gas emissions for the company to be climate neutral in 2022. To reach the zero-waste goal, they are going to adopt a Circular business model. Telia sees that they will not reach their goals on their own and will therefore collaborate and create solutions with suppliers, customers, and

other partners. Further, they will be transparent with their progress and lessons learned on the way. (Telia Company AB, 2019) By this, we can see that Telia is already preparing for or using a Circular business model and is open in finding new ways of operating. This has also been the general feeling in our initial meetings with the company. Moreover, a reuse approach has already been adopted by Telia in the form of a "trade in" service. Here, customers can evaluate their old phone, and depending on its condition, get a discount when they buy a new phone. Later, Telia sends a return package for the old phone together with the new phone, to the customer. Telia argues that this is a more sustainable option as it prolongs the phone´s use phase and recycles what cannot be reused. (Telia, n.d.a) Further, Telia offers phone as a service to companies where companies can get the latest phone at a fixed monthly price and quick support if needed (Telia n.d.b)

The conclusions of the study are limited to Telia and the generalisation of the study to other cases might therefore be questionable. Although, parallels can be drawn to similar businesses within the same sector and there is considerable reason to expect that other companies within the same sector have similar activities. As explained by Collis & Hussey (2014) it is possible to generalise from a single case if the analysis captures interactions and characteristics of the phenomena.

3.2.1 Apple iPhone

This study is further limited to investigate Apple iPhones in terms of material use and supply chain activities, as this is one of the most commonly used brands in the world (Counterpoint, 2021). Moreover, iPhones are the most used phone model in Sweden (internetstiftelsen, 2019). Similar to the case company, this limitation is also believed to be rather generalisable as most phones of approximately the same size are anticipated to contain roughly the same materials and processes. Apple Inc. is an American computer and home-electronics company, founded by Steve Jobs, Steve Wozniak, and Ronald Wayne in 1976 (Wikipedia, 2021). Apple's products are known for their easy use and elegant design and today the iPhone stands for the main part of Apple's income (Wikipedia, 2021).

3.3 Collection of Data

This research makes use of archive searches and a discussion with the case company. As explained by Collis & Hussey (2014), it is favorable to use several data collection methods rather than just one, it would therefore be preferable to have complemented the discussion with observations of Telia´s logistics activities.

Although, this was not feasible due to the current pandemic that does not allow us to visit the company. Therefore, the primary data consists of an online discussion with the case company and the secondary data consist of archive searches. All collected data is of a qualitative nature and aims at explaining both customer preferences, as well as the environmental impacts of the Performance Economy.

3.3.1 Primary Data

In the paradigm of this thesis, interviews aim at, among other things, exploring data on understandings, opinions, and attitudes (Collis & Hussey, 2014). To capture this and to anchor the results of the analysis to reality, a discussion was held with the case company. This discussion would by Collis & Hussey (2014) and Bryman & Bell (2011) be described as a partly open and partly semi-structured interview. Initially, the findings of the analysis were discussed, and the respondent gave their general opinions and attitudes of the conducted analysis. This was done to see where Telia could identify problems and/or opportunities with this analysis. Thereafter, some more specific questions, or topics of discussion, that had been identified in areas in which Telia could contribute with their specific knowledge was discussed. These were open-ended questions, which meant that they required a well developed answer (Collis & Hussey, 2014). To give the respondents the prerequisites to think their thoughts and answers through, the findings of the analysis as well as the topics of discussion, were sent to the supervisor at Telia beforehand. Based on this, three members of the company that could contribute to the discussion were identified. The respondents had full access to the analysis and were asked to come with insights to the analysis where they saw fit. The topics of discussion can be found in Appendix 1.

The discussion was held online, via Teams with video cameras on to capture the respondents' gestures and facial expressions which makes it easier to interpret the answers. A face-to-face discussion would in this context be preferable but due to the current pandemic this was not an alternative, and the online meeting enabled us to meet the respondents with rather short notice and made it easier for the respondents to make time in their hectic schedules. The Teams meeting was not recorded as we wanted the respondents to feel free to express their thoughts and opinions even though it could have helped to be able to look back at what was said during the discussion. This uncertainty was handled by taking detailed notes from the meeting and sending the empirical findings to the respondents for approval. Further, it was chosen to conduct the discussion in a group with all respondents

at once to get the respondents joint opinions and answers. By this, the respondent best equipped to answer the question could share their answer while others could join in if they had a different view of things. The pros of this are that, as the discussion was very open, the respondents could together discuss and come up with the most correct answers. However, the risk is also that everyone does not feel comfortable expressing their opinion. The findings of this discussion are presented unanimously as empirical findings from the case company Telia. However, the persons participating in the discussion are listed in the table below.

Respondent	Title
Annika Wennberg	Head of Logistics Operations
Claes Nord	Business Process Improvement
Kalle Jonsson	Logistics Manager Sweden

Table 2 - Respondents at Telia

Information was also gathered from the case company to specifically complement the theoretical chapter about supply chain activities and new production (2.2.1 New Production). This information was gathered by asking questions about Telia´s logistics activities in a Teams meeting with the supervisor at Telia. These questions were looked up and answers to these were collected through email. These questions can be found in Appendix 2.

3.3.2 Secondary Data

Secondary data is used to understand the topic and to conduct a literature review which is a vital part of the study. As mentioned, literature searches were made through search engines such as Google Scholar, the university of Gothenburg “super search”, ordinary google searches, etcetera. The main sources used are academic articles and general information about e-waste and recycling from different web pages. The academic articles used are believed to have a high credibility, while some web pages that are used might be biased to some extent. For example, one web page (TXO Systems, 2017) is produced by TXO, who is a provider of management services, so of course they want to highlight that reverse logistics is important so that you buy their services to help you organise this. Moreover, Wikipedia is an often criticized source that has been used in this thesis to gather summarised information about Apple Inc. and Telia Company AB. When using Wikipedia, the primary sources specified at the website have been looked up to validate the information and therefore, Wikipedia is believed to be a good source of this type of objective and summarised information.

3.4 Analysing the Data

As the study once again is under the interpretivist paradigm, non-quantifying methods have been used when analysing the data as we are seeking depth and richness of the data. According to Collis & Hussey (2014), the analysis of qualitative data involves three activities. First, the data is reduced (Collis & Hussey, 2014). This was done continuously throughout the thesis project, both when data was collected and when it was summarised, organised, and simplified in the analysis. Secondly, the data is displayed visually (Collis & Hussey, 2014). This is done in the form of two SWOT-analyses that aim at identifying the strengths, weaknesses, opportunities, and threats of implementing a Circular- and Performance based business model in terms of environmental sustainability and customer demand. The method used in this SWOT-analysis is described in detail in the next section. Lastly, findings are validated (Collis & Hussey, 2014). This was done through a discussion with the case company to get their view and inputs, as well as discussing certain topics that have been identified during the analysis which is the basis of the empirical findings as explained in "3.3.1 Primary Data". The empirical findings are followed by a discussion (chapter 6) where the main findings from the SWOT-analysis and empirical findings are debated and the conflicting findings of the thesis are discussed with theory that is used to strengthen the discussion and make statements that lead us to the final conclusions where the research questions are answered. That is;

Q1: Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of environmental sustainability?

Q2: Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of customer demand?

3.4.1 SWOT-Analysis

The SWOT-analysis is qualitative and descriptive in nature and is an analysis method used to assess the strengths, weaknesses, opportunities, and threats of an organisation, a plan, a project, a person or a business activity (Gürel & Tat, 2017). This was done in two steps, first a SWOT-analysis was conducted on implementing a Circular business model (i.e. closing the loop) when selling mobile phones. Secondly, a SWOT-analysis was conducted on implementing a Performance business model (i.e. adding leasing) when selling mobile phones. The analysis method involves two dimensions and four areas, the internal dimension involves strengths and weaknesses; and the external dimension involves opportunities

and strengths of the phenomenon being analysed. (Gürel & Tat, 2017) The SWOT-analyses were conducted by thoroughly going through the literature review and mapping the initial strengths, weaknesses, opportunities, and threats that could be identified. Meaning, identifying internal strengths and weaknesses within the business models themselves as well as external opportunities and threats of the business models when taking different external factors into account. After this initial mapping, the identified strengths, weaknesses, opportunities, and threats were analysed in detail through discussion between the authors and weighing pros and cons against each other. This analysis in some cases lead to that something that was initially identified as a strength ended up in the threats section as it is clear that this is not a black and white subject, and most aspects contain both pros and cons. The strengths, weaknesses, opportunities, and threats identified will exclusively be limited to environmental and customer aspects. As customer preferences are something external to the business model these are identified in the external dimension as opportunities and threats for implementing the model. For example, a willingness from customers to lease would be seen as an opportunity for the model. If environmental costs could be identified within the model those were defined within the internal dimension, as a weakness of the model. However, opportunities to limit environmental costs such as for example regional recycling facilities were defined within the external dimension. The examples above are intended to give the reader an idea of what choices have been taken when analysing the literature review.

3.5 Research Quality

This research is made within the interpretivist paradigm, meaning that emphasis is put on the quality and depth of the collected data (Collis and Hussey, 2014). The *reliability* in the sense that the same results would be obtained if the study were to be conducted again, as defined by Bryman & Bell (2011), could be questionable in this research due to the challenge of capturing the exact same results in a study based on subjectivity and people's individual thoughts. However, Collis & Hussey (2014) discuss that reliability lacks importance or can be interpreted differently in the paradigm of this study. They argue that importance is put on whether the observations can be explained. From this perspective, the reliability of the study is less questionable. This is because part of the aim is to understand and discuss theory, and to explain how aspects related to logistics and customer preferences in the Performance Economy are believed to impact the case company and its operations. A lot of focus is put on explaining the

phenomena and the respondents' comments and thoughts on the conducted SWOT-analysis, which will aid the reliability.

The *validity* of the report is considered to be higher than the reliability, as this refers to which extent the study measures what is said to measure (Collis & Hussey, 2014). According to Bryman & Bell (2011), this is the most important criterion in many ways. However, this criterion is also argued to have a different meaning within qualitative research (Collis & Hussey, 2014).

Due to the mentioned differences in measuring the quality of quantitative and qualitative research, Bryman & Bell (2011) explain that two other primary criteria for measuring the quality of a qualitative study have been proposed instead of reliability and validity. These are *trustworthiness* and *authenticity* and will be explained below in relation to this thesis.

3.5.1 Quality in Qualitative Research

Trustworthiness consists of four criteria: credibility, transferability, dependability, and conformability (Bryman & Bell, 2011). All of these criteria will be defined below, as well as explaining how they have been handled in this study. The authenticity criterion concerns the wider political impact of the research and have not been an influential criterion in research (Bryman & Bell, 2011). This criterion will therefore not be discussed further for this report.

