# CHANGING OR UPHOLDING THE SYSTEM? - FINNISH UNIVERSITY STUDENTS' PERCEPTIONS ON NOVEL WOOD-BASED TEXTILES

**Jyväskylä University**
**School of Business and Economics**

**Master's Thesis**

**2023**

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**ABSTRACT**

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Title
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| Subject | Type of work |
|---|---|
| Corporate environmental management | Master's thesis |
| Date | Number of pages |
| 30.8.2023 | 71 |

Abstract

The clothing and textile industry is one of the most problematic in terms of sustainability: the production value chain harbours a multitude of environmental and social problems, and the rampant success of fast fashion has made consumers buy more clothes than ever in an accelerating pace. To combat these adverse impacts and drive the sustainability transition in the industry circular bioeconomy strategies, practices, and models such as substituting textile materials currently used with more sustainable biobased alternatives should be implemented. These novel textiles have shown great promise in their environmental attributes in increasing the positive climate impact of both the clothing industry and the forest-based industry as well.

This paper discusses the consumer perceptions on three selected Finnish novel wood-based textiles. The in-depth views on attributes consumers associate with wood-based textiles and that affect purchase decisions in terms of textiles in addition to the main barriers of purchasing wood-based textiles were examined in three focus group interviews with 13 participants.

The results show that consumers perceived these textiles positively overall, but the use of wood raised concerns of deforestation and biodiversity loss. The recyclability of these novel textiles somewhat reduced the concerns. The main attributes of textiles influencing purchase decisions were feel and quality, where price had a diminished affect regarding the novel textiles. The main barrier for purchasing wood-based clothing was the lack of knowledge, which created other barriers such as doubt and uncertainty about the product and its sustainability. The barrier could be overcome, and the novel textiles more easily accepted by emphasizing the circular economy aspects of the novel wood-based textiles or focusing the marketing and communication of the textiles to other more purchase determining factors such as quality.

Key words
sustainability, circular bioeconomy, consumer perception, clothing industry, new wood-based products

Place of storage
Jyväskylä University Library

**TIIVISTELMÄ**

Tekijä
Aija Hokkanen

Työn nimi
Systeemin muuttajat vai ylläpitäjät? - Suomalaisten korkeakouluopiskelijoiden asenteet uusia puupohjaisia tekstiilejä kohtaan

| Oppiaine | Työn laji |
|---|---|
| Yritysten ympäristöjohtaminen | Pro gradu -tutkielma |
| Päivämäärä<br>30.8.2023 | Sivumäärä<br>71 |

Tiivistelmä

Vaate- ja tekstiiliteollisuus ovat kestävyyden näkökulmasta ongelmallisia: tuotannon arvoketju sisältää laajoja sosiaalisia- ja ympäristöongelmia, ja pikamuodin edelleen voimistuva suosio on saanut kuluttajat ostamaan vaatteita enemmän kuin koskaan. Haitallisten vaikutusten vähentämiseksi ja alan kestävyyssiirtymän kiihdyttämiseksi kierto- ja biotalouden strategioita ja toimintatapoja, kuten nykyisten tekstiilimateriaalien korvaamista uusilla biopohjaisilla vaihtoehdoilla, tulisi toteuttaa. Uudet bio- tai puupohjaiset tekstiilit ovat osoittaneet ympäristöominaisuuksiensa vuoksi hyötyjä positiivisten ilmastovaikutusten lisäämisessä niin vaate- ja tekstiilialoilla, kuin metsäalallakin.

Tässä tutkimuksessa tarkastellaan kuluttajien asenteita kolmea valikoitua suomalaista puupohjaista tekstiili-innovaatiota kohtaan. Syväluotaavia näkemyksiä ominaisuuksista, jotka kuluttajat yhdistävät puupohjaisiin tekstiileihin ja jotka vaikuttavat ostopäätökseen tekstiilien suhteen, sekä ensisijaisia esteitä puupohjaisten tekstiilien kuluttamiselle tutkittiin fokusryhmähaastatteluiden avulla. Haastatteluita järjestettiin kolme ja niihin osallistui 13 korkeakouluopiskelijaa.

Tutkimustulokset osoittavat, että kuluttajat asennoituvat tutkittuihin tekstiileihin positiivisesti, mutta puun käyttäminen raakamateriaalina herätti huolia metsien häviämisestä ja luonnonmonimuotoisuuden köyhtymisestä. Kuitenkin, uusien tekstiilien kierrätettävyys vähensi näitä huolia jonkin verran. Ensisijaiset ominaisuudet, jotka tekstiilien suhteen vaikuttivat kuluttajien ostopäätökseen, olivat tuntu ja laatu. Hinnan vaikutus ostopäätökseen väheni puhuttaessa uusista tekstiileistä. Pääasiallinen este puupohjaisten tekstiilien kulutukselle oli tiedon puute, joka loi uusia esteitä kuten epäilyä ja epävarmuutta tekstiiliin ja sen kestävyyteen liittyen. Tämä este pystyttäisiin ohittamaan, ja uudet tekstiilit hyväksymään helpommin, painottamalla uusien puupohjaisten kuitujen kiertotaloudellisia ominaisuuksia tai keskittämällä uusien tekstiilien markkinointi ja viestintä muihin vaikuttavampiin ominaisuuksiin, kuten laatuun.

Asiasanat
kiertotalous, biotalous, kuluttaja-asenteet, vaateteollisuus, uudet puupohjaiset tuotteet

Säilytyspaikka
Jyväskylän yliopiston kirjasto

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# 1 INTRODUCTION

## 1.1 Background

The fashion and clothing industry is a highly globalized, 1,2 trillion-euro business that employs over 300 million people worldwide across its value chains (Ellen MacArthur Foundation, 2017). In 2020 the citizens of the EU consumed approximately 6,6 million tonnes of new textile products amounting to 6 kg of clothing and 6,1 kg of household textiles per person (*Textiles and the Environment*, 2023). This represents a 40 % increase in clothing consumption from the mid-1990s though the growth was hindered slightly by the Covid-19 pandemic in 2020 (Dahlbo et al., 2017; Šajn, 2019; *Textiles and the Environment*, 2023). Similarly, the production volume of clothing has doubled since the early 2000s (Ellen MacArthur Foundation, 2017, p. 18; Niinimäki et al., 2020).

Both developments – increases in consumption and production of clothes - can be explained by the rise and reign of 'fast fashion' (Ellen MacArthur Foundation, 2017, p. 18; Niinimäki et al., 2020; Šajn, 2019). Fast fashion essentially describes a business model in which the change in trends is fast paced and something new is offered to the consumer constantly (Ellen MacArthur Foundation, 2017, p. 18). Thus, the pace of production is increased as well as the number of collections offered which can mean even 12-14 new collections annually (Ellen MacArthur Foundation, 2017, p. 18; Šajn, 2019). The consumer prices are also driven as low as possible (Ellen MacArthur Foundation, 2017, p. 18; Šajn, 2019). The low prices are subjective to the main objective of the business model: to maximize sales volumes and reach maximum profits (Gardetti & Torres, 2013, p. 27; Šajn, 2019). The chase of maximum profits and increasing volume of production has led to a high level of globalization and the development of one of the most intricate and complex supply chains where most of the clothes are produced with lower labour and environmental standards in developing countries but consumed in developed countries (Šajn, 2019).

With fast fashion, consumers are taught to view clothes more and more as perishable and disposable goods thus encouraging overconsumption and the disposal of clothes after as few as seven wears (Ellen MacArthur Foundation, 2017, p. 19; Niinimäki & Hassi, 2011; Šajn, 2019). The increase in production volumes has enforced the decrease in prices and hence, the decrease in the perceived value of clothes (Niinimäki & Hassi, 2011; Šajn, 2019). In addition, clothes have become so inexpensive and effortless to buy that consumers do not perceive mending and repairing them feasible anymore (Niinimäki & Hassi, 2011).

The current system of clothing production, distribution and consumption is linear, relying on the planned obsolescence of consumer desires and aiming towards endless growth (Ellen MacArthur Foundation, 2017, p. 19; Gardetti & Torres, 2013, p. 57; Niinimäki & Hassi, 2011). Large amounts of nature's resources

are extracted to manufacture the demanded volume of clothes at an accelerating pace, yet approximately half of the clothes produced are disposed of within one year (Ellen MacArthur Foundation, 2017, p. 19; Niinimäki et al., 2020; Šajn, 2019). This linear way of conducting business burdens resources heavily, pollutes and destroys the environment, in addition to creating multiple adverse societal impacts on local, regional, and global scales (Ellen MacArthur Foundation, 2017, p. 19). Though consumers' awareness regarding these adverse impacts of clothing production and consumption has increased, the demand for clothes is growing and the environment is deteriorating at the same rate (Gardetti & Torres, 2013, p. 29). It is estimated that clothing production will reach 160 million tonnes in 2050 – more than triple the number of clothes produced in 2017 – if the industry continues business as usual (Ellen MacArthur Foundation, 2017, p. 21).

## 1.2 Sustainability of clothing value chains

The environmental impacts of the clothing value chain are vast: the industry produces over 92 million tonnes of waste and consumes 79 trillion litres of water annually, and as an example, producing one tonne of textile requires 200 tonnes of water (Niinimäki et al., 2020). This excessive use of Earth's finite supply puts the sufficiency of natural resources at risk, and contributes to climate change and the loss of biodiversity (Gardetti & Torres, 2013, pp. 27–28). The clothing industry also emits 8-10% of all global $CO_2$ equivalent emissions amounting to 4-5 billion tonnes of emissions every year (Niinimäki et al., 2020). The main contributor to the emitted emissions is the source of energy in the manufacturing process due to the energy intensiveness of the process (Niinimäki et al., 2020).

In addition to the carbon emissions the industry generates approximately 35% of primary microplastic pollution found in oceans (Niinimäki et al., 2020). Furthermore, studies have found the dyeing and treatment of textiles accountable for on estimate 20% of industrial water pollution globally (Ellen MacArthur Foundation, 2017, p. 21; Niinimäki et al., 2020). The clothing industry uses over 1900 chemicals in its production, 165 of which have been deemed hazardous to humans and/or the environment by the EU (Dahlbo et al., 2017; Šajn, 2019). In the EU, clothing accounts for 2-10 % of the environmental impacts of consumption (Šajn, 2019). Though, the comprehensive impacts are difficult to estimate accurately due to the multi-tiered supply chains in addition to the majority of environmental impacts being realized outside of the EU in countries where the goods are produced (Niinimäki et al., 2020; Niinimäki & Hassi, 2011; Šajn, 2019).

In addition to global environmental affects, the industry has also direct local impacts – from environmental hazards such as land depletion to adverse societal impacts such as modern-day slavery, child labour, poor working conditions, and low wages (Ellen MacArthur Foundation, 2017, p. 21). These societal issues stem from system change in the industry to conform to the principles of fast fashion – the production of clothes is very labour intensive, so to achieve large production

volumes fast and with lower costs the fashion companies have sought out countries with high population density and low labour costs (Księżak, 2017). Thus, the production of clothes has shifted from the global north to the global south – away from the main place of purchase and use (Księżak, 2017; Niinimäki et al., 2020). Reversing this adverse development creates a dilemma as well: the countries producing clothing usually depend quite heavily on the industry for employment, for example in some countries cotton production accounts for 7% of all employment thus essentially creating a barrier for e.g., shifting production back to global north (Ellen MacArthur Foundation, 2017, p. 18).

For this master's thesis, the impacts of fibre production and clothing consumption are examined more closely in the next chapters.

### 1.2.1 Sustainability issues in textile fibre production

Textiles construct from textile fibres which derive from different raw materials depending on what type of attributes are needed from the textile itself. 60% of all produced textile fibres are used for clothing, other uses include for example interior and industrial textiles, geo- and agrotextiles, and hygienic textiles (Niinimäki et al., 2020). Similar to clothing production, the overall production of textile fibres has doubled in the last 20 years, and it is expected to continue growing by 30% in the next decade (Textile Exchange, 2021). In 2021 the industry produced 113-tonnes of textiles and its division according to the percentages of different fibres produced is depicted in Figure 1 (Textile Exchange, 2022).

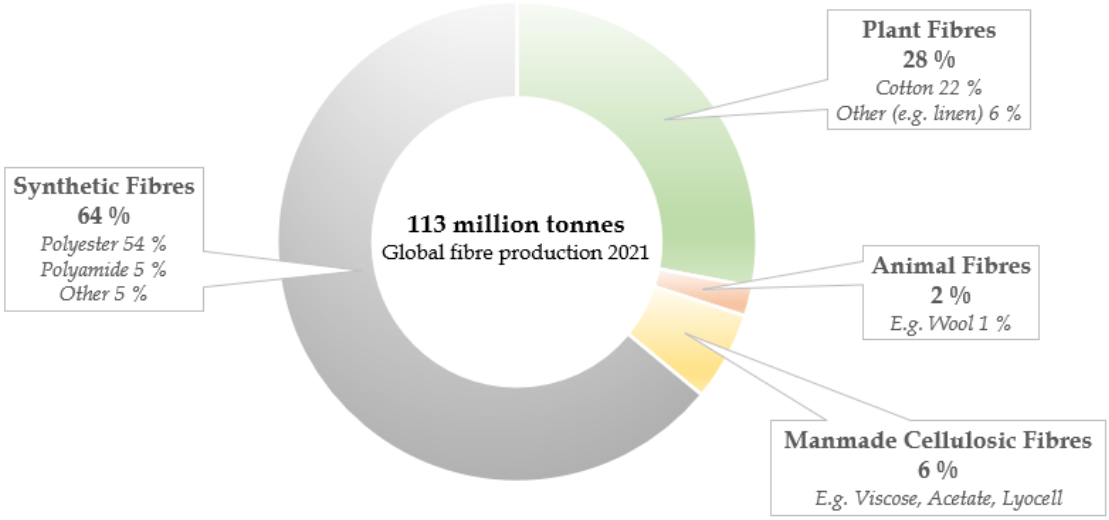


*Figure 1.* Distribution of textile fibres produced in 2021 (modified from Textile Exchange, 2022)

The most common textile fibres are polyester and other synthetic fibres – accounting for around 72,2 million tonnes of all textile fibres produced (Textile Exchange, 2022). These synthetic fibres derive from fossil fuels and are multifunc-

tional, very low maintenance and durable which explains the fibres high production volume (Niinimäki et al., 2020; Šajn, 2019). The second most common fibres are cotton and other plant fibres – accounting for 31,1 million tonnes of all produced textile fibres (Textile Exchange, 2022). The third most-produced fibres are Man-Made Cellulosic Fibres (MMCF) such as viscose and lyocell – accounting for 7,2 million tonnes of all produced textile fibres (Textile Exchange, 2022). MMCFs are produced by chemically dissolving or otherwise treating wood pulp making them natural on one hand, but synthetic on the other (Šajn, 2019).

Cotton is the most common textile fibre used in clothing hence it acquires the largest share of the textile fibre market for clothes in the EU (Šajn, 2019). The further approximate division of fibres by their regularity of use in clothing in the EU market is depicted in Figure 2. Though derived from nature, cotton production has considerable harmful impacts on the surrounding environment. The cultivation of cotton demands a lot of land, water for irrigation and different types of pesticides and fertilizers to promote a yield as large as possible (Dahlbo et al., 2017; Šajn, 2019). Due to the adverse impacts of especially the chemicals used, the industry is slowly shifting towards more sustainably and organically grown cotton which in 2021 accounted for 24% of all cotton fibre produced globally (Textile Exchange, 2022). Furthermore, less frequently used, more resource-efficient natural fibres such as hemp, linen and flax are under inspection to determine if they could to some extent replace cotton in the future (Šajn, 2019). These other plant fibres accounted for 6% of all textile fibres produced in 2021 (Textile Exchange, 2022).

