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University of  
Stavanger

**How to gain circularity in the value chains in the textile industry?**  
*A case study of wool clothes*

**MASTER DEGREE IN**  
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## Abstract

In this master thesis, a case study of wool clothes has been the basis for answering the problem statement on how to gain circularity in the value chains in the textile industry. The textile industry is causing environmental impacts through the production, consumption, and end-of-life phase of clothes. This study has looked at the consumer's behavior regarding the use of wool clothes through a case study. Gathering information about consumers' behavior has been done through a quantitative survey. The respondents were asked questions related to their washing behavior and how they care for their wool clothes.

This study concentrates mainly on the case of wool clothes. Still, cotton clothes have been compared with wool clothes to understand how consumers' behavior might be affected by using and purchasing different textile clothes. The findings show that wool clothes were used longer between washes, washed at lower temperatures, and most respondents were not using a tumble dryer for drying wool clothes. Therefore, based on the findings in this study, it may be possible to assume that using wool clothes has lower environmental impacts than cotton clothes and can gain circularity in the textile industry.

This study is also looking at circular business models for wool clothes from a consumer perspective. These circular business models are presented by Lacy & Rutqvist (2015). The study researchers if some of these models could work for the wool clothes industry. The respondents answered that they were willing to repair their wool clothes, related to the circular business model, product life-extension. The respondents also donated wool clothes, which might lead to a circular business model focusing on recovery and recycling wool clothes. Recovery and recycling can, for instance, result in delivering back used clothes to the companies. But on the other hand, a lack of information on sustainability and consumers' behavior regarding environmental impacts can affect how and if businesses can implement circular business models in the textile industry.

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## 1. Introduction

There is an increased focus on sustainable development in society today, making changes, finding new solutions, and receiving a more sustainable society. However, actions that have occurred since the dawn of industrialization have been dominated by the linear model. This model consists of a linear flow, and the use of this model is harming the environment. This model's flow of materials and energy is one of the main challenges of sustainable development and threatens nature by resource overuse, waste, and emissions release (Korhonen, Honkasalo & Seppälä, 2018).

Since the linear model is causing harm to the environment, a more circular approach is needed to gain a more sustainable society. The circular economy model aims to move in the direction of circularity. The circular economy model focuses on replacing the end-of-life concept sketched in the linear model through better use of renewable energy, eliminating toxic chemicals, reusing, and eliminating waste through design, systems, and products within the business models (Ellen MacArthur Foundation, 2013). The three dimensions of economic, environmental, and social have to be considered in a circular economy: the exact dimensions in sustainable development. A circular economy focuses on coping with the natural ecosystem and gain more circularity (Korhonen et al., 2018).

The circular economy can provide a more closed-loop of the materials that flow through the value chain driven by renewable energy. The purpose is to make the materials stay in the loop, rather than becoming waste, and gain more circularity in the value chains (Kalmykova, Sadagopan & Rosado, 2018). The value chains in the textile industry of textiles and clothing are complex because the different phases in the value chains are usually spread worldwide, which then makes them global value chains (European Parliament, 2019).

The use of clothes and textiles can be seen as a fundamental part of life, making this sector an essential part of the global economy. In this sector, clothes account for more than 60% of textiles used. From 2000 to 2015, the production of clothes almost doubled, where the main drivers were an increase in clothing sales and the world GDP. At the same time, the number of times an item was worn decreased. It is estimated that this decrease is 36% in the same

period. Related to the increase in clothing sales and production is the rise of the phenomenon of fast fashion. Clothes are produced quickly because new collections are usually offered several times a year at an affordable price. It is estimated that half of the items produced related to fast fashion becomes waste in under a year (Ellen MacArthur Foundation, 2017).

These days the linear model dominates in the textile industry. This results in available resources are being pressured, emissions relate to the environment, and negative social impacts. The textile industry needs to focus on a circular economy to cope with these concerns. The materials used need to be safe and healthy, which can avoid impacts through the value chain. The average number of times an item is used needs to be increased by designing out waste and higher quality. Increasing the focus on recycling and use renewable resources as raw materials (Ellen MacArthur Foundation, 2017). Focusing on these things can help the textile industry move to a more circular economy.



## 1.1 Problem statement

The purpose of this master thesis is to look at the opportunities to gain circularity in the textile industry's value chains. Studying this problem statement is that the textile industry is causing impacts on the environment by using the dominant linear model when producing items. Therefore, the textile industry may be one of the sectors that can shift to a circular economy model. A case study of wool clothes will be used for answering the problem statement.

With this in mind, I have developed this problem statement:

*How to gain circularity in value chains in the textile industry?*

To answer my problem statement, I have developed two research questions:

- 1. How can consumers' use of wool clothes affect circularity considering the environmental impacts?*
- 2. Which circular business models could be suitable for gaining more circularity in the value chain of wool clothes? From a consumer perspective*

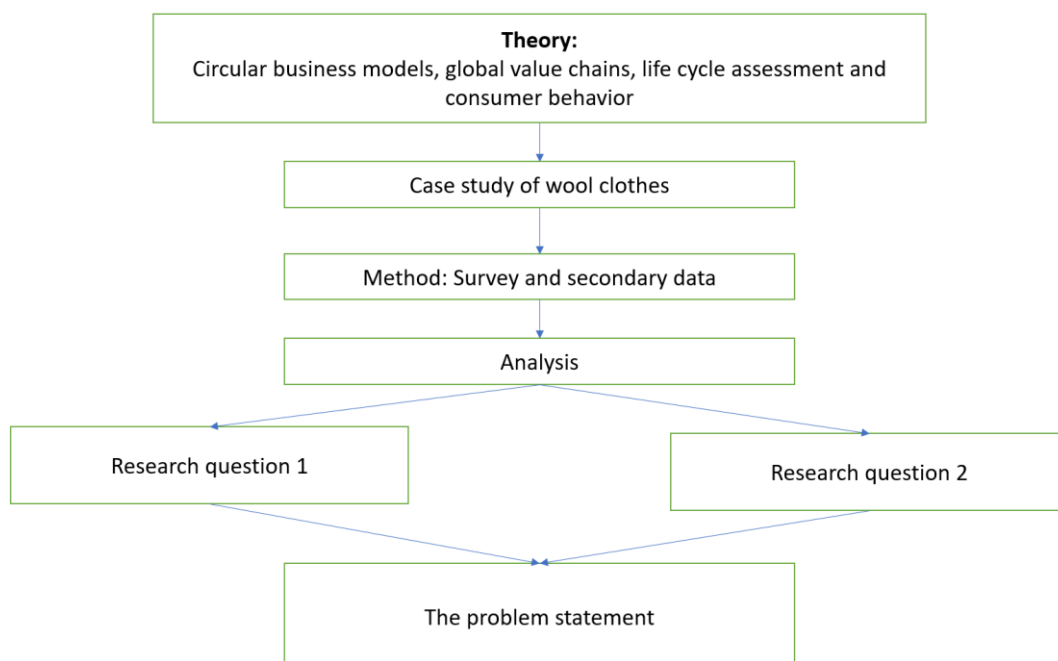
## 1.2 Limitations

To limit the thesis, I have decided to focus on a case of wool clothes. The choice of limitation is based on the fact that the textile industry is broad and consists of many sub-sectors. When considering the time limit for writing this master thesis, it would be challenging to focus on the whole textile industry, leading to a study that would probably be unfocused. The geographical focus of the respondents in the survey in this study is Norway. In a circular economy, you need to consider three dimensions, the environmental dimension, the economic dimension, and the social dimension. This thesis will only focus on the environmental dimension. The study will focus on the environmental impacts of wool clothes' value chain from a consumer's perspective. This means looking at the consumer's behavior regarding wool clothes and how they care for them—in other words, focusing on the consumer use phase and the end-of-life phase from a consumer perspective.

### 1.3 The structure

The thesis consists of 8 chapters in addition to a reference list and appendix. Chapter 1 includes an introduction, the problem statement, research questions, limitations, and a flow chart showcasing this thesis's structure. Chapter 2 consists of the background for this thesis, describing the framework behind the problem statement and focus in this thesis. Chapter 3 explains the theories that are being used in this thesis. Chapter 4 present the research strategy. Chapter 5 describes the method used in this master thesis. Chapter 6 is the analysis, which consists of three parts, part 1: consumers' use of wool clothes, part 2: The concept of fast fashion and circular business models, and part 3: environmental concern and information about sustainability. The data from the survey is presented together with secondary data. Chapter 7 discusses the gathered data that have been conducted through this thesis. Lastly, chapter 8 presents the conclusion of this study.

The figure down below illustrates how this study is structured. With this, I want to show how the theory, research design, choice of method, and analysis can relate to the research questions and how these research questions can answer the problem statement in this thesis.



## 2. Background

First, in the background chapter, sustainable development will be discussed. After presenting sustainable development, I will move on with the linear model to describe the dominant model used for value chains in the textile industry. Next, the circular economy will be presented, including a description of the model, concepts and theories that this model is based upon, and limitations and challenges. Lastly, the textile industry will be presented with its impacts and the benefits of using a circular economy model.

### 2.1 Sustainable development

The emergence of the concept of sustainable development has historically been related to environmental concerns. Later on, economic development and social development were added, meaning that the context of sustainable development consists of concerns related to the three dimensions, economic, environmental, and social (Hák, Janousková & Moldan, 2016). In the report, *Our Common Future* from the World Commission on Environment and Development, the concept of sustainable development achieved attention internationally (Meadowcroft, Banister, Holden, Langhelle, Linnerud & Gilpin, 2019). This report defined sustainable development as: "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p.43 in Meadowcroft et al., 2019).

The Paris Agreement that was signed is focusing on how the world can tackle the ongoing climate change. The goal in this agreement is that the global average temperature increases to well below 2 degrees above pre-industrial levels and try to limit the temperature increase to 1,5 degrees above pre-industrial levels (United Nations Framework Convention of Climate Change, 2015, p.3). The world probably needs to work together and find more sustainable solutions if the goal set in the Paris Agreement is to be achieved.

In 2015 all the Member States of the United Nations adopted the Sustainable Development Goals (SDGs), also called the global goals, and consist of 17 goals in total. These goals are related to the environment, climate change, and environmental, economic, and social concerns. Decisions that are taken need to consider all aspects. Taking action in one of these

areas will affect the outcomes in other areas. This means finding a balance by considering environmental, social, and economic sustainability developments (United Nations Development Programme, 2021).

Sustainable development needs to consider environmental developments, social developments, and economic developments, which are the exact three dimensions that need to be considered to gain circularity. Further, I will describe the linear economy's dominant economic system before moving on to the circular economy. The linear system is mentioned here because it is important to understand how a linear economy works to know why it is important to implement an economic system that focuses more on circularity.

## 2.2 Linear economy

The linear model is the dominant economic model that exists these days. A linear economy can be described as a socioeconomic system that distracts resources to produce products that the consumers use and then dispose of when they no longer create any value (Michellini, Moraes, Cunha, Costa & Ometto, 2017). The Ellen MacArthur-foundation further explains this system as a *"take-make-dispose"* economy (2013). The linear model can be explained as a straight line with a clear start and ending point. The fundamental core of this model is that raw materials are extracted from nature, produced into products that consumers buy and use, and then parts or all the materials end up as waste. Considering Norway, more than 97 percent of the materials are not being recycled and become waste (Nilsen, 2021).

The use of the linear economy model grew out of the industrial revolution. The industrial revolution started in Europa at the end of the 18<sup>th</sup> century and was increasing rapidly. This resulted in goods being produced in large quantities, and it was cheaper to buy goods rather than producing them independently. Goods made of textile are one example of goods that became cheaper to buy because the term fabric grew out of this period. Societies were moving away from a pre-industrial society, where it was more usual to produce needed products independently, to industrial society (Schrumppf, Bull & Tvedt, 2020).

The linear economy model depends on two basic assumptions for continuing to flourish. 1) The resources needed for producing the product must always be available for extraction, and 2) there always needs to be a place to throw the product after it has served its purpose (Andrews, 2015). Since the beginning of the industrial revolution, the population on earth has been growing from one billion people in 1804 to 7,2 billion people in 2014. It is predicted that the population on this earth will increase to 9,6 billion people by 2050. This increase in the population copes with the increase in waste that is being generated on this earth because the demand for products increases together with growth in the population. The result is that resources are used faster than they regenerate, and the natural resources available on earth becomes limited (Andrews, 2015).

Using this linear model results in an unsustainable pattern because of the different impacts related to the use of this model. The shift to a model that is more sustainable is needed, which is the circular economy model.

### 2.3 Circular economy

Early generations had a more circular approach based on how they lived compared to later generations. For example, it was customary to repair clothes that were damaged. If they were not able to be fixed, other products were made out of them. Later, this changed because of increased wealth conditions and production growth (Nilsen, 2021).

Over the last years, the concept of the circular economy has gained a lot of attention. Attention is related to providing a new system that is more sustainable by increasing the circularity and regenerate the value of products and materials (Reike, Vermeulen & Witjes, 2018). The European Commission (2021) has defined the aim of circular economy as followed:

*"A circular economy aims to maintain the value of products, materials and resources for as long as possible by returning them into the product cycle at the end of their use, while minimising the generation of waste. The fewer products we discard, the less materials we extract, the better for our environment"* (The European Commission, 2021).

To cope with this aim, the processes related to a product have to start at the beginning of a product's lifecycle. New intelligent solutions in the design and the product's production process can help minimize the resources needed (The European Commission, 2021). The design stage is a critical step in a product's lifecycle. Changes in this stage may affect the entire lifecycle, gaining a more sustainable product and create a more circular economy.

### 2.3.1 The circular economy model

The circular economy concept wants to cope with the triple bottom line: environmental, economic, and social perspectives. The Ellen MacArthur Foundation has illustrated the circular economy model, firmly called the butterfly diagram. This diagram consist of two wings also called the technical wing and the biological wing. These two wings illustrate the flows of materials. The diagram is based on the cradle-to-cradle concept, where biological and technical nutrients are distinguished (Velenturf, Archer, Gomes, Christgen, Lag-Brotons & Purnell, 2019).

The biological cycle of material flows consists only of biological nutrients. In this cycle, the materials can safely return to the biosphere after it is used because it can be re-created in natural systems. On the other hand, the technical cycle consists of materials that can't safely be returned to natural systems. This cycle consists of more flows than the biological cycle because the goal is to use the materials again at high quality with minimal energy loss. For this to happen, the materials need to be maintained, reused, remanufactured, and recycled. Suppose a product is designed to fit within a technical or biological materials cycle. In that case, no waste is produced because this model is designed in a way that materials either can safely return or be used again (Ellen MacArthur Foundation, 2013).

The goal of the circular economy model is to gain an economy that is designed to produce no waste. However, in one year, the amount of waste that returns to the natural environment from the used resources is 50-75 %. A product's waste should be reused as raw materials in another product to change this pattern if it cannot be used again in the same product (PWC, 2018).