Credibility comes down to ensuring that "good practice" has been used and making sure the researchers have understood the "social world" correctly. As explained by Bryman & Bell (2011), this can be done by submitting the findings to the members of the social world. This is what has been done in this study. Firstly, the analysis of the collected theory has been submitted to the case company (highly knowledgeable members of the telecommunication industry) for comments and confirmation. Secondly, the findings drawn from these comments have also been submitted to the company to make sure these are understood correctly. This is called member or respondent validation (Bryman & Bell, 2011).

Transferability is about providing a database for others to make judgements about the transferability of the study to other settings. This can be done through what is called a "thick description", meaning rich accounts of the details of a culture. (Bryman & Bell, 2011) In this study, this has been handled through an extensive literature review and a detailed analysis, giving the reader a chance to follow the arguments and information used. Moreover, it is not argued that this study is fully transferable to other companies within the sector. This is discussed earlier in the section "3.2 Case Company".

Dependability is a parallel to the reliability in quantitative research. The idea here is that to ensure dependability the researcher should use an auditing approach. This means keeping detailed records for the whole research process, including problem formulation, interview transcripts, data analysis decisions, etcetera. However, this has not become a popular approach. (Bryman & Bell, 2011) This is a criterion where this study can be seen as lacking as records have not been kept on decisions like this. This is because this is a time-consuming activity that has not been prioritised for this paper. The method of the study is thoroughly explained in this chapter which the authors consider transparent enough to ensure the dependability.

Confirmability comes down to ensuring that the authors have not let personal values impact the study, even though complete objectivity is not possible in qualitative research. (Bryman & Bell, 2011) One of the authors of this report is currently working for the case study company´s hardware delivery department, which is the reason an interest was initiated to do a Master Thesis project for the company. By this, the author is to some extent aware of the processes of the company and their logistics. This could be seen as problematic as the author can be biased by her knowledge within the company, which can direct questions in the interview etcetera. Although, this has also been an opportunity to ask the right questions as the author has some insight that has in some regards turned out to be wrong and some regards turned out to be right, when checking with the respondents at Telia.

One last aspect, speaking for the quality of the thesis, is that the result and findings will be presented to departments at Telia that might benefit from the insights made in the report.

3.6 Research Ethics

Research ethics is concerned with the means the research has been conducted in, as well as how findings and results are reported (Collis & Hussey, 2014). The most relevant aspects identified for this research, based on Collis & Hussey (2014), are voluntary participation and anonymity & confidentiality.

Voluntary participation: The research collaboration was initiated by the case company. Further, there has from the start been an open discussion between the authors of the thesis and supervisor at the company about the topic and purpose of the research, as well as what will be needed from the case company to go through with the thesis. Participants were informed that there was no obligation to participate with thoughts and information they did not feel comfortable sharing, and the participants could withdraw from the discussion whenever they like.

Anonymity and confidentiality: All participants are offered confidentiality, so that they can remain anonymous in their thoughts and opinions shared during the discussion. All participants were asked consent to be mentioned by name and/or title in the thesis. The same has also been offered to the case company as a whole. Further, issues regarding anonymity and confidentiality have been discussed with the supervisor from the company since the start of the thesis project. This resulted in the authors signing a Non-Disclosure Agreement from the company. Moreover, the thesis has been sent to the supervisor during the development of the report, enabling the supervisor to see what is included in the report and raising questions about this if an issue is identified.

4. Analysis

4.1 Circular Business Model

This first SWOT-analysis has identified strengths, weaknesses, opportunities and threats in terms of environmental sustainability and customer demand for implementing a Circular Economy business model (i.e. closing the loop) in the telecommunications sector. In the next chapter (4.2 Performance business Model) a second SWOT-analysis is presented for implementing a Performance based business model in the sector. When analysing the earlier research on the subject the standpoint of "best practice" is taken. This means that the analysis is made with the assumption that the processes that are identified as "best" for the environment can be used.

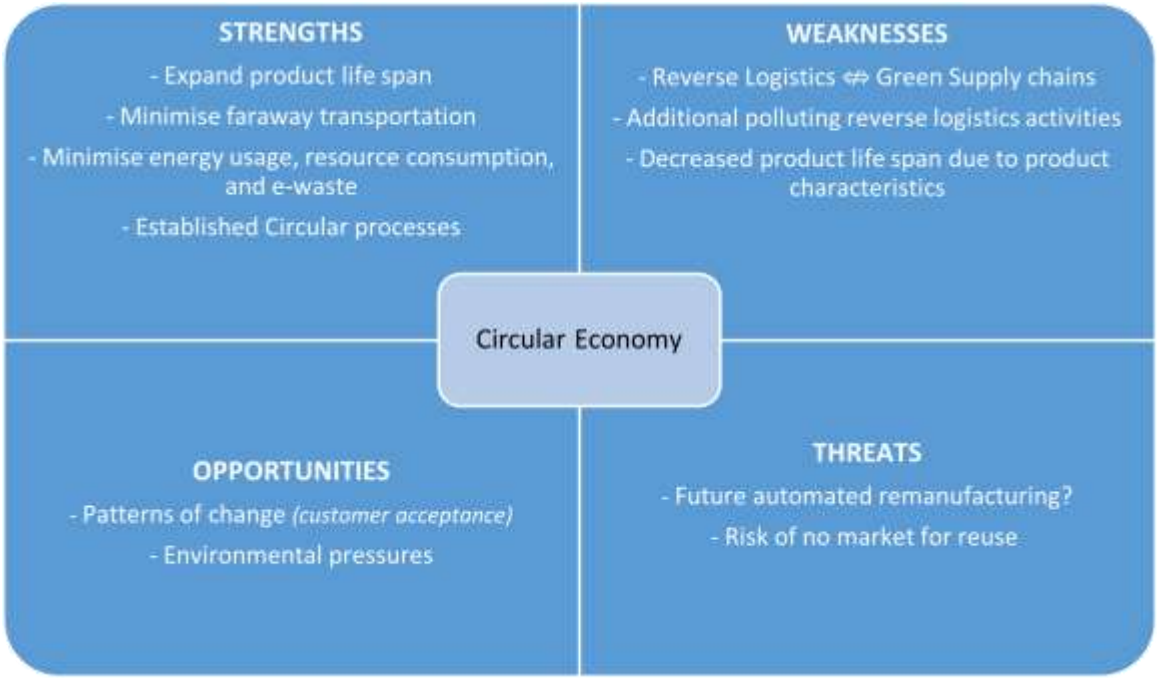

Figure 6 - SWOT-analysis of the circular economy business model (own construction)

4.1.1 Strengths

It is agreed that the Circular Economy is a way of decoupling economic growth from negative environmental externalities (Van Loon & Van Wassenhove, 2020; Kissling et al., 2012). New production entails CO_2 emissions (Van Loon & Van Wassenhove, 2020), energy usage (Rousseau, 2020; Valero Navazo et al., 2014) and resources (Petrova, 2018; Williams, 2019), which are all negative externalities that need to be reduced. Further, Stahel (2016) argues that the Circular Economy is a closed loop that reprocesses goods and materials and both Stahel (2016) and Van Loon & Van Wassenhove (2020)

emphasise how this closed loop can minimise consumption of resources. This is of great importance as there is a shortage of raw material in the industrial sector, where the shortage is especially emphasised as a concern when it comes to manufactured products (Pacheco et al., 2018). Therefore, Pacheco et al. (2018) describe how new techniques and methods are needed to decrease the consumption. Further, the authors highlight how usage of a small number of raw materials is vital. (Pacheco et al., 2018) All these externalities make it evident that the climate requires more sustainable solutions such as reuse and recycling, which is something that the telecom sector is believed to have the opportunity to do. (TXO Systems, 2017) In fact, when looking into companies within the telecom sector, they have already started to develop trade-in programs that entail both reuse and recycling (Telenor, n.d; Tele2, n.d; Tre, 2021; Telia, n.d). This is a strength for the Circular business model, as processes for handling reuse and recycling thereby already exist. Moreover, Stahel (2016) emphasises how implementing proper reuse and recycling management can enable zero waste operations.

As it is recommended that reuse is considered before recycling, meaning that you should only recycle what cannot be reused (Van Loon & Van Wassenhove, 2020) and that a combination of these activities can enable a zero-waste operation (Stahel, 2019). This is because reuse prolongs a product's life span and thereby enables longer usage of the product. While recycling makes sure that the materials are being handled properly when the product can no longer be reused. These two aspects will be further analysed and explained below, starting with reuse, followed by recycling.

4.1.1.1 Reuse

Expand product life span

The resources used in new production of an iPhone can be minimised in a reuse business model (Stahel, 2019). Reuse can expand a product's life span by making it possible for a single phone to have several owners (Van Loon & Van Wassenhove, 2020), this would make it possible to minimise the number of new produced phones, while still covering the demand. Furthermore, Van Loon & Van Wassenhove (2020) explain how the extension of the products life span that is introduced in the reuse business model has positive environmental impacts. This is at least true in a manual remanufacturing process as resources are saved and the energy consumed in disassembly and assembly is minimal (Van Loon & Van Wassenhove, 2020). Furthermore, this is of special importance regarding phones as their life span is short (Rousseau, 2020; ISWA, 2020), and EEE life spans are getting shorter (Kissling et al., 2012), which creates a lot of

e-waste. Further, phones end up in people's drawers (Wilhelmsson, 2019; Valero Navazo et al., 2014) or are disposed of in landfill (Robinson, 2009; ISWA, 2020).

Minimise Energy in Production

As discussed, reuse should be prioritised before recycling, this is what Van Loon & Van Wassenhove (2020) refer to as the "power of the inner circle". However, they also explain that this is criticised as the using phase of products whose energy efficiency is increased with innovation need to be included. This means that when the characteristics of a phone are being evaluated, it is of importance to take the amount of energy that is saved in the using phase due to more energy efficient phones into account, when evaluating if reuse implies energy savings. However, Valero Navazo et al. (2014) are clear that a majority of the energy used in phones' life span is consumed at the production. Therefore, to lower or eliminate the energy consumption in production has a bigger potential for lowering the total energy used than innovation. Meaning, to minimise production, by reusing phones, should be prioritised.