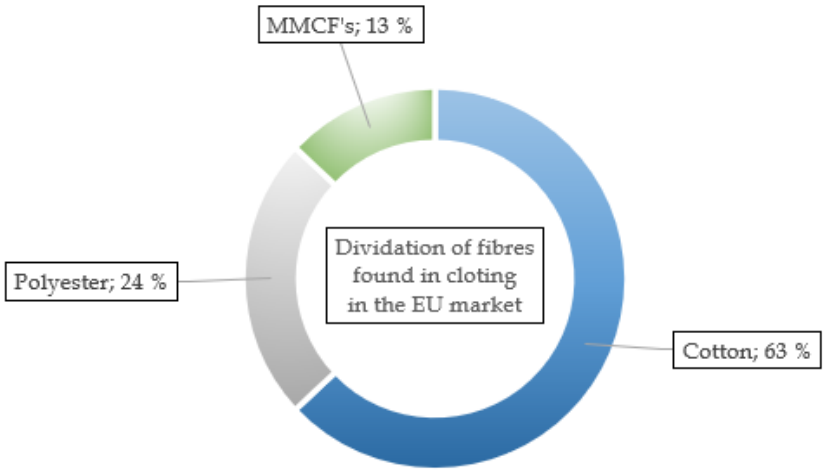


*Figure 2*. Approximate division of textile fibres found in clothing in the EU market (modified from Šajn, 2019)

Globally the most produced textile fibre, polyester, is the second most found fibre in clothing (Šajn, 2019). Compared to cotton it does not require as much water or land in its production and due to its industrial manufacturing process, it can quite easily be recycled into new fibre (Šajn, 2019). In 2021 15% of

all produced polyester fibres were recycled fibres (Textile Exchange, 2022). However, the main raw material of polyester is crude oil which makes it very harmful to the environment in the extraction and use phases (Šajn, 2019). Studies have concluded that using polyester – or other fossil-based textile fibres – is a major contributor to the microplastics found in oceans (Ellen MacArthur Foundation, 2017, p. 21; Šajn, 2019). Currently, a biobased alternative for replacing fossil fuels in polyester production is searched, however, it has been proven difficult to locate a feedstock that does not compete with food production or require a lot of pesticides or water use (Šajn, 2019). In 2021 0,02% of all polyester produced was bio-based (Textile Exchange, 2021).

MMCFs, such as viscose and lyocell, accounted for 13% of all textile fibres found in clothes sold in the EU market (Šajn, 2019). Though derived from a renewable source MMCFs also have impacts on the environment. The process of manufacturing these fibres is more energy-intensive than e.g., cotton production thus increasing the carbon footprint of the end-product. Furthermore, keeping the sources of the fibre's raw material, pulp, sustainable opposes a challenge (Niinimäki et al., 2020; Šajn, 2019). In 2021 approximately 60-65% of the wood pulp in MMCF fibres was certified by a forest conservation organisation and 0,5% of produced MMCF fibres were recycled fibres (Textile Exchange, 2022).

### 1.2.2 Sustainability issues in use and end-of-life phases of clothes

Though the vast adverse effects of the production phase of clothes, studies have found the use phase the biggest environmental burden due to the consumption of water, energy and different chemicals when washing the clothes (Gardetti & Torres, 2013, p. 379; Šajn, 2019). Furthermore, approximately half a million tonnes of plastic microfibres shed annually from the washing of clothes made from synthetic fibres e.g., polyester, nylon, and acryl (Ellen MacArthur Foundation, 2017, p. 21). Due to the amounts of resources required to produce clothes, it can be assumed that the more clothes are consumed the more the environmental impact of use and end-of-life phases of the lifecycle of clothing increases.

As mentioned before, clothing industry generates approximately 92 million tonnes of waste annually (Niinimäki et al., 2020). The generated waste can be divided into pre- and post-consumer waste. Pre-consumer waste is created during production, and it most commonly consists of textile cut-offs left over in the assembly phase, but it can also include fibre or yarn which accounts for around 20% of the industry's textile waste (Niinimäki et al., 2020; Šajn, 2019). Another type of pre-consumer waste is deadstock which means new, un-used and un-sold garments that are thus allocated to waste (Niinimäki et al., 2020). The greater problem, however, is the post-consumer waste. Post-consumer waste are textiles consumers have discarded after use (Niinimäki et al., 2020). Most of the disposed clothes end up in landfills or incinerators among other municipal waste and only 15-40% of the clothes – differing from country to country - are separately collected for reuse or recycling (Niinimäki et al., 2020; Šajn, 2019). Furthermore, only

approximately 1 % - or less – of the collected clothes are recycled into new clothing (Ellen MacArthur Foundation, 2017, p. 20; Niinimäki et al., 2020; Šajn, 2019). In addition, as mentioned, buying clothes is currently so convenient and cheap that consumers no longer necessarily need to take care of their clothes as they did some decades ago (Niinimäki & Hassi, 2011). This – and the continuous increase of production volumes – might have led to more low-quality textile waste thus making it harder to repurpose, resell or recycle. Furthermore, fast fashion has disconnected consumers from the clothing production which in turn has skewed the understanding of the value of clothing and ultimately created a cognitive dissonance in consumers' buying behaviour which also affects when and how the clothes are discarded (Gardetti & Torres, 2013; Joy & Peña, 2017).

It can be assumed that the recycling of clothes has suffered due to the fast influx of textile waste created by the business methods of the industry and subsequent consumer behaviour. Hence, the developments have created a demand for more efficient infrastructure in collection and sorting of clothing. Furthermore, the mixing of different textile fibres of different raw materials, e.g., cotton or other natural fibres with polyester or other synthetic fibres, further challenges the efficient and appropriate recycling and reuse of textiles. Existing recycling systems include either mechanically shredding or chemically dissolving textiles back to fibre filaments. Mechanically shredding the fibre, though most conventional, is not the most feasible method of recycling because the process shortens the fibre filaments thus losing 75% of the quality and value of the material (Šajn, 2019). Chemical recycling – where the fibres are dissolved and pressed again to create new filaments – could solve the problem of decreased value but it is not yet accessible to all textile types – e.g., the before mentioned fibre blends – and the scale of it is still quite minor (Šajn, 2019).

## 1.3 Circular bioeconomy as a solution

### 1.3.1 The concept of circular bioeconomy

Possible solutions to decrease and combat the environmental impacts of the clothing industry have slowly started to emerge. Many studies have called for an overall systemic change which would require the involvement of all stakeholders from producers and retailers to consumers, governmental entities and NGOS's (Dahlbo et al., 2017; Gardetti & Torres, 2013; Joy & Peña, 2017; Niinimäki et al., 2020; Niinimäki & Hassi, 2011). All research regarding the sustainability of clothing industry emphasises the fact that the industry's current linear and fast-paced production and consumption model should be disrupted. Circular bioeconomy is one proposed holistic system change aimed to transform the whole economic system in pursuit of meeting the targets of UN's Sustainable Development Goals and the Paris Agreement (Hetemäki et al., 2017). It could also provide the needed

tools for a systemic change in the clothing industry. The concept construes two separate concepts: circular economy and bioeconomy.

Circular economy aims towards an economic system in which the resource efficiency of production is maximized and generated waste is minimized: the flow of energy and material is slowed down and the post-use material is directed back towards the production i.e., striving to a closed loop system (Bocken et al., 2016; Brydges, 2021). Bioeconomy aims towards an economic system where fossil-based materials, e.g., fuels, materials, chemicals and energy are substituted with or derived from renewable biological resources i.e., plant and animal sources (McCormick & Kautto, 2013). Though, either concept is with no fault: currently companies apply selective and strategic circular economy practices rather than aiming towards a greater systemic change (Brydges, 2021; D'Amato et al., 2020) and concerns have been raised regarding the possible sustainability issues in bioeconomy if only the use of additional biomass is promoted in policies and strategies (Asada et al., 2020; Ramcilovic-Suominen & Pülzl, 2018; Vainio et al., 2019). For example, failing to successfully combine sustainable development goals and bioeconomy can lead to deforestation, decreases in biodiversity and water quality, in addition to deepening poverty and livelihood challenges in rural areas (Ramcilovic-Suominen & Pülzl, 2018) whereas unsuccessfully applying said goals in circular economy strategies is merely a tad more efficient business as usual.

Thus, Hetemäki et al. (2017) and Kardung et al. (2021) found that these two concepts are stronger together and that it is eminent that they are connected. If bioeconomy is to conform with the sustainability attributes and the impacts anticipated from it, circular economy strategies must be included (Hetemäki et al., 2017; Kardung et al., 2021). Vice versa implementing bioeconomy elements to circular economy strategies, practices and models could encourage a more holistic approach to sustainability transition and increase the ambition of said operations. Together these concepts could tackle some of the biggest environmental threats of the clothing and textile industry: reduce the amount of waste, pollution, and greenhouse gas emissions produced, make resource and land-use more efficient, in addition to attempting to decouple the industry's growth from the depletion of the environment (Asada et al., 2020; Brydges, 2021; McCormick & Kautto, 2013). However, Giampietro (2019) emphasises that circular bioeconomy should not be viewed as a new concept through which business as usual can be continued. They suspect the possibility of decoupling economic growth from the exploitation of the environment thus reminding that drastic systemic changes are needed; in addition to the currently widely accepted reusing and recycling schemes, reducing, i.e., changing how people and companies operate and what they aim towards, is needed as well (Giampietro, 2019).

### 1.3.2 Circular bioeconomy possibilities in the forest-based sector

Transition to circular bioeconomy is already in motion and there has been a growing interest towards adopting the concept and developing operations towards it especially in countries with very established forest-based sectors e.g., Finland and Sweden (Antikainen et al., 2017). D'amato et al. (2020) studied the different circular bioeconomy business models applied in forest-based small and medium sized enterprises and found that the current business models are focusing on traditional practices, e.g., improving efficiency, and lacking on more radical, creative solutions. This is because the traditional practices are closely connected to cost reductions and the financial and/or strategic benefits are not as evident with the more eccentric ideas (D'Amato et al., 2020). Furthermore, D'amato et al. (2020) found that the SME's were relying heavily on the public support of their new business models due to the revenues yielded by the circular bioeconomy business models still fall behind the revenues of their conventional counterparts. Thus, the acceptance of the public is one key factor in the success of circular bioeconomy business models in the forest-based industries.

Näyhä (2019) as well found that the companies in the Finnish forest-based sector were attempting to apply circular strategies and practices in their business models and striving towards a sustainable and profitable forest-based business. The companies perceived themselves as forerunners due to the heritage of Finnish forest-based industry, with sustainability and reasonable use of wood at its core (Näyhä, 2019). However, Näyhä's (2019) results show some challenges in these perceptions, for example there were discrepancies in the way the companies viewed the proper use of the wood biomass, e.g., producing bulk-products and energy, or higher-value added products. Furthermore, the concepts of circular economy, bioeconomy and sustainability were seen as more political than practical (Näyhä, 2019). Yet, the Finnish companies in the forest-based sector viewed sustainability as paramount part of a desirable future for the industry (Näyhä, 2021).

One viable way of implementing circular bioeconomy in the forest-based sector is the innovation of novel viscose type i.e., wood-based textile fibres. In addition to furthering the possible sustainability goals adding value-added products, e.g., textiles into their product portfolios can combat the decline in the demand of more conventional products, e.g., graphic paper. This change in demand has been projected for many years thus compelling the forest-based industries to extend their product selection. Producing textile fibre from forest based raw materials has been deemed as one of the most promising new wood-based product markets (Hurmekoski et al., 2018; Temmes & Peck, 2020). Other markets include construction, biofuels, chemicals, and plastic packaging (Hurmekoski et al., 2018). Venturing to these new markets could result in 18-75 billion euro increase in yearly revenues by 2030 depending on the chosen product portfolio and the company's position in the value chain. Furthermore, it is also estimated that any of the identified products could compensate for the decreased demand of graphic

paper (Hurmekoski et al., 2018). Hurmekoski et al. (2018) found that the compensation could be even greater if the companies are prepared and equipped to have capacity for more downstream operations, e.g., textile or chemical production.

However, the challenge in producing e.g., textiles is that the different emerging products in addition to the conventional uses of sawmilling and pulping by-products, e.g., energy and paper industries, compete for the same raw materials. Furthermore, due to the absence of circular flows from the society the raw material for textile production in the forest industry is quite scarce and providing it would require e.g., increasing the volume of available raw material or prioritizing the emerging products over already established ones (Hurmekoski et al., 2018; Temmes & Peck, 2020). Thus, Kallio (2021) suggested that new investment is needed in the industry to satisfy the growing demand. They recommended converting papermills in to mills that could produce both textiles and paper to create synergy benefits and diminish the apparent risk of establishing a completely new mill (Kallio, 2021). This supports a similar suggestion made by Hurmekoski et al. (2018) that synergies between the sawmilling, e.g., wood construction, and the industries dependent on their by-products, e.g., textiles, chemicals, and biofuels, are key for the success of emerging products.

Kallio (2021) also predicted, similar to Hurmekoski et al. (2018), that increasing the textile pulp production would increase the competition over pulpwood and sawmill residues which in turn could decrease the investments made to e.g., paper production. However, Kallio (2021) concluded that increasing the production of textile pulps would support the transition towards sustainable bioeconomy: the increased demand for the by-products would support the solid wood product industries and the utilization of the side streams of pulp production. Furthermore, Hurmekoski et al. (2020) assessed that rather than increasing the sawn wood production and hence the availability of the by-products, the by-products should be used in e.g., textile production rather than for e.g., heat or energy. This way also the positive environmental impact of the biomaterial substitution was estimated to be greater (Hurmekoski et al., 2020). Kunttu et al. (2021) came to a similar conclusion. They found that regardless of the level of forest harvesting, changing the product portfolios to utilize the side-streams and waste wood from energy to high added-value products, such as textiles, the substitution benefits from the climate targets point of view would be greater (Kunttu et al., 2021).

### 1.3.3 Novel wood-based textiles as a circular bioeconomy solution

The benefits of forest-based textile production go beyond the new prospecting markets and growth for the forest-based industries. They have also shown immense promise in making the textile and clothing industry more sustainable. Shen et al. (2010) found in their comparative calculations of the environmental impacts of different textile fibres' production that MMCFs – excluding Viscose produced in Asia – are more environmentally sustainable than the most common fibres: polyester, polyamide, and cotton. The newest MMCF at the time, Tencel,

had the lowest environmental impact of all fibres that were compared. This was due to low energy consumption, low use of chemicals and low water consumption (Shen et al., 2010). Thus Shen et al. (2010) concluded that modern MMCFs have potential to reduce the environmental impacts of the textile and clothing industry over conventional fibres.