### 2.3.2 Early concepts and theories that circular economy is based upon

The circular economy concept is not new. This idea is built upon different concepts and theories in the literature about the concept of closed loops. Mentioning some of the concepts/theories that can be drawn to the idea of circular economy is cradle-to-cradle, laws of ecology, looped and performance economy, regenerative design, industrial ecology, biomimicry, and the blue economy (Geissdoerfer, Savaget, Bocken & Hultink, 2017). Furthermore, the waste hierarchy is also a vital principle when considering a circular economy. Waste is the new raw material that can be used to produce new products, which can help gain a more sustainable economy (Avfall Norge, 2021). Under I will explain some of the concepts that circular economy builds upon and the waste hierarchy.

#### *Cradle-to-cradle design*

The first concept is the *cradle-to-cradle design*, which is based on industrial systems that positively consider environmental, economic, and social goals (Braungart, McDonough & Bollinger, 2007). This concept is based on the idea that materials can be divided into either biological nutrients or technical nutrients. Biological nutrients are based on the biological cycle. The material used is a part of biological processes, poses no hazards, and is safe for the environment. The materials used are safe for natural systems and humans. They can be returned to natural systems where the materials can be transformed into resources reused for human activity. Technical nutrients are defined as materials that are not a part of natural systems. An example of such materials is minerals. The purpose is that the materials maintain in the product's life cycles many times, with the same high value. They focus on manufacturing, recovering, and reusing the materials in a closed-loop system (Braungart et al., 2007).

#### *Performance economy*

According to the Ellen McArthur Foundation, the concept of performance economy is based upon a research report that the architect and industrial analyst Walter Stahel wrote to the European Commission in 1976 (2013). In this report, he described an economy that went in loops, also called the circular economy. The use of these visions could also impact waste

prevention, job creation, resource savings, and economic competitiveness. The main goals in a performance economy are to extend the product's life, prevent waste from occurring, and considering reconditioning activities. Stahel also highlights that products should not be sold, it should instead be sold as a service (Ellen McArthur Foundation, 2013).

### *Biomimicry*

The third concept is *biomimicry*. Janine Benyus is the author behind the book *biomimicry*, an innovation inspired by nature. This concept is trying to solve human problems by studying the best ideas in nature and then imitate these processes and designs (Ellen McArthur Foundation, 2013). It is about understanding the principles of a biological process and then adapt these concepts to help solve specific technical challenges (Lurie-Luke, 2014). The three fundamental principles that biomimicry relies on are nature as a model, nature as a mentor, and nature as a measure (Ellen McArthur Foundation, 2013).

### *Industrial ecology*

The fourth concept is *industrial ecology*, which uses the same principles as natural ecosystems and tries to cope with the closed loops in industrial ecology. This means that the processes that industrial systems operate with will learn from the processes that exist in natural ecosystems. Further, the only external energy used is solar energy, which only produces waste energy or heat (Korhonen, 2004). Therefore, the materials used in the cycle return to the system for reuse and are then considered effective because no waste is produced. Therefore, to reduce the environmental impacts, the economic activities produced by humans have to move away from causing changes in environmental systems (Graedel, 1994).

### *Waste hierarchy*

The waste hierarchy principle has existed for over 40 years and was 2016 included in the Sustainable Development Goal 12 (Pires & Martinho, 2019). This hierarchy illustrates the EU's framework directive for waste and the priorities in the Norwegian waste policy. This hierarchy looks like a bottom-up pyramid because the purpose now is to start first with the bottom of the pyramid, reducing waste (Avfall Norge, 2021).



The waste hierarchy consists of five layers: waste prevention, reuse, material recycling, energy recovery, and disposal. Waste prevention consists of the growth in waste lower than economic growth, reducing the waste produced. Reuse is about reusing the products instead of throwing them and produce waste. Material recycling consists of reusing the materials as raw materials in new products rather than becoming waste. Energy recovery is about reusing waste for heating or electricity instead of burning it. Disposal means that waste is being produced, but there have been several changes in the rules regarding what is allowed to be disposed of. The first layers are the ones that should be prioritized first (LOOP- Stiftelsen for Kildesortering of Gjenvinning, 2008).

### 2.3.3 Limitation and challenges with circular economy

It can be argued that the implementation of the concept of circular economy is promising because it helps businesses to focus more on sustainable development in their work. It makes sense that the resources used are extracted from nature, which results in a product or a service. The resources can be used many times and still have economic value. Although the use of circular economy is promising, it has been argued that it does not provide much innovation when considering environmental sustainability (Korhonen et al., 2018)

The global economic system that exists today is more locked in the linear model. The existing implementation of circular economy has been more on regional and local levels, and there is no global governance. This makes it challenging since sustainable development is a worldwide goal. Success on regional and local levels have made problems through the value chains in other places because there are more international relationships through the value chains when producing products (Korhonen et al., 2018)

Other challenges are related to the land-use and use space of circular economy activities, how they contribute to sustainability. Shifting from the use of non-renewable energy production to renewable energy production requires the use of land. The use of more recycling may need more roads for transportation. These issues pose challenges to the question regarding sustainability (Korhonen et al., 2018)

Market competition may pose a challenge between new circular economy models and existents and the dominant linear model. This may be challenging because of the higher positions of the dominant ones in the market than new ones. These may be more locked in their path dependency and difficult to compete with and make changes (Korhonen et al., 2018).

## 2.4 Textile industry

### *Impacts*

In today's society, the focus on living more sustainably is increasing, and people are becoming more aware of their consumption. However, the resources available on this earth are being extracted at a rate that is not sustainable. If we continue this path, we will need the same resources equal to supplying three planets of the earth by 2050 (European Parliament, 2021b). In the textile industry, fast fashion has led to clothes being produced with lower quality and then thrown away because of the focus on delivering new styles and competing on price (European Parliament, 2021a). To make one t-shirt, you need 2.700 liters of water, which is the same amount of water that can provide drinking water for one person for 2.5 years. Washing clothes made of synthetic materials are realizing 0,5 million tonnes of microfibre in the ocean every year, accounting for 35% of the primary microplastics released into the environment. The production of clothing and footwear is responsible for 10% of the global greenhouse gas emissions, which is more than the emissions released from all international flights and maritime shipping together. These are just some examples of the impacts that the textile industry has on the environment. Moving towards a more circular economy will help reduce these impacts on the environment (European Parliament, 2021a).

### *Benefits of using circular economy*

A shift for businesses in the textile industry from a linear economy to a more circular economy can be beneficial. The Ellen MacArthur Foundation (2017) highlights some of these. First, fewer materials result in lower costs and decrease their exposure to volatile raw material prices. This relies on that clothes are being recycled. Second, new circular business models can increase customer relationships and build up long-term relationships. These relationships can be strengthened by offering services related to products. Finally, new ideas

can emerge by focusing on the circular economy, increasing innovation (Ellen MacArthur Foundation, 2017).

As seen here, the textile industry creates negative impacts on the environment because of its function today. Providing a shift towards a more circular textile industry may reduce these effects. Benefits arise from shifting the focus to a more circular textile economy.

### 3.Theoretical framework

In this chapter of the master thesis, the theoretical framework for this study will be presented.

#### 3.1 Circular business models

In this part of the theory chapter, different business models that focus on gaining a more circular economy are highlighted. Chaining the strategy in a company is not an easy task because the way of thinking is rooted in the linear model. Circular business models are more concerned with the impacts of the product, and benefits can be achieved by chaining these business models (Lacy & Rutqvist, 2015). The cost related to available resources on this earth and the production of waste are increasing. The use of circular business models can reduce resource costs by gaining more circularity in the resources used for producing a product. Furthermore, waste generated can create revenue for the company (Lacy & Rutqvist, 2015).

Peter Lacy & Jakob Rutqvist (2015) in their book "*Waste to Wealth: The Circular Economy Advantage*" are describing five circular business models that are generating resource productivity improvements in innovative ways that Accenture has identified in their analysis of 120 companies. These five circular business models are circular supply-chain, recovery and recycling, product life-extension, sharing platform, and product as a service (Lacy & Rutqvist, 2015).

##### 3.1.1 The circular supply-chain

The circular supply-chain is the first business model that is being highlighted. This model focuses on doing the right thing from the start, which may lower the possibility of making changes during the process (Lacy & Rutqvist, 2015). Raw materials and energy needed to make a product have been more tied to how the linear model functions. Raw materials have been related to polluting, toxic and non-recyclable resources, and energy has been mostly generated from fossil fuels. Chaining the inputs to recyclable, renewable, or biodegradable materials and energy is the core of this business model. Choosing to develop a more sustainable product can lower risks and cope with new applicable regulations. They also

point at that the consumer will choose a more sustainable product if it can compete on price and quality (Lacy & Rutqvist, 2015).

### 3.1.2 Recovery and recycling

Recovery and recycling is the second business model, where the focus is that waste becomes history. This model focuses on finding new ways of using waste and create value. Waste is being transformed through the use of recycling and upcycling. With the help of new technology, a two-way supply chain can be created. This works because the product goes from the producer to the consumer and the other way around. In other words, the end-of-life products are brought back from the consumers. A two-way supply chain makes it possible to create by-products and use the waste stream to optimize revenue (Lacy & Rutqvist, 2015).

### 3.1.3 The product life-extension

The product life-extension is the third business model, where the focus is on making the products last longer. This circular business model shifts the focus away from producing products in a high volume, which is logical considering the economy and causing environmental issues. This model work in that instead of buying a new product, the product in this model is designed to last longer by repairing, upgrading, or refilling the products (Lacy & Rutqvist, 2015).

This business model can be related to the classic long-life model, where the focus is on making products that last longer and has high quality. The value lies in a high level of service to make the customers hold on to their products. This model is one of the circular business models that fit into the design strategy for slowing the resource loops (Bocken et al., 2016)

### 3.1.4 The Sharing Platform

The sharing platform is the fourth business model that fits with a circular economy. You usually go to the store and buy and pay for a product that is than yours. This sharing platform opens up the opportunity for multiple customers to use the same resources, which

means that the demand for manufacturing something new is reduced. It can increase the consumption use without increasing the use of resources which can be defined as circular (Lacy & Rutqvist, 2015). The product owner is connected with individuals or organizations that want to use the product on this platform. This approach can work either by sharing, renting, borrowing, or exchanging products. Since the platform owner does not own the products, these companies generate revenue by charging a percentage of all the transactions on the platform. Uber is an example of a company that operates with a sharing platform. Here, a person who drives a car can use Uber to contact customers, and then Uber takes 20 percent of the price that the customer pays (Lacy & Rutqvist, 2015).

### 3.1.5 Product as a service

Product as a service is the fifth business model, and the idea is that you pay for a service rather than the product. This business model can help lower the environmental impacts by offering several forms as a product as a service. The first one is the *pay for use*; the customer pays for using a service by, for example, the hours you use the service. The following form is *leasing*; the customer buys rights through a product contract. This contract contains agreements on how long the customer is leasing the product, and it may be over an extended period. The third is *rental*; the customer buys rights to use the product over a shorter period, the most common is less than 30 days. This agreement is typically more flexible than the leasing agreement because it is only for a short period (Lacy & Rutqvist, 2015).

This model can be related to the “access and performance model” with the same focus, providing a service rather than physically owning the product. This focus builds upon the design strategy related to slowing the resource loops. An example of this model is the leasing of clothes (Brocken et al., 2016).

## 3.2 Global value chains

As we see it today, the world is more interlinked, and we can trade with countries around the globe. In a global value chain, the raw materials used in the product and the final consumers can be on each side of the world. The world has become smaller.

Kaplinsky & Morris (2001), in their book "A handbook for value chain research" describe a value chain as following,

*"The value chain describes the full range of activities which are required to bring a product or service for conception, through the different phases of production (involving a combination of physical transformation and the inputs of various producer services), delivery to final consumers, and final disposal after use" (p. 4).*

This description shows that the value chain may look like it only consists of these different phases, referred to as links. These value chains are more extended in the real-life, and each of these links consists of several other activities (Kaplinsky & Morris, 2001).

In a global value chain, the different activities that exist are spread across the world, and these activities impact jobs, processes, products, technologies, standards, and regulations. The core of the global value chain analysis is to examine what shape and transform global economic processes and the relationships between different firms by looking at the actors and mechanisms (Gereffi & Christian, 2009). The global value chain framework can be useful to use when understanding real-world problems. For example, this can be that someone wants to upgrade to a higher value segment, and then this framework can help understand their competitive strengths and challenges (Gereffi & Christian, 2009).

A global value chain model consists of different research steps. The first step is to identify the stages and actors in the value chain, from the start to the consumer. Identification is achieved by looking at the entire process. Tracing all the processes related to the input-output process. The value chain typically look like this: research and development -> design -> production -> distribution -> marketing -> sales (Gereffi & Christian, 2009). After the different processes related to the input-output process are accounted for, the actors are identified in the analysis. This includes all the actors that are a part of the different stages through the value chain. The core of this part of the analysis is to determine the actor's size, importance, and how their different roles can be changed (Gereffi & Christian, 2009).

The second step is the geography of the value chain. This step determines the value chain spread (Gereffi & Christian, 2009).

The third step is to identify the connection between the firms in the industry. This step of the analysis aims to determine who controls the standards, technology, and brands in the value chain and how the chain operates. This is described as a governance structure because it looks at these relationships between firms in the industry. Traditionally value chains can be distinguished into a producer-driven chain or a buyer-driven chain. A producer-driven chain is about connecting firms through tight production alliances. On the other hand, a buyer-driven chain is about outsourcing the production, and these chains are characterized by lead firms (Gereffi & Christian, 2009)

Typically consist of the technology industries' producer-driven chains, where the manufacturers usually play central roles in the production networks considering the coordination. Examples of such industries are aircraft, computers, and automobiles. In a buyer-driven chain, the companies generally control the design and the market, but others do the production. Examples of such firms are retailers, footwear companies, and apparel companies (Gereffi & Memedovic, 2003).

The last step in the analysis is of the institutions, where the different activities in the chain are influenced by the institutions, such as governments, regulatory bodies, and agencies (Gereffi & Christian, 2009).

### 3.3 Life cycle assessment

The focus on considering the potential impact products may have on the environment has been developed and highlighted more throughout the years. The potential environmental impacts and the resources used in the lifecycle of a product can be highlighted through the use of a tool called life cycle assessment (Finnveden, Hauschild, Ekvall, Guinée, Heijungs, Hellweg, Koehler, Pennington & Suh, 2009). These potential environmental impacts do not just involve the product itself but the whole process related to the product. This consists of the extraction of the raw materials needed to produce the product, the phases that involve



the production of the product, the use of the product after the production, and the last steps that involve waste management. The final stage, waste management, includes disposal and recycling of the product (Finnveden et al., 2009).