Minimise Faraway Transportation

Stahel (2019) and Fleischmann et al. (2001) mention how companies like Canon and Xerox Corporation use regional facilities for their reuse activities. Further, Van Loon & Van Wassenhove (2020) explain how new production includes transportation from suppliers to factories, and finally to retailers and customers. These transportations can be identified in Apple's supply chain of new produced iPhones, it implies several transportations, from faraway suppliers in several countries and continents. Moreover, airplanes are identified as the mode of use when transporting the phones from China to Telia (Telia, personal communication, 8th of March, 2021). A strength of reuse is thereby that transportation from sourcing and manufacturing sites in other countries is reduced as activities of reuse and remanufacturing can be kept inside Sweden's borders. This is of great importance as transportation has negative impacts on our environment, such as water and air pollution (Lu et al., 2011), especially air transportation is stated as the far most polluting mode of transport (International Chamber of Shipping, n.d.)

4.1.1.2 Recycle

Minimise Energy usage, Resource consumption, and E-waste

As mentioned, e-waste is the sector with the fastest growing domestic waste in the world, due to short life cycles and few repairing options (ISWA, 2020). Further, we know that e-waste and iPhones consist of both valuable

metals and hazardous materials (Williams, 2019; Rousseau, 2020; Robinson, 2009; Valero Navazo et al., 2014; Petrova, 2018). Valero Navazo et al. (2014), ISWA (2020), and Robinson (2009) agree that e-waste is a danger for both humans and the environment as it consists of toxic substances such as mercury which pollutes the environment if e-waste is landfilled or handled improperly. However, a lot of these materials can be recovered by recycling phones (Valero Navazo et al., 2014). This is of great importance as several authors emphasise that smartphones have a short life span and are rarely built to last (Rousseau, 2020; ISWA, 2020). Further, Kissling et al. (2012) argue that the life cycle of EEE is becoming even shorter. This contributes to a lot of e-waste and is a great concern in regard to Pacheco et al.´s (2018) explanation on how there is a shortage of raw material in the industrial sector. In addition, Valero Navazo et al. (2014), Stockholmsregionens Avfallsråd (2007), Återvinning Stockholm (2021), and Återvinningscentralen (2007) describes how energy can be saved when recycling and recovering materials, rather than mining new. So, we can see that there are multiple gains from recycling and recovering phones. Not only are resources saved and e-waste and pollutants minimised, but there are also energy savings. Despite this, valuable metals such as gold, silver, copper etcetera valued at US $57 billion, are getting burned or dumped instead of being gathered, treated, and reused (ISWA, 2020). In addition, Valero Navazo et al. (2014) explain how many people keep their old phones in their drawer, which is something that Wilhelmsson (2019) also believes is common and entails opportunities to save energy and resources if these were recycled correctly. Furthermore, proper management regarding e-waste can minimise global warming (ISWA, 2020). Lastly, Rousseau (2020) explains how devices are often discarded in a non responsible manner which may lead to an irreplaceable loss of resources.

4.1.2 Weaknesses

Decreased Product Life span

Van Loon and Van Wassenhove (2020) describe that electronic products have an optimal life span which limits the number of life cycles that are environmentally preferable, this means that circularity is not always better for the environment. Further, the characteristics of a phone can limit the number of times the phone can be reused. This might be a concern as Rousseau (2020) says that smartphones are often being designed to become obsolete and Buchholtz (2021) describes that appliances are rarely being built to last. Further, Kissling et al. (2012) also describe that the product life span of EEE is becoming even shorter. This is a great threat to the model as Kissling et al. (2012) argue that to successfully reuse a

product it is important that the *total* using phase of the product is expanded. Therefore, it is of importance that the reuse leads to the product being used longer than if it would just have had one user. Meaning, if the phone is used by two different persons (i.e. reused one time) in one year each, the model is considered a failure as a smartphone typically has a life span of 2-3 years according to Rousseau (2020). The phenomenon of reuse then loses its purpose as the total life span has decreased. This could create a false sense and feeling among the consumer of doing right by the environment as they are buying a reused phone, when more phones instead have been produced to meet the demand.

Reverse Logistics ⇎ Green Supply Chains

It is argued that the main goal of reverse logistics is not the same as the main focus in green supply chains (Pacheco et al., 2018), meaning that not all reverse activities are green (Marsillac, 2008). This could be a challenge for telecom companies in terms of environmental sustainability when adopting a Circular business model. As the aim of the Circular model is to improve environmental practices, this can be hard to do with reverse logistics activities that are set up to optimise efficiency and cost, rather than environmental impacts as explained by Pacheco et al. (2018). Therefore, it is challenging for companies to create a reverse logistics system that is green and has its main focus on sustainability. Nonetheless, Marsillac (2008) describes how reverse logistics consist of four main standards where all four focus on environmental issues, which after all argues for that reverse logistics includes environmental aspects. Also, just as Pacheco et al. (2018) describes, reverse logistics can be divided into after-sales and after-consumption reverse logistics, depending on why the activity takes place. It could be argued that the reverse logistics in this thesis handles after-consumption activities within reverse logistics as it handles products at its end-of-life. In comparison to the after-sale reverse logistics, that might have a higher focus on pleasing the customer and less focus towards the environment. Yet, this area needs to be further investigated. Just as Marsillac (2008) explains, reverse logistics is a research field that is lagging behind and intentions of addressing the environmental impacts mentioned above are not fulfilled. This puts even higher pressure on companies like Telia to address these issues when implementing a Circular business model.

A reverse supply chain is required in a Circular business model (Van Loon & Van Wassenhove, 2020). This implies new activities within the supply chain in order to deal with the products coming back (Van

Loon & Van Wassenhove, 2020). Further, just like Van Loon & Van Wassenhove (2020) emphasise, it is crucial to make sure that the business model is sustainable. In other words, be sure that the purpose of the model is fulfilled in practice and not just in theory. Therefore, the activities described as *Gatekeeping, Sorting, Collection and Recovery & Disposal* (Daaboul et al., 2014; Cullinane et al., 2017) within the reverse network design in this study have been investigated to identify any added environmental costs these bring.

4.1.2.1 Gatekeeping

First, Lambert et al. (2011) describe how *Gatekeeping* involves office space, personnel, and office automation. We can identify that this implies added pollution and energy- and resource consumption to some level. This will not be investigated in more detail, however the added environmental impacts should be considered.

4.1.2.2 Sorting

The second activity is the *Sorting system* (Daaboul et al., 2014; Cullinane et al., 2017). According to Lambert et al. (2011), this system implies inspections of the product's condition to decide treatment. Therefore, facilities for these inspections are needed which introduces environmental impacts similar to those described in Gatekeeping. Another risk is the possibility to accurately identify which products that can be reused. Van Loon & Van Wassenhove (2020) explain that it is common that components that are originally identified as reusable are later found not to be reusable. This could result in unnecessary processing of these components and also mean that the number of reusable products are not as high as believed at first sight.

4.1.2.3 Collection

Thirdly, the *Collection system* implies collection of returned products from end customers (Daaboul et al., 2014; Lambert et al., 2011). Lambert et al. (2011) highlight the need for transports of the returned products and that this is something that can be handled by the company itself, the customers or a third-party. Further, this results in environmental impacts as Lu et al. (2011) describe how both transportation and reverse logistics imply negative externalities such as energy usage as well as air and water pollution. Further, road transport is anticipated to be used when collecting phones, as Telia uses Postnord´s distribution network in their deliveries (Telia, personal communication, 8th of March, 2021). However, the environmental effects depend on how the transportation is managed. For example, to imply a consolidation strategy with UCCs is a way of eliminating unnecessary trips by higher vehicle utilisation, minimising energy, congestion,

and vehicle emissions in urban areas if it is set up properly (Lin et al., 2016; Venkatadri et al., 2016; Mesa-Arango & Ukkusuri, 2013; Zhang et al 2021). Yet, it is still adding damaging emissions, higher energy usage, emissions, and additional congestion. Moreover, Lambert et al. (2011) emphasise how clear instructions are required such as return address and packaging. There is a risk of additional pollution if customers do not manage to follow the instructions and for example send the returned phone to the wrong address or have unnecessary big packages. Clear instructions are therefore of importance. Moreover, the collection requires the company to provide the customers with packaging to send phones back to the company, meaning added resources and transportation to get return packaging to the customer. Alternatively, customers could be responsible for this return packaging themselves, which could be problematic. This is both in terms of making sure that the phone is properly protected for transportation, but also to guarantee that the packaging is sustainable and that it can be reused. However, one alternative to reduce this potential added transportation is how Telia handles their trade in service, where the company sends return packages together with the new phone that customers order (Telia, n.d.). Furthermore, as briefly mentioned, it is important to consider what material the package should have, to be as green as possible. Marsillac (2008) also points to this issue as the author highlights that packaging should be done with cardboard instead of polystyrene and that the materials within the system should be recycled. It could therefore be of interest to make sure that the packages used when sending phones back should also be reused. Yet, this is still added resources and therefore a weakness of the model.

4.1.2.4 Recovery & Disposal

First and foremost, the phones that are going to be recovered or disposed of need to be transported to the place where this can be managed. This implies added transportations but can be minimised with proper transportation management such as consolidation, as described above. Stahel (2019) and Fleischmann et al. (2001) highlight Xerox Corporation´s successful remanufacturing strategy, where reuse remanufacturing takes place in regional facilities as already discussed. What cannot be reused is returned to the original producers for recovery (Stahel, 2019; Fleischmann et al., 2001). This entails faraway transport, however there are also possibilities to recycle inside Sweden's borders at Boliden (Valero Navazo et al., 2014), which makes it possible to recycle without having to send phones to faraway destinations.

Moreover, Van Loon & Van Wassenhove (2020) mention that optimal recovery is obtained by the original producer

(in this case Apple) that knows the product best and therefore can optimise the reuse. This raises the question whether companies like Telia are rightfully equipped for handling reuse in an efficient way. What is needed for optimal reuse is thereby high product knowledge which Telia could be argued to have.

4.1.3 Opportunities

Patterns of Change (customer acceptance)

The shown impacts that consumption has on our environment has further changed customers' consumption- and purchasing patterns to be more sustainable (Pacheco et al., 2018). The demand for more sustainable products has increased (Marsillac, 2008), which forces companies to take more responsibility and think of their products' environmental impacts, not only in production and distribution, but also in the end of the products- and services life cycles (Pacheco et al., 2018). Rousseau (2020) emphasises how it is a rapidly growing interest to move from a Linear Economy towards a Circular Economy and that new business models are created for this transition. Further, Kissling et al. (2012) emphasise how EEE-companies have successfully managed and developed different models for reuse etcetera. This can be seen both within the telecom sector by companies such as *Telenor* (Telenor, n.d.), *Tele2* (Tele2, n.d.), *Tre* (Tre, 2021), and *Apple* (Apple, 2021a) that all have started to develop reuse practices, as well as in other sectors (Hooker, 2021; Volvo Cars, 2021; Svenska Diskbolaget AB, n.d; Miljö & Utveckling, 2019; Amazon, n.d.). This implies that the society moves towards sustainable practices and that there is a demand and acceptance from the market. This is confirmed by Marillac's (2008) statement that customers today want more environmentally friendly products. Further, Teece (2010) describes that customers today have more power due to more choices on the market, which makes companies today more reliant on adjusting to customers´ preferences. As implementation of reverse logistics that reuse, recycle and reduce waste can give organisations an image of being corporate (Daaboul et al., 2014), an adoption of the Circular business model could be an opportunity for companies within the telecom sector. Marsillac (2008) also highlights how environmentally sustainable practices can generate high customer loyalty ratings.