Due to the findings regarding the environmental impacts of the MMCFs, increased interest in wood-based textile fibres in the forest and textile sectors, and the simultaneous need for circular solutions, there has been a surge of innovation in the textile sector in Finland (Antikainen et al., 2017) e.g., Ioncell® originated in Aalto University, Spinnova® originated in VTT and Metsä Group's Kuura®. In the case of these fibres however, the novelty stems from not only the material, but the production processes themselves. Ioncell® is a research project initiated over ten years ago where a novel non-toxic solvent and a close-looped process for textile fibre production was created. The solvent and process have been tested with more conventional wood pulp, but also with textile and paper waste (*Ioncell*, 2023). Spinnova® on the other hand does not use any solvent at all but has created a novel extrusion process to create textile fibres which has also been tested on e.g., left over leather from shoe production in addition to the conventional pulp (*Spinnova*, 2023). Metsä Group's Kuura® relies on synergy benefits: the textile fibre is produced in the same facility where its raw material, pulp, is produced thus reaping the benefits of the industrial ecosystem (*Kuura*, 2023). These new innovations provide an interesting prospect for the development of sustainability in the textile and clothing industry.

Though the evident growth in the novel textile fibre sector, there are still some challenges to solve before their successful commercialization. Antikainen et al. (2017) recognized the potential of the novel fibres but found them to be in early stages of development where the quality of the fibres was ensured but the feasibility and resource efficiency still needed improvement. More recently Verkerk et al. (2022) corroborated only the improvement need for the feasibility of the novel fibre production. Yet, they estimated that commercial production of some of the novel fibres would start in 2022 (Verkerk et al., 2022). Furthermore, Hurmekoski et al. (2018) called for consumer views and reactions to the diffusion of novel wood-based products. Similarly, Vainio et al. (2019) found the consumer views on bioeconomy, and thus bio-products, to be more nuanced and multifaced than that of the official strategies, thus suggesting the need for public discourse to ensure broad acceptance and engagement of consumers in the implementation of those products and strategies.

### 1.3.4 Consumers' role in implementing circular bioeconomy

Wilke et al. (2021) assessed the role of the consumers in different bioeconomy strategies and found the consumer role detached and passive in the transition to bioeconomy. The focus of the strategies was on the techno-economic paradigm, essentially covering the production process of the product (Wilke et al., 2021). However, the use phase of the product, i.e., the role of the consumer, was mostly

overlooked though the use and especially the way a product is discarded has a massive effect on the product's real sustainability (Wilke et al., 2021). Nagy et al. (2021) examined the awareness and acceptance of forest-based bioeconomy of Swedish consumers. They found that the consumers perceived the forest based bioeconomy rather positively but that they were limited on in-depth knowledge on what it actually involves (Nagy et al., 2021). The consumers had contradicting opinions on the forest based bioeconomy, e.g., wood was preferrable construction material to steel and concrete but building with it was perceived as causing deforestation and biodiversity loss (Nagy et al., 2021). Furthermore, they found that consumers disagreed on if the biggest beneficiary of a forest based bioeconomy would be the rural areas of the country or big corporations (Nagy et al., 2021). Thus, to ensure a successful transition to circular bioeconomy and the success and feasibility of the new products, consumers need to accept and choose to buy them over other alternatives. For this, studies on consumer perception are needed.

## 1.4 Purpose of this study

This master's thesis examines the consumer perceptions specifically of new wood-based textile fibres. This study draws from two previously conducted studies by Wallius (2019, see also Wallius et al., 2023) and Husu (2020). Wallius (2019) assessed how consumers view new wood-based innovations and Husu (2020) observed how the perception of wood-based textiles and their sustainability compared to other textile fibres. Wallius (2019) found that consumers perceived the new wood-based products promising and they would choose them over their conventional counterparts. Furthermore, they found that the most influential purchase determinants were predominantly quality and safety, second was environmental friendliness and price was only listed after them (Wallius, 2019). This is a surprising finding due to many consumer studies emphasising the role of price as a determinant for purchase. Instead of a higher price, what Wallius (2019) found as a barrier for purchasing wood-based products, was the lack of knowledge and objective information. Overall wood-based products were perceived as friendly, safe and healthy, somewhat expensive and generally unavailable (Wallius, 2019). Thus they suggested more effective communication and improving the quality instead of endeavouring to make them as cheap as possible to increase the market share of new, emerging wood-based products (Wallius, 2019).

Husu's (2020) findings revealed that the perceived sustainability of different textiles is challenging to evaluate for consumers due to lack of knowledge. But, they found that the material of clothing had either significant or somewhat significant impact on the purchase decision and material was a better indicator for consumers of the perceived sustainability of clothing than certifications

(Husu, 2020). Regarding wood-based fibres, Husu (2020) concluded that consumers found the new options, e.g., wood-based, and waste-based fibres, interesting but they also raised a number of questions and doubts. For example, wood-based materials were suspected of contributing to deforestation and biodiversity loss (Husu, 2020). What was also recognized was that younger respondents were more critical towards the sustainability claims of companies (Husu, 2020).

Yet, there is a gap in the knowledge on in depth consumer perceptions on new wood-based textile fibres, due to the low amount of consumer studies related to textile materials in general. More studies have been made related to consumer perception on other biobased products and different new circular- or bioeconomy business models in the clothing industry. Furthermore, most studies apply quantitative methods in their research thus lacking on the reasons why consumers feel or think a certain way regarding new wood-based products. Husu (2020) recognized that consumer perceptions related to the different materials of clothing was challenging with quantitative method due to the real or perceived lack of knowledge of the respondents on the topic. Younger, educated consumers were selected as the preferred participants in this study due to the assumption that they would be interested in and knowledgeable about the sustainability issues in general and in the clothing and textile industry. Furthermore, it was assumed that due to this knowledge the participants would be more critical and thus have multifaceted views on possible solutions to said sustainability issues. The findings of Husu (2020), corroborated this assumption of criticalness in the younger consumers regarding novel textiles.

This master's thesis endeavours to contribute to the closing of the mentioned gap of knowledge regarding consumer perceptions on new wood-based textiles. This research is highly topical due to the multiple emerging textile innovations in Finland, as mentioned before. The success of these innovations can have a vast impact on both the textile and clothing industry in Finland and the Finnish economy. Furthermore, these innovations can be important parts of the systemic change towards sustainability in the clothing industry in the global scale. But as stated before, consumer acceptance and positive perceptions are key to their success. Thus, this masters' thesis examines the in-depth views and opinions of consumers by applying qualitative research methods. The main research question was formulated as follows:

- How do Finnish university students perceive new wood-based textiles?

Three sub-questions were formulated to determine the main aspects of interest in consumers' perceptions:

- What attributes consumers associate with wood-based textiles?
- What are the main product attributes affecting purchase decisions in terms of textiles?
- Which are the main barriers of purchasing wood-based textiles? How can these barriers be overcome?

This master's thesis is structured as follows: first the topic, and background and context for the study are introduced. Then the theoretical framework of the thesis is introduced after which the research methodology and data collection is depicted. The fourth part of the thesis represents the results of the empirical research, and the results, the limitations of the study and potential future research possibilities are discussed in the fifth part. Lastly, conclusions are made based on the results and discussion.

# 2 THEORETICAL FRAMEWORK

In the case of sustainable, green, or biobased products, many studies have been made examining the views, attitudes, and perception of consumers. Furthermore, the behavioural aspects of the so-called green consumption and the aspects of consumer behaviour which effect it are also quite widely researched. Due to the topic of this master's thesis, the previous studies on consumer views and purchase behaviour regarding biobased products and innovations are examined. In addition, consumer views and purchase behaviour concerning sustainable fashion and fashion innovations are studied more closely.

## 2.1 Consumer perceptions and behaviour regarding bio-based products

In general, consumers are interested in bio-based products (Häyrinen et al., 2020; Karachaliou et al., 2017; Ranacher et al., 2018; Reinders et al., 2017; Sijtsema et al., 2016) and they would prefer (Karachaliou et al., 2017; Pfau et al., 2017) and presume to pay a premium price for them over conventional products (Carvalho et al., 2017; Pfau et al., 2017). However, the studies also indicate that a product being bio-based does not yet determine the purchase behaviour – it is a positive attribute, but there are other factors that influence the decision making process more (Karachaliou et al., 2017; Pfau et al., 2017; Ranacher et al., 2018; Sijtsema et al., 2016) e.g., price, accessibility or familiarity. Pickett-Baker and Ozaki (2008) corroborated this finding: they found that a general positive attitude towards green products is not enough to encourage sustainable purchase behaviour. Consumers have other subjective and personal interests that interfere and are prioritized over the sustainability aspect of the product (Pickett-Baker & Ozaki, 2008).

The main barrier for choosing a bio-based product is the lack of knowledge and awareness of the consumers (Karachaliou et al., 2017; Pfau et al., 2017; Ranacher et al., 2018; Sijtsema et al., 2016). Especially regarding bio-based innovations, Ranacher et al. (2018) found that lack of awareness led to consumers associating fears and concerns to the innovation. The lack of awareness also leads to misconceptions and mixing e.g., bio-based products with organic products (Karachaliou et al., 2017; Pfau et al., 2017) which can lead to false expectations and subsequent disappointment (Pfau et al., 2017). In addition, Karachaliou et al. (2017) found that consumers did not feel that information regarding bio-based products was sufficiently available.

The main information consumers are looking for regarding the bio-based products according to the studies is: what's in it for me (Karachaliou et al., 2017; Ranacher et al., 2018; Sijtsema et al., 2016)? Personal benefits impact the consumer perception and purchase decision largely (Pfau et al., 2017) but Ranacher et al.

(2018) revealed that in the case of innovations, the innovations familiar to the consumer are evaluated on a personal level but unfamiliar innovations on a societal level. This increases the need for general information regarding the societal, ecological, and economic benefits of the innovation. However, communicating benefits on both levels can result in conflicting messages due to the diversity of consumers (Ranacher et al., 2018). Furthermore, Pfau et al. (2017) related a contradiction in the consumers want to be informed: they found that though consumers state their need for information they are not willing to put much effort into informing themselves. These results in addition to findings of concern, mistrust or doubt towards producer stated sustainability (Karachaliou et al., 2017; Sijtsema et al., 2016) further challenge the communication about bio-based products. Thus Pfau et al. (2017) suggested that either companies inform the consumers fully e.g., personal benefits, climate impact and societal benefits or they focus the marketing on the other more determining attributes of the product.

Clothing as products do not drastically alter the previously presented findings: overall attitude towards sustainable, e.g., bio-based, clothing is positive but it is not the most influential attribute to encourage purchase behaviour (Bucklow et al., 2017; Kemppainen et al., 2021; Vehmas et al., 2018). More impactful attributes include for example price, quality, aesthetics and availability (Bucklow et al., 2017; Lai et al., 2017). Furthermore, studies show that consumers associate sustainable clothing with low quality, limited choices, and unappealing aesthetics (Bucklow et al., 2017; Lai et al., 2017; Sandra & Alessandro, 2021). Though the reported negative associations and other more determinant aspects in clothing, Sandra & Alessandro (2021) reported that large segment of respondents in their study (N=696) was willing to pay a 64%-128% price premium for eco-friendly clothing. Furthermore, a higher concern for the environment increased the willingness to pay (Sandra & Alessandro, 2021). Nevertheless Kemppainen et al. (2021) found the question of pricing contradictory: they reported that while a high price is a barrier for a consumer to buy a product, too low of a price on sustainable clothing can be viewed as suspicious.

The lack of awareness and need for information was evident also in the case of sustainable, e.g., bio-based clothing. Kemppainen et al. (2021) reported that due to the diverse ways of communication among companies, consumers find it difficult to assess and compare the sustainability of their products. Thus buying sustainable clothing is viewed as challenging (Kemppainen et al., 2021; Lai et al., 2017) which can further discourage sustainable clothing consumption and allow the consumer to ignore the responsibility issues in their behaviour (Kemppainen et al., 2021). However, due to the highly individualistic, emotional, cultural and visual perception of clothing it is hard to accurately predict the actual clothing purchasing behaviour and how much the stated impediments and drivers really affect consumers decisions (Bucklow et al., 2017).

To endeavour to explain and predict consumer behaviour and the formation of their perception regarding novel products, two theories were selected

as the theoretical framework of this master's thesis: the theory of planned behaviour (Ajzen, 1991) and innovation diffusion theory (Rogers, 2003). These theories and their application to the context of clothing is depicted next.

## 2.2 Theory of planned behaviour

Ajzen's (1991) theory of planned behaviour endeavours to explain how people make decisions to engage in different behaviours and what impacts the decision-making process. The basis of the theory is depicted in Figure 3.

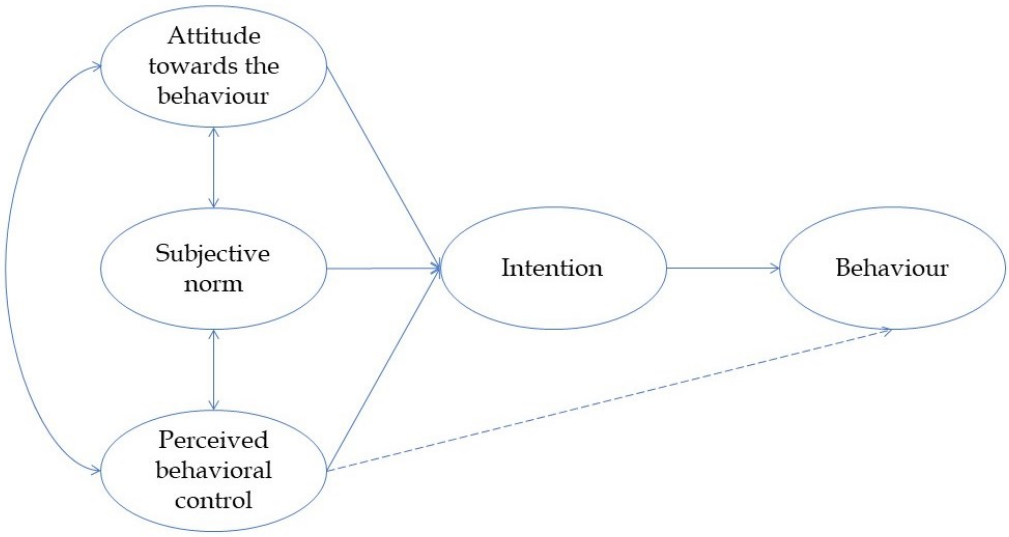


*Figure 3*. Theory of planned behaviour (modified from Ajzen, 1991)

The theory proposes that the key in encouraging a certain behaviour is to increase the intention of an individual – the higher the intention, or motivation, the more probable the behaviour should be (Ajzen, 1991). The theory defines intention as a person having the needed opportunities and resources and meaning to execute the behaviour. The level of intention is affected by the attitude towards the proposed behaviour, the subjective norm of the individual and their perceived behavioural control. Attitude toward the behaviour is depicted as the degree to which an individual views the behaviour favourable or unfavourable. Subjective norm means the perceived pressure set by the surrounding society to perform or not to perform the behaviour (Ajzen, 1991)

Perceived behavioural control in addition to affecting the intention, can have a direct affect to the behaviour. Ajzen (1991) defines behavioural control as the actual resources and opportunities an individual has, to perform a behaviour. However, it is important to consider the individuals perception of their behavioural control i.e., do they themselves believe that they are able to execute the

behaviour successfully. Thus, perceived behavioural control is defined as perception of ease or difficulty in executing a behaviour including reflections on past experiences and expected barriers. Ajzen (1991) argues that two individuals with similar behavioural control succeed in performing a behaviour differently if their perception of their behavioural control varies: the individual with increased perceived behavioural control will perform better than the one with lower perception of their behavioural control. Perceived behaviour control can also substitute for actual behaviour control, if the perception is accurate i.e., if the individual is well informed about the behaviour, requirements to succeed have stayed the same or no new and unfamiliar aspects have been added to the situation (Ajzen, 1991). The theory thus suggests that the more favourable the attitude and subjective norm toward the behaviour along with greater perceived behavioural control, the stronger the intention to perform the behaviour. It is also indicated that the relative importance of these determinants in the prediction of intention and behaviour will vary from behaviour and situation to another (Ajzen, 1991).