A product can further be explained as both goods and services and are produced because there is a demand for it in the market. This pattern is based on a "cradle to grave" approach and has the same pattern as a linear model (Rebitzer, Ekvall, Frischknecht, Hunkeler, Norris, Rydberg, Schmidt, Suh, Weidema & Pennington, 2004). The purpose of the life cycle assessment tool is to throw light on the possibility of improvement considering the impacts on the environment in these stages. Emissions related to the whole lifecycle of a product and the extraction of resources contribute to a wide range of impacts on the environment. These can be impacts such as climate change, resource availability, water, land use, the ecosystem, and human health. The life cycle assessment tool can help in this process by considering the entire life cycle of a product by calculating different indicators and the potential environmental impacts linked to a product. This can help both in pollution reduction and reduction in the resources that are needed (Rebitzer et al., 2004)

The life cycle assessment analysis consists of four stages. The first stage is to define the goal and scope of the study. In the first stage, you describe the production system by looking at the boundaries. The functional unit is also defined, which is the function that the product system fulfills. The second step is the inventory analysis, which looks at the consumption of resources and how much waste/emission is generated in the system, which is the total inputs and outputs of material and energy flow within the product system. The third step, the impact assessment, uses the data from the inventory analysis to determine the potential impact from the product system. The last step, the interpretation, is where the results are presented. This stage reviews all the stages in the life cycle assessment analysis (Rebitzer et al., 2004).

### 3.4 Consumer behavior

This part of the theory chapter uses the book *"The Psychology of Consumer Behavior"* written by Brian Mullen & Craig Johnson (1990) to explain consumer behavior.

In consumer psychology, questions are asked related to everyday behavior and are defined as a scientific study of consumer behavior. A person that uses products, goods, or services can be defined as a consumer. Studying consumer behavior is complex since it consists of various variables and relationships that affect consumers' behavior (Mullen & Johnson, 1990). Further on, the general model of consumer behavior will be elaborated.

The first part highlighted here is the stimulations that affect the consumers' behavior, firmly called "stimulus situation". The stimulations that affect the consumers are complex because they involve a single stimulus and a pattern of stimulus in consumer behavior. The world as it is today is complex. Consumers are being affected by different types of stimulation, like commercials and product packaging. That is why it is difficult to determine the stimulus affecting consumers' behavior (Mullen & Johnson, 1990).

The next part is related to the internal processes and described as changes that occur within the individual. These processes can either be viewed as consequents or antecedents. The difference between those two is that the first one is caused by something else, and the other causes something else. When an internal process is viewed as a consequence, it is treated as a dependent variable that is then influenced by other independent variables. There are interactions between the variables: the cultural context, the social context, other internal processes, the stimulus situation, and the individual's behavior. When an internal process is viewed as an antecedent, it is the opposite of a consequence, which means that the internal process is treated as an independent variable, which is then influenced by other dependent variables (Mullen & Johnson, 1990).

The different internal processes that are being discussed are highlighted here. It can be challenging to discuss these processes separately because they are defined as a related series of changes. The first internal process is perception and can be defined as a result of awareness of the product. The second internal process is cognition and can be defined as a result of beliefs or evaluation of the product. The third internal process is memory and can be defined as a result of remembering information about the product. The fourth internal process is learning and can be defined as a result of the formation of associations. The fifth

internal process is emotion and can be defined as a result of feelings about the product. The last internal process is motivation and can be a result of desire or need for the product (Mullen & Johnson, 1990).

The intention is the next part that is described, which relates to some specific behavior that is a part of a plan, such as an act or a response. When there is a plan for using products or purchasing products, it's referred to as the intention, and when products are used or purchased, it's referred to as the behavior (Mullen & Johnson, 1990).

Lastly, the social and cultural context in this general model of consumer behavior is described. Different stimulation influences the individual, but the social context is referred to as the total of social stimulation that influences the individual. Examples of such social stimuli can be family, friends, or the sales personnel. On the other hand, the cultural context can be referred to as the total of cultural stimulation that influences the individual and the individual's social context (Mullen & Johnson, 1990).

## 4. Research strategy

There are four different types of research strategies that can be used: deductive, inductive, retroductive, and abductive. It is possible to use one of these strategies, or you can use a combination of these. It is important to choose wisely which research strategy or research strategies are being used since they have different ways of answering the research questions (Blaikie & Priest, 2019). I will argue that a combination of inductive and abductive research strategies is used in the study. According to Blaikie & Priest (2019), "*Inductive logic may help to investigate patterns and regularities, and Abductive logic is useful when generating in-depth descriptions of similarities and differences*" (p.116).

An inductive research strategy has been used to collect data to describe the consumers' use and behavior related to wool clothes and then try to connect this to the research questions. The inductive research strategy focuses on generalization, and as seen from my findings, these findings can probably not be used for generalization. An Abductive research strategy has been used to understand consumers' use of wool clothes and their behavior. That is why I think it might be appropriate to combine an inductive and abductive research strategy for my research.

## 5.Method

This chapter aims to describe the method and the design used to answer the problem statement in the master thesis. This chapter explains the design, the choice of data method, how the data has been collected, and secondary data. It is essential to be critical of the selected method because it may not be the only appropriate way of answering the problem statement.

Based on the problem statement, a case study will be used as a design for the master thesis. A case study will be used because the problem statement in this thesis focuses on gaining circularity in value chains in the textile industry. Considering that the textile industry consists of several elements (size, different categories), it may be helpful to look at one specific part of the industry to secure more accurate and valuable data about the topics in this thesis. That is why it can be argued that using a case study of wool clothes is an appropriate angle to answer the problem statement. According to Thomas (2021), when you are using a case study as a design for your research, you focus on one specific thing. When doing a case study, the most used methods is interviews and observations, but it is also appropriate to use a survey related to a case study (Blaikie & Priest, 2019). In this research, a survey is used related to the case study of wool clothes.

The use of a case study is well suited when the research questions want to answer "how" and "why" questions (Yin, 2013). The research questions in this thesis wish to find out 1) how can consumers` use of wool clothes affect circularity considering the environmental impacts and 2) which circular business models could be suitable for gaining more circularity in the value chain of wool clothes; from a consumer perspective. It may therefore be appropriate to use a case study for this study.

When using a case study as a design, you have to determine if you want to use a single case study or a multiple case study (Yin, 2013). In this study, I want to use a single case study and only look at wool clothes. Doing this will make it easier to focus my research rather than looking at multiple cases. The time limit is also an essential factor for using a single case study because then the study can be more focused. After deciding to use a single case study,

it is vital to define how many units you are analyzing (Yin, 2013). A unit can be, for example, a place or an organization. On the other hand, you can look at different subunits in a case, for example, various processes. In this study, I am looking at several subunits regarding wool clothes. This choice is because the research looks at several processes from a consumer perspective related to the use of wool clothes. This case study approach is called an embedded single case study (Yin, 2013).

## 5.1 Data method

In this part of the method chapter, the data method used to collect the needed data will be explained. Data method is the next step in developing the research design and will help answer the research questions. The data method choice describes how you have received and analyzed the needed data (Blaikie & Priest, 2019). Since the selected method is helping the researcher answering the research questions, it is crucial to be critical of the data sources used and be aware that the method will be essential to the result of the research.

### 5.1.1 Qualitative and quantitative method

In general, it is common to divide research methods into either quantitative or qualitative methods. The difference between these two methods is that quantitative measures aspects of social life, and qualitative is describing and exploring social actors. The typical way of gathering the needed data in the quantitative method is through questionnaires and structured interviews. It is normal to use this type of method when collecting numerical data. In a qualitative method, the standard way is through unstructured or semi-structured interviews, in-depth, focused, or in groups. It is normal to use this type of method when gathering non-numerical data. You can also use a combination of these two methods to answer the research questions (Blaikie & Priest, 2019 ).

In this master thesis quantitative method is used to gather the needed data. This method is chosen because the survey used for this research wants to reach out to the consumers using wool clothes. This method is also selected because it is suitable for gathering a representative sample of consumers using wool clothes. A quantitative method can also be

beneficial, considering that the thesis is trying to map out connections between consumer behavior and circularity in the textile value chain.

#### 5.1.2 Data sources – Primary and secondary data

We can distinguish between three main types of data in social research: primary, secondary, and tertiary. The researcher can use one type of data, or the researcher can use a combination of all three data types. Primary data is referred to as new data, which a researcher generates and gathers for answering specific research questions. The researcher also has control over how the data were collected and to which purpose. Secondary data is referred to as data that is collected by someone else. This data often has another purpose but can be helpful if the information gathered is relevant for a specific research project. Tertiary data is referred to as data analyzed by another researcher, which means that it may only be the results available and not the raw data (Blaikie & Priest, 2019).

This master thesis will consist of a combination of primary and secondary data. The reason for selecting this combination is because the secondary data can help support the primary data gathered. In addition, using secondary data together with gathered primary data will make the findings in the research comparable. The primary data used in this master thesis is collected through a survey of wool clothes.

The data used in the master thesis either ends up in the form of numbers or words, or both. Primary data usually start as words, remains in words through the analysis, and still results in words (Blaikie & Priest, 2019). Other primary data start as words, transform into numbers and statistical models, and then end up as words. (Blaikie & Priest, 2019). For example, the primary data collected in this research will first be in words, which are the questions in the survey. The results from the survey will then be presented by using statistical models and then end up in words when explaining the models and the findings.

## 5.2 Data collection

This part of the method chapter will present the data collection and pre-work before the survey was published.

### 5.2.1 Survey

Data have been collected through a survey for answering the research questions in this master thesis. The survey consists mainly of closed-ended questions, but there is one open-ended question at the end of the survey. Using a survey to gather the needed data for research is a widely used social science technique. This technique can take many forms and has many uses, such as internet opinion polls, phone interviews, and different questionnaires (Neuman, 2014).

In this master thesis, the survey will be a questionnaire. This form is selected because the gathered data ask the consumer about the use of wool clothes and how they care for their wool clothes. When using a survey as a method for collecting the needed data, you can ask the same question to a broad group of people at the same time. This method can help get quicker responses because it only takes, as in this survey, 3 to 5 minutes to answer it. Answering this survey does not need any specific qualifications other than just owning and using wool clothes.

### 5.2.2 Design layout of the survey

After deciding to use a survey to gather the needed data, survey questions and the survey design need to be conducted, referred to as the planning phase (Neuman, 2014). The survey consists of two main parts. The first part is about consumers' washing behavior. The reason for asking consumers about washing behavior is that this topic can provide research answers regarding the environmental impacts of washing. Wool is expected to have low environmental impacts related to washing, compared with other textiles, such as cotton. It's therefore interesting to see if the respondent's answers can support this. Wool clothes are the main focus in the first part of the survey, but cotton clothes are compared with wool clothes related to washing. The reason for including questions about cotton clothes is that



such clothes are usually washed more frequently and at higher temperatures than wool clothes.

The second part of the survey focuses on gaining information about consumers' behavior regarding donation, repairing, fast fashion, second-hand wool clothes, leasing and renting, concerns related to the environment when purchasing wool clothes, and experiences regarding provided information on sustainability. These questions are asked because they can give information about how the respondents care for their wool clothes.

Neuman (2014) distinguishes the categorization that can be asked about in a survey: behavior, attitudes/beliefs/opinions, characteristics, expectations, self-classification, and knowledge. The different questions asked in the survey are questions related to behavior, characteristics, and the category attitudes/beliefs/opinions. The characteristics of questions asked are age and gender, and the rest of the questions in the survey can be associated with the other two categories.

### 5.2.3 Open-ended questions and closed-ended questions

When using a survey for gathering the necessary data needed for the master thesis, it is customary to choose between open-ended questions and closed-ended questions or a mix of both. Open-ended questions can be questions with no limitations regarding what answers can be received to a specific question; the respondents have more freedom. Closed-ended questions can be more structured questions; the respondents can choose between a set of fixed responses (Neuman, 2014). There are several disadvantages and advantages for both of these methods related to the form of questions. Open-ended questions benefit from writing verbatim answers, which means that they can give a more detailed answer. The disadvantage is that the answer can be more complex, and the answer might be irrelevant and useless for the researcher conducting the survey. Open-ended questions can make it more difficult for the researcher to code and compare answers and is more time-consuming. Closed-ended questions have the advantage of being faster for the respondents to answer, it is not time-consuming, and it is easier for the researcher to code and compare the gathered data. The disadvantage is that the researcher may lose some vital information because the

respondents are more forced to answer the researcher's fixed categories. Since each of these two forms has disadvantages and advantages, the crucial part to consider for the researcher is the most appropriate use in the research's specific situation (Neuman, 2014).

The form of questions used in this research is closed-ended questions and one open-ended question at the end of the survey. The main reason for using closed-ended questions is that it may increase the chances of getting more respondents to answer the survey conducted in this research. This is because this master thesis seeks to understand consumers' behavior related to wool clothes, and the gathered data is a sample that represents the consumers. Also, the one open-ended question allows the respondents to give comments related to the questions in the survey.

#### 5.2.4 Pilot test of the survey

Before making the survey public for respondents to answer, a pilot test of the survey was conducted. A pilot test allows the researcher to test the survey on a few selected respondents, similar to the respondents answering the public survey. Pilot testing the survey can give the researcher information about if the questions asked were straightforward (Neuman, 2014). The survey was sent to a few family members and friends before it was published public. The response that was received was that the questions were understood.

#### 5.2.5 Collecting the respondents for the survey

According to Blaikie & Priest (2019), the population used for the survey needs to be related to the research questions, and you can choose how to define the population. The population in this research is people in Norway. The sample of this survey is the consumers in Norway that use wool clothes. A snowball sampling through social media was used to gather the needed sample for this research. Snowball sampling is described as a snowball that grows when it is rolled in the snow, and this method can be used in friendship networks (Blaikie & Priest, 2019). The survey was posted on Facebook, both on my profile page and the University of Stavanger's student page. Some respondents shared the survey through their own Facebook page, which might increase the chances of getting more respondents. As seen from the survey results, the respondents gathered for the sample are mainly females; 80% of

the respondents are females. The main groups of respondents are between 18-25 (31% of the respondents) and 26-35 (50% of the respondents). These results show that the sample is not representative of the whole population but rather a small population sample.

The respondents are mainly randomly gathered because the survey has not been sent out to specific groups of people. Although the population is people in Norway, the survey cannot reach out to all the citizens through social media. Random sampling seeks to reach the whole population because of equal chances of being selected. Random sampling differs from non-random sampling, where the population has not an equal chance of being selected (Blaikie & Priest, 2019). Each individual has not an equal chance of being selected in this survey. That is why that the sample for this research is more non-random and differs from the random-sampling approach.

#### 5.2.6 Privacy

There is a law about how to treat personal information called Personal Data Act “personopplysningsloven” in Norway. This law needs to be taken into account when conducting a master thesis with the involvements of people who have participated in the research development. This law says that if the treatment of personal information is happening through an electronic helping tool, it has to be reported (personopplysningsloven, 2000, § 3).

This survey is created and conducted through SurveyXact, a tool that students can access through the University of Stavanger. Using this tool gives the researcher the opportunity of conducting a completely anonymous survey. That is why this survey has not been reported to the NSD for approval. In addition, this survey tool does not track IP addresses or the name of the respondents.

