Mending

Fashion

Future scenarios of sustainable fashion in Finland in 2035

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Master's Thesis

International Design Business Management IDBM

School of Arts, Design & Architecture

Aalto University

2017

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School of Arts, Design
and Architecture

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Title of thesis: Mending fashion - Future scenarios of sustainable fashion in Finland in 2035

Department: Department of Design

Degree programme: International Design Business Management

Year: 2017   **Number of pages:** 124 + 73   **Language:** English

Abstract

The world's second most polluting industry, fashion, is currently facing a massive challenge: how to design and produce clothing for an increasing global population without further harming the environment. This master's thesis uses futures research methods to examine the topic of future scenarios of sustainable fashion in Finland in 2035.

The goal of this thesis is to seek an answer to the research question: "What are the main drivers and trends that are expected to impact fashion industry in the next decades?". I also aim to examine whether the future can help to create sustainable fashion design strategy.

In order to inspect ambiguous research question, I draw from two different streams; fashion sustainability and futures research methods. The thesis consists of four parts. The topic is firstly familiarized with literature review and further continued with an online study. Following, an environmental scanning is performed in order to identify relevant trends, drivers, and uncertainties that are likely to affect sustainable fashion in Finland in 2035. Next, the acquired understanding is used as the basis of the future scenarios. Finally, scenarios and their possible effects are analyzed.

As a result of this research, the identified three future scenarios describe how sustainable fashion might occur in Finland in 2035.

Scenarios illustrate how relevant trends and drivers might affect the development of sustainable fashion. Each of the three plausible scenarios reveals new aspects and diverse views on sustainable fashion in Finland in 2035. All scenarios include both positive and negative aspects, realistic situations, events, and potential advancements. They also describe how technology, attitudes towards recycling and ecology, and company's capability and willingness to develop circular business models might affect sustainability in the future.

The findings of this study suggest that in 2035 both Finnish society and fashion industry could possess qualities, aspects and events from each of the scenarios as signs of developments portrayed are already appearing. Initial assumption that scenarios might offer valuable novel perspectives is validated. However further research would be needed in order to determine whether the scenarios can facilitate sustainable fashion design strategy creation. These results further support the idea that it is crucial to understand the drivers and trends and their potential implications in order to make educated future decisions. The scenarios may be used to illustrate with comprehensive examples how the future development of sustainable fashion can drive the needed transition from current unbearable situation to a more desirable future.

Tiivistelmä

Maailman toiseksi saastuttavin teollisuudenala, muotiteollisuus, on valtavan haasteen edessä: kuinka valmistaa vaatteita kasvavalle maailmanlaajuiselle väestölle vahingoittamatta ympäristöä entisestään? Tämän taiteen maisterin opinnäytetyön aiheena on tutkia tulevaisuusskenaarioiden avulla, miten muodin kestävä kehitys ilmenee Suomessa vuonna 2035.

Opinnäytetyön tavoitteena on vastata kysymykseen: "Mitkä ovat tärkeimmät megatrendit ja ilmiöt, joiden odotetaan vaikuttavan Suomen muotiteollisuuden kestävään kehitykseen seuraavien vuosikymmenten aikana?". Tutkin myös voivatko tulevaisuusskenaariot olla hyödyksi kestävän kehityksen huomioivan vaatetusalan designstrategian luomisessa.

Aihetta lähestytään kahdesta näkökulmasta; vaatetusalan kestävää kehitystä tutkien sekä tulevaisuustutkimusmenetelmiä käyttäen. Opinnäytetyö koostuu neljästä osasta. Ensin aiheeseen perehdytään kirjallisuuskatsauksessa, jossa kerättyä tietoa täydennetään internet-tutkimuksella. Toimintaympäristön muutosten tarkastelun tehtävänä on tunnistaa ne olennaiset megatrendit, driver-ilmiöt sekä epävarmuustekijät, joiden odotetaan vaikuttavan Suomen vaatetusalan kestävään kehitykseen vuonna 2035. Hankittua ymmärrystä käytetään tulevaisuusskenaarioiden laatimisen perustana. Lopuksi skenaariot sekä niiden mahdolliset

vaikutukset analysoidaan.