Researchers have used Ajzens (1991) theory to attempt to predict consumers green purchase behaviour and to determine which of the theory's determinants have the greatest impact on the intentions. Paul et al. (2016) found all the three determinants of the theory of planned behaviour positively related to the intention to purchase green products. However, they felt the need to test additional determinants e.g., environmental concern, as well due to the uniqueness of green products (Paul et al., 2016). They reported that of the three determinants of the theory of planned behaviour, attitude was the strongest predictor for purchasing green products and subjective norm was the weakest. The added determinant of environmental concern had also a weak direct influence but it was indicated to have a positive effect on perceived behavioural control (Paul et al., 2016). Slightly contradictory to Paul et al.'s (2016) findings Liobikiené et al. (2016) reported the subjective norm as the strongest predictor of green purchasing behaviour. Furthermore, due to the study being conducted in various EU-countries, they found that subjective norm was significantly dependent on the country's economic development – the higher the GDP the weaker determinant subjective norms represented (Liobikienė et al., 2016). In addition, they indicated that knowledge and confidence, i.e., aspects of perceived behavioural control, had a significant influence on the purchase behaviour (Liobikienė et al., 2016).

The slight disparity of the findings can be explained by the confirmed consumer attitude-behaviour gap regarding sustainable or green purchasing behaviour i.e., consumers' stated values are disconnected from their actual behaviour. Moser (2016) explored the role of personal morals and willingness to pay in relation to the determinants of the theory of planned behaviour in the context of consumers' attitude-behaviour gap. They reported that willingness to pay was the strongest determinant of behaviour in this context though they also recognized the existence of other barriers e.g., consumer expertise (Moser, 2016). Furthermore, Kumar et al. (2017) studied the relation of attitudes with environmental knowledge and subjective norms in the context of consumer attitude-behaviour

gap. They related that environmental knowledge had a positive direct impact on attitude which in turn had a significant positive affect on purchase intention (Kumar et al., 2017).

In the context of fashion and clothing Becker-Leifhold (2018) studied the theory of planned behaviour in the context of consumer intention and engagement in alternative fashion consumption models. In addition to Ajzens (1991) determinants they studied the effects of fashion involvement, materialism, status consumption, interpersonal influences, moral norms, and environmental and cots consciousness (Becker-Leifhold, 2018). They found the attitude to be the strongest indicator for behaviour and social norm the weakest, similar to Paul et al. (2016). However, Becker-Leifhold (2018) indicated that social norm was significantly connected to the attitude and perceived behaviour control thus having a significant indirect impact on the intention. They also found that in a fashion context environmental consciousness, materialism or altruistic value orientations did not have a significant impact on the intention but egoistic value orientations e.g., status consumption and being susceptible for interpersonal and fashion influence had (Becker-Leifhold, 2018). The results indicated that this was because the intention of engaging in alternative fashion consumption models was mainly driven by hedonistic motives e.g., trying different styles or lower costs (Becker-Leifhold, 2018).

The theory of planned behaviour has corroborated the findings of other studies regarding green, sustainable, or bio-based product consumption: the perception of the product must be positive, and the consumer must feel confident in engaging in the behaviour. Both aspects culminate in the need for information and communication described earlier. The theory also shows signs of quite accurate prediction of behaviour in simple scenarios but as stated before, clothing consumption is quite complex. Thus, the focus and the importance of different determinants shifts in different situations or with different types of research samples hence making the behaviour and its drivers and barriers more difficult to predict.

## 2.3 Diffusion of innovations

To explain how the knowledge and confidence regarding novel products for example, in the case of this study wood-based textile innovations, is increased, the Rogers' (2003) theory of innovation diffusion is examined. Innovation diffusion describes a process which includes four main elements: the innovation, communication through chosen channels e.g., media, scientific report or word of mouth, time, and the social system. An innovation can be an idea, practice or an object which is novel to the unit of adoption e.g., a country, an industry or a group of people (Rogers, 2003). The newness of an innovation creates a lack of predictability, structure and information thus requiring knowledge, persuasion, and a deci-

sion to adopt it to be diffused. The innovation is evaluated by its perceived attributes; the degree to which the innovation is perceived as better than the preceding idea, how well the innovation upholds the existing values, past experiences, and the needs of the adopters, how difficult the innovation is to use or understand, how easy it is to try the innovation before full adoption and how well the results of the innovation can be observed by others (Rogers, 2003). In this evaluation process the individual's perception exceeds the objective e.g., societal perception in importance. The higher the innovation is evaluated against these criteria the faster the innovation will be diffused (Rogers, 2003).

However, no mere individual evaluation of innovation ensures the diffusion of an innovation on a society level; that calls for communication. As stated before, when evaluating an innovation, individual's perception is more important than the objective perception. Rogers (2003) suggests that the nature of communication e.g., individual reading a scientific report about a product versus an individual talking to another individual who has used said product, determines the success of innovation diffusion: individuals value peer evaluations more than objective evaluations. Rogers (2003) also points out the difficulty of communication to diverse group of individuals; if the individuals of the group have a little in common communication becomes difficult due to e.g., the individuals perceiving messages differently and valuing different aspects in a product. This disparity can make the communication ineffective and impede and slow down the diffusion process.

Time is required for an individual to make a decision on an innovation – they gather information thus gradually decreasing the uncertainty of the innovation from peers and perceived authorities which results in either adoption or rejection (Rogers, 2003). The time required for the process depends on the individual and their needs regarding the innovation. Rogers (2003) indicates that individuals can be divided into five categories according to the required time for them to decide on an innovation. These categories include innovators, who are active information and innovation seekers, and can decide only based on objective perception, early adopters, early majority, late majority, and laggards, who are uninterested or even unwilling to adopt the innovation. The division of these categories follows a classic bell curve; the innovators and laggards represent the smallest percentages; a simplified example of the bell curve is depicted in Figure 4. The steepness of the curve – i.e., the speed of diffusion - can differ however, from innovation to innovation and from social system to social system (Rogers, 2003). Rogers (2003) defines social system as a set of interrelated units, e.g., individuals, groups, or organizations, engaged in joint problem solving to reach a common goal. A social system is structured – a pattern exists of an arrangement of the units in the system, e.g., organizational hierarchy (Rogers, 2003). The social structure can present a barrier for or encourage the innovation diffusion process.

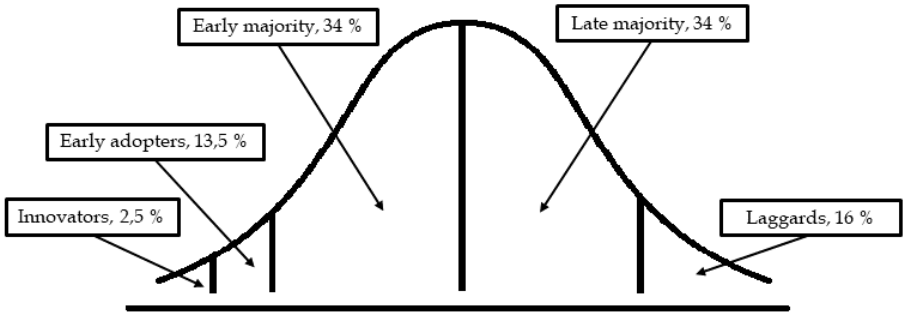


*Figure 4*. Diffusion of innovations (modified from Workman & Lee, 2017)

Stummer et al. (2015) studied the innovation diffusion of a bio-based product innovation of repeat purchase and a high competed market. They found that due to the price increase of the bio-based novel alternative, the repeated purchase behaviour decreased (Stummer et al., 2015). Furthermore, Stummer et al. (2015) indicated that the awareness of the innovative attributes of the novel product were key in endeavouring to sustain the repeat purchase behaviour. Similarly, Ranacher et al. (2018) found the awareness of the attributes of an innovation to be key in easier acceptance and adoption of it: as stated before a lower awareness made it easier for consumers to associate fears and concerns to the innovation. In addition, the same study corroborated the difficulty of innovation communication that Rogers (2003) mentioned: the heterophily of the community and the diverse needs of information can result in conflicting and ineffective communication (Ranacher et al., 2018).

Workman & Lee (2017) modified Rogers' (2003) theory to a fashion context. They felt that Rogers' (2003) innovation diffusion theory did not completely serve the context of fashion due to it being originally aimed to ideas rather than products and due to the uniqueness and complexity of fashion products (Workman & Lee, 2017). Workman & Lee (2017) measured the involvement in fashion due to their assumption that higher involvement indicates higher probability of early adoption of a new fashion. They found that in the fashion context there are only four adopter categories instead of the Rogers' (2003) suggested five. These categories are shown in the bell curve division in Figure 5.

Workman & Lee's (2017) proposed categories include consumer change agents, early adopters, late adopters, and reluctant adopters hence they suggest that in the fashion context Rogers' (2003) innovator and early adopter categories should be merged. They found that the individuals in these categories where most homogeneous and evidently highly involved in fashion thus they were grouped together in the consumer change agent category (Workman & Lee, 2017). The second group of early adopters were found to inflict the upward curve of the innovation diffusion thus exceeding the threshold of commonality however, Workman & Lee (2017) relate that more research is needed on this consumer group to confirm these results. The late adopters were found to adopt the new fashion due to probable increase in visibility and perhaps because at that point of the diffusion process not adopting the style would present a higher risk than

adopting it (Workman & Lee, 2017). The reluctant adopters – or in Rogers' (2003) theory laggards – were found to have no enthusiasm nor willingness to adopt the new fashion though there would be little monetary risk due to the fashion being at the end of its lifecycle and thus there being a wide selection with a low price (Workman & Lee, 2017).

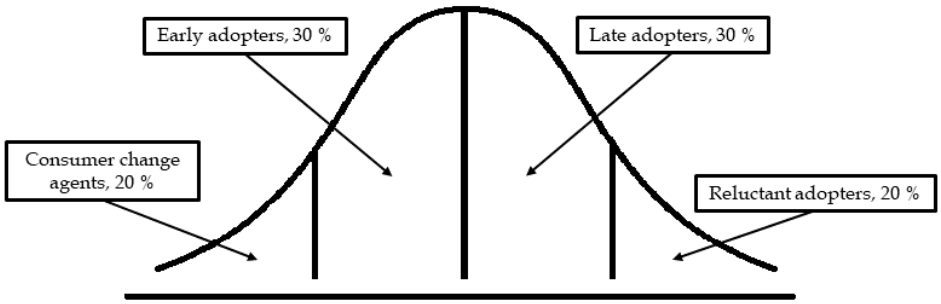


*Figure 5*. Innovation diffusion in fashion context (modified from Workman & Lee, 2017)

Rogers' (2003) diffusion of innovations theory and Ajzens (1991) theory of planned behaviour both endeavour to explain and depict how and why individuals make certain decisions and what types of aspects impact the decision-making process. Due to the complexity of the chosen product in this master's thesis it is beneficial to look at the possible barriers and drivers for a consumers' intention to purchase a novel wood-based textile product from the perspective of both theories. Though similarities can be found in the theories the point of view is slightly different: innovation diffusion ponders the acceptance and adoption of novel products – which a textile innovation is – and the theory of planned behaviour examines the individual's consumption decision and its process. In the following chapter the empirical study of this master's thesis is depicted in addition to the interviewing and analysis process.

# 3 RESEARCH DESIGN AND DATA COLLECTION

To honour the topic of this master's thesis and the research questions a qualitative research method was chosen. The method was selected mainly due to its relevance to the research topic but also to build on the results of previously mentioned studies conducted by Husu (2020) and Wallius (2019). In both studies the perceptions of consumers were examined with quantitative methods and thus a qualitative study was suggested as a possible avenue of future research.

## 3.1 Methods of this study

Where quantitative methods look for generalizable and statistically significant causality, qualitative methods aim to holistically understand complex realities and processes (Mayoux, 2006). Qualitative methods observe and examine the different meanings and perceptions of topics and problems, and use different purposive sampling techniques; e.g., identifying key-informants that have special outlook on the topic in question (Mayoux, 2006). To conduct a qualitative study multiple tools can be applied e.g., individual interviews, group observations or focus group interviews. Each of the tools have a different focus thus they conform to different research designs and topics differently (Morgan, 1997). To endeavour to find the most holistic views on the topic of this master's thesis the focus group interview was chosen as the designated tool for collecting empirical data.

### 3.1.1 Focus group interview

Focus group interview as a qualitative research method exists in between the two most common qualitative methods; individual interview and group observations (Morgan, 1997). It refers to a group of people focused on discussing a selected topic and it is widely used in business research to examine consumer behaviour e.g., attitudes, needs and perceptions (Eriksson & Kovalainen, 2016). A focus group interviews' objective is to collect data on viewpoints and experiences of the participants, or on the spontaneous interactions between the participants thus exploring why an issue is important and what about it is important while recognizing discrepancies between words and actions (Eriksson & Kovalainen, 2016).

The key characteristics of a focus group interview include a group of 2-10 people, a facilitator (e.g., the researcher) and a topic or an issue to discuss in an informal atmosphere and with a freedom of expression, speech and sharing (Eriksson & Kovalainen, 2016). Compared to group observations focus group interviews are limited since the studied situations are only restricted to verbal behaviour and self-reported data (Morgan, 1997). Furthermore, the interview situation is created and managed by the researcher hence it is not natural for the

participants (Morgan, 1997). Compared to the individual interviews, the researchers' role has a greater emphasis, and the opinions and experiences of the individual participants are more ambiguous in the focus group interview context (Morgan, 1997).

These discrepancies with the other qualitative research methods emphasize the weaknesses of focus group interviews. First, Morgan (1997) found that the necessity of researcher's creation and control on the interview situation could tarnish the accuracy of the information gathered in a focus group interview. However, they also stated that there was no concrete evidence that the influence of the researcher would be any greater in focus group interviews than in other qualitative methods (Morgan, 1997). Still, the possibility of the researcher inserting their views too strongly or otherwise guiding the group should be considered when evaluating the data collected from focus group interviews.

Secondly, Morgan (1997) notifies that in a group setting the participants might have either a tendency toward conformity, e.g., they might withhold some thoughts or opinions to better match the groups opinions, or toward polarization, e.g., they exaggerate their views more in a group setting than they would in private. Eriksson & Kovalainen (2016) recognized a similar issue with focus groups. They convey that a focus group interview can be challenging for minorities, people who have exceptional experiences, and inarticulate or shy people, all of whom might find a group setting intimidating (Eriksson & Kovalainen, 2016). Because of this Morgan (1997) suggests that before choosing focus group interview as the research method the sensitivity of the topic should be evaluated; if there is any doubt that participants would feel uneasy talking about a topic in a group setting focus group interview should not be chosen as the method for said topic.

Yet, there are also many benefits to focus group interviews. Morgan (1997) reflected that focus group interview as a method can be highly efficient; it can produce strenuous amounts of data on the specific topic of interest with less effort than individual interviews. No scientific evidence has been found that individual interviews would yield more in depth views and reflections than a focus group interview can (Morgan, 1997). Furthermore, the group setting can enrich the views and opinions shared and thus the data gathered, due to the participants ability to compare and reflect their own views against the other participants' (Morgan, 1997). Hence, the method supports discussions and examination of complex behaviours and motivations. Eriksson & Kovalainen (2016) also highlight the position of the participants as a benefit to focus group interviews; the participants are the experts and there is no pressure to perform or find the 'correct' answers due to the open and conversational atmosphere. The interview is designed so that there is time to reflect and digest views, thoughts and issues, thus possibly arising new viewpoints that might not come to mind in individual interviews (Eriksson & Kovalainen, 2016).