Analyzing and coding the answers has been done through SurveyXact and Microsoft Excel. SurveyXact can sort the respondents into different diagrams and gives examples of how the design result can be. Microsoft Excel can be used for sorting the answers and seeing if there are similarities and differences in respondents' gender and age.

### 5.2.7 Secondary data

The secondary data used in this study is gathered from other researchers and reports. Laitala & Klepp, 2016: "*Wool Wash: Technical Performance and Consumer Habits*", Laitala et al., 2011: "*Potential for environmental improvements in laundering*", Laitala et al., 2018: "*Does Use Matter? Comparison of Environmental Impacts of Clothing Based on Fiber Type*", Bech et al., 2019: "*Evaluation the Environmental Performance of a Product/Service-System Business Model for Merino Wool Next-to-Skin Garments: The Case of Armadillo Merino*" and Forbrukerrådet, 2019: "*Del 2: Sirkulær økonomi, rådgivningsroboter og Consumer Market Scoreboard*".

## 6. Analysis

In this chapter, the analysis will be presented. First, I will give an introduction and present the survey respondents' age and gender. Further on, part 1: consumers' use of wool clothes, then part 2: Fast fashion and circular business models, and lastly, part 3: environmental concerns and information about sustainability. In the analysis, the study will focus on the case study of wool clothes.

### 6.1 Introduction

The global textile industry generates impacts on the environment by producing clothes. These environmental impacts exist throughout the whole life-cycle (Wiedemann, Biggs, Nebel, Bauch, Laitala, Klepp, Swan & Watson, 2020). Clothes made of synthetic fiber have expanded, resulting in a higher demand for resources and environmental impacts. The textile industry needs to change its' direction towards environmental efficiency improvement because of the environmental impacts related to the textile industry. The focus should be on how consumers use and care for their clothes and how products in the textile industry are produced (Wiedemann et al., 2020). The textile industry can be related to a buyer-driven chain where the companies generally control the design and the market, but the production is being outsourced to others (Gereffi & Christian, 2009) (3.2).

Wool is a part of the textile industry, and is a natural, renewable fiber, and has a high value. The main steps in the wool value chain are that the wool comes from the sheep's at the farm, then the wool is processed into yarn, and different items are produced. The last steps after the production phase are the consumer use and the end-of-life phases (Wiedemann et al., 2020).

Further on, the study will focus on the case study of wool clothes and present the findings from the survey conducted in this research of consumers' behavior regarding the use of wool clothes.

Questions related to gender and age will first be presented in the analysis. There were a total of 126 respondents that answered this survey. There were 25 males and 101 females.

Down below is a table showing how the respondents are divided into different age groups. In the question related to age, only 125 of the respondents chose to answer this question. This means that one of the females who responded to this survey did not answer age. From the table, you can see that the majority of the respondents fit into the age group 26-35 with 62 respondents. After this comes the age group 18-25, with a total of 39 respondents. These results show that the majority of the respondents that answered the survey are relatively young people.

Age group	Male	Female	Total
18-25	4	35	39
26-35	20	42	62
36-45	1	7	8
46-55	0	10	10
56-65	0	6	6
<b>Total</b>	<b>25</b>	<b>100</b>	<b>125*</b>

Tabel 1: Age and gender \*One person did not answer this question

### 6.2 Part 1: Consumers' use of wool clothes

This part of the analysis focuses on how consumers care for their wool clothes when considering washing habits. Part one of the survey will be elaborated in this part of the analysis. The respondents were asked questions regarding their washing behavior. Wool clothes have been compared with cotton clothes to see if there are any differences between how these two items are washed.

There are different environmental impacts in the consumer use phase that can be attached to this phase of a value chain. When studies have used a life cycle assessment analysis to determine the environmental impacts, the part which is usually the most energy-demanding period is the user phase related to clothes life cycle (Laitala, Boks & Klepp, 2011). The user phase of the value chain of wool clothes is expected to be the phase where wool clothes have low environmental impacts related to other fibers, such as cotton. Effects associated

with this phase that need to be considered are; how much water is used when washing clothes, which temperature is used when washing clothes, which method is used for drying clothes, how many times are clothes used before washing, and the lifetime of the garment (International Wool Textile Organisation, 2021). Kirsi Laitala & Ingun Klepp (2016) point out that wool clothes can be air dried, washed less frequently at lower temperatures, requires a shorter washing cycle, and it is not necessary to use a tumble-dryer, which then saves energy. These points can reduce the energy consumption compared to other fibers by considering energy per washing cycle with energy per day (Laitala & Klepp, 2016). Therefore it is interesting to see if the respondents represented in this survey have washing habits that match this description.

## 6.2.1 Frequency of washing

### 6.2.1.1 Introduction

The first impact that is of primary interest is the frequency related to washing. Suppose a consumer's habits regarding the environmental impacts are to be changed. In that case, the consumer needs to be willing to change, gain knowledge and information, and the technology needs to be available. There have been changes in technology to improve the washing practice, but this has not reduced consumers' time for washing. Time spent on washing clothes is related to consumers owning more clothes and washing the clothes more often (Laitala, Boks & Klepp, 2011). The behavior can also be explained by the fact that consumers want the clothes to feel fresh and clean when used, which can be related to cultural norms. Different items like underwear and t-shirts close to the skin are often washed after every use. Various communication regarding that different fiber types can be washed less can also affect the frequency of washing. When comparing with cotton, an important matter to consider is that wool clothes can be washed less because they are related to being self-cleaned (Laitala et al., 2011).

### 6.2.1.2 Findings

For this research, wool has been compared with cotton to overview the differences between wool and other textile fibers. In the survey, the question "*how many times do you usually*

use clothes made of wool before washing them?” was asked. The same question was asked in the survey regarding cotton clothes. The answer options for these two questions were between “I never wash them” to “10 times or more”.

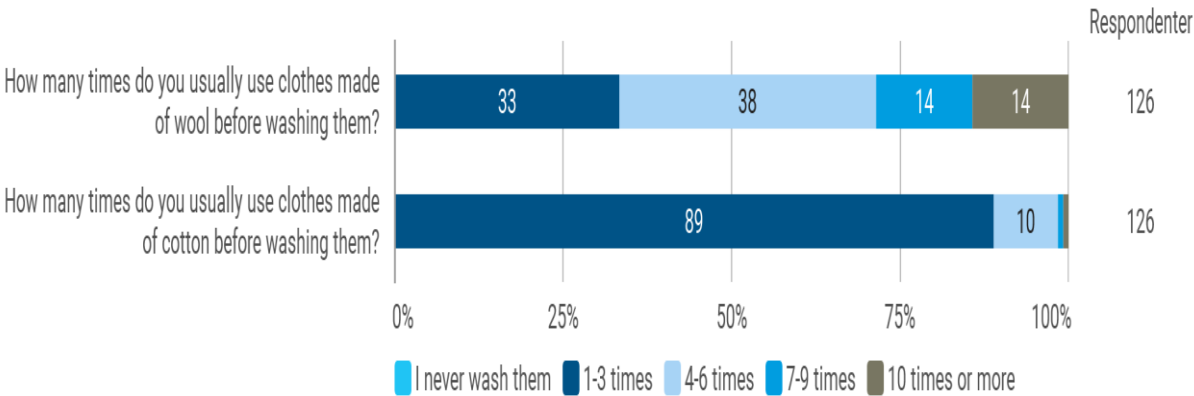


Figure 1: How many times do you usually use clothes made of wool before washing them? How many times do you usually use clothes made of cotton before washing them? (N= 126).

Wool

The findings from the survey show that the answer options that most of the respondents answered were 4-6 times before washing them (38%). Thirty-nine of these answers were females, and 9 were males, a total of 48 respondents. The age group of respondents who answered this was between 18-35. After this answer, 1-3 times were the most selected answer (33%). Thirty-six of these answers were females, and 6 were males, a total of 42 respondents. When looking at age, 34 of these respondents were between 18-35. Since most of the respondents were females and between the ages of 18-35, these results can probably not be used to compare across age and gender. At the same time, the findings show that young people may be more split in how often they use wool clothes before washing them. When looking at the average answer in numbers, respondents answered the options between 2 to 5, and the average response is 3,10, which is the category 4-6 times before washing the wool (Appendix B).

Cotton

The findings from the survey show that the answer options that most of the respondents answered were 1-3 times before washing them (89%). Eighty-nine of these answers were females, and 23 were males, a total of 112 respondents. Considering age, 92 of these



respondents were between 18-35. Like wool, this finding can probably not be used to compare with other age groups and gender. At the same time, it is interesting that 92 of 101 respondents representing the age 18-35 in the survey were using cotton clothes between 1-3 times before washing them. These findings can tell us that young people wash cotton clothes more frequently compared to the other age groups in the survey. Respondents answered the answers options between 2 to 5, and the average is 2,13, which is the category 1-3 times before washing the cotton (Appendix B).

#### Findings from secondary data

Kristi Laitala & Ingun Grimstad Klepp (2016) has written a paper where they discuss the washing of wool clothes and consumer habits. In this paper, they use surveys and interviews to receive the needed information. A question asked in the surveys was related to frequency in washing wool clothes compared to cotton clothes. The difference between the survey conducted in this research and theirs is that they looked at specific wool and cotton clothing items. The results from the surveys looking at people in Norway and Sweden were that they used wool clothes almost double as long between washes compared to clothes made of cotton.

#### Different wool items

Further on, a question regarding wool clothes was asked in this research, focusing on if different items were washed more frequently than others. The question asked was, *“Considering the different items under, are there some of these items that you wash more frequently?”*. The respondents could select several of the answer options in this question.

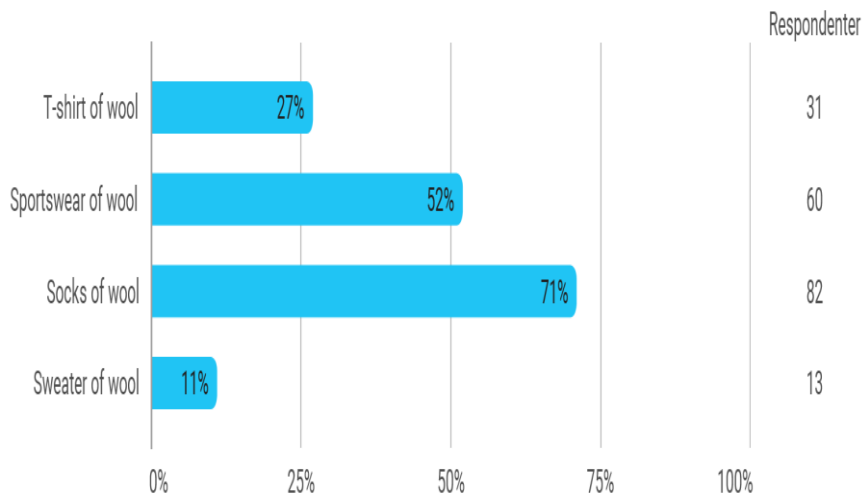


Figure 2: Considering the different items under, is there some of these items that you wash more frequently? (N= 116).

The findings show that the most selected answer option was socks of wool. A total of 82 respondents (71%) chose this item. The second most washed item was wool sportswear, with 60 respondents (52%) answering this option. The least washed wool product was a wool sweater, with 13 respondents (11%) answering this option. One respondent commented in the last question: the respondent used sportswear of wool when walking in the mountains and *washed after every use*. These findings may be because clothes you wear tight to your body and become sweaty may be washed more frequently because they feel dirty.

#### 6.2.1.3 Discussion

When looking at the findings, wool clothes are generally washed less frequently compared to cotton clothes. Usually, wool clothes are used 4-6 times before being washed, seen from the average answer of 3,10 for this question. On the other hand, when looking at the average response for cotton of 2,13, clothes are used 1-3 times before being washed. This shows that wool clothes are used almost double as long between washes compared to cotton clothes. The findings in this research give the same results in the survey conducted by Laitala & Klepp (2016). Their study also answered that respondents used wool clothes almost double as long before being washed compared to cotton. The difference is that Laitala & Klepp (2016) divided wool and cotton clothes into different items, such as t-shirt and

sweaters. However, still, it was expected that wool clothes were used longer than cotton between washes.

Although the average answer was 3,10 for wool clothes, figure 2 shows that many respondents washed wool clothes after 1-3 times used. The differences between these two options were only 38%-33%=5%. This result might relate to that this was asked for wool clothes generally, and different wool items may be washed more frequently. The findings point out that some items like socks and sportswear were washed more regularly than a sweater of wool. Laitala & Klepp (2016) have similar results, where a wool sweater was often used 6-10 days before washing, and an undershirt was used less between washes.

As mentioned above, one respondent washed wool sportswear after every use since the respondent used it when walking in the mountains. This may relate to the fact that clothes used for exercise and become sweaty are often washed more frequently. From the interviews in Laitala & Klepp (2016) research, similar results were found. Respondents from these interviews washed wool undershirts after every use when used for exercise. Devold, a Norwegian company that offers wool clothes to customers, provides information on their homepage on getting your wool clothes to last longer. The company points out that wool is self-cleaned and does not smell the same way it is sweaty like other fibers. After the wool is used, it should rather be hanged out in fresh air instead of washed (Devold, 2021).

#### *6.2.1.4 Conclusion*

Wool clothes are usually used double as long compared to cotton before washing them. Some wool items are washed more frequently than others, like sportswear and socks related to sportswear becoming more often sweaty. Still, it is pointed at that wool is self-cleaned and does not need to be washed after every time it is sweaty. These results show that wool clothes related to the frequency of washing may have lower environmental impacts.

### 6.2.2 The temperature used for washing

#### *6.2.2.1 Introduction*

The temperature used for washing clothes impacts the environment through energy consumption (Laitala et al., 2011). When washing, most of the energy needed is for heating the water, and the higher temperature used, the more energy is required (Dombek-Keith & Loker, 2011). Consumers' behavior relates to the feeling of wearing clean clothes, and higher washing temperatures may increase the possibility of this and reduce the fear of lousy washing results (Laitala et al., 2011).

6.2.2.2 Findings

To see if wool clothes are washed with lower temperatures, the question “Which temperature do you usually use for washing wool clothes?” was asked. The same question was asked for cotton clothes to compare and see any differences between wool and cotton clothes, considering the temperature used for washing. One of the females between the ages of 18-25 did not respond to these two questions, meaning that only 125 respondents answered these questions. One respondent commented, “I live at home, and my mother washes my clothes”. When analyzing the data, it turns out that this respondent was not the same person who did not answer these two questions.