Environmental Pressures

There are legislation and regulations on how companies must properly dispose of their telecommunication equipment, such as proper processing and treatment (TXO Systems, 2017). This is confirmed by

Scheinberg et al. (2016) who explain that the European Union has a well developed waste management system and also is the world's leader within policy commitments towards Circular Economy and waste management systems. Moreover, there is pressure from directives to handle waste in a sustainable manner, where the goal is to recycle electronic waste (Marsillac, 2008). Moreover, Robinson (2009) emphasises how the chemical architecture of e-waste is changing as environmental organisations and new technologies pressure firms to find alternatives that are more environmentally friendly. These pressures can be seen as an opportunity for the Circular business model as adopting this model helps companies adjust to these pressures and ensures sustainable operations.

4.1.4 Threats

Future automated remanufacturing?

As discussed in *"4.1.1 Strengths"*, when using a manual remanufacturing process, reuse has a positive environmental impact. However, it is harder to evaluate the energy consumption in an automated remanufacturing process. The reason for this is that energy in this case would be used in the disassembly and assembly process, in comparison to the insignificant amount of energy used in the manual process where we simply compare the resource usage and reduced waste (Van Loon & Van Wassenhove, 2020). Therefore, there is reason to think that this particular aspect might change if reuse becomes a standard practice in the industry where an automated remanufactured process is needed, instead of being used in today's small-scale reuse. A threat is that the future technique for these needed automated processes will not be as sustainable as the business requires. However, Apple's robots Daisy and Dave are examples of an automated remanufacturing process. These two robots can recover a lot of resources (Apple, 2020). Yet, as Van Loon & Van Wassenhove (2020) describes, it is hard to know the amount of energy that is consumed in the process. Therefore, this is a subject of importance when considering added negative externalities within a Circular Economy.

Risk of no Market for Reuse

First, the Circular business model relies on the existence of a market for used phones (Van Loon & Van Wassenhove, 2020). If this does not exist, the whole business model falls apart as demand for the phones that have already been used by one customer is crucial. For example, Welfens et al. (2016) argue that the high innovation speed of phones is a challenge as products go out of fashion which puts a limit on the reuse, as the product no longer suits customers´ preferences. Van Loon & Van Wassenhove (2020) also explain

that the willingness to pay is not that high for remanufactured products. Moreover, as highlighted by Welfens et al. (2016) there is the issue of mistrust towards companies. The authors state that companies need to find ways of making customers trust their reuse and recycling processes (Welfens et al., 2016). Customers need to feel that their personal information will not be misused when they hand in an old phone.

4.2 Performance Business Model

Strengths, weaknesses, opportunities, and threats in terms of environmental sustainability and customer demand have now been identified and analysed for implementing a Circular business model when selling phones in the telecommunications sector. In this chapter, a second SWOT-analysis has been done for implementing a Performance based model (i.e. adding leasing to the already analysed Circular Economy) in the telecommunications sector.

(*) The areas that have been identified in the SWOT-analysis for the Circular Economy (figure 5) are added in black, italic text in the SWOT-analysis for the Performance Economy (figure 6), as they also apply for this model. Further, leasing is of interest as Kissling et al. (2012) emphasise how the reuse industry has a lot of hidden potential due to phenomena such as the growing popularity of leasing. In fact, the concept of leasing is not new, as Aristotle stated as early as two thousand years ago, that "real wealth lies in the use, not the ownership of goods" (Stahel, 2019, p. 67).

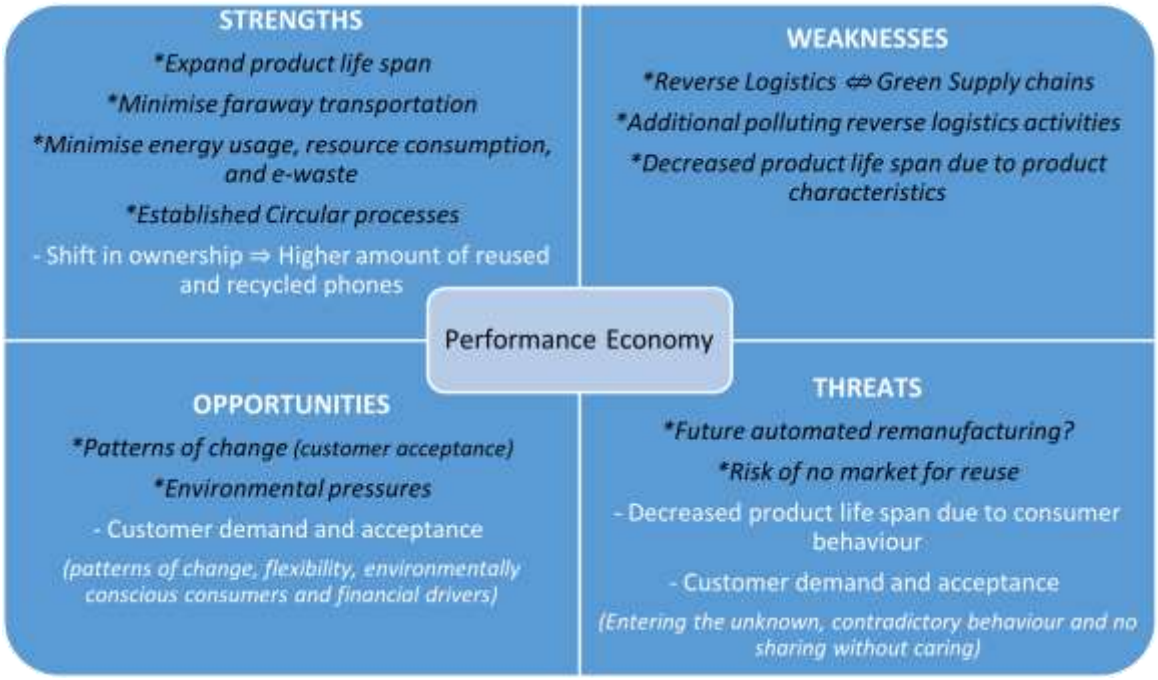

Figure 7 - SWOT-analysis of the performance economy business model (own construction)

4.2.1 Strengths

Stahel (2016) argues that the Performance Economy model should be the mainstream business model in the whole consumer realm. Further, as discussed by Stahel (2016; 2019), one of the main strengths identified in The Performance Economy model is the ability to make sure that all the positive aspects that have been introduced in reuse and recycling takes place. This is because of the shift in ownership that will be further described below.

Shift in Ownership

A central phenomenon discussed in the Performance Economy is the ownership of products. Where the ownership lies is essentially what differs a Performance based model from a Circular, as it is now shifted from the consumer to the company. The greatest strength of this model is thereby that with the ownership shift, there is also a shift in liability from the customer to the company. This makes the company responsible for costs, risks, and waste (Stahel, 2016; Stahel, 2019), which Stahel (2016) argues is the most sustainable business model and should be promoted. Further, Stahel (2019) argues that this leads to the producer having a strong economic incentive to avoid losses and waste. This could be beneficial in environmental terms as companies implementing this model not only have environmental initiatives to reduce waste etcetera, but also economic initiatives to make sure a phone has an as long using phase as possible. Once companies like Telia have bought an iPhone, they have the chance of leasing it to customers and making an income from this phone several times. This gives a high initiative to make sure the phone is reused as many times as possible, i.e. prolonging the using phase.

Yet, as covered in this report, we can see that reusing phones is not a future phenomenon, as it already exists, and several telecom companies have this offer as part of their business model. Still, only 2.5% of mobile phones are returned to industrial recovery facilities for recovery and 50% are kept in the drawer in people's homes (Valero Navazo et al., 2014). Moreover, the percentages that use a reused phone are small (Rousseau, 2020), which leaves a great opportunity for increasing the reuse of phones. To get to the point where phones are being handled in a proper manner, it might require companies to be responsible for the phones. This is at least what the low number of returned products that are presented by Valero Navazo et al. (2014) speaks for. Therefore, returning your used phone seems to be an activity that cannot be offered as voluntary for customers. This action instead needs to be made sure by the characteristics of the business model, which leasing has the opportunity to do. As the company is the owner and the customers have no other alternative than to hand in the old phone when they get a new one.

Figure 8 - Effects of ownership shift. (own construction)

4.2.2 Weaknesses

No direct weaknesses towards leasing have been identified. However, for implementing a Performance Economy model, there is a need to get the phones back to the company for disposal or the lease out to another customer. The environmental impacts that this brings have already been discussed in the SWOT-analysis for the Circular Economy (4.1.2 Weaknesses).

4.2.3 Opportunities

Several different opportunities can be identified in the Performance Economy model and are acknowledged as opportunities for the model in terms of consumer demand and acceptance. These refer to; patterns of change that can be seen in society; flexibility; and environmental- and financial concerns.

Patterns of Change

We can see that shifts are happening in society which incline that customers are prepared for changing their behavior and adapting to new ways of satisfying their telecom needs. As described above, Rousseau (2020) emphasises that there is a shift towards offering products as a service instead of selling them. In addition, Stahel (2019) explains how the idea is to sell results and solutions rather than objects, which is also confirmed by Teece (2021), as he states that customers nowadays are more interested in solutions to their needs rather than fixed products. Kissling et al.´s (2012) study shows that there is a growing popularity of the phenomenon of leasing, the authors also argue that the growing popularity of leasing implies a lot of hidden potential in the reuse industry (Kissling et al., 2012). This growing popularity of leasing can be also identified as companies in other sectors are offering leasing of their products, such as *Ikea* (Hooker, 2021), *Volvo* (Volvo Cars, 2021), *Diskbolaget AB* (Svenska Diskbolaget AB, n.d.), *Gina Tricot* and *H&M* (Miljö & Utveckling, 2019).

All this highlights a demand and an acceptance from the consumers and market on leasing, which could be seen as an opportunity for the telecom sector to adopt this business model too.