For these benefits and their suitability to the topic and aim, focus group interview was selected as the method of research for this master's thesis. Furthermore, focus group interview was the chosen method in one relatable study conducted by Häyrinen et al. (2020). They examined Finnish young adults' perceptions of the health benefits and sustainability of wooden interior materials (Häyrinen et al., 2020). Other more closely related studies applied quantitative methods (e.g., Husu, 2020; Wallius, 2019; Sandra & Alessandro, 2021) which in turn encouraged the selection of a qualitative method to provide a different view on the topic. Next the data collection in addition to the data analysis process is depicted in more detail.

## 3.2 Data collection

The design of a focus group interview exists on a spectrum. It can be designed as a group interview where the facilitator, e.g., the researcher, is completely in control of the situation and the group principally answer the facilitators questions with low interaction between the participants or it can be designed as more of a discussion where the interaction between the participants is high and they answer each other's questions rather than the facilitators (Eriksson & Kovalainen, 2016). Both extremes of the spectrum have positive and negative aspects, e.g., too much control on the facilitator eliminates some of the before mentioned benefits of a focus group interview and too little facilitator control can lead the discussion away from the research topic. Thus, to encompass the benefits of the method and to avoid the weaknesses a general interview structure was created for this master's thesis which can be found in appendices (see Appendix 2). The questions and structure were created to help guide the group discussion, but they were left on a general level to allow the group to express their views freely around the topic. The interview structure of Häyrinen et al. (2020) was used as a reference point in creating the interview structure for this study (see Appendix 2).

Evidently one of the key aspects of the design of focus group interview is the formation of the groups. Eriksson & Kovalainen (2016) suggest that the group members should have something in common, e.g., an experience or a situation in life. Homogeneity in that sense is beneficial because having too many drastically different voices in the discussion can distract the discussion away from the topic and aim of the interview (Eriksson & Kovalainen, 2016). Yet, heterogeneous groups can capture a range of views from participants acknowledged to be different and thus inspire creative insights, opposing views or critique of an issue (Eriksson & Kovalainen, 2016). For this study, common characteristics chosen for the sought participants was a student status in a Finnish higher education institute and conformation to age range of 18 to 30 years old. These characteristics were selected due to the objective to have discussions with participants stereotypically aware of and interested in the sustainability issues of the clothing industry. However, the chosen limitations still allowed for the formation of a group

contradicting the stereotype, i.e., students conforming to the age range but without awareness or interest regarding the research topic would have been welcomed to participate as well. To conduct the group division a pre-interview survey (see Appendix 1) was created, and participants were divided into groups based on their answers to the survey.

Eriksson & Kovalainen (2016) suggest avoiding convenience sampling and selecting participants according to the research aim and/or the participant's expected contribution. In this research sampling was conducted based on expected contributions of the sample selected, i.e., young Finnish university students. Recruitment of participants was done via e-mail and social media. The interview invitation was sent to Jyväskylä University and Jyväskylä University School of Business and Economics students' e-mail lists, in addition to an e-mail list of international students of Jyväskylä University of Applied Sciences in the autumn of 2021 and spring of 2022. Furthermore, the author reached out to her networks via social media and distributed the interview invitation there.

The answers to the pre-interview survey were analysed and based on the survey results the respondents were divided into groups. Due to the homogeneous responses the base for the division was the schedules of the participants. Thus, three separate focus group interviews were conducted one in the autumn of 2021 and two in the spring of 2022. Two of the interviews were conducted with the participants present in the same room and one interview was conducted online utilizing Microsoft Teams. Two of the groups were conducted in Finnish and one in English. Though Eriksson & Kovalainen (2016) advice against groups where the participants are familiar with each other to ensure that the participants do not influence each other's views, one of the groups participants knew each other. Due to this, special attention was made when conducting the interview of and analysing the data from said group.

As mentioned before, a structure was created for the interview (see Appendix 2), and it was followed in each group. However, some additional, more detailed questions were asked differing from the discussions had in the groups for the participants to elaborate on their thoughts and views. In addition to the created structure, each group was provided with a short presentation (see Appendix 3) about different textile fibres, their environmental impacts and three Finnish wood-based textile innovations; Spinnova®, Ioncell® and Kuura®. These innovations were selected due to their distinctive points of view and different ways of producing wood-based textile fibre. Furthermore, two of the innovations selected were local to Central Finland.

## 3.3 Data analysis

Data analysis refers to processing and transforming a voluminous amount of data into a clear, understandable and insightful form (Gibbs, 2018c). Other than data handling, qualitative data analysis is also interpretation and retelling of the

data, making the process as imaginative and speculative as it is analytical (Gibbs, 2018c). The main aim of both, data handling and data interpretation, is to find patterns and produce explanations to draw conclusions from the data (Gibbs, 2018c). Gibbs (2018) describes two main ways of finding the patterns: induction and deduction. Induction refers to an approach where a general explanation is generated or justified by accumulating multiple specific, but similar circumstances, where deduction is the opposite: it explains a particular situation by an assumption from a general statement about the circumstances (Gibbs, 2018c).

However, many qualitative studies do not fit into either approach but follow a separate approach between the two: abduction. Abduction suggests conclusions based on the observations of people or circumstances (Gibbs, 2018c). This approach also most describes the approach selected in this masters' thesis: the main aim is to suggest patterns and explanations based on the collected data, not to generalize an explanation, or strive to provide evidence or counter evidence for a generalized assumption. Still, the challenge with abductive approach is that a phenomenon or circumstance can be explained by multiple different explanations (Gibbs, 2018c). Hence, presenting the problem of how to choose the most fitting explanation, e.g., should the most powerful, general, plausible or simple explanation be chosen as the 'correct' one (Gibbs, 2018c).

Analysis of the transcribed data does not aim to reduce but enhance the data which can lead to impressionistic and purely descriptive analysis due to the vast amount of information (Gibbs, 2018b). Gibbs (2018b) thus suggest that the analysis of qualitative data should strive to uncover the unapparent phenomena. In addition, Eriksson & Kovalainen (2016) indicate that an important aspect to consider in the analysis of qualitative data is that the selected method of analysis provides answers to the research questions and to contemplate if the framework guides the analysis process somehow.

### 3.3.1 Ethical considerations

Qualitative data and its analysis include ethical considerations. Because the situation of data collection is usually quite personal the participants should have fully informed consent and they should be informed how the study is conducted, and where and how their data is used (Gibbs, 2018c). Furthermore, the data collected is highly individual and personal, so the analysis should be conducted so that the identity of the participants is protected (Gibbs, 2018c). In this master's thesis the research ethics guidelines of University of Jyväskylä were followed to ensure the protection of participants, i.e., the participants were provided with a privacy notice and a research notification, in addition to providing information on the next steps of the research process during the interviews. The collected data was pseudonymised instead of anonymised in the transcription phase due to the inability to completely discard all personal information, e.g., references to employment or area of residence, without possibly effecting the analysis results.

In addition to ethical considerations in the transcription phase it is also a key phase of the analysis. The transcription of data, e.g., audio, is a transformative and interpretative process (Gibbs, 2018a). The most influential decision in the process is which level of detail in the transcription selected due to its influence on the data that is further analysed (Gibbs, 2018a). In the case of this masters' thesis a general level of transcription was used, i.e., some of the dialect, repetition and pauses were included in the transcription. This was deemed as sufficient considering that the topic of the study did not include any necessity to transcribe non-verbal communication, e.g., voice intonation or non-verbal noises made. Gibbs (2018a) recommends that the researcher or the facilitator of the interview should transcribe the data due to their familiarity with the data collection situation because even small changes in the transcription can drastically change the consequent results of the study. To ensure the accuracy of the transcription the author transcribed the data, and rigorously and continuously checked and compared the transcription to the audio during the process.

### 3.3.2 Applied analysis methods

The focus group interviews held in this study were recorded and transcribed, after which the transcriptions were analysed. The method chosen for the analysis was thematic: the intention being to find and define implied and explicit ideas within the data rather than counting explicit words or phrases (Guest et al., 2012). Though the reliability of the analysis decreases due to the heightened need for interpretation when compared to for example content analysis, where the frequency of words and phrases are counted, it is still viewed as the best method to capture complex and multifaceted meanings in textual data sets (Guest et al., 2012). To simplify the search for meanings in the collected focus group data of this master's thesis, the data was first divided according to the general themes set in the interview structure (see Appendix 2). After the division the parts of the thematic documents important and interesting generally from the perspective of sustainability and consumer behaviour, in addition to the wood-based innovations in the clothing and textile industry were quoted and coded in Atlas.ti program. These quotes and codes were then exported to Microsoft Excel and organized by their themes. Subsequently the lists of quotes and correlated codes were examined more closely and concurred from the point of view of the research questions in addition to the interesting aspects found during the first round of examination. Lastly, the findings of the second round of examination were organized back to the four thematic categories set in the interview structure where patterns and implicit ideas were searched based on the concurred codes and quotations.

In addition to the qualitative data gathered in this master's thesis, the quantitative data collected in the pre-interview survey was also analysed. The chosen method for this analysis was descriptive statistical analysis due to the purpose of the data being solely to depict the background and level of knowledge and interest on the research topic of the participants. Descriptive analysis endeavours to

find what is typical for a variable (Thrane, 2023). This is done by studying the average, midpoint and/or most frequent variables of the data, i.e., calculating mean, median and/or mode from the examined quantitative data set (Thrane, 2023). Due to the purpose of the quantitative data in this master's thesis, only mean and mode calculations were performed on the pre-interview survey data.

# 4 RESULTS

## 4.1 Pre-interview survey results

The interview invitation and attached pre-interview survey (see Appendix 1) yielded twenty responses and of these twenty respondents thirteen took part in the actual focus group interviews. All the respondents were female, between the ages of 21-30. Most of the respondents (47 %) studied business and economics, second most (32 %) were humanities and social sciences students, third most (11 %) were education and psychology students, and few respondents studied either information technology (5 %) or sports and health sciences (5 %).

The respondents reported high interest in the responsibility and sustainability of clothing and textile industry. The interest was reported and measured on a Likert scale from 1 (not at all interested) to 5 (very interested). The Mean was 4,6 and Mode was 5. Yet, the familiarity with the concept of bioeconomy, which was measured similarly on a scale of 1 (not at all familiar) to 5 (very familiar), was significantly lower. The Mean was 2,9 and Mode was 3. This shows that the respondents were to some extent familiar with the concept of bioeconomy with a slight preference towards unfamiliarity. The division of responses in these two questions is further depicted in Figure 6.

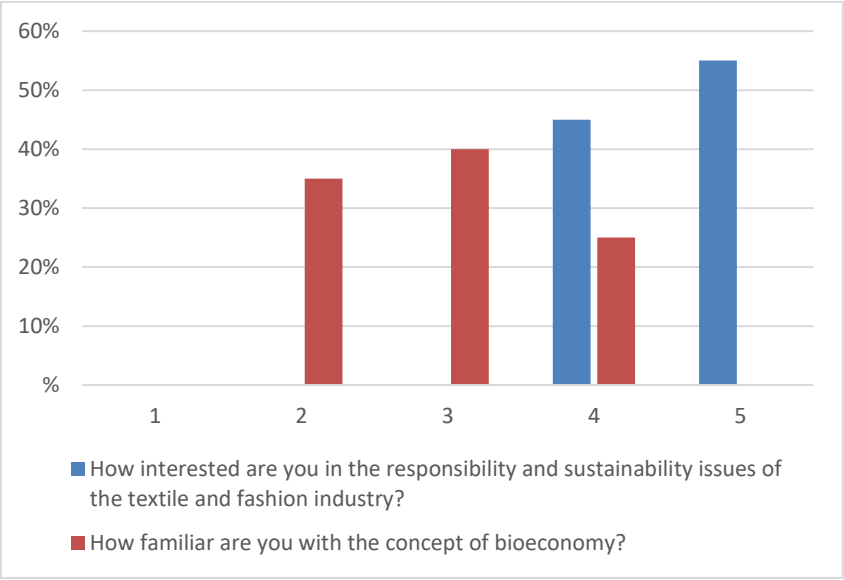


*Figure 6*. Pre-interview survey results: interest towards clothing industry sustainability and familiarity with the concept of bioeconomy

## 4.2 Clothing consumption habits

First part of the interview dealt with the participants self-reported preferences and habits concerning clothing consumption; what is consumed, how, and when, in addition to which aspects of clothes influence the purchase decision, and how the participants view the sustainability of clothes overall.

Generally, the participants utilized multiple channels in purchasing clothes. Some stated to prefer shopping in physical stores to feel and inspect the clothes, thus combatting certain uncertainties related to products purchased online. Others preferred online stores for their convenience and product range, e.g., one participant preferred online shopping due to the wider availability of sustainable clothing brands. What was evident in all group discussions was that a vast majority of participants would prefer to shop second-hand items, but viewed finding specific items that would fit their needs and the overall shopping in second-hand stores difficult and laborious.

"*-- I'm very bad at using second-hand [stores], because usually I'm looking for something pretty specific, so I feel like flea markets are maybe not the place to find something that -- you are looking for exactly.*" (respondent 2)

However, participants also stated quite high standards for new clothes to purchase. Examples of the needs and demands for clothing stated by the participants divided to new and second-hand clothes are depicted in Table 1. What was apparent from the discussions, and what was also stated verbatim by one participant, was that the participants demanded more from new clothing than they did from second-hand clothing. This lax of standards regarding second-hand clothing consumption was also voiced by discussing the concern of over consumption by buying second-hand clothes not out of necessity but out of pleasure due to a false sense of sustainability created by the concept of second-hand and buying products that have been already used. Thus, the common standard for purchasing clothing according to the participants was necessity and/or ensuring that the purchased clothing would be of use for the individual.

*Table 1.* Needs and demands stated by the participants regarding new and second-hand clothing.

| | |
|---|---|
| New clothing | - Quality, durability, versatility, and longevity<br>- A good reason or necessity to purchase the item<br>- Ethical production and transparent brand<br>- Conforming to the individual's needs and compatibility with other items in their wardrobe<br>- Made from specific materials<br>- Correct fit<br>- Pleasing aesthetics |
| Second-hand clothing | - Versatility and longevity |

| | |
|---|---|
| | - Conforming to the individual's needs and compatible with other items in their wardrobe<br>- Correct fit<br>- Pleasing aesthetics |

A few participants also reported emotions they relate to clothing consumption. One participant said that their emotions influence their clothing consumption and that they reward themselves by purchasing new clothes, while another stated feeling guilty every time they bought new clothes but gratification when they bought second-hand clothes. Some also reported going into great lengths and making a lot of effort in finding the best specific piece of clothing.