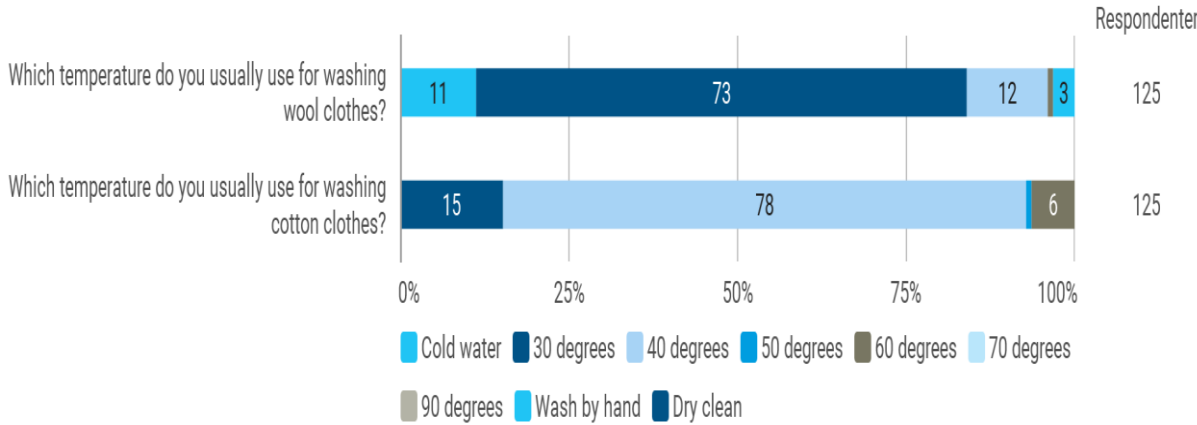


Figure 3: Which temperature do you usually use for washing wool clothes? Which temperature do you usually use for washing cotton clothes? (N= 125).

Wool

The findings from the survey show that the answer options that most of the respondents answered were the temperature 30 degrees (73%). Seventy-two of these answers were females, and 19 were males, a total of 91 of the respondents. When looking at age, 72 of the

respondents were between 18-35, 46 respondents were between the ages of 26-35 and 26 between 18 and 25. As mentioned above in the frequency part, these findings cannot compare across age and gender since most respondents were females and between the ages 18-35. It might tell us that females between 18-35 usually wash wool clothes at 30 degrees. The average answered number for wool clothes was 2,22, which is the category 30 degrees (Appendix B).

### Cotton

The findings from the survey show that the answer options that most of the respondents answered were the temperature 40 degrees (78%). Eighty of these answers were females, and 17 were males, 97 of the respondents. Seventy-six of these respondents were between the ages of 26-35, where 48 were between 26-35 and 28 between 18-25. This finding might tell us that females between 18-35 usually wash cotton clothes at 40 degrees. The average answer for cotton clothes was 2,98, which is accounted for to be 40 degrees (Appendix B). As seen from figure 3, category 2 is 30 degrees. Still, the average is 2,98, which is close to category 3 (40 degrees), and since 78% of the respondents answered 40 degrees, this category the average answer option.

### Findings from secondary data

The temperature used for washing has been discussed in the paper of Laitala & Klepp (2016). The findings in their report show that the average answer for washing wool clothes is 30 degrees. For cotton, they looked at different textiles like bedsheets and t-shirt. For a cotton t-shirt, the average temperature was 40 degrees. These findings only account for people in Sweden, and the people in Norway did not answer these questions.

A test has been conducted by Laitala et al. (2011) for measuring energy consumption at different temperatures. Comparing 30 degrees with 40 degrees showed that 30 degrees used 29,6 % less energy. In the same paper, there was a test regarding the cleaning effects at different washing temperatures. The test was conducted for washing temperatures 30 and 40 degrees. The same test also looked at the use of eight common detergents. The results show no significant difference in the cleaning effects by using 40 degrees rather than 30 degrees (Laitala et al., 2011).

### *6.2.2.3 Discussion*

As seen from the findings in this research, wool clothes are washed at a lower temperature than cotton clothes. These findings are similar to the results in the study conducted by Laitala & Klepp (2016). The difference is that they looked at different textiles of cotton and wool. When looking at wool, the average temperature was 30 degrees, while for cotton, the average temperature for a cotton t-shirt was 40 degrees. The respondents answering this question in their study were also people from Sweden (Laitala & Klepp, 2016).

As mentioned above in the introduction, the impacts on the environment will vary depending on energy consumption at different temperatures. Laitala et al. (2011) tested that lower temperatures for washing use less energy than higher temperatures. One possible reason people use higher temperatures when washing clothes may relate to given washing instructions in clothes. Often wool clothes instruct washing at 30 degrees, and cotton clothes instruct washing at 40 degrees.

Further, as mentioned in the introduction, people may use higher temperatures because of the cleaning effect. The test conducted by Laitala et al. (2011) shows no significant differences between using the temperature 30 degrees rather than 40 degrees when looking at cleaning effects.

### *6.2.2.4 Conclusion*

Wool clothes are generally washed with lower temperatures than cotton. This finding indicates that energy consumption for wool clothes is lower than for cotton when looking at temperatures—this saves energy, which lowers the environmental impacts. Cleaning effects are often related to the choice of washing temperature, but the test shows that there is no significant difference between using 30 or 40 degrees when washing.

### *6.2.3 The use of tumble drying*

### 6.2.3.1 Introduction

Energy used when tumble-drying clothes impact the environment. People use a tumble dryer because they feel that the clothes become softer afterward (Laitala et al., 2011). The opposite of tumble drying is to line dry the clothes after washing them, saving energy (Dombek-Keith & Loker, 2011).

### 6.2.3.2 Findings

To see if the respondents used a tumble dryer when drying their wool clothes, the question “Do you use the tumble dryer to dry wool clothes after washing them?”, were asked. The same question was asked for cotton clothes to see if there are any differences between wool and cotton regarding the use of a tumble dryer.

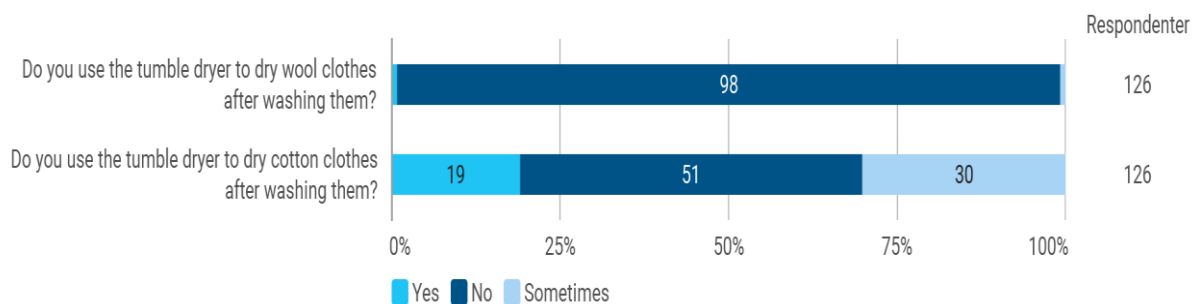


Figure 4: Do you use the tumble dryer to dry wool clothes after washing them? Do you use the tumble dryer to dry cotton clothes after washing them? ( N= 126).

#### Wool

The findings from the survey show that the answer options that the majority of the respondents answered were “no” (98%). Since 98% answered “no”, 124 respondents will not be elaborated more when looking at age and gender. If we look at the two other answer options, It shows that one female between the ages 26-35 answered “sometimes” and one female between the ages 56-65 answered “yes”. Since only two respondents responded differently from the rest, these findings cannot say whether the respondents use a tumble dryer for wool clothes. The average answer for wool clothes is 2,00, which is the option “no” (Appendix B).

#### Cotton

The findings from the survey show that the answer options that most of the respondents answered were “no” (51%), followed by “sometimes” (30%) and “yes” (19%).

Sixty-four of the respondents answered that they did not use the tumble dryer for drying cotton clothes. Fifty-two of those 64 respondents were females and 12 of them males. The majority of respondents who answered “no” were young people between 18 and 35, 54 respondents. For the answer option “sometimes”, most of the respondents were between the ages 18-35, with 29 respondents of a total of 38. For the answer options “yes”, most of the respondents were between the ages 18-35, with 19 respondents of a total of 24. These findings might show us a split in the respondent's views regarding using a tumble dryer for drying cotton clothes. The average answer number for cotton clothes is 2,11, which is the option “no” (Appendix B).

#### *6.2.3.3 Discussion*

As seen from the findings, wool clothes are usually not dried using a tumble dryer. This finding might be related to consumers' knowledge that wool is not supposed to be tumble-dried and may shrink the wool clothes. The drying instruction in wool clothes typically also provides information about not to use the tumble dryer. Compared to cotton, there is higher variance in the answers given by the respondents. Most respondents do not use a tumble dryer for drying cotton, but many still use it sometimes. This might be because relative young people do not have a tumble dryer available, making it challenging to use a tumble dryer.

#### *6.2.3.4 Conclusion*

For wool clothes, the use of a tumble dryer is usually not used as a drying method. This can reduce the energy used in the washing process and then lower the environmental impacts. Compared to cotton, there is a variance in the given respondent's answer, but a high percentage did not use a tumble dryer for drying cotton clothes, which can save energy.



## 6.3 Part 2: Fast fashion and circular business models

This part of the chapter provides an analysis of the findings from the survey. This part of the chapter will first discuss the concept of fast fashion and the relation of buying second-hand clothes. After this, the three different alternatively circular business models, product as a service, recovery and recycling, and the product life-extension, will be presented. Drawing on these three business models, I will discuss how the survey response may indicate what kind of circular business models may improve the sustainability of wool clothes.

### 6.3.1 Fast fashion

The notion of fast fashion alludes to the fast and efficient production of many seasonal collections every year. This is because companies in the textile industry are competing with each other. The result of this is that consumers buy, use, and dispose of more clothes that affect the environment (Gwilt & Rissanen, 2011 ).

Usually, these products consist of low-quality materials because they need to produce them fast and at a low price. Considering European apparel companies, the average number of collections each year has increased from two to five from 2000 to 2011. Examples of different companies that offer many clothing collections each year are Zara, and H&M. Zara offers 24 new collections and H&M between 12 and 16 collections each year (European Parliament, 2019).

The respondents in the survey in this research were asked if they felt that fast fashion affected the number of wool clothes they buy. The majority of the respondents did not think that fast fashion was affecting them when purchasing wool clothes. A total of 91 respondents (73%) answered “no” on this question.

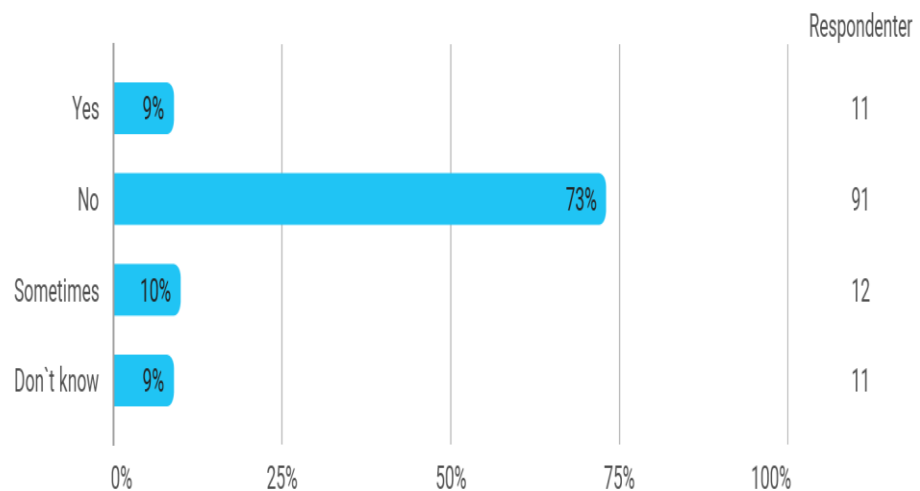


Figure 5: Do you feel that fast fashion (clothes that are cheap, trendy and produced rapidly) are affecting the amount of wool clothes that you buy? (N=125)

It seems from the findings that purchasing wool clothes are not being affected by fast fashion. One assumption concerning this matter might be that wool clothes last longer because they are not used often and are mainly used to keep you warm. One other assumption could be that wool clothes are not affected by the high number of new seasonal trends. There is no further information from the survey of why, but it may favor wool clothes. A survey has been conducted from another paper, asking respondents in Norway about the oldest garment they have. The findings in that paper show that wool, like a sweater, is one of the oldest owned items (Laitala, Klepp & Henry, 2018). This might support the fact that most respondents in this research did not feel that fast fashion affected the number of wool clothes bought.

Further, the survey in this study asked a question regarding buying used clothes of wool. Buying used clothes of wool can be referred to as second-hand clothes. Second-hand clothes are one of the possible solutions for reducing fast fashion (European Parliament, 2019). Most respondents answered “no” in the survey, which means that they are not buying used wool clothes. In a study conducted by “Forbrukerrådet”, clothes were one of the categories that respondents bought used (Forbrukerrådet, 2019). One reason why the results from “Forbrukerrådet” differ from the results in my survey might be because “Forbrukerrådet” asked about clothes in general and not about one specific item. An assumption might be that

people buy used clothes when buying other types of fibers like cotton, while wool clothes might not be seen as one type of item they want to buy used.

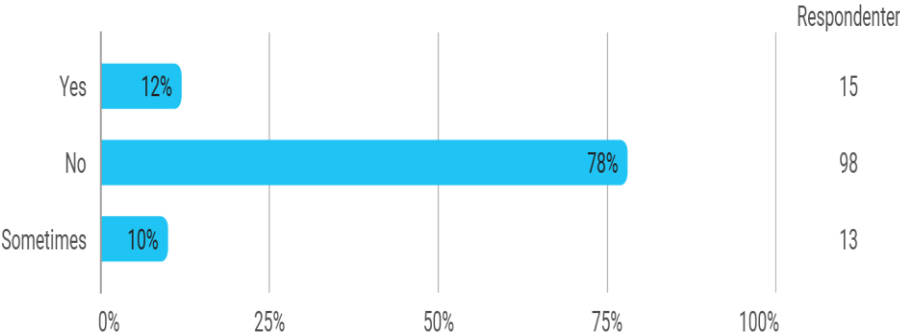


Figure 6: Do you buy used clothes of wool (N=126)

In this survey, a follow-up question was asked to see if the respondents answering “no” on the previous question would consider buying used clothes of wool. Twelve of the respondents answering this question were also answering “yes” on the last question. These twelve answers cannot further be evaluated in this study. This means that 35-12= 23 respondents answered “yes” if they would consider buying used wool clothes. Slightly more of the respondents are willing to consider buying used clothes than to do it right now.