Tutkimuksen tuloksena muodostetaan kolme tulevaisuusskenaariota, jotka kuvaavat millä eri tavoin vaatetus, muoti, kierrätys sekä kestävä kehitys voivat otaksuttavasti ilmetä Suomessa vuonna 2035. Skenaariot profiloivat kolme mahdollista ja erilaista tulevaisuuskuvaa, luovat näkymiä päätöksenteon avuksi, sekä selventävät mitkä seikat ovat oleellisia kestävän kehityksen jatkoedellytysten luomiseksi. Kaikissa skenaarioissa on positiivisten ja negatiivisten näkökulmien lisäksi realistisia kuvauksia siitä, miten edistysaskeleita kestävän kehityksen saralla voidaan ottaa. Skenaarioiden analyysista nousevan tiedon perusteella on syytä olettaa, että Suomessa on vuonna 2035, tai jo aiemmin, nähtävissä osia kaikista skenaarioista. Ne tuovat hyvin esille sen, kuinka teknologia, asenteet kierrätykseen ja ekologisuuteen sekä yrityksen valmius ja halukkuus kehittää kiertotaloutta vaikuttavat kestävään kehitykseen.

Alkuperäinen oletus, että skenaariot voivat tarjota hyödyllisiä uusia näkökulmia, vahvistuu. Lisätutkimuksia tarvitaan kuitenkin selvittämään, voivatko skenaariot helpottaa designstrategian luomista. Nämä tulokset tukevat ajatusta siitä, että päätöksenteossa on tärkeää ymmärtää sekä ilmiöitä, megatrendejä että kuluttajakäyttäytymistä. Skenaarioita voidaan käyttää havainnollistamaan kestävän kehityksen edistymistä, mikä edesauttaa siirtymistä nykyisestä sietämättömästä tilanteesta kohti kestävämpää ja ekologisempaa tulevaisuutta.

Avainsanat: kestävä kehitys, vastuullisuus, tulevaisuustutkimus, tulevaisuusskenaario, ennakointi, designstrategia, 2035, driver-ilmiö, megatrendi, vaatetusala, muoti, vastuullinen vaate

Contents

1.

Introduction

1. Introduction

The fashion industry is a significant player in the global economy, worth of nearly three trillion dollars annually (Business of Fashion & McKinsey & Company 2016). The industry has gained a questionable honor of being the second most polluting industry in the world after oil. Clothing that doesn't sell, fits badly, breaks or is out of fashion is too often discarded in landfills, even though 95% could be recycled or worn again. However, despite the challenges, fashion remains as an industry that relates to almost everyone on Earth by offering a captivating range of choice for self-expression, but also by involving populations globally with its supply chains (Forum for the Future 2009).

Fashion systems need mending. Currently, the industry is facing an urgent need to innovate vigorously to ensure safe development of both people and planet. Recently, researchers and businesses have shown an increased interest in sustainable fashion, after all, businesses have awakened to realize that sustainability has become an imperative for continuation as natural resources have become scarce and will not last forever. In the face of these issues, stakeholders in the textile industry and researchers around the world are joining forces in finding more lasting alternatives. Designing clothing systems for an increasing global population, while simultaneously decreasing its negative impacts on the environment is certainly a wicked problem. This thesis examines ways how the problems of current fashion industry could be mended in the future.

The topic of my thesis is future scenarios of sustainable fashion in Finland in 2035. The topic is highly important and relevant because the fashion industry is truly facing a need for a quick and radical change and future scenarios can illustrate diverse ways how the change could be achieved. In order to inspect quite ambiguous research questions, I draw

from two different streams; fashion sustainability and futures research methods. The main research questions that the thesis aims to answer is:

What are the main drivers and trends that are expected to impact fashion industry in the next decades?

As an outcome of the scenarios that are created based on the information acquired from the first research question I am also touching on following theme: Can future scenarios help in crafting sustainable fashion design strategy?

The purpose of this thesis is to review the recent research and latest information of sustainable fashion. The research objective is to identify the key drivers and megatrends that affect the sustainable fashion field and in addition also to inspect the possible future effects of those drivers and trends. The thesis comprises of four parts. Firstly, the research is launched by reviewing sustainable fashion literature. Literature review is further continued with an online study. Following, an environmental scanning is performed in order to identify relevant trends, drivers, and uncertainties that are likely to affect sustainable fashion in Finland in 2035. Next, the acquired understanding is used as the basis of the future scenarios. Finally, scenarios and their possible effects are analyzed. The analysis of the scenarios aims to identify new sustainable design opportunities and imperatives and as well to explore the relationship between future scenarios and design strategies.