"*I'm quite emotional consumer when it comes to clothing – and I partly use it [buying new clothes] to reward myself.*" (respondent 11)

" *– I buy second-hand clothing more frequently [than new clothes]. -- I buy [second-hand clothes] more for fun and I don't necessarily need [the new garment] but I buy it either because I've spent leisure time browsing the second-hand stores or because it makes me feel good when I buy some nice clothes second-hand. – I might be that type of consumer that feels bad whenever they buy new clothes that they do not necessarily need* --" (respondent 13)

Some of the needs and demands for clothing were also determinants that the participants reported for the purchase of clothing e.g., quality, fit, aesthetics and material were all mentioned as determinants. Yet, the most mentioned determinant was price. Price was also tied to the laxer standards of second-hand clothes – the participants didn't feel the need to demand so much from the garment due to lower price and perceived sustainability of consuming second-hand clothing. All reported determinants are listed in Table 2. Yet, what was clear from the discussions, all most mentioned determinants were more influential than perceived sustainability of the product, but the participants also stated that though they would like to make sustainable consumption decisions they felt unable to do so due to lack of knowledge and awareness regarding the different sustainability aspects of clothing industry.

" *– [I am] trying to find something that is out of the material that I want and actually fits me. So, if I find that from another brand that's not necessarily sustainable, I will buy that as well.*" (respondent 4)

*Table 2.* Mentioned determinants for the purchase of clothing.

| **Mentions per determinant** | **Determinant** |
|---|---|
| 7 | Price |
| 6 | Quality |
| 5 | Versatility, material |
| 4 | Fit, aesthetics |

| | |
|---|---|
| 3 | Feel (material) |
| 2 | Durability, comfort, brand (transparency) |
| 1 | Responsibility, uniqueness, longevity, compatibility, up-keep (material) |

As conventional for a focus group interview, the discussions differed a bit from group to group, thus some groups were asked more detailed questions about topics that came up during their discussion. Hence one group was asked to evaluate the influence of the origin of clothes to their consumption behaviour. Majority of the group stated that they check the country of origin from the clothing tags, but the influence of the country stated varied among participants. Most of the participants who said that they checked the country of origin felt that they did not really know what the country of origin means and how it affects e.g., the sustainability of the garment. Yet, one participant said that in addition to the country of assembly they prefer to also check the country of origin for the material of the clothing, while another participant said that they do not check the country of origin because they purchase clothing only from sustainable brands that they have already researched and thus trust.

"*I might check it [clothing tag] and be like, oh, this is made in – or this is not made in China or Bangladesh. Oh, surprise. Other than that, it doesn't give you the info you need, --.*"(respondent 3)

To get a more comprehensive idea on the participants sustainability perception they were asked to describe what they viewed as the most sustainable clothes. They were asked to do this separate from their own perceived consumption habits thus to also examine how well their consumption habits conform with their perception of sustainable clothes. A few mentioned that most sustainable clothing is something that is already owned – either by the individual themselves, or someone else i.e., second-hand clothing. With new clothes the most mentioned aspect to increase this perceived sustainability was material, e.g., durable, high quality, or recycled. Ethical production was the second most mentioned aspect, third durability, transparent value chain and long-lasting design, then quality, local production, and recyclability.

"*-- the clothes that are already there, so what we already own or buy second-hand. -- when buying new I would say a combination of environmental factors, mostly materials --. And then social factors, so how the people were paid and the supply chain --. And personal factors, you have to like it and it will have to fit you for a long time and you'll have to enjoy wearing it for a long time.*" (respondent 4)

## 4.3 Textile materials as a purchasing determinant

After a general discussion about the participants' consumption habits the discussion was led to the topic of textiles, opinions and views on different textile materials and the effect they have on the participants willingness to purchase a garment. Before diving deeper into the knowledge and perception relating to materials a presentation about the most conventional ones and the novel wood-based fibres was shown to the participants (see Appendix 3). Many other types of materials were mentioned during the discussion and the participants had varying opinions regarding them. These are shown in detail in Table 3.

Most of the participants reported checking the material of a garment they would like to purchase. The reasons for checking the material include e.g., evaluating the quality and possible upkeep of the garment, and evaluating the feel of the fabric when buying clothes online. Some also stated that they check the material because they are looking for specific materials, e.g., linen, cotton, or other natural fibres. Furthermore, few participants stated that by checking the material they ensure that they purchase only garments made of materials they like and thus will use.

"*Yes, I check [the material] as well. At least if I'm buying [clothes] online and I don't get to feel the garment in my hands, then I'll check [the material] so I can evaluate what [the garment] might be like.*" (respondent 10)

Yet, some of the participants, though a clear minority, said that they do not check the material of a garment. According to these respondents the reasons for not checking were for example the lack of knowledge regarding the materials. The lack of knowledge made it hard for them to evaluate different materials and thus, the need to check them diminished. In addition, one participant said that they prefer the feel and quality of the garment over the material. Hence, they do not feel the need to check the materials if the other aspects of the garment are up to their standards. One participant also reported only checking the material to avoid buying genuine leather.

"*I don't really know much about textile materials, which might be a problem – I don't really know what is good and what is not or what even is sustainable and what is not. So, I don't know between [materials], for me it goes right over my head, which of them would be better. –*" (respondent 7)

*Table 3.* Materials mentioned during the discussion and participants' attitudes toward them.

| **Material** | **Attitude** |
|---|---|
| Natural materials e.g., Merino wool, linen, cotton, and silk | Specifically sought after due to positive experiences and perceptions on the benefits of the materials, e.g., durability, easy up-keep, and quality. |

| | |
|---|---|
| Leather | Negative feelings, due to animal ethical issues in leather production. |
| Specially treated fabrics (e.g., waterproofed) | Uncertain feelings due to the lack of knowledge on the sustainability aspects of such materials. |
| Plastic – i.e., synthetic – fabrics | The amount of plastic and plastic fibres in clothing awoke feelings of disgust. |

The participants were quite apprehensive when asked about their knowledge regarding different materials and their sustainability. Most were aware of the environmental and social impacts of conventional fibres, e.g., cotton and polyester. Furthermore, conventional wood-based fibres, e.g., viscose was familiar to the majority. Similarly, some of the innovations were familiar due to their locality and then topical success and subsequent presence in local media. The new topics, or things that the participants were unfamiliar with were clearer. Though the impacts were known the scale of them was new, in addition to how textile fibre is produced. Furthermore, innovations and wood-based fibres were mostly unfamiliar as well as the different possibilities they present – e.g., recyclability – and how many of them there actually are in Finland.

"*The environmental impacts [of the conventional textiles] I knew roughly, but couldn't necessarily understand the scale [of them] … I was surprised by the new fibres, how much they are produced and how much is invested into the research and continuous development of something new.*" (respondent 12)

To further examine the participants familiarity with wood-based textiles they were asked to report if they owned any clothing made from such textiles. Some of the participants were unsure due to lack of knowledge and difficulty of recognizing the materials in general, but some stated owning either Tencel, Viscose or Modal. The experiences with the wood-based materials varied among the participants. Some were disappointed with the feel of the wood-based textiles, yet others sought wood-based materials out specifically due to their feel. Other reasons stated for preferring wood-based textiles were their quality and durability.

## 4.4 Perceptions of novel wood-based textile fibres

After discussing the materials broadly, the groups were asked to discuss the novel wood-based innovations and share their views and opinions regarding them from the point of view of them individually as well as the innovations' role in the sustainability transition in the clothing industry.

Overall, the innovations sparked interest in all participants. Especially the recycling abilities and the possibility to hence increase awareness of the industry's sustainability issues awoke positive feelings in the groups. The innovations

were seen as promising and more sustainable substitutes for conventional materials and possibly having a positive impact on the Finnish economy and businesses by producing the fibres locally. However, the participants were suspicious on the motives of the companies. The main concern was that the sole aim of substituting materials would not be an enough of a change and would enforce the current consumption patterns. The participants gave the benefit of the doubt for the motives of the companies but hoped that they would, instead of just creating more things for people to consume, strive for changing the system. Furthermore, some participants saw the cooperations with fast-fashion brands, such as creating capsule collections or only providing the brands with their innovative material, as evidence against this pursuit of a systemic change. This created feelings of disappointment, disrespect, and distrust toward the companies.

"*And at that point [cooperating with fast-fashion groups] I kind of lose my respect for or trust in to – [company]. -- If they are working on producing sustainable fibres, I would want them to cooperate with actual sustainable brands to do these collections and not just go big on the communication and try to get this like, "we are collaborating with H&M"-factor. But -- stick to values.*" (respondent 4)

Furthermore, the accessibility, and scalability of the innovations and the possibility of green washing by using the innovations raised concerns. Yet, it was concluded in all groups almost unanimously that these innovations were a step in the right direction.

The participants were asked to evaluate would they choose a garment made from the novel wood-based textile or cotton. The general answers are shown in Table 4. If the cotton and novel textile would be the same price most of the participants would choose the novel textile. The most mentioned reason for this decision was the objective of choosing the more sustainable option, and the novelty of the textile and thus testing the qualities of the fabric was second most mentioned. A participant stated that they would choose the innovation due to its locality, but only if the selling brand was local as well, and one said they would choose the novel fabric to support innovation.

"*-- If I think of myself --, I would probably try it -- because it's new. To test something that is emerging on the market.*" (respondent 3)

"*Well, if the wood-based one would truly have like lower water consumption and such, and less energy was used then I think that would be my choice.*" (respondent 5)

The participants who were uncertain of their choice were slightly leaning towards choosing the innovation. However, they needed either more reassurance and information on the sustainability of the fabric, or they thought their decision would be more dependent on the feel of the fabric and/or aesthetical factors of the garment than the material. Yet, the perception that the innovations' similar price to cotton products could also be viewed as suspicious emerged from one of

the discussions. It was assumed that this suspicion might have a negative effect on the purchase decision.

*Table 4.* Choices between novel wood-based textiles and cotton.

| **Decision** | Would choose the novel wood-based textile over cotton if they were the same price: | Would choose the novel wood-based textile over cotton if it was more expensive: |
|---|---|---|
| **Yes** | 10 | 10 |
| **Unsure** | 3 | 1 |
| **No** | 0 | 2 |

If the garment made with the novel wood-based fabric was more expensive than the cotton one, still most of the participants would prefer it. Yet, in this hypothetical situation there were participants who would choose the more affordable option. This was due to high emphasis on price as determinant of purchase – so high in fact, that one participant reported that the effect of price induced a value-action gap, i.e., they would want to consume more sustainable products - and in this hypothetical situation viewed the novel fabric as such - but cannot do so due to the price.

" *– I would probably still buy the cheaper one. Unless if I would have like exceptionally good financial situation, then I would probably invest and buy the more ecological and ethical option. – usually as a student it is so, that – you must choose the cheaper one even though you know that the more ecological and ethical – is not what you end up choosing --*" (respondent 13)

In addition to financial situation and what can be afforded the willingness to pay a premium price was also dependent on the product for one participant. They assessed that with a more expensive product they would accept a higher premium than with a less expensive product. But they also recognised the connection between their current financial situation and the level of premium they would accept to pay.

Yet, most of the participants in the groups thought that they would still choose the novel fabric, even if they were required to pay a premium. They reported that they already pay a premium for their clothes, or that they see clothes as investments, or that they felt that the premium price was justified because of the novelty and quality of the product. However, these participants also had some apprehensions. For example, they were unsure of how much premium they would be willing to pay, they wanted the sustainability of the product to be guaranteed somehow before they were willing to pay the premium, or they wanted to be ensured of the quality and durability of the product.

"*-- I also think that I would be ready to pay a bit more. But let's say if -- it's like double to -- the cotton one for example then -- maybe not anymore. But let's say if the*

*[cotton] t-shirt would be 20 euros and then this [novel textile] t-shirt would be 25, I would be ready to pay five euros -- for a better -- option.*" (respondent 2)

"*I already pay probably somewhat more for my clothes. -- So, I don't think it would be an issue for me. At least in my current financial situation. And I kind of think that if I can't afford it, then I should not have it.*" (respondent 5)

One focus group was asked to elaborate on and evaluate how their perception of the novel wood-based textile would change depending on where the raw material, i.e., pulp, was produced. Most participants stated that the origin of the raw material would alter their perception of the product: they were concerned about the vulnerability and harm done to the nature and people in the country of origin and the increase in transportation emissions. The participants emphasised the feeling of false advertising if the raw material would be produced somewhere other than where the textiles were. However, one participant said that the impact on their perception would be dependent on the realised ecological sustainability of the product, i.e., if the product would still be more environmentally sustainable, they would choose it regardless of where the raw material is produced.

Other possible issues related to the novel wood-based textiles which emerged during the discussion can be divided into five different categories: issues relating to the raw material, issues relating to the innovation, issues relating to the industry and other issues. These are depicted in Table 5.

*Table 5.* Sustainability issues recognized by the respondents related to the novel wood-based textiles.

| **Category** | **Issues** |
|---|---|
| Raw material | - Need for virgin material cannot be avoided thus the consumption of natural resources increases.<br>- Extracting the raw material impacts the nature and its biodiversity.<br>- Extracting the raw material impacts the locals thus creating inequality and an unjust situation.<br>- Yet using local raw material would limit the scaling potential of the business and to achieve an impact on the industry smaller plants should be situated all over the world. |
| Innovation | - Motives and incentives of the companies: are the innovations created to change the system or to make a profit?<br>- Are the innovations only new ways for people to consume more?<br>- Distrust on company stated sustainability demands evaluation from third parties.<br>- Can the innovations impact the want to utilise existing materials? |

| | |
|---|---|
| Industry | - Forest industry is viewed as problematic and distrustful, but by-product use, and synergy benefits are seen as possibilities.<br>- Concern of what will happen to these novel fabrics after use since the clothing recycling infrastructure is challenging and depends heavily on consumer action. |
| Environment | - The product is wood based in the core which contradicts the forest and biodiversity preservation targets.<br>- Some of the innovations still use chemicals which poses a possible harm to the environment and people.<br>- Depending on the raw material origin the transportation of goods has an impact on the environment. |
| Other | - The value chain of the innovations should be transparent and traceable.<br>- Consumer behaviour is in the core of the sustainability issues in the clothing industry – having only more sustainable materials do not solve the systemic issue. |

What is clear from Table 5. is the grave concern for the environment and suspicion towards industries, companies, and innovations who claim to be more sustainable than their counterparts but still striving to make a profit as well. Some contradictions can be found also, e.g., not wanting to transport the raw material from somewhere else but not really wanting to use the Finnish forests for it either. The issues discussed highlight well the complexity and intricateness of the problem – on the one hand the innovations are seen as a step in the right direction and a needed development in the industry but on the other hand the company statements about the sustainability of the product are suspected and the incentives questioned.

## 4.5 The need for information and its perceived availability

Due to the recognized key role of communication in environmentally friendly consumer behaviour (see e.g., Pfau et al., 2017; Kemppainen et al., 2021) the last section of the focus group interviews examined the participants' perceptions of communication and availability of information regarding the sustainability of clothing industry in general, in addition to wood-based textiles and their sustainability. Furthermore, the participants were asked to assess what kind of information and communication they would wish to have about these topics, where the information would be conveniently consumed and from whom they would wish to receive this information.

Overall, most of the participants felt that information regarding the clothing industry and its sustainability was not readily available. They felt that usually

information was hard to find and if it was found, it was vague, sometimes redundant, and hard to interpret and evaluate critically, which the participants thought a paramount barrier for sustainable consumer behaviour. They viewed the unsustainable consumer behaviour as proof of the industry's obscurity or of the fact that consumers are uninterested. Though some good examples of company communication were also mentioned during the discussions the participants agreed that external pressure, e.g., from consumer or other non-governmental advocacy groups, is needed. The participants did not believe that companies would make their sustainability communication more transparent solely by goodwill due to the required resources full transparency calls for. They felt that financial or image related motivator – or both – was needed to make the pursuit for transparency worthwhile for the companies.