Flexibility

Stahel (2019) argues that people who value fashion and its continual pattern of change could benefit from a renting business model, as they would be able to rent different expensive objects whenever they want to. This is confirmed by Rousseau (2020) where he emphasises how one driver for leasing smartphones is people's wish to have the latest model. Rousseau (2020) describes, in a more general sense, that products with high innovation cycles have higher incentives for customers to lease rather than buy.

Environmentally conscious consumers

As described in section "4.1.3 Opportunities", there is a demand for environmentally friendly practices and products from society. Moreover, it has been seen that customers who are environmentally aware are more prone to lease, if the leasing is perceived as a green choice (Rousseau, 2020). This could be seen as an opportunity for the telecom sector to adapt a leasing business model, as customers demand more environmentally friendly products (Marsillac, 2008).

Financial drivers

Another driver for customers who value fashion and having the latest products could be the economic initiative. As explained by Rousseau (2020), customers who are replacing their phone every or every other year can have economic gains of leasing. This is because monthly payment might end up being cheaper in total, in comparison to buying the iPhone for a one-time price and then scrapping the phone after just one year or two. Furthermore, as the company retains the ownership, leasing implies opportunities regarding investments for the customer, as it is considered as a bad investment to buy something expensive that loses value, similarly to a car (Stahel, 2019). Stahel (2019) even makes the statement that it makes no sense for individuals to own a smartphone.

Despite this, there are also reasons to believe that customers are not prepared for this change. This will be explored below.

4.2.4 Threats

To shift the business model to a model based on leasing would be a big change for the company. Van Loon & Van Wassenhove (2020) see that shifts like this are usually difficult due to many external factors such as legislation, competition, and customer behavior. Further, we have identified several external factors that could be seen as a threat for the business model that will be explained below.

Decreased Product Life span

An important initiative for implementing a Performance based model is the longer life spans of phones, that improve resource efficiency, minimise waste and reduce energy usage. Yet, once again we see that this incentive also presents a threat against the model as there is a risk that product life spans are getting shorter instead of longer. Kissling et al. (2012) describe that product life spans are in fact getting shorter in the leasing model**.** However, Kissling et al. (2012) also describe how leasing is in need of reuse. This means that leasing itself does not imply sustainability gains as this only implies one leasing occasion. Instead, reuse is required

meaning that one phone must have several users. Yet, this should not be an issue as the Performance Economy model is a Circular model where reuse and recycling has already been identified as parts of the Performance Economy model. Therefore, the identified challenges with prolonging the product life span in the SWOT for the Circular Economy (4.1.4 Threats), is also presented as threats in the Performance Economy model. In addition, the fact that the financial gains of leasing are higher for customers who have their phones for a short period, as discussed in opportunities (4.2.3 Opportunities**)**, adds to the risk of shortening the total life span of phones. This is due to the fact that the model by this mainly attracts customers who tend to swap phones often, meaning that the phones will have to be reused more times than if customers who have their phones for a long period were attracted to leasing for the model to be environmentally preferable, and would be seen as a failure if this were not possible. Furthermore, another risk could be if the business model only attracts people who want the latest model of a phone and therefore change if often, as Stahel (2019) emphasises how this type of customer could gain from the business model. In this extreme case, the phones would only be leased out without being reused. Further, this would shorten the life span of phones and increase the environmental costs, as leasing is in need of reuse to have sustainability gains (Kissling et al., 2012). An interesting finding is thereby that opportunities for implementing the leasing model in terms of customer acceptance (flexibility, financial drivers) might actually lead to threats in terms of environmental sustainability as it risks shortening the product life span. However, it needs to be remembered that all customers do not have the same preferences in wanting the newest phone on the market, as the world is not that black and white. Instead, this might be an opportunity for companies to also attract more price sensitive customers who are prepared to lease an older phone to a lower price.

Financial barriers

Just as financial concerns are a driver towards leasing for some customers, it can also be a barrier for others. That is, if the customers normally own their phone for several years and therefore do not see financial gains in a leasing agreement. (Rousseau, 2020) However, if the phone breaks within acceptable terms which is a considerable risk as appliances are rarely being built to last as explained by Buchholtz (2021), entering a leasing agreement could instead be a financial driver, as the ownership has shifted which makes the company responsible in exchange for a monthly payment. In this case, the customer minimises the risk of buying an expensive iPhone with the expectation of

using it for a long period, and still ends up with it being broken. This is emphasised by Stahel (2019) where he states that leasing enables customers to know the cost beforehand with less risk of unpredictable expenditures.

Entering the Unknown

As discussed, it can be an opportunity that other sectors are adopting a leasing model, meaning that customers are prepared to accept this type of purchasing. However, it could also present a threat as it is not the practice within the telecom sector and implies the need of being the first one to apply the Performance Economy model and work towards this change. This act of being a first mover, by offering leasing in the telecom sector, can be a challenge as customers are not sure about the consequences of entering this type of leasing agreement. This is identified as a barrier towards leasing by Rousseau (2020) and includes things such as a feeling of lacking control and clarity in aspects such as insurance, defects and accidents, the final cost, and final ownership of the product at the end of the leasing agreement. Therefore, companies adopting the Performance Economy model need to be clear in their information to the customers, to give a sense of stability and gain trust. This is of special importance as Welfens et al. (2016) highlight the issue of mistrust towards companies, where the authors state that companies need to find ways of making customers trust their reuse and recycling processes. Moreover, there are concerns from customers about the self-identity in a smartphone, which includes privacy concerns and a desired ownership (Rousseau, 2020).

Contradictory behavior

Environmental concerns from customers have been highlighted above as an opportunity for the leasing model. However, Rousseau (2020) found in her study that consumers, or more specifically millennials, can have quite contradictory behavior. In this regard, millennials do not always do what is best for the environment even if they value sustainability. This makes it hard to predict customer behavior towards leasing (Rousseau, 2020). Moreover, the results of Rousseau´s (2020) study show that customers' attitude towards leasing their smartphone seems reluctant. This is of course a major concern for companies if they are to implement the Performance Economy model.

No sharing without Caring

There is also a concern that customers will not take as well care of the phones if they do not own them and thereby do not suffer the consequences of financial loss themselves as discussed by Van Loon & Van Wassenhove

(2020). Stahel (2019) highlights the importance of this but also states that this is something that can be controlled in between the users, so that the one who is responsible for the damage can be identified. This is possible in the telecom sector as we have identified a reverse network design where the phone is being collected, sorted, investigated etcetera by the company. By this, the company can identify the person who is responsible for the damage before the phone is reused by a new consumer.

5. Empirical Findings

In this chapter, the empirical findings from the discussion with the case company, Telia, will be presented. The chapter will focus on the areas where Telia raised questions and/or thoughts related to the conducted SWOT-analysis, to reach the goal of anchoring the thesis to reality. Furthermore, the respondents' inputs on the identified topics of discussion (Appendix 2) are presented.

5.1 Opinions raised by respondents at Telia

Overall, the respondents considered the conducted SWOT-analysis to give a reasonable picture of the different strengths, weaknesses, opportunities, and threats the company might face if they were to implement the Performance business model. However, two areas were raised for discussion by Telia. These will be presented below. (Telia, 2021)

5.1.1 Reverse Logistics ⇎ Green Supply Chains

In the analysis, reverse logistics and green supply chains were identified as having different main goals. Here, green supply chains' main goal is sustainability, in comparison to reverse logistics where sustainability is a part of it, but not the main objective. Telia raised a discussion about this subject, as they were not sure if it is correct. One respondent explained that Telia's goal for their reverse logistics is to have "100% Returns and Zero Waste". (Telia, 2021) In this way, Telia has a reverse logistics that is in line with green supply chains as the main goal for this practice is sustainability. This perspective will be further elaborated in "6. Discussion", where it is debated whether reverse logistics differs, depending on if it is an after-consumption reverse logistics, or if it is an after-sales reverse logistics.

5.1.2 Limited Reuse

One respondent raised the risk of companies like Telia having a limited opportunity to reuse phones as they often tend to "overwork" things. The respondent clarified this by explaining that it is within the company's biggest interest to make sure that the reused phone is of a high standard. Therefore, the company, as one respondent declared, puts more money and effort into ensuring a high standard and quality of the phone than what is actually needed. Further, the respondent also raised aspects regarding personal data where he/she explained that the company in many cases has a bigger interest in securing personal data than the customers themselves, as it would be detrimental for Telia if someone's personal data from a

reused phone were to get out. Even though iPhones are encrypted, which means that many resources should not be needed to ensure data security, Telia still spends a lot of money to ensure this which shows how prone Telia is to ensuring data security for their customers. Furthermore, the respondent made a comparison with the secondhand markets such as “Blocket” or “Tradera”, where he/she stated the possibility of them having a greater opportunity to reuse a higher number of phones by selling them directly. This is because the second-hand market is based on what consumers are willing to pay, whereas Telia´s standards might be too high to keep the price down. Today, about 8-10 percent of the phones that have been traded in are reused. With this view Telia themselves can be a threat towards reusing the maximum number of phones. (Telia, 2021)

5.2 Topics of Discussion

5.2.1 Regional remanufacturing

Telia sees a great ability to keep the activities of remanufacturing on a regional level within Sweden's borders. One respondent even emphasised how there is no doubt that it would work, as the respondent described how Telia has a practice called “Telia Care and Repair” in Ljungby and has an integrated technical expertise when it comes to refurbishment in their partner PostNord. “Telia Care and Repair” has aside from Ljungby, also more local placements in Stockholm, Gothenburg and in some of Telia´s stores. When it comes to the refurbishment, another respondent added that these processes are not set up if the volumes are too small. As Sweden is a big market for Telia, this could be a node for refurbishing in the Nordics. To keep these activities inside Sweden's borders is therefore not a problem. (Telia, 2021)

5.2.2 Manual remanufacturing process

In their reuse today, Telia are as already mentioned using regional facilities such as their “Care and Repair” activities in Ljungby. These activities handle simple activities of refurbishments such as changing glass and batteries on used phones. Moreover, this is a manual process handled by their partner PostNord. When asked if they think that this manual handling of remanufacturing is possible on a larger scale, the answer is yes. The Performance business model would dramatically increase the number of phones coming in for reuse, but Telia still believes this is a process they would manage to handle. (Telia, 2021)

5.2.3 Regional recycling

Telia explained that recycling goes from being global to today becoming more local.