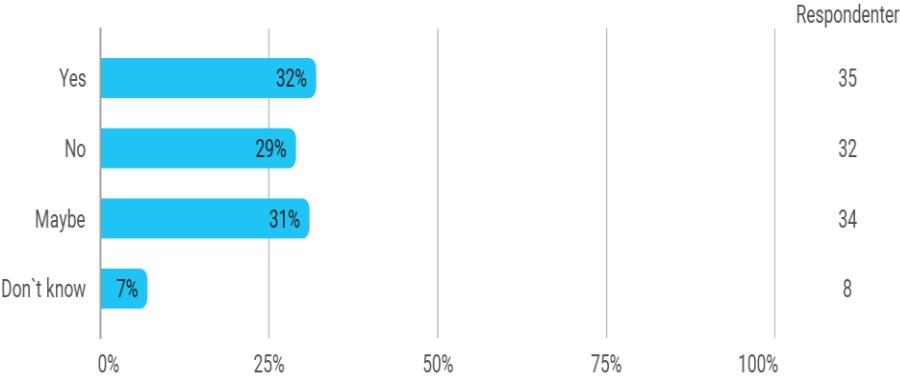


Figure 7: If you answered “no” on the previous question, would you be willing to consider buying used clothes of wool? (N=109 after correction N=97)

As mentioned above in the introduction, the concept of fast fashion in the textile industry affects the consumption of clothes. Still, the findings from looking at consumer behavior regarding wool clothes show that most respondents are not influenced by fast fashion. These findings also show that the majority of the respondents are not buying used wool

clothes right now. This makes it interesting to see if one or several circular business models may function for the wool clothes industry when focusing on the consumers.

### 6.3.2 Circular business models

In this part of the analysis chapter, the circular business models described in the theory chapter by Lacy & Rutqvist (2015), data gathered in this study, and secondary data will be elaborated. However, since I have not been able to gain data for two of the five business models, the sharing platform model and the circular supply chain model, these two models will not be further described in this thesis. That is why the focus in this study will be on the three circular business models: product as a service, recovery and recycling, and product life-extension model.

#### 6.3.2.1 *Product as a service*

##### 6.3.2.1.1 Introduction

As mentioned in the theory chapter, this business model focuses on providing a service instead of a product where you pay for a service rather than a product (Lacy & Rutqvist, 2015) (3.1.5). In other words, a shift from a product-based business model to a service-based business model. This shift increases the focus on the service part related to the product, compared to focusing on only product sales (Kindström, 2010). A well-known example of this business model is the automobile industry, where cars are offered through leasing agreements. The product's design needs to be considered to achieve success with this business model. One design strategy is designing for slowing the resources loops, focusing on creating long-life products. When the design strategy is about slowing the resources loops, the focus is on emotional and physical durability. Emotional durability is concerned with if a consumer feels a relation to the product and trusts the product. Physical durability is that the product lives up to specific standards, such as different weather conditions (Bocken et al., 2016).

In the survey in this study, one of the main focus areas was to see if this circular business model, which provides a product as a service, could work in the textile industry, specifically for wool clothes. Companies in the textile industry may not primarily use the product as a service as a business model. This can probably relate to the fact that products are typically produced in large quantities and that there is no relationship between the company and the consumer. People may feel that leasing clothes after somebody else has used it may reduce the value of the clothes and make it easier to buy new ones. Therefore, the focus may be on strengthening the relationships between companies and consumers and designing products not to reduce their value. As discussed in part one in the analysis chapter, wool clothes are washed less frequently, which might increase the possibility of this model working.

In the textile industry, the Norwegian company Bergans of Norway has recently started leasing children's suits. The function of this leasing agreement is that you pay a monthly price, and then you get a suitable season children suit that fits your child. After you have finished using the product or it is too small, you can return the child's suit and get a new one that fits the child. The child's suit is returned, repaired, and washed before a new child can use it again. The goal is to allow families to save money by not buying a new and expensive suit. Furthermore, since the suits are part of a leasing agreement, they can help children take more care of their clothes and reuse clothes (Bergans of Norway, 2021). Implementing this at an early stage of their life may help children be more aware of consuming clothes and moving away from linear thinking to a more circular perspective.

The British Ministry of Defence (MoD) has looked at the possibility of shifting from purchasing synthetic t-shirts from sportswear clothing companies to using a product service system (PSS) business model for Merino wool t-shirts. A case of Armadillo Merino (AM), looking at the environmental potential. This PSS model may have the opportunity to increase the quality of the garments and longevity, which then can reduce environmental impacts (Bech, Birkved, Charnley, Kjaer, Pigosso, Hauschild, McAlonne & Moreno, 2019). The benefits for MoD with this agreement are that AM will be responsible for repairing and maintenance, reusing the garment, and the end-of-life phase, for example, recycling (Bech et al., 2019). For the synthetic t-shirts, each soldier is given five t-shirts for each six-month trip. Each t-shirt is washed after one day of use, which is 36 times per trip. They assume that 50 % of the

synthetic t-shirts will be burned, and the other 50% will be landfilled. For the merino t-shirts, each soldier is given three t-shirts for a six-month trip. Each t-shirt was used for three days between washes and washed 20 times per trip. Since the PSS model has been used, the expected lifetime of each merino t-shirt is two years. It is also anticipated that 95% of the merino t-shirt collection will be gathered at the end-of-life phase using this agreement (Bech et al., 2019).

6.3.2.1.3 Findings

The increase in consumer buys because clothes become cheaper and accessible encourages over-consumption, which again leads to a higher amount of textile waste (Gwilt & Rissanen, 2011). This is related to the linear approach rather than a circular approach, and the solution is probably to move to a more sustainable way of consumption and production. Due to this, product as a service is one business model that can gain more circularity in value chains. The survey seeks to provide information about if consumers are using this service-based business model related to wool clothes. The survey results show that 125 respondents (100%) answered “no” on the question related to renting and leasing wool clothes. This result indicates that today, the use of a product as a service for leasing or renting may not be used, seen from a consumer perspective.

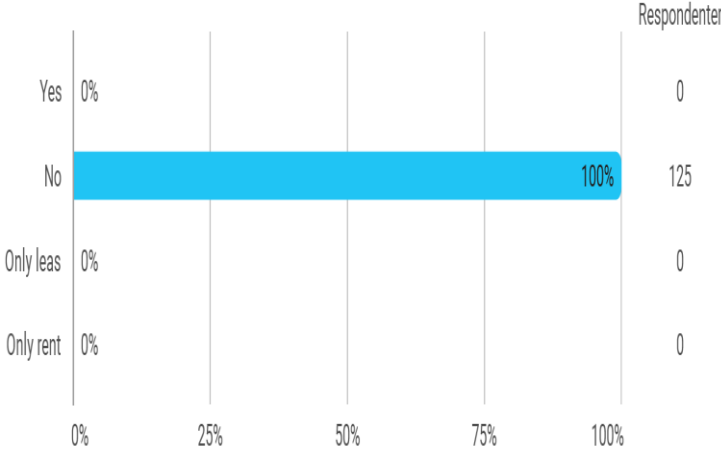


Figure 8: Do you rent (short period) and leas (long period) wool clothes? (N=125)

One reason why 100% of the respondents answered “no” on this question may be that this arrangement is not known for customers buying wool clothes. Not that many companies provide this solution right now, so consumers do not use this solution.

Further, it would be interesting to see if respondents in this survey that answered “no” on the previous question would consider renting and leasing wool clothes. The result shows that six respondents (5%) answered “yes”, which means they could consider using this agreement form. The majority of the respondents answered “no” 97 respondents (78%).

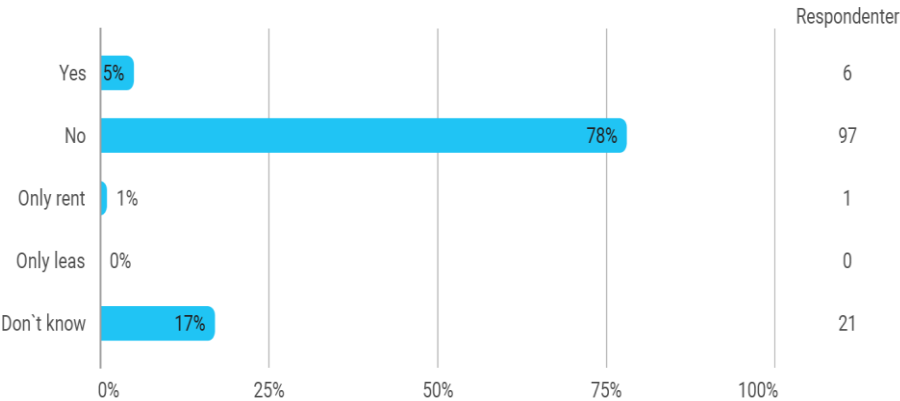


Figure 9: If you answered “no” on the previous question, would you consider rent and leas wool clothes? (N= 125)

There is a shift in how people care about the environment today, which can relate to the increasing focus on sustainable development. Different industries have increased their focus on providing information about what they are doing to cope with the green shift in society. The younger generation of today's population has engaged in the focus on sustainability. The textile industry might be one of the sectors where this sustainability focus might have an impact. It is interesting to see a connection between those who answered “yes” about whether the consumer would consider leasing or renting wool clothes and respondents' ages. All the six respondents were between 18-35 years old, where three were female, and 3 were male. One respondent also answered only rent, and this was a female in the age group 18-25. Those respondents (17%) who answered “don't know” were between 18-35. These respondents are unsure of this topic, and it may be challenging to say whether they would use this type of agreement, but it's essential to consider this significant answer percentage.

#### 6.3.2.1.4 Discussion

Although all the respondents answered “no” on whether they are renting and leasing wool clothes today, some respondents would consider doing it. Since only six respondents would consider renting or leasing wool clothes in the future, this result might not give enough information about whether consumers are willing to use the circular business model product as a service. One possible reason consumers are not renting and leasing wool clothes today may be related to the lack of companies providing this solution and marketing this solution.

The example about the company Bergans, which provides leasing agreement of children suits, may probably work because Bergans is a familiar company in Norway. Many consumers in Norway might relate to their products. This relation might benefit Bergans because consumers might trust their products, and the children's suits have been tested for different weather conditions and wear and tear for children. This assumption relates to the emotional and physical durability of the product (Bocken et al., 2016). Resulting in that product as a service agreement may work for the company Bergans.

Suppose the company Armadillo Merino can collect the expected rate of 95% of end-of-life merino t-shirt. In that case, it can probably say something about the potential for circularity in the value chain of wool of merino t-shirt by using this form of agreement.

When we look at the findings in the survey conducted by Forbrukerrådet, we can see similarities between the results in their study and this study. One question that was asked in Forbrukerrådets study about whether the consumers have leased or rent clothes in general for the last two years shows that none of the respondents had used these sort of agreements when purchasing textile clothes (Forbrukerrådet, 2019). This result is the same gathered in this study.

These days, many people are aware that car companies provide leasing agreements of cars, a well-known product as a service used today. The question to consider is if renting and leasing agreements can work for wool clothes. The leasing agreement from the company Bergans may push other companies in the textile industry to move towards using a product



as a service circular business model. The case of Armadillo Merino shows that there may be a potential for environmental improvements using a leasing agreement for wool clothes. This potential may be because the responsibility of the product's end-of-life is moved from the consumer to the producer, which gives the company more control over the merino t-shirts.

#### 6.3.2.1.5 Conclusion

If this model would work for wool clothes, the question may depend on whether companies producing wool clothes are willing to provide this solution. Companies might rely on the consumers' willingness to use this form of agreement because they are the ones that buy and use the products. This study shows that the consumers are not leasing and renting wool clothes, and the majority of the respondents would not consider using this form of agreement. On the other hand, the increasing focus on sustainable consumption and production may help move from a product-based model to a more service-based model.

#### 6.3.2.2 Recovery and recycling

##### 6.3.2.2.1 Introduction

This circular business model focuses on waste becoming history by looking at the possibilities of a supply chain that goes both ways. This two-way supply chain means that the product does not just go to the consumer but is delivered back to the producer afterward (Lacy & Rutqvist, 2015) (3.1.2). The function of this circular business model can relate to the waste hierarchy, which is a bottom-up pyramid. The purpose of the waste hierarchy is to start at the bottom of waste prevention (Avfall Norge, 2021) (2.3.2).

Consumers' decisions on what they do with clothes are an essential part of waste prevention. Consumers' decisions affect the choices made concerning recycling and the lifespan of clothes, which is a crucial part from an environmental point of view. Reasons behind the choice of throwing clothes from a consumer's perspective are that the clothes do not fit, new fashion, wear and tear and need of new storage place (Laitala, 2014).

Wool is a natural fiber, which opens up the opportunity for wool clothes to last longer. These fiber characteristics can provide more circularity in wool clothes' value chain, which can reduce environmental footprints (International Wool Textile Organisation, 2020). These fiber characteristics open up different forms of opportunities for recycling wool clothes. One way is to transform the garment back into raw materials, which then can be used to make new garments. This way of recycling relates to a closed-loop system. One other way of recycling is to use the garment to produce other products associated with the open-loop system. The result is that recycling wool can reduce the waste caused by the textile industry (International Wool Textile Organisation, 2020).

6.3.2.2.2 Findings

From a consumer perspective, this circular business model can function for wool clothes because of the potential for donating clothes. Donation of clothes to different organizations is a part of recycling. It is pretty common in Norway to donate clothes too, for instance, Fretex. For this reason, it may not be a surprise that the findings from the survey in the study show that 91 of the respondents (73%) were donating wool clothes to different organizations and answered “yes” on this question.

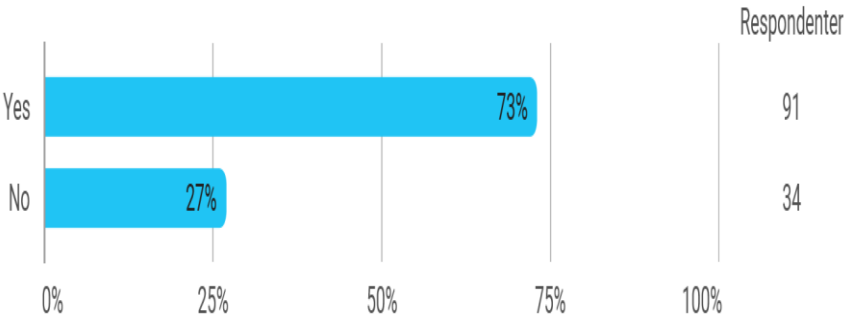


Figure 10: Do you donate clothes made of wool? (N=125)

Further, it would be interesting to see a connection between respondents' ages and the respondents who answered “yes” on donating wool clothes. Forty-two of the respondents that answered “yes”, are in the age group 26-35, which means 20 respondents in the same age group responded “no” to the question. Comparing age groups, how many respondents in the different age groups, and the answer given to this question do not show any significant findings. But still, all the six respondents in the age group 56-65 answered “yes”

on donating wool clothes. This finding may tell us that older adults donate wool clothes, but it's essential to know that six respondents (4,8%) are too little to conclude that older adults donate clothes.

There can be several reasons why some of the respondents answered "no" on the question related to donating wool clothes. One reason could be that some respondents are giving wool clothes to family members or feeling that the clothes are too damaged to donate. This finding will not be elaborated further in this study, but it's important to register that 34 respondents (27%) answered "no" on this question, which is a significant percentage to take into account.