To this date sustainability in fashion is seen as something complementary, like a cherry on a cake, hoping that a few steps into more sustainable direction will lead to better sales and brand image. However, in my opinion, sustainability should always be an integral core of all company's actions. Sadly, in most cases, this is not fulfilled. Turner (2013) thinks that the key in facing problems like global sustainability issues and

scarcity of resources could be successfully addressed with a collaboration of design and innovation processes. My thesis examines if this is really the case, can future scenarios illustrate potential futures and possibly trigger initiatives for a better tomorrow?

The fashion industry is waking up to discover an urgent need for sustainable solutions in the face of uncertain future and quickly changing economic situation. According to Wahl and Baxter (2008), designers have the potential to act as facilitators of multidisciplinary challenges. Designers and industry should aim their focus to why we design products as it affects what and how we design. (Wahl & Baxter, 2008.) Designer's ability to use foresight in making insightful choices is a useful capability in extremely challenging situations. Personally, I see that my responsibility as a foresight-inclined designer is to facilitate and communicate the transition for more sustainable practices that the industry should confront sooner the better.

Changing mental models and thinking can only be achieved by challenging one's assumptions. What better way to question prevailing beliefs than by creating alternative scenarios of possible futures? Whilst Gandhi's quote "be the change that you wish to see in the world" is a well-known phrase, it remains accurate. In order to build change-makers attitudes, we need to step out of our current position. This thesis aims to provide food for thought and alternative perspectives of sustainability in Finland by offering a range of possible future paths that entice imagination. Although it is not possible to know what future will bring, it is possible to influence some elements of it.

"The fashion industry is waking up to find an urgent need for sustainable solutions."

2.

Background

2. Background

My personal interest in the topic arises from my background. I am a fashion designer and trend forecaster with ten years of experience within the industry. The unethicality of the industry led me to my studies, which have so far comprised of studies of design management, creative sustainability, wearable electronics and future studies. The topic combines my studies and interests in an ideal manner.

The thesis connects to the wider discussion of a paradigm shift in fashion. The radical change should happen from trend-driven fast fashion to enable new business models and shift in consumer habits that flourish within the planetary boundaries. Designing for sustainability not only demands the redesign of our habits, lifestyles, and practices but also redesigning the way design as a concept is considered (Wahl & Baxter, 2008).

Currently, I am not interested in what is larger audience generally finds as sustainable fashion: crafts, waste recycling or using recycled materials in production and SMEs with good ideas but small offering that have no substantial change in the masses behavior. In my opinion, these are not the real problems that should be faced, but only solutions to partial needs. I see the whole current fashion industry and consumerism as a wicked problem in need of elucidation. Radical change should penetrate from trend-driven fast fashion to new business models and consumer habits that flourish within the ecological limits of the planetary boundaries (Wahl & Baxter, 2008).

2.1. Previous research

A considerable amount of literature and research has been published on sustainable fashion. The topic that has been extensively researched lately

also in Aalto University. Associate Professor Kirsi Niinimäki examines the relationship between design and consumption of textiles and clothing and sustainable design from the consumer's' viewpoint in her doctoral dissertation (2011). Niinimäki has also published various other reports and articles on the matter. Other master's thesis with direct topics related sustainable fashion has been published in Aalto University are numerous, to name few: Jolkkonen (2015) and Obregón (2012). Like myself, Obregon (2012) is interested in the paradigm shift and how "designers can contribute to change the current paradigm" (p 3).

Laura Dempsey studied how sustainable change might happen in the fashion industry in her vast master's thesis Fashion for a Finite Planet: Sustainable Consumption in the Garment Industry (2015). She presented potential paths for bridging the gap between the current paradigm and a more sustainable future for the fashion industry. However, my focus regarding the framing and scope of the topic looks at the problem from a different angle, making the topic valuable and interesting. My goal is to create alternative visions for future sustainable fashion design, rather than to study about fashion sustainability in itself, as the field has already been researched widely.