Further, Telia highlights that the 100% return that would appear with the leasing business model would require several fairly large industrial units where production is available for recycling of raw materials. Furthermore, Telia explained that their practice today is to sell the products for recycling to global players, such as Foxway, which results in Telia losing control over what happens next. Or as one respondent declared; it is hard for Telia to know how to recycle materials that are too advanced for them to have deeper knowledge about. As mentioned, Telia themselves today handle reuse and refurbishment of phones and thereby have the knowledge and competence for this. When it comes to recycling however, the phones that cannot be reused are sold to companies like Foxway that have this competence. (Telia, 2021)

5.2.4 Trade In boxes

Telia considers the material of the reuse boxes to be important and are working on getting them more sustainable. (Telia, 2021)

6. Discussion

The following chapter will discuss the main- and conflicting findings of the thesis to tie the SWOT-analysis and empirical findings from Telia together. By this, the research questions are discussed which will serve as the background that leads us to the conclusions of the thesis.

6.1 Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of environmental sustainability?

The world is in need of more sustainable practices, such as reuse and recycling, which is something that the telecom sector is believed to have the opportunity to implement. It is seen that the Circular Economy is a way of decoupling economic growth from negative externalities like e-waste, resource consumption, and carbon emissions. (4.1.1 Strengths) Further, Wilhelmsson (2019) highlights the importance of reuse by selling the phone again and recycling of "old" phones. These greener practices are something that both Telia and other companies within the telecom sector have started to develop, by implementing programs where they collect phones and thereby adopt a Circular business model (4.1.1 Strengths). Further, Telia is today handling their reuse manually with their Care and Repair activities and sees a possibility to keep on doing this in the future (Telia, 2021). As analysed in "4.1.4 Threats - *Future automated remanufacturing?*", this is of importance as it would be harder to evaluate sustainability in an automated process.

It has been discussed in the SWOT-analysis that the Circular Economy both minimises transportation (4.1.1.1 Reuse - *Minimise Faraway Transportation*), and that it adds polluting reverse logistics activities (4.1.2.3 Collection). Furthermore, Telia confirms this analysis by explaining that reuse activities are held within Sweden´s borders (Telia, 2021). Therefore, we can see environmental opportunities with the Circular Economy, as the benefits of minimizing faraway transportation by plane, could outweigh the environmental costs of collecting the phones in the reverse logistics network if it is handled efficiently. Another aspect that adds polluting activities into the system is the packages used when customers send in their used phones, analysed in "4.1.2.3 Collection". However, this issue has been identified by Telia and the company is working on getting trade in boxes more sustainable (Telia, 2021). Still, the environmental costs of reverse logistics are

something that needs to be considered as these cannot outweigh the benefits of Circular processes if the Performance business model shall be seen as a way forward for the telecom sector.

In "4.1.2 Weaknesses - *Reverse Logistics ⇎ Green Supply Chains*" is it analysed how reverse logistics and green supply chains have different main goals and the sustainability of reverse logistics could therefore be questioned. However, we have identified that there might be differences in the activities of reverse logistics depending on the intentions of it. For example, Pacheco et al. (2018) explain that there are two types of reverse logistics, after-sales, and after-consumption. This was also brought up by Telia (2021), where we discussed that one intention with reverse logistics might be a higher service level, by efficiently handling customer returns due to wrong orders and customer service (for example, customers order one item in several sizes to send the ones that do not fit back). This can be compared to the after-sales reverse logistics explained by Pacheco et al. (2018) and is not examined in this paper and does not fulfil the purpose of the Performance Economy. Another intention (the one examined in this thesis) is the handling of products at the end-of-life and can thereby be compared to what Pacheco et al. (2018) name as after-consumption reverse logistics. Here, the main goal of reverse logistics could be argued to be sustainability, by taking back and taking care of the resources that the company has once produced. Yet, of course, also with this intention, customer preferences play a part in this business model. The business model would not exist if there was not a demand for the service, which is examined in this thesis through research question 2 (see discussion in the next section) However, there are still sustainable intentions, and this type of reverse logistics does not always fit with the identified network design as we could see in "2.3.1 Network Design - *Gatekeeping"*. For example, the gatekeeping-step in this thesis allows all returns into the network, as the business model is built on circularity and getting phones back for reuse or proper disposal. This view of reverse logistics was also identified by Telia (2021). Telia´s goal for their reverse logistics matches the end-of-life intention as their goal is to have 100% returns and zero waste (Telia, 2021). So, the analysis that reverse logistics goals do not match green supply chains goals (4.1.2 Weaknesses - *Reverse Logistics ⇎ Green Supply Chains*), might just mean that we need to find new a definition and network design for reverse logistics meant to handle product at end-of-life rather than for customer service. That the research field is lagging behind is something that is also mentioned by Marsillac (2008). By this, both Telia (2021), Marsillac (2008) and the findings of this thesis implies a need for more research within

the field. Just as Pacheco et al. (2018) emphasises, reverse logistics can be divided into *after-sales* and *after-consumption reverse logistics*. These definitions should be further explored to broaden the research area on the field and make the two different definitions more commonly known and used.

The above discussion shows clear opportunities for the Circular business model to be implemented in a sustainable way. Now, the Performance business model will be discussed. A central topic identified to evaluate whether the model is sustainable or not is the life span of the phone; here, conflicting aspects have been found and will now be further debated. A main incentive for adapting to the Performance Economy is to expand the product's life span by leasing it to several owners and thereby making it last longer. In a utopia, this would mean that instead of one consumer having their phone for 2-3 years, which is the typical life span of a smartphone according to Rousseau (2020), and then discarding it, the phone would be returned to the company and leased out again to another consumer. This would happen several times and thereby expand the life span of the phone, which is of importance as Kissling et al. (2012) explain that life spans are getting shorter and Robinsson (2009) describes that phones are considered as the electronic item with the shortest life span.

However, as we all know, the world is not a perfect utopia. A main issue identified with implementing Performance Economy in the telecom sector is therefore the issue of guaranteeing a longer product life span. What has been found is that both customer behavior (see 4.2.4 Threats - *Decreased Product Life span*) and product characteristics of phones (see 4.1.2 Weaknesses - *Decreased Product Life span*) might threaten the whole purpose of the model-*longer life span*. This is of course a major concern as it in this case would entail added transportation of collection without prolonging the using phase. *(See example in the box)* Moreover, another risk due to product characteristics and customer behavior is if the phone cannot be reused at all (4.1.2 Weaknesses - *Decreased Product Life span*). In this case, we lose the reuse, which is recommended by Van Loon & Van Wassenhove (2020) to be

Let us clarify this with an example; In a *linear business model*, a customer buys a phone and uses it for three years. While, in the *leasing model*, customers lease a phone for one year, then it gets transported back into the company, gets refurbished and then transported to a new leasing customer. If this leased phone has three users or less, who use the phone for one year respectively, it will mean that the phone has the same or shorter lifespan as the phone in the linear economy. In addition, it would demand transportation between these customers as well as resources and energy for refurbishment. To sum up: the leasing model, in comparison to the linear model, have added polluting activities as well as risking a shorter lifespan. Yet, the leasing model still introduces a strength in its capability of taking care of the phone that it lets out into the system. In comparison to the linear economy, where the phone might end up being landfilled.

considered before recycling (4.1.1 Strengths). Therefore, a positive/less negative environmental impact cannot be guaranteed. Still, a strength of the Performance Economy is that it guarantees circularity due to the shift in ownership (4.2.1. Strengths - *Shift in Ownership*), assuming that companies hold their words and recover and dispose of phones correctly.

In terms of reuse, Telia lifted the aspect that the company might have a hard time competing with the secondhand market. Telia´s reused phones are more expensive as they are held to a higher standard such as quality of the phone and guaranteeing data security. Therefore, Telia highlighted how the secondhand market, such as Tradera and Blocket, might have a greater opportunity to reuse a higher percentage of phones. (Telia, 2021) However, the fact that few phones are returned to industrial recovery facilities for recovery, and many ends up left in people's homes (Valero Navazo et al., 2014; Rousseau, 2020), which is a risk Wilhelmsson (2019) also highlights, speaks differently. Additionally, different customers have different demands. While price sensitive consumers might prefer to buy a phone from the secondhand market, others want and value the security of a telecom company as a "middleman". These concerns from customers are analysed in "4.1.4. Threats - *Risk of no Market for Reuse*" and will be further discussed in the next section. Furthermore, even if the phone is bought on the secondhand market, it will at its end-of-life be every customer's responsibility to recycle the phone, which the high amount of e-waste (ISWA, 2020), and the low number of phones that are returned for recovery (Valero Navazo et al., 2014), speaks for does not work. Instead, if the manufacturer retains the ownership and thereby being responsible for waste etcetera, could be environmentally beneficial (Stahel, 2019).

6.2 Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of customer demand?

It is clear that there is a demand and acceptance from the market for more sustainable products and practices. Therefore, companies need to take responsibility for the environmental impact of products at end-of-life, which has resulted in a growing interest for Circular business models. This means that there is an opportunity for companies to strengthen their image of being corporate, which is what customers demand. (4.1.3 Opportunities - *Patterns of Change*) Moreover, there are also environmental pressures on firms to properly dispose of their e-waste by recycling, which is something companies cannot ignore (4.1.3 Opportunities - *Environmental Pressures*).

Taking it one step further, we have the Performance Economy where the idea is to sell goods as services with business models such as renting, leasing and sharing, where you sell results rather than objects. This economic model could be a possible way forward for industries and companies, as it is explained that there is a shift towards more emphasis on access to goods and services, instead of ownership and disposability. Furthermore, it is identified that customers want more than just products: they want solutions to their needs. (4.2.3 Opportunities - *Pattern of Change)* Moreover, several industries and companies are adapting to both the Circular- and Performance Economy business model, where giants such as Amazon, Apple, IKEA, Volvo Cars, and H&M offer leasing- and/or reuse & recycling services. (4.1.3 Opportunities - *Patterns of Change;* 4.2.3 Opportunities - *Patterns of Change*) This gives a clear picture of a pattern of change, as well as a demand from the customers for this type of business. Further, we can see how telecom operators have started to adapt to the Circular Economy business model, where they are offering trade in services (4.1.3 Opportunities - *Patterns of Change*), which also highlights a demand from this industry. The next step in this development could thereby be to introduce leasing in the industry. This is an opportunity as environmentally conscious consumers are more prone to lease if they see leasing as a green option (4.2.3 Opportunities - *Environmentally conscious consumers*). Yet, even if we can see a shift in society towards selling services instead of products, a study by Rousseau (2020) shows a difference when it comes to phones. Here, Rousseau (2020) has investigated millennials' demand for leasing phones in Belgium, where she identified a desired ownership of smartphones. This is a clear threat towards the business model in this thesis. Yet, as the study is limited to Belgium and millennials, more research is needed to see whether this applies for the business area as a whole.