"*-- With most brands [finding information on sustainability] it's not possible and then even if you find information -- I would say many consumers don't know how to interpret that information or how true it is or how critically evaluate -- that type of information.*" (respondent 4)

A minority of the participants felt that the information was available, but they did not consider it to be conveniently reachable for consumers. They assessed that finding the information requires a lot of personal effort and interest on the topic. Yet, these participants considered that the awareness of sustainability issues has increased among consumers which in their view has led to some consumers hiding the information from themselves to make consumption decision and hence essentially life more convenient and simpler. Furthermore, due to this pursuit of simplicity the participants did not think that increasing the amount of information available would automatically lead to increase in awareness as well. It was also noted that if the companies themselves cannot know everything about their value chains and the standards they claim to adhere to, how consumers could possibly gather such information about these companies? Like the participants who did not feel that information was available these participants as well found the comparison of companies from the sustainability perspective difficult. But other than the lack of information, they assessed the problem stemming from the lack of concreteness in the sustainability communication and the differences in the ways in which the companies communicate.

"*-- it's mostly an impossible standard for consumers, since many companies themselves can't get a hold of their own production chain and where their materials come from. -- if the companies themselves can't get the information or -- hold their own standards then how could consumers have that information?*" (respondent 5)

"*I think if you are looking for it, you can find it. But if you are not particularly interested or don't care so much, I don't think that they -- push it too much on you, because of course they have to make money. -- If you want to know, you can find the information. -- But of course, there are probably a lot of parts that no one kind of wants*

*to -- see like, this unethical stuff or the real effects. -- So, I think it depends on the persons own interest* –" (respondent 2)

Regarding specifically information available on wood-based textiles and their sustainability the opinions did not differ much to that of the clothing industry in general. The participants assessed that the information regarding wood-based textiles was not readily available and to access it personal effort and interest are required. The novel wood-based textiles were more familiar to the participants, and most had seen communication about them. This was due to two of the innovations being local thus their success had impacted the area and potentially at some point the Finnish economy and labour market. Hence, they were reported in local and national media, in addition to their presence in the regional policy making. Furthermore, the cooperations with the innovations and well-known brands, e.g., Marimekko and H&M, had increased their visibility by the participants' evaluations. However, the participants felt that the communication regarding the innovations was still centred too much around the possible benefits. Due to the hype, they felt that the communication was mostly marketing the innovations and they hoped for a more objective evaluation and communication. The ones who had not seen any communication regarding the innovations reasoned it with the scale of the operations – they felt that because the companies are still in the early stages of scaling up, they do not have a reason to communicate to consumers yet.

"*– if they [company] have cooperations with other brands, then maybe they will be more noticeable to people, because they will be like 'wohoo this brand has joined this thing as well'.*" (respondent 7)

"*-- I've heard of [company] from media, mainly because they listed in the stock market but also you mentioned that they don't really commercially yet sell so maybe that's also a reason why the communication or media space is not yet that visible because if they don't have anything to sell maybe it's just a waste of money to advertise or be -- present in the media otherwise but for their innovations and for the money part basically. -- If they have something to actually sell, then maybe more. But -- for now just mainly because of the stock stuff.*" (respondent 2)

"*I think most of the communication that I've seen concerning these wood-based textiles and new wood-based textiles has mainly been about the economic impact that it has on the local area. So that there'll be new employers in Central Finland and money coming to Central Finland. --*" (respondent 5)

The participants' wishes relating to the communication of the sustainability of the clothing industry can be divided into two separate categories: channels and descriptions. The contents of these categories can be found in Table 6. The participants stated that both company communication and third-party, e.g., non-profit organizations or scientific communication is needed. They felt that third parties

act as 'watch dogs' for companies' operations and the availability of and access to third party evaluations increase the trust in the company communications. The participants assessed that if companies would report their imperfections and areas of development in addition to their successes, they would trust the companies more.

*Table 6.* Wishes for sustainability communication in the clothing industry.

| **Category** | **Contents** |
|---|---|
| Communication channels | - Company<br>  o Report<br>  o Website<br>  o Social media<br>  o Tags or QR-codes in clothing – for consumer convenience<br>  o Visual information<br>- Third party (e.g., NGO's, policies, etc.)<br>  o Standards<br>  o Certificates<br>  o Peer reviewed scientific studies |
| Descriptions | - Easy to understand<br>- Intensive and extensive<br>- Transparent<br>- Externally verified – to increase trust and comfort<br>- Honest |

Furthermore, the discussions revealed separate wishes for company communication and the influence of third parties, e.g., non-profit and advocacy organizations, to said communication. These wishes are depicted in detail in Table 7. It is apparent from these wishes that the participants do not trust the company communication but demand an objective assessment on the company claims. Furthermore, the clear aim of the wishes directed to the third parties is making the comparison between companies simpler and more convenient. With common standards for sustainability reporting and generally agreed level of minimum effort could make it easier for consumers to feel more confident with the sustainability of their purchasing decisions.

*Table 7.* Wishes for company communication and third-party influences on the sustainability of clothing industry.

| **Actor** | **Wishes** |
|---|---|
| Third-party | - Standards for sustainability communication, e.g., guidelines for company reporting<br>- Easily interpreted and trustful certifications based on information generated by an independent organization<br>- Internationally agreed standardised level of minimum effort<br>- Confirmation of company reported calculations e.g., environmental emissions and life cycle assessment |
| Company | - Transparency<br>  o Environmental and social impacts of value chain |

| | |
|---|---|
| | - Reporting<br>  o Making an effort increases trust<br>- External audits and confirmations |

In the discussions sustainability reports of companies were mentioned many times. One group was asked to elaborate and evaluate in more detail the role of the report. The group thought that social media would be better communication channel regards to the reach of consumers and because they thought that the communication in social media was more interesting to consumers due to its visuality. However, they felt that a sustainability report was very important for a company to have so they suggested that companies could inform consumers about their report and highlight the most important aspects of it in social media. But they also recognized that the communication in social media would only reach the consumers interested in the company or the industry hence emphasising the problem of how to reach the consumers who are not interested in the topic. Furthermore, the emphasis on social media was criticised because everyone does not have access to social media thus communication there would only reach certain demographics.

The participants also recognized the need of resources in the companies to create the reports and communication. Thus, they were concerned that the demand of reporting would benefit the larger companies and harm smaller companies, and entrepreneurs. To solve this resource discrepancy the participants pondered on for example adjusting the demands of reporting by the company size or making sustainability reporting mandatory through e.g., legislation or regulation, thus allowing the government to support smaller businesses in their reporting. Yet, what was clear from the discussion was the emphasised requirement of transparency and honesty – the reporting of the negative in addition to the positive was mentioned multiple times in the discussions as a way of increasing consumers' trust.

In addition to sustainability reports, different certificates and standards were mentioned during each of the discussions. One group was asked to elaborate their thoughts and opinions regarding sustainability certifications of clothes. The group thought that the certificates were not transparent and that they could be used to misdirect consumers and to convey a certain image. However, they also felt that a certificate was better than nothing and that if they were trustworthy, certifications would be very convenient from consumers' point of view. However, seeing a certification on a product could be comforting for consumer thus making the purchase decision more acceptable thus tempting them to consume more. What the group hoped – similarly than the group evaluating reports – was for more third-party involvement and setting stricter guidelines to make the certificates more trustworthy hence increasing the consumer convenience and confidence in the evaluation of a products sustainability.

What was most mentioned during the discussions regarding sustainability communication was the third parties; non-governmental and non-profit organizations, in addition to regulators and decision-makers. Two groups were asked

to evaluate the role of consultancy companies as third parties and what kind of third-party communication they found necessary. The evaluations of reliability in terms of the organization can be found in Table 8.

*Table 8*. Evaluations of the reliability of sustainability communication of different third parties

| **Level of reliability** | **Third-party actor** |
|---|---|
| Highly reliable | - Public organization bound by laws or lawful principles<br>- EU/UN governed non-profit organizations |
| Somewhat reliable | - Foundations and advocacy groups<br>- Specialized consultancy firms with expertise on sustainability issues |
| Unreliable | - General consultancy companies<br>- For profit organizations in general |

The common opinion in the discussions was that the most reliable, and thus the third party from which the participants would want to receive the information regarding the sustainability of an industry, would be a public organization and preferably a non-profit one. The involvement of money and companies paying someone for e.g., an evaluation of calculations was seen as highly problematic. The participants worried that due to the financial gain of the evaluating party they would have an incentive to or be pressured by the client company to provide a more favourable assessment than the client in reality would deserve. This was also the suspicion with foundations and – to an extent – with non-governmental organisations as well; the participants wondered would the investor or donator of these organisations influence the integrity of the foundation or an NGO. With consultancy companies, the for-profit nature of them awoke immediate suspicions. The participants thought that at least general consultancy companies could not be trusted because the participants doubted their ability to make these assessments without any specific expertise on the topic of sustainability. Thus, some leeway was given to specialised consultancy firms. Yet, one participant pointed out that they did not believe non-profit, public organizations would be dynamic problem solvers due to the lack of financial incentives. They felt that not much happens with non-profit organizations and that for-profit organizations, e.g., consultancies are necessary for more active problem solving and thus transition in the industry.

# 5 DISCUSSION

In this chapter the main findings of the results are reflected and discussed through the current research and discourse on the topic, in addition to the theoretical framework of this thesis.

## 5.1 Lack of knowledge, distrust, and the need for information

In the theoretical framework, in both previous studies regarding consumer behaviour and perceptions regarding biobased or sustainable products and the theories of planned behaviour and innovation diffusion, the role of information and communication is emphasised and the lack of information is seen as one of the main barriers in sustainable consumer behaviour (Ajzen, 1991; Karachaliou et al., 2017; Pfau et al., 2017; Ranacher et al., 2018; Rogers, 2003; Sijtsema et al., 2016). The results of this master's thesis corroborate these findings; in multiple occasions the impediments or difficulties participants voiced regarding sustainable or clothing consumption in general was their need for more information or lack of knowledge. Furthermore, the demand for extensive sustainability reporting was apparent. Ajzen's (1991) theory suggest that without sufficient information the consumers do not feel confident in engaging in the behaviour, e.g., in this case purchasing sustainable clothing or clothes made from novel textiles, thus decreasing the probability of the behaviour realizing.

Regarding the different textile materials, as Husu (2020) had concluded, the real or perceived lack of knowledge was apparent in the results of this study as well. Most of the participants were aware of materials that they preferred to buy, e.g., natural materials like linen, cotton and wool were specifically sought after, some were aware of all textile materials, e.g., they had done extensive research and compared different materials and their impacts on the sustainability of clothes, and some had little to no knowledge of any materials. The participants who had little to no knowledge of textile materials perceived the concept challenging or difficult, but they could also perceive it as such due to their lack of personal interest in the topic. The participants emphasised the paramount position of personal effort and interest in this instance; they viewed that to familiarize the different textile materials one must make a conscious effort to do so and due to the real or perceived lack of accessible information the needed effort was deemed strenuous.

Thus, the results corroborate the findings of Pfau et al. (2017) that consumers lack the willingness to inform themselves. The requirement of personal interest and effort to access and absorb the information regarding not only the different materials, but clothes and their sustainability in general was mentioned mul-

tiple times during the interviews. This lack of interest and effort is in stark contradiction to the also conveyed demand for more extensive reporting. As said only few participants in this study claimed that they research extensively the clothing materials or brands they consume though most wanted companies to communicate and report more. This then begs the question: why is the elaborated and detailed information really demanded? Is it due to the consumers actual interest, or because the information is viewed as something that should be offered by the companies and that 'has to be demanded' by consumers who are aware of different sustainability issues? If the latter, what is the real purpose of said information?

Furthermore, on multiple occasions the participants expressed a distrust towards all company generated communications due to a perception of 'incorrect' incentives: they felt that companies could not and/or would not be honest with their sustainability related communication due to the for-profit nature of their operations and the extensive resources transparent sustainability communication demands. This distrust on company claims was also found in studies conducted by Karachaliou et al. (2017) and Sijatsema et al. (2016). The participants of this study preferred external evaluations, e.g., sustainability audits or scientific articles, to company communications. However, some of external evaluations, such as certifications, raised some suspicions as well. The certifications were seen as suspect due to lack of regulation and common standards among them. Still, the participants viewed certifications as positive as well in that if standardized and unified they could make sustainable purchase decisions easier for consumers. Though in that scenario, participants worried that consumption would increase due to a false sense of security – the participants viewed that the main aim of all sustainability communication should be to above all else decrease consumption.

Suspecting the sustainability claims of companies went even deeper than doubting what the companies reported: the participants doubted the incentives and motives of the companies. The doubt related to the reasons why the companies had created these novel fabrics in the first place. In the discussions it was implied that if the companies would have created the novel ways of producing textile fibres to make a profit, it would affect the perception of the company and the textile negatively, or at least increase the level of suspicion towards the claimed sustainability of the textile. Though the participants understood and accepted that the core aim of a business is to make profit, still the motivation of profit was perceived negatively in this context.

This obvious distrust on virtually anything clothing industry and sustainability related can have many reasons. Ranacher et al. (2018) found that a familiar innovation is evaluated from personal point of view while an unfamiliar innovation is evaluated from societal point of view. This, for example in the case of a novel textile thus an unfamiliar-familiar innovation, can create conflicting and ineffective communication due to the very different communication needs of different stakeholders. The participants presented this type of evaluation: on one hand they viewed clothing from their personal perspectives but when talking

about the innovation their perspective was much broader and encompassed the effects to, e.g., the environment and Finnish economy. Furthermore, Ranacher et al. (2018) state that if the innovations attributes are familiar, it is more easily accepted. However, due to the nature of the textiles examined here the attributes were not known for the participants thus probably resulting in more critical evaluation than if the qualities of the fabrics would have been familiar to them. This unfamiliarity and discrepancies of the communications the participants had noticed regarding the new wood-based textiles can be one reason for the doubt and distrust presented.

However, there might also be a much deeper reason for the evident distrust. As mentioned before, in Ajzens (1991) theory of planned behaviour one of the determinants of behaviour is perceived behavioural control, i.e., how confident does the individual feel to successfully engage in a behaviour. This feeling of control is influenced by available information and past experiences, and it can have a direct affect to the behaviour itself and not only to the intention (Ajzen, 1991). Due to the vast and decades long media attention of crises in the clothing industry, e.g., Rana Plaza and other human and workers' rights violations (see e.g., *Rana Plaza*, n.d.; Uddin et al., 2023), and many times alleged green washing of fast fashion brands, the consumers might have become cynical and suspect all actors in the textile and clothing industry. Hence, their perceived behaviour control is affected negatively thus decreasing the odds of them engaging in said behaviour. Consumers recognize their lack of knowledge and understanding of the industry but simultaneously seem to judge all companies as not sufficient in any aspect of sustainability thus somehow projecting their lack of confidence on to the companies.

These contradicting thoughts pose a complex challenge from the point of view of the industry and the innovating companies. For the innovation to be accepted and for the purchase behaviour to happen the consumer attitudes must be positively influenced (Ajzen, 1991; Rogers, 2003). But the distrust in companies and their communication, and the personal interest and effort required to find the needed information creates an impediment to the diffusion process: if consumers are not willing to make the effort to find information created by third parties but simultaneously, they do not trust the companies or their claims of sustainability, how could they, in their view, ever have sufficient information? Thus, Pfau et al. (2017) made the conclusion that other differentiative attributes than sustainability should be used in marketing and communication of biobased products. As mentioned before, though sustainability was considered important for the participants of this study, they did not view it as the most influential in clothing purchase decisions; quality, fit, price, and aesthetics were all more important. Hence, the novel wood-based textiles and the information about them could be more easily accepted by the consumers with emphasising e.g., quality of the fabric more than the sustainability of it.