Futures research methods have not proven to be a very popular field in Aalto University. Susanna Björklund studied trend forecasting in her thesis (2013). She mentions future methods, such as Delphi, future illustrations, and scenarios but looks at them from a trend-forecasting angle, not from a wider societal and design strategy view like myself. Doctoral dissertation by Saija Toivonen (2011) utilizes similar futures research methods to mine, such as environmental scanning, forecasting, and trends, within the topic of commercial real estate market. My thesis' topic remains viable and meaningful since the search did not reveal any direct similarities in the research published recently.

3.

Research questions and objectives

3. Research questions and objectives

The overall goal of the thesis is to produce new knowledge in the field of fashion sustainability by using future scenarios. The aim is not to create a handbook of sustainable fashion because many extensive research and publications can already be found on the topic. Rather, the goal is to provide food for thought and snapshots of possible and diverse futures and later see how these future paths could help organizations and companies to form their design strategies. Seeing the interconnection of large systems that are interlinked to other large systems will hopefully inspire and enable me to identify new opportunities. The literature and online research aims to find the key drivers that affect the sustainable fashion field and additionally to analyze the possible future effects of those drivers and trends. The principal research question that the thesis aims to answer is:

What are the main drivers and trends that are expected to impact fashion industry in the next decades?

Created future scenarios are found on the information acquired from the first research question. Based on the three future scenarios I also touch on the following topic:

Can future scenarios help in crafting sustainable fashion design strategy?

The first research question is studied in chapter seven using knowledge retrieved from chapter five's literature review as grounding information. I assume that answers to the second question can be found after the scenarios have been created and further analyzed.

The objective of the research is to use new knowledge in the sustainable fashion field in creation of three future scenarios of the Finnish fashion industry in 2035. The scenarios aim to connect with the wider frame in the global fashion industry but also to link future megatrends to possible changes in the Finnish society. Resulted scenarios are three generalized but distinct paths of the state of the fashion industry & consumerism in Finland in 2035. The contribution of the thesis is future scenarios, new knowledge, and new personal professional competence.

4.

Methods and thesis process

4. Methods and thesis process

The methodology for this thesis includes documentation and analysis of two main information sources. First, an in-depth literature review is completed, covering a broad range of research topics varying from sustainable design, sustainable fashion, design strategy, strategic foresight to futures research methods. The literature review helps to bring clarity to further research, aims to identify important concepts and challenge my existing assumptions of sustainable fashion.

Next, in order to proceed with the futures research methods and start building future scenarios, an environmental scanning is made in the fields of megatrends, fashion, business, sustainable design, and consumption. The information retrieved from environmental scanning is used for forming scenarios. Initially, the idea was to o-create the future scenarios together with the panel of different stakeholders (fashion professionals and customers) in a workshop. However, due to scheduling challenges, the idea of co-design workshop needed to be canceled. Hence the scenarios were crafted by me by using the backcasting method. Scenarios are followed with analysis, comparison, reflections, and conclusions. The scenario creation process is further explored and detailed in chapter 8. The whole thesis process workflow in pictured on the next page in figure 1.

While commencing the thesis process, I also wanted to study sustainable business models. The third research question would have been "What are the scalable sustainable fashion business models?" However, that topic is quite ambiguous and big entity enough to stand as sole grounds for a thesis, thus it had to be left out of the framing as it could not have been studied within the time and other resource limitations of this thesis.

1.

LITERARY REVIEW

**Sustainable fashion
Design strategy
Fashion thinking**

Futures research

↓ ↓

2.

**ENVIRONMENTAL SCANNING:
Megatrends, drivers & uncertainties**

↓ ↓

3.