Coming back to environmentally conscious consumers, it is seen that these can have quite contradictory behavior. Even if leasing could be an opportunity as customers are prone to lease if it is seen as a green option, this does not always fit with their realised actions. (4.2.4 Threats - *Contradictory behavior*) As analysed, there must be a market for reused phones if this is to be a part of the business model. Threats in this aspect can be that customers do not want phones that have gone out of fashion or that customers do not trust companies like Telia to handle their personal information correctly when reusing phones (4.1.4 Threats - *Risk of no Market for Reuse*). This is also analysed in terms of leasing, where the risks of being the first mover are identified. The identified risks are mainly about customers' insecurities about the consequences of entering this type

of leasing agreement and therefore feeling a lack of control. Therefore, telecom companies need to be clear in their information about the consequences of the leasing agreement to minimise these insecurities. Furthermore, data security is also highlighted as a concern for customers. (4.2.4 Threats - *Entering the Unknown*) This, however, should not be an issue as Telia explained how they are even more concerned about their customers' data leaking, as this would strongly affect their image. Therefore, Telia puts a lot of effort into guaranteeing personal security, even more than what is actually needed. (Telia, 2021) Therefore, if telecom operators like Telia find a way of ensuring their consumers about their consciousness in these aspects as well, the customers' concerns regarding data security could also be minimised.

Furthermore, there are two sides of the coin in terms of financial aspects, as some customers see that leasing will increase their cost for their phone as they want to have the same phone for several years (4.2.4 Threats - *Financial barriers*), while some see that they will gain from this model (4.2.3 Opportunities - *Financial drivers*). This is analysed in "4.2.3 Opportunities - *Flexibility*", where it is discussed how customers who value fashion and/or flexibility of phones could benefit from the leasing model. The benefits for customers who value flexibility are therefore twofold, as they gain financially as well as satisfy their need for flexibility/having the latest model. This is strengthened by Stahel (2019) who emphasizes how owning a smartphone does not make sense in terms of capital gains as it decreases in value over time and that renting offers flexibility in the use, knowledge of the cost of use and only pay when using it (Stahel, 2019). Therefore, we can see a great opportunity for the business model in terms of customer demand. Yet, customers that do not value flexibility in their use could have a harder time seeing the gains of the agreement, as it could end up being more expensive (Rousseau, 2020). However, these customers do not end up empty handed, as they might also gain from leasing as the risk of ending up with a broken phone is reduced (4.2.4 Threats - *Financial barriers*) and could therefore also end up accepting and finding the service valuable.

7. Conclusion

The seventh and last chapter of the thesis concludes the findings by answering the two research questions. That is, Q1: Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of environmental sustainability? and Q2: Could the Performance Economy model be a possible way forward for the telecommunications sector when selling mobile phones in terms of customer demand?

It can be concluded that the telecommunication sector is one of the fastest growing sectors in the world and that it is an important infrastructure of today's modern society, as just about everything depends on telecom. However, it has been found that the telecommunication sector is responsible for environmental impacts, such as - among other things - waste phones. At the same time, attention regarding both the climate change, as well as the environmental impacts that the industrial sector is responsible for has increased. Furthermore, it also has been stated that there is a shortage of raw materials, where companies have started to develop methods that minimise the usage of raw material. Today, the consumption of EEE has increased to a level where manufacturers must take responsibility and collect their products from their downstream consumers to either reutilise the products or dispose of the products properly. One way of taking this responsibility is adopting a Performance Economy business model and thereby reusing and recycling phones. This is made possible through the idea that consumers lease instead of buy their phones, which makes the company responsible for waste phones. However, this business model entails adding polluting reverse logistics when taking the phones back into the company, such as emissions generated by transportation and the packages that the phones are transported in. Yet, these polluting activities can be overcome by the strengths that the model implies, such as minimized energy usage, resource consumption and e-waste, as well as minimized faraway transportations. Moreover, the telecom sector, as well as the case company of the thesis, Telia, already have established circular processes. This can be seen as a strength of the Performance economy model, as reuse and recycling are already known practices instead of being unexplored territory. Furthermore, these already established circular processes gives Telia the opportunity to state that the current, and potentially more sustainable, manual remanufacturing process is a possible way forward also in the future, with the larger quantities that come with a fully applied Performance Economy model. This is of

importance in terms of environmental sustainability, as in contrast to manual remanufacturing, an automated remanufacturing process is harder to evaluate in terms of environmental sustainability.

What can also be concluded about the Performance Economy is that the life span of phones plays a central role in whether the economic model is environmentally sustainable or not. Here, different theory points to different scenarios, where the life span could be prolonged due to the reuse that the Performance business model entails. But also shortened due to the phone's characteristics of not being built to last, as well as customers' consumption patterns. Thereby, it cannot be guaranteed that the Performance Economy prolongs the total using phase of phones and sustainability can therefore not be guaranteed in this aspect. However, what can be guaranteed is circularity, due to the ownership shift that comes with leasing. This is of importance as the low number of returned mobile phones and the high amount of e-waste highlights the need for change within the ownership, where it seems like it cannot be every customer's responsibility to reuse or recycle the phone at its end-of-life. Instead, the Performance Economy presents a business model where the manufacturer retains the ownership and thereby is responsible for the e-waste, which could be environmentally beneficial. Here, leasing could be a step in the right direction as it is a way of reaching full circularity. Therefore, the Performance Economy model could be a possible way forward for the telecommunications sector when selling mobile phones in terms of environmental sustainability.

Next, the second research question of the thesis will be answered. Here, we can see that society moves towards sustainable practices, where giants are adopting Circular and/or Performance business models. This highlights a demand and acceptance from the customers for these greener practices. Also, we can see how customers' consumption patterns move towards being more sustainable, as well as that they have started to demand access to goods and solutions to their needs, rather than ownership over physical products. This emphasises a demand for Performance Economy business models. Further, opportunities for implementing the model can also be seen as customers can benefit from the Performance Economy in financial, flexibility, and fashion aspects if they want to switch phones more often. However, threats towards the model are also identified as this is a new and unexplored territory. Concerns from customers in aspects such as feeling a lack of control in data security, where they do not trust companies to handle their personal data properly, and financial concerns from consumers who do not value flexibility in their use has been found. The Performance Economy could

therefore be a possible way forward for the telecommunications sector when selling mobile phones in terms of customer demand if these concerns are handled so that customers know what to expect when entering a leasing agreement, as well as finding a way of meeting the more price sensitive customers´ values. How this should be done however, requires more research and perhaps specific consumer surveys from the company's customers to see under which circumstances consumers are prepared to lease and reuse their phone.

7.1 Future research

This thesis has investigated the environmental aspects of implementing a Performance business model in the telecommunications sector, as well as the customer demand for this type of business model. Another aspect from a business perspective is the profitability of the model, as this is essential for the model to be an economically viable alternative for companies. Therefore, this aspect needs to be investigated. Further, there are several other aspects that would profit from further research on the subject. For example, we can see that literature on customer demand is to some extent lacking. Therefore, future research could aim at compiling customer preferences in a more structured manner than in this research through customer surveys. Furthermore, the delimitations in this thesis highlight how there might exist other ways for the sector to become greener, such as influencing customers in several ways to make the consumer use their phone for a longer period of time, or to sell and buy phones on the secondhand market.

Lastly, as discussed, we also see that there is a need to develop the theoretical framework of reverse logistics to suit the intentions of end-of-life reverse logistics. This could be done in line with Pacheco et al.´s (2018) research on reverse logistics, to strengthen the distinctions between after-sales and after-consumption and make these definitions more commonly used.

References

Amazon. (n.d.) Trade In & Upgrade to a new Amazon Device. Available: https://www.amazon.com/l/9187220011 [2021-04-12]

Apple. (2019). Supplier Responsibility 2019. Supplier List. Available: https://www.apple.com/supplier-responsibility/pdf/Apple-Supplier-List.pdf [2021-02-23]

Apple. (2020). Environmental Progress Report 2019. Available: https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2020.pdf [2021-02-23]

Apple. (2021a). Apple Trade In - Turn the device you have into the one you want. Available: https://www.apple.com/shop/trade-in [2021-01-23]

Apple. (2021b). Apple Recycling Programs - Apple makes it easy to recycle your device in your country or region. Available: https://www.apple.com/recycling/nationalservices/ [2021-01-23]

Baykasoglu, A., & Kaplanoglu, V. (2011). A multi-agent approach to load consolidation in transportation. Advances in Engineering Software (1992), 42(7), 477-490.

Bryman, A., & Bell, E. (2011). Business research methods. 3rd ed. Cambridge ; New York, NY: Oxford University Press.

Buchholtz, K. (2021). The countries producing the most e-waste. Available: https://www.statista.com/chart/24291/e-waste-by-country/ [2021-03-05]

Cambridge Dictionary. (2021a). Rent. Available:

https://dictionary.cambridge.org/dictionary/english/rent [2021-04-09]

Cambridge Dictionary. (2021b). Leasing. Available:

https://dictionary.cambridge.org/dictionary/english/leasing [2021-04-09]

Collis, J., & Hussey, R. (2014). Business research a practical guide for undergraduate & postgraduate students (Fourth ed.).

Counterpoint. (2021). Global Smartphone Market Share: By Quarter. Available: https://www.counterpointresearch.com/global-smartphone-share/ [2021-03-26]

Corporate finance institute. (2021). Telecommunications Industry. Available: https://corporatefinanceinstitute.com/resources/careers/companies/telecommunications-industry/ [2021-05-18]

Cullinane, S., Browne, M., & Karlsson, E. (2017). An Examination of the Reverse Logistics of Clothing (r)e-tailers in Sweden, Proceedings Of EUROMA Conference, 41998, Edinburgh, 1-5 July., 2017.

Daaboul, J., Le Duigou, J., Penciuc, D., & Eynard, B. (2014). Reverse logistics network design: A holistic life cycle approach. Journal of Remanufacturing, 4(1), 1-15.

Diouf, B., Pode, R., & Osei, R. (2015). Recycling mobile phone batteries for lighting. Renewable Energy, 78, 509-515.

Elgazzar, S., Tipi, N., Hubbard, N., & Leach, D. (2012). Linking supply chain processes' performance to a company's financial strategic objectives. European Journal Of Operational Research, 223(1), 276-289.

Fleischmann, M., Beullens, P., Bloemhof-Ruwaard, J., & Wassenhove, L. (2001). THE IMPACT OF PRODUCT RECOVERY ON LOGISTICS NETWORK DESIGN. Production and Operations Management, 10(2), 156-173.