## 5.2 Contradictions in consumer behaviour and the preference for second-hand clothing

Though this thesis' aim was not to examine the consumer behaviour per se, some relevant aspects emerged during the discussions that can contribute to the overall aim. The participants voiced the need for convenience and lack of personal effort or interest in the context of clothing consumption as with before discussed awareness and communication. Yet, this is in contradiction to the sustainability and ethical standards that the participants demanded from the companies to perceive them as preferrable. These pursuits in one hand for convenience and on the other hand for rigorous sustainability combined with the distrust on almost any company claims on sustainability discussed before, create an impossible impediment. Thus, if none of the companies can conform to these standards could they release the consumer from following the standards in their purchasing behaviour themselves? Thus, creating a "planned" value-action gap?

Yet, these standards for consumption appeared to lax when the participants discussed the purchase of second-hand clothes. Nearly all participants stated that they would prefer to buy clothes second-hand but not many did so, and some had even stopped buying second-hand clothes due to them viewing it as challenging, e.g., because of the limited selection. Nevertheless, second-hand clothes were unanimously viewed as more favourable and sustainable option to new clothes regardless of their attributes. It is possible that for a sustainably aware consumer it is easier to consume clothes that someone else has already purchased thus directing the actual responsibility of the purchase to that person. Consumers might then view themselves as sustainable consumers no matter what type, or how much of second-hand clothes they purchase due to their perception of essentially not being responsible for the environmental or societal impacts of the garment. Furthermore, Ajzens (1991) theory of planned behaviour lists attitude towards a behaviour as one of the most influential determinants of engaging with and completing said behaviour. Due to the negative association's consumers might have relating to purchasing new clothes it might affect their attitude towards that behaviour, i.e., consumers are not inclined to purchase new clothes due to them viewing said behaviour negatively. Additionally, societally frivolous clothing consumption is viewed somewhat negatively thus affecting another Ajzens (1991) determinants: subjective norm, i.e., the pressure from surrounding society to perform or not to perform a behaviour. However, with second-hand clothes such strains might not exist, or they are greatly diminished individually and societally, thus such behaviour is encouraged.

Furthermore, what can be deduced from this unanimous acceptance and pursuit to consume second-hand clothing rather than new ones is the probability that consumers could accept circular business models and circular economy more easily than bioeconomy solutions. The participants stated, similarly to Nagy et al. (2021) findings, that the biggest hesitation with the novel wood-based

textiles is the virgin raw material, i.e., wood, and its contribution to deforestation and biodiversity loss. But the clearest positive aspect directly related to the innovations was their recyclability and the use of the innovation technologies to recycle existing textile waste. This is understandable since circular economy strategies, models and practices can be easier to grasp for consumers: the main objective being to maximize resource efficiency and minimize generated waste (Bocken et al., 2016; Brydges, 2021). Such aspirations can be compatible with common sense from consumer point of view since similar resource efficient practices can be found in everyday home-economics, e.g., all prepared food is eaten, or electric appliances are shut off when they are not used. Thus, such strategies in national economics or business seem to have no apparent downsides or risks due to their familiarity. Therefore, emphasising the circular aspects could increase the probability of consumer acceptance and decrease the worries and doubts related to the environmental sustainability of these novel textiles.

Still, the role of sustainability in the consumption decisions regarding clothes should not be overly emphasized due to the results inclining towards similar findings as Becker-Leifhold (2018): consumers engage with fashion and clothing consumption from hedonistic points of view, i.e., trying out new styles or being cost conscious. Many participants in this study stated that they would try the novel fibres because they are new or that they prefer second-hand clothes for their low cost and uniqueness, thus implying a hedonistic motivation instead of e.g., an altruistic one. This corroborates the findings that sustainability is not the main determinant but can indirectly influence the purchasing decision (see e.g., Karachaliou et al., 2017; Pfau et al., 2017; Bucklow et al., 2017; Kemppainen et al., 2021). In this study, the participants viewed the sustainability attributes as positive, but in many studies sustainable clothing has been found to have negative connotations among consumers (see e.g., Bucklow et al., 2017; Lai et al., 2017; Sandra & Alessandro, 2021). This further emphasises that sustainability should not be the main selling point for a product but an attribute among the rest.

## 5.3 The role of textile materials in clothing consumption and the sustainable transition of the clothing industry

Textile materials were viewed as influential to the purchase decisions by most, as in the results by Husu (2020). Only few participants said that they do not check the material of clothes, or that they prefer other aspects, e.g., quality, feel and construction of clothing more than just the material of it. Other aspects that all participants viewed as influential included fit, feel and comfort, price, and quality. Many studies (see e.g., Bucklow et al., 2017 & Lai et al., 2017) referred price as one of the main determinants of purchasing behaviour of clothing or biobased products but some have also disputed its influence (see e.g., Sandra & Alessandro, 2021 & Wallius, 2019). In this study the results incline towards a diminished role

of pricing in the context of novel textiles. In the discussion related to the participants current clothing consumption habits, price was one of the most mentioned determinants. However, many participants stated that they view clothing as an investment, or that they consume new clothing so seldom that they would be willing to pay a premium price for a more sustainable, in this case wood-based, clothing but the question of how much premium the participants would be willing to pay remained ambiguous. What was revealed of the pricing in this study was that, similarly to the findings of Kemppainen et al. (2021), too low of a price for the novel wood-based textiles would create doubts of their sustainability.

The results of this study concerning the novel wood-based textiles correspond to previous studies regarding biobased products (see e.g., Häyrinen et al., 2020; Karachaliou et al., 2017; Sijatsema et al., 2016): the participants were interested in them and assessed that they would be willing to pay a premium price for clothes made from them over their conventional counterparts. The participants also recognized the economic- and business opportunities these innovations present locally and for Finland. Yet, one concern stood above all: is it enough of a change? The participants were aware of the vast sustainability issues in the textile and clothing industry and thus critically examined the novel textiles in the context of sustainability transition in the industry. They saw possibilities with substituting the more harmful conventional fibres with their wood-based counterparts and the circular thinking the novel fibres possess but feared for deforestation and biodiversity loss. These findings are similar to e.g., Nagy et al. (2021). Essentially, the participants voiced concerns about nothing else changing in the industry: they were apprehensive about the novel textiles because they recognised that those alone could not affect the root sustainability issues of the clothing industry – fast fashion. Yet, what was concluded in each of the discussions was that the utilization of these novel textiles would be a step in the right direction.

Studies regarding the affected industries have come to a similar conclusion: utilization of the by-products and side streams of the forest-based industry would increase the pace of sustainable transition in both the clothing industry and the forest-based industry (see e.g., Verker, 2022; Kallio, 2021; Hurmekoski et al., 2020). The novel textiles have been evaluated as more sustainable compared to the market leader's polyester and cotton, and climate benefits for high-value added side-stream products for the forest-based industry, such as textiles, have also been identified. But here too, the narrow scope of applied sustainable economy solutions presents the biggest problem: without the circular stream of material from the society the competition of raw material is bound to hinder the greater availability of the novel textiles due to the markets still benefitting the mature products. Thus, active building of societal infrastructures to allow the collection of recyclable materials is needed, in addition to the forest-based businesses prioritising these novel wood-based innovations over mature products. This possibly would ensure enough raw materials to produce enough of these textiles for the consumers to access and hence accept them. Furthermore, the full

environmental and economic benefits of circular bioeconomy, and of the novel textiles also identified by the participants of this study, cannot be realised if the required raw material for growth is not accessible.

## 5.4 Limitations and further research

Because this study was conducted with qualitative research method of focus group interview these results are not generalizable and they might vary with different samples and demographics of people. What these results do offer, is reinforcement to the results and findings of related previously conducted studies and a more in-depth look into the consumer perceptions of different textiles and their sustainability which has scarcely been studied before.

To further improve the novel wood-based textiles entering the market the willingness to pay a premium should be studied more closely. Though price seemed to have a reduced influence on purchasing behaviour it still has significance to the consumer; either too high of a price creates a barrier, or too low of a price arises doubts and suspicion. In addition, to further the sustainability transition in the clothing and textile industry consumer buying behaviour from the point of view of shared responsibility should be examined. Current literature, this thesis included, examines mostly consumers reactions to new innovations or business models. Yet, consumers have a more active role in clothing consumption which should be studied to achieve a more holistic view of the possible avenues through which and solutions with which the sustainability transition of the whole industry could be advanced. Furthermore, providing the consumer with a more active role in the research design could shed more light on the root causes of the distrust in companies found in this research.

# 6 CONCLUSIONS

This master's thesis examined the perceptions of Finnish university students on new wood-based textiles. The overall perceptions were positive, and the novel textiles were viewed as possible parts of a larger systemic change in the clothing and textile industry. However, the use of wood raised concerns about deforestation and biodiversity loss, but the recyclability of these textiles reduced this concern slightly.

The main product attributes of textiles that affect the purchase decisions were concluded as feel and quality. Price had a diminished affect in the context of novel textiles. The determining attributes of clothing included in addition to the attributes associated with textiles, the fit and aesthetics. The attributes associated specifically with wood-based textiles were the feel of the material and the quality of it.

The main barriers of purchasing wood-based clothing were the lack of knowledge and awareness. These impediments created other barriers such as doubt, uncertainty and suspicion directed towards the product and its sustainability, and the producing company. These barriers could be overcome by emphasizing the circular economy aspects of the novel wood-based textiles, due to the circular solutions seeming to be more easily accepted and relatively little doubted by consumers. Another solution would be focusing the marketing and communication to the more purchase determining factors such as feel and quality of the fabric.

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# APPENDIX 1 – Pre-interview survey

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

**Pre-interview survey**

Welcome to answer the pre-interview survey of "*Consumer perceptions regarding new wood-based textiles*" master's thesis. We collect this information in order to assign the participants in their focus groups. The personal information (i.e., the email address) collected in this survey will not be used in the research, nor will it be shared with third parties. The contact information collected is only used to reach the participants regarding the details of the up-coming focus group interviews.

You can find the privacy notice of the research here: https://drive.google.com/drive/folders/18UMbKSRnFUQrvTZRcoqIORBxZK5Z-QC-?usp=sharing

**1. Gender**

- ◯ Female
- ◯ Male
- ◯ Other
- ◯ Prefer not to say

**2. Year of birth**

- ◯ 2004
- ◯ 2003
- ◯ 2002
- ◯ 2001
- ◯ 2000
- ◯ 1999
- ◯ 1998
- ◯ 1997
- ◯ 1996
- ◯ 1995
- ◯ 1994
- ◯ 1993
- ◯ 1992
- ◯ 1991

**3. Faculty where you study**

- ◯ Faculty of Information Technology
- ◯ Faculty of Humanities and Social Sciences
- ◯ Faculty of Education and Psychology
- ◯ School of Business and Economics
- ◯ Faculty of Sports and Health Sciences
- ◯ Faculty of Mathematics and Science

**4. How interested are you in the responsibility and sustainability issues of the textile and fashion industry?**

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Not at all interested | ○ | ○ | ○ | ○ | ○ | Very interested |

**5. How familiar are you with the concept of bioeconomy?**

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Not at all familiar | ○ | ○ | ○ | ○ | ○ | Very familiar |

**6. Please select the interview times that suit you the best**

- ☐ Monday 21.3. from 1 pm. to 3 pm. ONLINE
- ☐ Monday 21.3. from 1 pm. to 3 pm. AT CAMPUS
- ☐ Tuesday 22.3. from 10 am. to 12 pm. ONLINE
- ☐ Wednesday 13.4. from 1 pm. to 3 pm. AT CAMPUS
- ☐ Thursday 14.4. from 10 am. to 12 pm. AT CAMPUS
- ☐ Thursday 14.4. from 1 pm. to 3 pm. AT CAMPUS

**7. Please leave your email address below**

[ ]

# APPENDIX 2 – Focus group interview questions and structure

1. ***Introduction***
   - Introducing the researchers
   - Aim of the study
   - Use of results
2. ***aspects that influence purchase decisions***
   - where/how often/why you buy clothes? - **how would you describe yourself as a clothing consumer**
   - What aspects of clothes influence purchase your purchase decision
     - *is material one of them? why/why not?*
   - *Do you generally check material when purchasing clothing*
     - *or the origins of the material*
   - *place of production?*
3. ***Wood-based textiles***
   - Introduction
   - What participants knew already? what was new?
   - Do you know if you have clothes made from wood-based textiles?
     - what kind of thoughts about the new innovations? could they be a solution to the problems in the clothing industry?
   - Would you be interested in buying a piece of clothing made from said textiles? would you rather buy a piece of clothing made from these novel textiles or from organic cotton?
     - Why?
     - What would influence the decision?
   - Do you see any issues with wood-based textiles and their production? What kind of issues?
4. ***Influence of information***
   - Have you noticed e.g. in media discussion/advertisements about wood-based textiles?
   - Do you feel there's enough information available
     - generally about the sustainability of clothing industry
     - wood-based textiles/new innovations?
     - the sustainability of wood-based textiles?
   - What kind of information would you want to have?
   - From which channels / From whom?
     - companies own communications? third parties (NGOs)?
5. ***Ending the interview***
   - thanks and next steps of the research

# APPENDIX 3 – Focus group introductory presentation

## WOOD-BASED TEXTILES

Master's thesis focus group interview
Aija Hokkanen & Venla Wallius
26.11.2021

## TEXTILE FIBRES – INTRODUCTION

- First step in the value chain of clothing > producing textile fibres
  - Fibres are spun into a yarn which is weaved or knitted into a fabric > further cut and sewn into clothing
- Over half of the yearly produced textile fibres (111 million mt in 2019) is used in the clothing industry
- When clothing production has increased, similarly the demand and production of textile fibres has increased
  - The amount produced has doubled in the last 20 years and it is still expected to grow by 30% to 2030

## MOST COMMON TEXTILE FIBRES IN CLOTHING (EU)

1. Cotton and other natural fibres – 43%
   - Out of all textile fibres produced 23 % is cotton
2. Polyester – 16 %
   - Out of all textile fibres produced 52 % is polyester
3. Man made cellulose fibres – 9 %
   - Out of all textile fibres produced 6,4 % is man made cellulose fibres

## ENVIRONMENTAL IMPACTS OF TEXTILE FIBRES

Cotton
- Land use
- Water consumption
- Chemicals (herbicides, pesticides, etc.)

Polyester
- Raw material - crude oil
- Micro plastics

## ENVIRONMENTAL IMPACTS OF WOOD-BASED TEXTILE FIBRES

Commercial man-made cellulose fibres

•Viscose
- Chemical and energy intensive
- The origin of pulp and where viscose is produced

•Modal
- Decreased need for fossil energy > efficiency
- Smaller process emissions (chemicals)

•Lyocell
- Even further decreased need for energy, water and chemicals

## ENVIRONMENTAL IMPACTS OF WOOD-BASED TEXTILE FIBRES

Commercial manmade cellulose fibres vs new innovations

- Spinnova
  - No chemicals, decreased water consumption and minimized carbon emissions
  - Recycling possibilities
- Ioncell
  - Novel solvent > process very close to a closed loop
  - Recycling possibilities
- Kuura
  - Synergy benefits > textile fibre produced in bioproduct/paper factory

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- Technology https://spinnova.com/technology/
- Ioncell is a method https://ioncell.fi/
- Process https://www.kuura.eu/process/