3 FUTURE SCENARIOS

Scenario co-design workshop

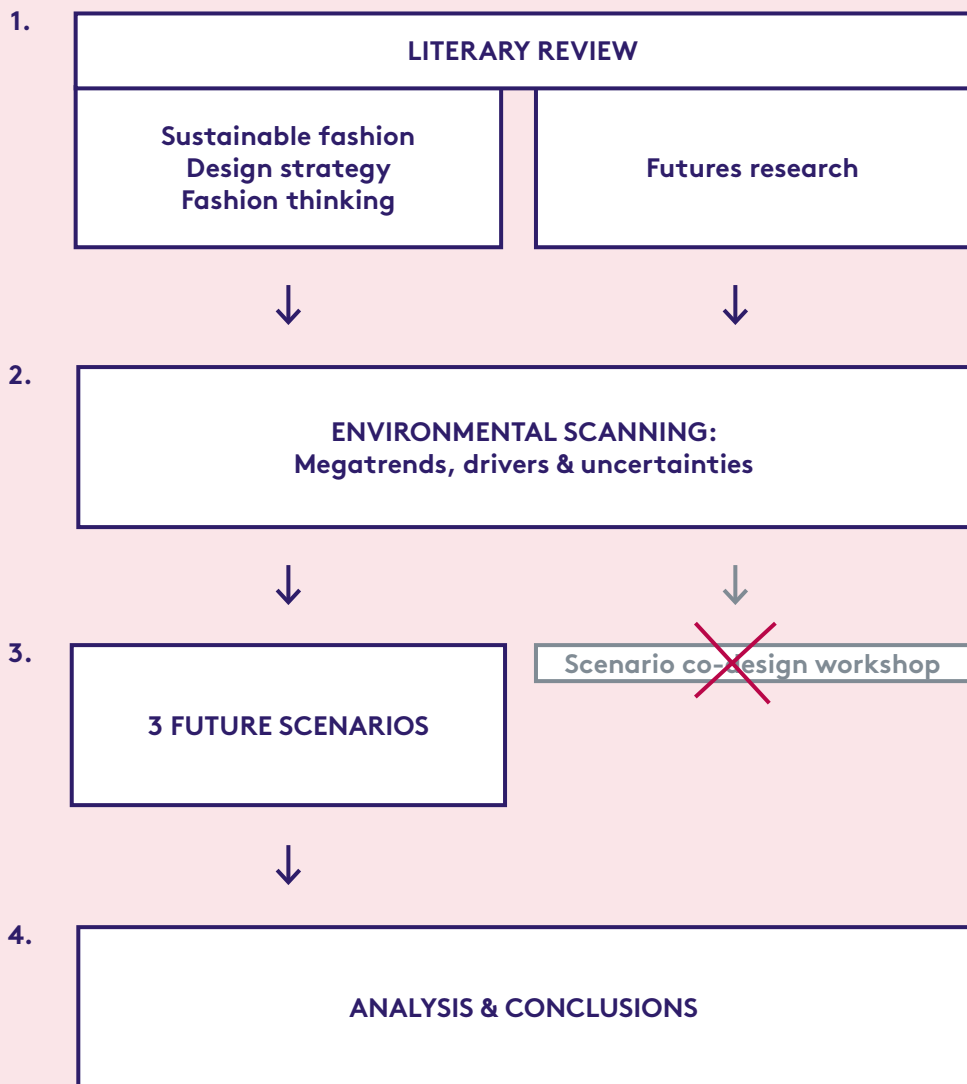↓

4.

ANALYSIS & CONCLUSIONS

Fig. 1. Thesis process workflow.

5.

Central concepts

5. Central concepts

The nature of this thesis is to anticipate future events of the fashion industry. As futures research is not an exact science, I have chosen to look into various themes in order to cover the scattered field. Like systems thinking -concept, my goal is to look at big entities that can influence other big entities and so on. Seeing the interconnection of large systems that are interlinked to other large systems will hopefully inspire me and enable to identify new opportunities that help to enable valuable forecasting. In the following chapter, the topic of my thesis is firstly familiarized within a literature review that reveals the three main theoretical concepts affecting my thesis and their relevance to the topic. These concepts are sustainability in fashion, fashion thinking, and design strategy and they are presented in the order mentioned hereby.

5.1. Sustainable fashion

Firstly, I will investigate the main topic and starting point of the whole thesis; sustainable fashion. Myriad of books handling sustainable fashion were reviewed during the desk research. The most valid points related to this thesis are presented in this chapter.

The word sustainability originates from the 1950's when it was used to describe means to mitigate global poverty (Rissanen & Gwilt 2010). Lately, the word has been adopted by businesses and marketers. Moon et.al. (2013 p 393) define sustainable fashion goods as "products that maximize positive and minimize negative environmental, social, and economic effects along with their supply and value chain". Currently, over 70 different definitions of sustainable fashion can be found, most of them referring to the way clothes are made and consumed. All the

same, plethora of definitions might lead to problematics and confusion of the customers and sometimes to greenwashing and covering other more suspicious operations. (Rissanen & Gwilt 2010.)