#### 6.3.2.2.3 Discussion

The findings in this study are not saying something about if consumers are delivering back their wool clothes to the companies, which can provide a solution for a two-way supply chain. Still, since most respondents donate wool clothes, it might be possible to implement an arrangement where wool clothes are delivered back to the producer after the clothes are no longer used. By offering such an arrangement for the consumers, companies producing and selling wool clothes can better control their products. Ulvang, a company in Norway that offers wool clothes, provides customers the opportunity to deliver back their clothes and make new sustainable products from them (Ulvang, 2021). The overall goal of this circular business model is not to produce waste. Donating wool clothes compared to disposal of wool clothes is a way of gaining recycling behavior from consumers.

#### 6.3.2.2.4 Conclusion

As seen from the findings in the survey for wool clothes, the majority of the respondents were donating wool clothes. Donations may provide an opportunity for companies to move from a linear approach to a business model focusing on recovery and recycling. The findings in this study do not provide information about if the consumer would deliver the wool clothes directly back to the companies. However, since most respondents donate wool

clothes, it might increase the possibility of returning the wool clothes to the companies and creating a two-way supply chain.

### 6.3.2.3 *The product life-extension*

#### 6.3.2.3.1 Introduction

In this circular business model, the purpose is to make the products last longer. Products can last longer by designing products that can be repaired, upgraded or refilled, to avoid consumers buying new products (Lacy & Rutqvist, 2015) (3.1.3). Avoiding consumers to purchase new products can relate to the business model classic long life, where products are designed to fit with the design strategy for slowing the resources loops (Bocken et al., 2016).

Using this business model from a producer's perspective can create more value out of fewer products instead of over-producing products. Focusing more on quality and offering services for repairing can make the products last longer. From a consumer's point of view, using this business model can help minimize the need for buying new products by offering better quality products and services (Lacy & Rutqvist, 2015) (3.1.3). Using this business model can minimize waste and reduce the environmental impacts.

#### 6.3.2.3.2 Findings

One of the services that the product life-extension model focuses on is repairing products. For electronic products, offering this service from the producer to the consumer may prevent customers from buying a new product when the product needs to be fixed. This service may have to be done by the producers since it may be more difficult for consumers to repair electrical products by themselves. For wool clothes, the case can be different. It may be easier for some people to try to fix the wool clothing by themselves. Eighty-seven respondents (70%) say that they will try to repair a wool sweater if damaged. One of the respondent's comments in the survey, *"I haven't experienced wool clothes being damaged, other than socks. And I usually throw them out when they are damaged"*. There are no significant connections between age groups and respondents' answers to this question.

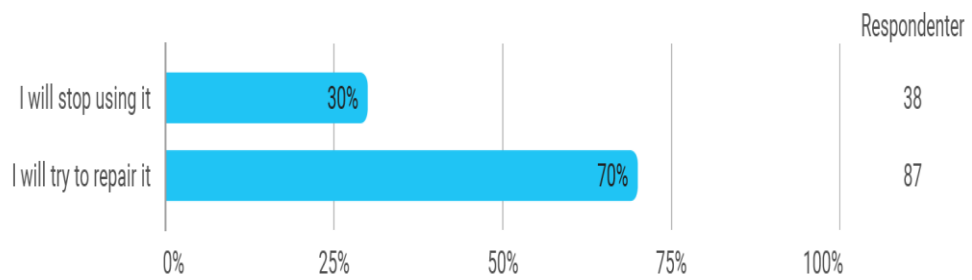


Figure 11: If your wool sweater gets damage, do you try to repair/fix the sweater or do you stop using the sweater? (N= 125)

Offering repairing guidance may prevent consumers from throwing or stop using their wool clothes when they are damaged. Nøstebarn, a Norwegian company offering wool clothes, where the focus is to provide high-quality wool clothes made from untreated wool, may have a higher price than others. They provide guidance on their homepage on how to repair their wool clothes if they are being damaged. To achieve that, consumers use their wool clothes longer and then extend the longevity of woollen clothes (Nøstebarn, 2021). This arrangement of repairing guidance may lead to more people trying to fix their clothes when damaged. The 38 respondents (30%) answering “I will stop using it” might change their behavior when offered this solution.

Ten respondents who answered “I will stop using it” are willing to try to repair the wool sweater if the suppliers gave them a recipe on how to do it. Seventeen respondents answered that they might try, and eight respondents did not consider the recipe to try to fix it.

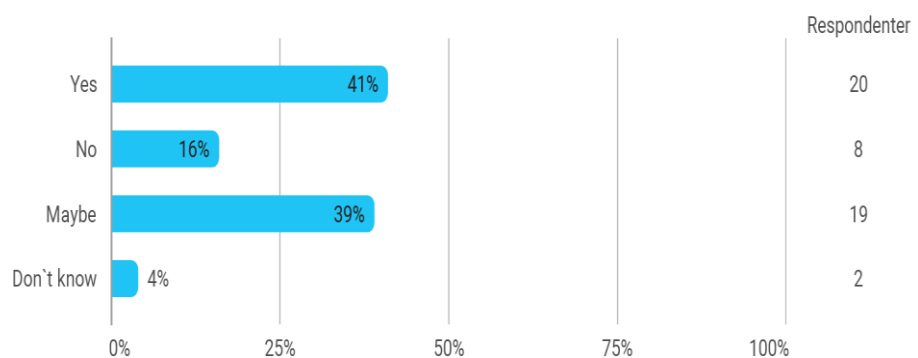


Figure 12: If you answered “I will stop using it” on the previous question, would you try to repair the wool sweater if the supplier were giving you a recipe on how to repair it? (N= 49 after correction N=37)

There is a deviation related to the follow-up question, which is that 12 respondents answered this question after answering “ I will try to repair it” on the first question. This deviation means that there were a total of 49 respondents, instead of 38, which were supposed to answer this question. Of those 38 respondents, there was one respondent who did not respond to the follow-up question. Of those 12 respondents, ten answered “yes” and 2 “ maybe”. The table down below gives the right results for this follow-up question in the survey.

<b>Yes</b>	<b>10</b> respondents	$10/37 = 0,27 = 27\%$
<b>No</b>	<b>8</b> respondents	$8/37 = 0,216 = 22\%$
<b>Maybe</b>	<b>17</b> respondents	$17/37 = 0,459 = 46\%$
<b>Don` t know</b>	<b>2</b> respondents	$2/37 = 0,054 = 5\%$
	Total: <b>37</b> respondents	Total: <b>100%</b>

Tabel 2: Correction of the findings

6.3.2.3.3 Discussion

Using this circular business model for wool clothes can lead to the consumer keeping their wool clothes longer. The survey findings show a high percentage of the respondents who try to repair their wool sweaters. This finding may indicate that the consumer cares for their wool clothes and is willing to fix them before buying new ones.

Further on, the following up question shows a willingness to repair wool clothes when a recipe is provided. The focus in the survey was on a wool sweater, and this item may be more valuable to consumers than wool socks.

The population survey done by “ Forbrukerrådet” looked at whether people had experienced product damage in the last five years. Clothes were one of the categories considered, and the results show that 70 percent had experienced clothes being damaged or had faults. When asking if they would repair it, clothes were the category that most people would fix. Repairing itself or with the help of friends and family members was usually the preferred

method. In general, when asking what the reason was for not repairing their products, 84 percent of the respondents said it was related to a lack of information on how to do it. There was no information on how this relates explicitly to clothes (Forbrukerrådet, 2019).

Similarities between the Forbrukerrådets survey and the survey in this study are that consumers are willing to repair their clothes in general. This study shows that respondents' willingness to fix the wool sweater increased if a recipe was provided, which may support the assumption that lack of information is one reason for not repairing clothes. However, the information gathered in Forbrukerrådet's study does not explicitly say something only about clothes.

#### 6.3.2.3.4 Conclusion

This circular business model focuses on offering products that last longer, with higher quality, and services to repair the products if they are damaged. The question to be asked is if this model can be suitable for wool clothes to gain more circularity in the value chain. The example of Nøstebarn might show that this can work for wool clothes in general. Offering better product quality and recipes on how to repair the products may lead to fewer items purchased. This study shows that consumers are willing to repair wool clothes. Still, it might not be enough information to determine if this model should be implemented for companies in the wool cloth industry. This assumption can be supported by the results from the survey conducted by "Forbrukerrådet". Their findings do not tell us whether consumers are willing to pay more for the product or use it longer.

## 6.4 Part 3: Environmental concerns and information about sustainability

### 6.4.1 Introduction

Lastly, this chapter will examine the environmental concern from the consumer's perspective when purchasing wool clothes and if the consumer feels companies provide them with information about sustainability.

Consumers' concerns about the environment interlink with knowledge, beliefs, and behavioral intentions. In other words, this interlink means that the more concerned consumers are about the environment, the more knowledge they will have, which results in that consumers' beliefs towards green products will be more positive and the sustainable behavior will be more robust (Pagiaslis & Krontalis, 2014). While this connection may be true, previous research shows a gap between what the consumers are saying about caring for the environment and what they do when purchasing more sustainable (O'Rourke & Ringer, 2015).

Information about sustainability provided by companies can give consumers knowledge about how different sustainable products are and may lead to consumers making more sustainable choices. Consumers can make sustainable choices, and information from companies about sustainability may stimulate these choices. Still, consumers may be more locked-in the usual patterns that they have, related to infrastructure, habits, and social norms. These three components have to be considered simultaneously to make consumers make more sustainable choices (Tukker, Emmert, Charter, Vezzoli, Sto, Andersen, Geerken, Tischner & Lahlou, 2008).

#### 6.4.2 Findings

Since concerns related to the environment relate to knowledge, beliefs, and behavior intentions, this study seeks to determine if the respondents answering the survey think about the environmental impacts of wool clothes when buying them. Focusing on how consumers feel about environmental impacts may impact how consumers care for their wool clothes regarding washing wool clothes and businesses' choice of circular business model.



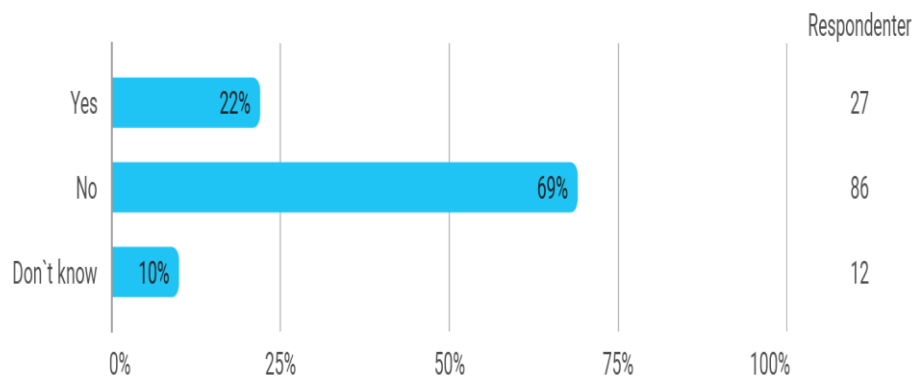


Figure 13: Do you think about the environmental impacts related to wool clothes when you are buying them? (N= 125)

The survey in this study shows that the respondents tend not to think about the environmental impacts of wool clothes when purchasing them. A total of 86 respondents (69%) answered “no” on this question. Comparing these respondents' answers to this question with other questions in this study to see if there is a connection may reflect how consumers behave and think. A high number of these respondents to this question, a total of 55 respondents, answered “yes” on the question related to repairing a wool sweater if it gets damaged. All the respondents except one were also answering “no” on the question related to using a tumble dryer for wool clothes. The question about washing temperature also shows that 55 respondents used either 30 degrees, cold water or washed the wool clothes by hand. Sixty-four of these respondents did not feel that the concept of fast fashion was affecting the number of wool clothes that they buy.

Although most respondents (69%) answered “no” on the question related to environmental concern, 27 of the respondents (22%) answered “yes” on the same question. Comparing these respondents' answers with other questions in the study shows that 23 of the respondents would try to repair a wool sweater if it gets damaged. All of these respondents, except one, answered “no” on the question related to using a tumble dryer for drying wool clothes. The question in the survey about washing temperature used for washing wool clothes shows that 23 respondents either used 30 degrees, cold water or washed wool clothes by hand. Eighteen of these 23 respondents did not feel that the concept of fast fashion was affecting the number of wool clothes that they buy.

Further, the study wants to see if the respondents feel that different brands provide enough information about sustainability. The majority of the respondents (42%) answered “ don’t know” on this question, and 29 respondents (23%) answered “no”. Only seven respondents (6%) answered “yes” on this question, but there were slightly more respondents (29%) that felt like they sometimes got enough information about sustainability.

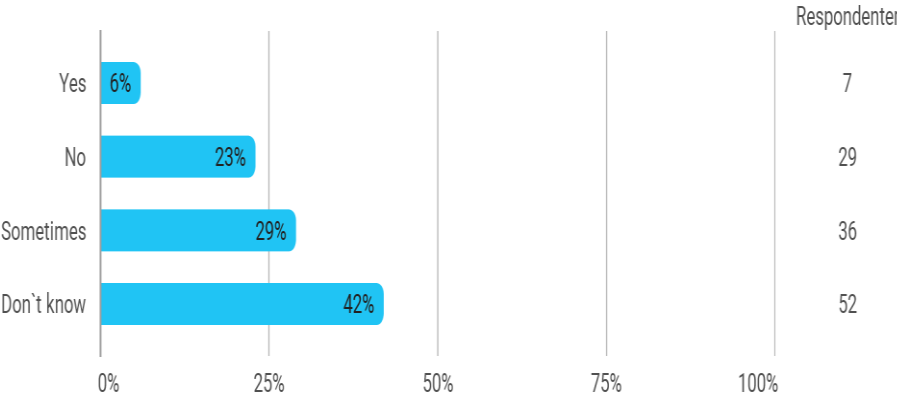


Figure 14: Do you feel that different brands that sells wool clothes are providing good enough information about their focus on sustainability? (N=124)

Comparing the results from this question with the question related to environmental impacts shows that 21 of the respondents answering “no” did also respond that they did not think about the environmental impacts of buying wool clothes. Only two respondents thought about the environmental concern and felt like different brands provided enough information about sustainability regarding wool clothes. There were slightly more respondents who felt that companies sometimes provided enough info (12 respondents) that also thought about environmental impacts. Seven respondents answered “no” on the same question and answered “yes” regarding the environmental concern.

6.4.3 Discussion

This study shows that even though most respondents did not think about the environmental concern of wool clothes when buying them, it may be possible to assume that they care about their wool clothes by considering their washing behavior. This assumption may also be related to consumers' knowledge about how to wash and dry their wool clothes, and that typically, in Norway, wool clothes are washed at 30 degrees. A population survey done by “Forbrukerrådet” shows that 9 of 10 consumers agree or slightly agree that it is important to

think about the environment when consuming. Still, this survey shows that there is a difference between products when buying them. For clothes in general, only 3 of 10 consumers were thinking about the environment when purchasing new clothes (Forbrukerrådet, 2019).