Gürel, E., & Tat, M. (2017). SWOT analysis: a theoretical review. Journal of International Social Research, 10(51).

Hooker, L. (2021). Ikea aims to launch delayed 'Buy Back' scheme in UK. Available: https://www.bbc.com/news/business-56186217 [2021-03-02]

Investopedia. (2021). What Is the Telecommunications Sector? Available: https://www.investopedia.com/ask/answers/070815/what-telecommunications-sector.asp [2021-05-18]

International Chamber of Shipping (n.d.). Environmental Performance: Comparison of CO2 Emissions by Different Modes of Transport. Available: https://www.ics-shipping.org/shipping-fact/environmental-performance-environmental-performance/ [2021-03-08]

Internetstiftelsen. (2019). Svenskarna och internet. Enheter och uppkopplade saker. Available: https://svenskarnaochinternet.se/rapporter/svenskarna-och-internet-2019/allmant-om-internetutvecklingen/ [2021-03-18]

ISWA. (2020). The Global E-waste Monitor 2020. Available: https://www.iswa.org/home/news/news-detail/article/-21c8325490/109/ [2021-02-09]

Khor, K., Udin, Z., Ramayah, T., & Hazen, B. (2016). Reverse logistics in Malaysia: The Contingent role of institutional pressure. International Journal of Production Economics, 175, 96-108.

Kissling, R., Fitzpatrick, C., Boeni, H., Luepschen, C., Andrew, S., & Dickenson, J. (2012). Definition of generic re-use operating models for electrical and electronic equipment. Resources, Conservation and Recycling, 65, 85-99.

Lambert, S., Riopel, D., & Abdul-Kader, W. (2011). A reverse logistics decisions conceptual framework. Computers & Industrial Engineering, 61(3), 561-581.

Lin, J., Chen, Q., & Kawamura, K. (2016). Sustainability SI: Logistics Cost and Environmental Impact Analyses of Urban Delivery Consolidation Strategies. Networks and Spatial Economics, 16(1), 227-253.

Lu, C. (2020). Apple Supply Chain - The Best Supply Chain in the World. Available: https://www.tradegecko.com/blog/supply-chain-management/apple-the-best-supply-chain-in-the-world [2021-02-23]

Lu, Yingjin., Lu, Jiao., & Jia, Huifang. (2011). Study on the Environmental Cost-sharing Method for Reverse Logistics in Household Appliances. Energy Procedia, 5(C), 186-190.

Marsillac, E. L. (2008). Environmental impacts on reverse logistics and green supply chains: Similarities and integration.(Author abstract). International Journal of Logistics Systems and Management, 4(4), 411-422.

Mesa-Arango, R., & Ukkusuri, S. V. (2013). Benefits of in-vehicle consolidation in less than truckload freight transportation operations. Transportation Research Part E: Logistic and Transportation Review, 60, 113.

Miljö & Utveckling (2019). “Trenden hyrkläder växer – här kan du hyra dina kläder i höst”. Available: https://miljo-utveckling.se/trenden-hyrklader-vaxer-har-kan-du-hyra-dina-klader-i-host/ [2021-01-22]

Mohanty, S., & Carrizo Moreira, A. (2014). Sustainability in Global Telecommunications. IEEE Potentials, 33(5), 29-34.

Moss, M., Kaufman, S., & Townsend, A. (2006). The relationship of sustainability to telecommunications. Technology in Society, 28(1-2), 235-244.

Pacheco, E., Kubota, F., Yamakawa, E., Paladini, E., Campos, L., & Cauchick-Miguel, P. (2018). Reverse logistics. Benchmarking: An International Journal, 25(5), 1447-1460.

Panayiotou, N., Aravosis, K., Idowu, S., & Louche, C. (2011). Supply Chain Management. In *Theory and Practice of Corporate Social Responsibility* (pp. 55-70). Berlin, Heidelberg: Springer Berlin Heidelberg.

Petrova, M. (2018). We traced what it takes to make an iPhone, from its initial design to the components and raw materials needed to make it a reality. Available: https://www.cnbc.com/2018/12/13/inside-apple-iphone-where-parts-and-materials-come-from.html [2021-02-23]

Robinson, B. (2009). E-waste: An assessment of global production and environmental impacts. The Science of the Total Environment, 408(2), 183-191.

Rousseau, S. (2020). Millennials' acceptance of product-service systems: Leasing smartphones in Flanders (Belgium). *Journal of Cleaner Production, 246*, Journal of cleaner production, 10 February 2020, Vol.246.

Scheinberg, A., Nesić, Savain, Luppi, Sinnott, Petean, & Pop. (2016). From collision to collaboration – Integrating informal recyclers and re-use operators in Europe: A review. Waste Management & Research, 34(9), 820-839.

Slaper, T. F., & Hall, T. J. (2011). The triple bottom line: What is it and how does it work. Indiana business review, 86(1), 4-8.

Stahel, W. (2019). The Performance Economy, industry adopting the circular industrial economy as default option. In The Circular Economy: A User's Guide (1st ed., pp. 66-79). Routledge.

Stahel, W. R. (2016). The circular economy. Nature News, 531(7595), 435.

Stockholmsregionens Avfallsråd. (2007). Aluminum. Available: http://www.atervinningscentralen.se/web/page.aspx?refid=132 [2021-02-16]

SupplyChain247. (2013). Is Apple's Supply Chain Really the No. 1? A Case Study. Available: https://www.supplychain247.com/article/is_apples_supply_chain_really_the_no._1_a_case_study [2021-03-01]

Sutherland, E. (2016). Corporate social responsibility: the case of the telecommunications sector. info, 18(5), pp.24–44.

Svenska Diskbolaget AB (n.d.). "Din diskmedelspartner när det verkligen gäller!" Available: http://diskbolaget.se/diskmaskiner/hyrmaskiner/ [2021-01-22]

Teece, D. (2010). Business Models, Business Strategy and Innovation. Long Range Planning, 43(2), 172-194.

Telenor. (n.d). Byt mobil när du vill. Available: https://www.telenor.se/handla/tjanster/mobil/change/ [2021-02-27]

Tele2. (n.d.) Byt in din gamla mobil. Få rabatt på en ny. Available: https://www.tele2.se/handla/byt-in [2021-02-27]

Telia Company AB (2019). Annual Report. Available: Retriever Business.

Telia Company. (n.d. a). Our road to zero. Available: https://www.teliacompany.com/en/sustainability/environment/ [2020-01-20]

Telia Company. (n.d.b) Purpose and values. Available: https://www.teliacompany.com/en/about-the-company/purpose-and-values/ [2021-02-18]

Telia. (2021). Oral discussion with respondents from Telia over Teams. [2021-04-13]

Telia. (n.d.a) Panta mobilen. Available: https://www.telia.se/privat/telefoni/byt-in [2021-04-12]

Telia. (n.d.b). Mobil som tjänst. Available: https://www.telia.se/foretag/losningar/mobil-som-tjanst [2021-05-18]

Tre. (2021). Byt in din gamla mobil eller surfplatta. Available: https://www.tre.se/varfor-tre/hos-tre/3atervinn [2021-02-18]

TXO Systems. (2017) Reverse logistics for the telecoms industry. Available: https://www.txo.com/news/reverse-logistics-telecoms-industry/ [2021-01-12]

Valero Navazo, J., Villalba Méndez, G., & Talens Peiró, L. (2014). Material flow analysis and energy requirements of mobile phone material recovery processes. The International Journal of Life Cycle Assessment, 19(3), 567-579.

Van Loon, P., & Van Wassenhove, L. (2020). Transition to the circular economy: The story of four case companies. International Journal of Production Research, 58(11), 3415-3422.

Venkatadri, U., Krishna, K., & Ulku, M. (2016). On Physical Internet Logistics: Modeling the Impact of Consolidation on Transportation and Inventory Costs. *IEEE Transactions on Automation Science and Engineering*, *13*(4), 1517-1527.

Volvo Cars. (2021). Volvo privatleasing. Available: https://www.volvocars.com/se/kop/finansiering-och-tjanster/privat/privatleasing [2021-01-22]

Welfens, M., Nordmann, J., & Seibt, A. (2016). Drivers and barriers to return and recycling of mobile phones. Case studies of communication and collection campaigns. Journal of Cleaner Production, 132(C), 108-121.

Wikipedia. (2020). Telia Sverige. Available: https://sv.wikipedia.org/wiki/Telia_Sverige [2021-02-18]

Wikipedia. (2021). Apple Inc. Available: https://sv.wikipedia.org/wiki/Apple_Inc. [2021-03-23]

Wilhelmsson, W. (2019). Vad finns i en iPhone? Available: https://feber.se/mobil/vad-finns-i-en-iphone/394765/?rss=true [2021-02-16]

Williams, A. (2019). Scientists use a blender to reveal what´s in our smartphones. Available: https://www.plymouth.ac.uk/news/scientists-use-a-blender-to-reveal-whats-in-our-smartphones [2021-02-16]

Wong, L., Tan, G., Lee, V., Ooi, K., & Sohal, A. (2020). Unearthing the determinants of Blockchain adoption in supply chain management. International Journal of Production Research, 58(7), 2100-2123.

Zhang, Y., Lin, W., Huang, M., & Hu, X. (2021). Multi-warehouse package consolidation for split orders in online retailing. European Journal of Operational Research, 289(3), 1040-1055.

Återvinning Stockholm. (2021). Metallåtervinning. Available: http://www.xn--tervinningstockholm-zwb.se/atervinningsprocessen/metallatervinning/ [2021-02-16]

Återvinningscentralen. (2007). Järn. Available: http://www.atervinningscentralen.se/web/page.aspx?refid=131 [2021-02-19]

Appendix 1 Topics of discussion

These are the topics of discussion that were raised through the SWOT-analysis as areas in which Telia could contribute with their specific knowledge about how different processes and activities could be organised "in the real world". By this more realistic information was gathered that is not only identified as a possible solution in theory, but actually feasible solutions for the company in implementing a Performance or Circular business model.

Regional remanufacturing - Do you see a possibility to keep activities of remanufacturing on a regional level, inside Sweden's borders?

Manual remanufacturing process - Can a manual process of remanufacturing be used? Is this something you use today? If so, is it possible on a larger scale?

Regional recycling - How is it handled today? Is it possible to do inside Sweden's borders?

Trade In boxes - Material of reuse boxes?

Appendix 2 Questions answered through email

- How are the phones transported from Apple Inc. to Telia? With what mode of transport and with what frequency?
- How are the phones sent to the final customer and different stores?
- Where are Telia´s warehouses located?