The similarities between the findings in this survey and the survey conducted by “Forbrukerrådet” are that most respondents are not considering the environmental impacts of buying wool clothes and clothes in general. The difference is that the survey by “Forbrukerrådet” points at that consumers were more concerned about the quality and the lifetime of clothes (Forbrukerrådet, 2019). The survey in this study did not focus on the quality and lifetime of clothes, but rather on washing behavior and, for instance, repairing wool clothes, which may lead to wool clothes lasting longer.

Comparing environmental impacts and information about sustainability shows that most respondents answering “no” on whether companies provide enough information about sustainability also responded “no” to the environmental concern. It is not easy to determine the reason for this finding, but it may be because since the respondents seem to not care about the environmental concern, they do not try to see if there is information about it. Or it could be the other way around, that it is not enough information, which can result in not considering the environmental impacts.

The survey done by “forbrukerrådet” points out that the environmental impacts from clothes are high and that it is weird that consumers are not concerned about the environment when purchasing clothes. They also point out that information as a tool for reaching out to the consumers is not good enough and needs to be worked on to reach the consumers with information (Forbrukerrådet, 2019).

#### 6.4.4 Conclusion

It is difficult to predict why the respondents did not think about the environmental impacts. Comparing the response to environmental impacts and the response to information on sustainability, one can assume that there is not enough information about sustainability

when purchasing wool clothes. The survey from “forbrukerrådet” shows similar results and points at accessible information as one possible explanation of why consumers seem to not care about environmental concerns. These findings lead us back to the introduction in this part of the analysis, where it is explained that consumers are locked in how they usually behave and that information alone is not enough to change behavior patterns.

## 7 Discussion

This chapter will evaluate the findings and the data concerning reliability and validity. This chapter will also provide a discussion on whether this research can be generalized. It may be challenging to write a master thesis without any bias, and that is why it is essential to discuss the reliability and validity of the study.

### 7.1 Validity

Validity is about measuring. More precisely, validity is to see if there is a connection between what the researcher think is measured and what is measured. Validity is about to see if what the researcher is measuring can be related to the research problem statement (Reve, 1985). It is interesting to see if the quantitative survey used in this study is suited for answering the problem statement or if it is not appropriate.

The questions used in the survey are focusing on the consumer's use and care of wool clothes. Since the problem statement focuses on circularity in the value chain of the textile industry, I think it is appropriate to use a survey to gather the needed data about the consumer use phase of the value chain. The findings in the survey can be used to explain how this phase can achieve circularity. Wool is a part of the textile industry, so the focus has been on wool clothes in the survey. A survey was also used to secure correct questions for answering the problem statement and the research questions. A survey can also reach out to a broader part of the population, strengthening the validity. You can get more respondents to answer the same questions. A pilot test was also conducted to get second opinions on understanding the questions in the survey, which might strengthen the validity.

On the other hand, using a survey may weaken the validity because it does not provide any further information from the respondents except the answer given to a specific question. The focus in the survey is on the consumer's behavior, and that is why a combination of interviews and a survey would probably strengthen the validity. An open question was used for the respondents to give information and comments on the questions, strengthening the validity. The initial idea was that the sample of respondents was to represent consumers

using wool clothes in Norway between the ages of 18-65. The survey results show most of the respondents were between the ages of 18-35, which means that the sample from the survey mainly represents young people in Norway. This result shows that this survey does not provide a correct picture of consumers in Norway between 18-65, which weakens the validity. The majority of the respondents are young people, which might be because a snow-ball sampling was used to reach the respondents. The survey was posted on Facebook, both on my own Facebook page and the University of Stavanger student page. From these pages, the survey has been shared by others. The validity can also be weakened because of the uncertainty concerning respondents' answers. There is a risk that respondents can give wrong answers because the survey has been anonymous or because of wrong-informed responses.

## 7.2 Reliability

Reliability can tell us something about if the data gathered in the research is reproducible, stable, and reliable. It is about seeing if the measurements are free from faults (Reve, 1985). When collecting data, there will always exist some amount of error. When using a survey, the errors can be distinguished between random errors and measurement errors. Random error can be defined as unpredictable errors. These types of errors can be lowered in a survey by, for example, using a sample that is larger and more representative. Measurement error can be referred to as the quality of the instrument used to perform of the given population (Fink & Litwin, 1995).

The data gathered from the survey is based on questions with different answer options. It is not easy to determine if other studies have been using the same questions, giving the same results as the survey in this study. People might change their answers if the same questions were asked again. Another possibility is that if another sample is used, they may have different opinions related to the questions asked in my survey. What might strengthen reliability is that secondary data from other surveys have been used. Some of these surveys also focus on wool clothes, and similar questions are asked, with similar findings. A survey might strengthen the reliability since the results are gathered using statistical models, and

there might not be several ways to interpret the findings. Compared to interviews, where it might be easier to interpret the given answers.

The random error in the survey might be weakened since the sample is not large enough to represent the population. Using a larger sample for a survey, with not just relative young people being the majority of the respondents, would probably strengthen the reliability.

### 7.3 Generalization

In this study, a single case study of wool clothes has been used. Using a case study in the research has been criticized for not being useful for generalization (Blaikie & Priest, 2019). It is argued that it is impossible to generalize from a single case study since each case is unique (Blaikie & Priest, 2019). On the other hand, using a survey can enable generalization when a random sampling method is used to get a sample representing the population (Polit & Beck, 2010). However, this survey's sample in this study is probably too small and non-random because of using a snowball sampling method and not a random sampling method. In other words, this means that the answers given from the gathered sample of respondents cannot be used for generalization. Still, the sample can provide some information about consumers' behavior related to wool clothes.

## 8 Conclusion

This chapter will conclude the answers to the research questions and the problem statement in this study.

### 8.1 Research question 1: How can consumers' use of wool clothes affect circularity considering the environmental impacts?

The consumer use phase for wool clothes is expected to have lower environmental impacts than other textile fibers. In this part of the study, different questions were asked regarding consumers washing behavior concerning wool clothes and cotton clothes. As seen from the findings, wool clothes are usually used double as long as cotton before washing them. Some wool items were washed more frequently than others, like sportswear and socks. The findings show that the respondents wash wool at a lower temperature than cotton. Wool clothes were usually washed at 30 degrees and cotton at 40 degrees. When drying clothes, using a tumble dryer causes more environmental impacts than line drying. Most respondents answered that they were not using a tumble dryer for drying wool clothes. These findings show that wool clothes have lower environmental impacts than cotton and that correct use of washing and drying wool clothes might increase circularity in the user phase of the wool value chain.

### 8.2 Research question 2: Which circular business models could be suitable for gaining more circularity in the value chain of wool clothes? From a consumer perspective

It is not easy to determine which circular business models could be suitable for gaining circularity in the value chain of wool clothes. From a consumer perspective, the main challenge might be to change the consumer's behavior. The first circular business model, product as a service, using leasing and renting as methods, was not used for wool clothes. This finding may be related to companies not providing this solution for wool clothes or that consumers are unwilling to lease or rent wool clothes. The following circular business model, recovery and recycling, focuses on creating a two-way supply chain, which may work since most respondents donate wool clothes. Because respondents donate wool clothes, it can increase consumers' willingness to deliver back their wool clothes to companies. Wool is a



natural fiber that is easy to recycle, which might increase the chances of gaining circularity using this business model. The last circular business model, the product life-extension model, focuses on making the products last longer. In this study, the focus has been on repairing wool clothes. Most of the respondents would try to fix their wool clothes if they were damaged. Some of those respondents that would not try to repair the wool clothes answered that they would fix the wool sweater if they were given instructions on how to perform the repair. These findings show that focusing on making the product last longer to gain circularity might work from a consumer perspective. The focus should probably be on providing enough information regarding repairing instructions for changing the consumer's behavior.

### 8.3 The problem statement: How to gain circularity in value chains in the textile industry? A case study of wool clothes

Based on the answers to the two research questions, I will argue that consumer behavior will probably gain circularity in value chains in the textile industry. The focus in this research on the case of wool clothes shows that the environmental impacts related to washing wool clothes are lower than cotton clothes. Changing how businesses conduct business from a linear approach to a circular approach can work for wool clothes by making the products last longer, focusing on repairing and recycling the products back to the companies. The concept of fast fashion is impacting the textile industry. Focusing on buying more used clothes can reduce the production of large quantities of clothes. When looking at wool clothes, most of the respondents were not impacted by fast fashion, but most of the respondents were not buying used wool clothes either. When considering the arguments listed above, I will argue that the benefits of using wool clothes would probably gain more circularity in the textile industry. Providing information on sustainability might increase the consumer's focus on the environment and perhaps change their behavior. But, this study does not provide enough information on this matter because the findings of the environmental concern and the information provided about sustainability were unclear and therefore need to be studied more in detail. Focusing on washing behavior and the circular business models for other textile fibers might also gain circularity, but there is not enough information in this study to conclude with this. This study is just a start on what the focus could be, and further studies

should be conducted related to the problem statement to get more precise answers regarding this topic.

#### 8.4 Further studies

There may be several suggestions for further studies related to this problem statement. This master thesis has focused on a single case study of wool clothes. It would be interesting to see which findings could have been found if a case study focused on cotton clothes. Further, the case of wool clothes could have been researched from a producer perspective, where interviews would probably have been interesting to gather more in-depth data. To see how the companies stand related to gaining circularity in the value chains in the textile industry.

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## Appendix A

Hi!

I am a master student at the university of Stavanger and are currently writing my master thesis.

This survey is looking at consumer behavior regarding use of wool clothes. If you could spend 5 minutes of you time to answer this survey I would be grateful!

This survey is completely anonymous.

Thank you!

### **Gender**

- (1)  Female
- (2)  Male
- (3)  Don` t want to answer

### **Age**

- (1)  18-25
- (2)  26-35
- (3)  36-45
- (4)  46-55
- (5)  56-65

### **How many times do you usually use clothes made of wool before washing them?**

- (1)  I never wash them
- (2)  1-3 times
- (3)  4-6 times
- (4)  7-9 times
- (5)  10 times or more

### **How many times do you usually use clothes made of cotton before washing them?**

- (1)  I never wash them
- (2)  1-3 times
- (3)  4-6 times
- (4)  7-9 times
- (5)  10 times or more

**Considering the different items under, is there some of these items that you wash more frequently?**

- (1)  T-shirt of wool
- (2)  Sportswear of wool
- (3)  Socks of wool
- (4)  Sweater of wool

**Which temperature do you usually use for washing wool clothes?**

- (1)  Cold water
- (2)  30 degrees
- (3)  40 degrees
- (4)  50 degrees
- (5)  60 degrees
- (6)  70 degrees
- (7)  90 degrees
- (8)  Wash by hand
- (9)  Dry clean

**Which temperature do you usually use for washing cotton clothes?**

- (1)  Cold water
- (2)  30 degrees
- (3)  40 degrees
- (4)  50 degrees
- (5)  60 degrees
- (6)  70 degrees
- (7)  90 degrees
- (8)  Wash by hand
- (9)  Dry clean

**Do you use the tumble dryer to dry wool clothes after washing them?**

- (1)  Yes
- (2)  No
- (3)  Sometimes

**Do you use the tumble dryer to dry cotton clothes after washing them?**

- (1)  Yes
- (2)  No
- (3)  Sometimes

**Do you rent (short period) and leas (long period) wool clothes?**

- (1)  Yes
- (2)  No
- (3)  Only leas
- (4)  Only rent

**If you answered "no" on the previous question, would you consider rent and leas wool clothes?**

- (1)  Yes
- (2)  No
- (3)  Only rent
- (4)  Only leas
- (5)  Don`t know

**Do you feel that fast fashion (clothes that are cheap, trendy and produced rapidly) are affecting the amount of wool clothes that you buy?**

- (1)  Yes
- (2)  No
- (3)  Sometimes
- (4)  Don`t know

**Do you buy used clothes of wool?**

- (1)  Yes
- (2)  No

- (3)  Sometimes

**If you answered "no" on the previous question, would you be willing to consider buying used clothes of wool?**

- (1)  Yes  
(2)  No  
(3)  Maybe  
(4)  Don't know

**If your wool sweater gets damaged, do you try to repair/fix the sweater or do you stop using the sweater?**

- (1)  I will stop using it  
(2)  I will try to repair it

**If you answered "I will stop using it" at the previous question, would you try to repair the wool sweater if the supplier were giving you a recipe on how to repair it?**

- (1)  Yes  
(2)  No  
(3)  Maybe  
(4)  Don't know

**Do you donate clothes made of wool to different organizations?**

- (1)  Yes  
(2)  No

**Do you think about the environmental impacts related to wool clothes when you are buying them?**

- (1)  Yes  
(2)  No  
(3)  Don't know

**Do you feel that different brands that sells wool clothes are providing good enough information about their focus on sustainability?**

- (1)  Yes  
(2)  No

(3)  Sometimes

(4)  Don't know

**If you have any comments or information that you think that I should be aware of related to this survey, feel free to write it below (you can write in English or Norwegian)**

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## Appendix B

	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
Gender	1,00	2,00	1,20	126
Age	1,00	5,00	2,06	125
How many times do you usually use clothes made of wool before washing them?	2,00	5,00	3,10	126
How many times do you usually use clothes made of cotton before washing them?	2,00	5,00	2,13	126
Considering the different items under, is there some of these items that you wash more frequently?	-	-	3,87	116
Which temperature do you usually use for washing wool clothes?	1,00	8,00	2,22	125
Which temperature do you usually use for washing cotton clothes?	2,00	5,00	2,98	125
Do you use the tumble dryer to dry wool clothes after washing them?	1,00	3,00	2,00	126
Do you use the tumble dryer to dry cotton clothes after washing them?	1,00	3,00	2,11	126
Do you rent (short period) and leas (long period) wool clothes?	2,00	2,00	2,00	125
If you answered "no" on the previous question, would you consider rent and leas wool clothes?	1,00	5,00	2,46	125
Do you feel that fast fashion (clothes that are cheap, trendy and produced rapidly) are affecting the amount of wool clothes that you buy?	1,00	4,00	2,18	125

	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
Do you buy used clothes of wool?	1,00	3,00	1,98	126
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
If you answered "no" on the previous question, would you be willing to consider buying used clothes of wool?	1,00	4,00	2,14	109
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
If your wool sweater gets damaged, do you try to repair/fix the sweater or do you stop using the sweater?	1,00	2,00	1,70	125
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
If you answered "I will stop using it" at the previous question, would you try to repair the wool sweater if the supplier were giving you a recipe on how to repair it?	1,00	4,00	2,06	49
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
Do you donate clothes made of wool to different organizations?	1,00	2,00	1,27	125
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
Do you think about the environmental impacts related to wool clothes when you are buying them?	1,00	3,00	1,88	125
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
Do you feel that different brands that sells wool clothes are providing good enough information about their focus on sustainability?	1,00	4,00	3,07	124
	Observert minimum	Observert maksimum	Gjennomsnitt	Respondenter
statoverall	-	-	3,66	152