It is forecasted that clothing consumption will rise by 63%, to 102 million tons in 2030, stressing the hurry to fix fashion industry's both social and environmental sustainability issues. Scarce natural resources combined with population growth are likely to add challenges to the mix while simultaneously putting businesses' profitability at risk. (Pulse of the Fashion Industry 2017.) The fashion industry has so far relied on fast and growing consumption. Although some efforts have been made for better and healthier consuming habits, current actions can merely be described as just a bit more sustainable fashion. The State of Fashion 2017 report (Business of Fashion & McKinsey & Company 2016 p 32) states four sustainability problems that the fashion industry is currently facing. These issues are:

1. too elevated water consumption
2. disposing of perilous chemicals
3. abuse of human rights and neglecting labor standards,
4. pollution and emission of greenhouse-gas waste (Business of Fashion & McKinsey & Company 2016 p 32.)

Companies have diverse goals and commitment levels when it comes to sustainable initiatives. The clear enabler for sustainability is company size, not its price positioning in the market (Pulse of the Fashion Industry 2017 p 31) I.e., the biggest firms do best even if they offer cheap goods. This conclusion proves that even fast fashion companies can and should adopt sustainable initiatives successfully. Some data illustrating that sustainability initiatives might endorse businesses exist already today. However, over 50% of the industry, mainly SME companies in general,

have made no efforts regarding sustainability. (Pulse of the Fashion Industry 2017.)

Sustainable fashion includes both environmental and socio-economic aspects during product's lifecycle and its stages. According to Green Strategy consultants (2014), sustainably inclined garment's entire lifecycle includes following phases: "design, raw material production, manufacturing, transport, storage, marketing and final sale, to use, repair, remake and recycling of the product and its components" (Green Strategy 2014). Moon et al. (2013) define sustainable fashion as products that have the least negative effects on humans, Earth and its ecosystems during clothing's entire lifecycle. They see simply that sustainable fashion comprises of three stages:

1. clothing production design and supply-chain
2. clothing use
3. clothing post-consumer life. (Moon et al. 2013.)

In order for fashion to be called sustainable there needs to be a holistic approach to fashion as a whole system, or as Fletcher (2008 p 5) says: "in sustainability, there is no such thing as a single-frame approach. Issues dealt with in single frames will almost by definition lead to unwanted and unforeseen effects elsewhere". Fletcher (2008) proposes a more complex and fuller definition of a holistic sustainable practice than Moon et al. (2013). Fletcher's (2008 p5) definition of a sustainable garment's lifecycle includes seven different stages:

1. cultivation of the raw material
2. textile production
3. clothing manufacturing
4. clothing distribution
5. consumer laundering
6. reuse
7. final disposal (Fletcher 2008 p5)

Currently, most design production and supply chains go through different lifecycle phases in a linear manner. They start from design, and move to production, use and end up discarded stages straightforwardly. In a traditional linear process, the raw materials are exploited only once and recycling of either products or their components is minimal. Environment could largely benefit from turning this linear process into a circular, by returning the raw materials back to production and consumption. Circular fashion design practice is further inspected in chapter 7.2. and it can be titled as one of the main drivers advancing sustainable fashion in the future.

According to Greenpeace's research (2016), clothing production has doubled from 2000 to 2014. The sales are forecasted to rise from US$ 1 trillion in 2002 to 2.1 trillion by 2025. Typical logic of a fashion retailer is to b uy a large volume of clothing at a low price and sell constantly renewing collections of goods at low prices leading to repeatedly shopping customers (Rissanen & Gwilt 2010). If this tendency of more and cheaper clothing continues, gains from eliminating hazardous chemicals and pollution will be exceeded by the higher amount of production and consumption (Greenpeace 2016). Rissanen & Gwilt (2010 p 20) describe the fast fashion process following; "cheaper goods mean more consumption, which in turn means cheaper goods, which means more consumption". This principle can be described by Meadow's (2008)

Cheaper products

+

Use of scarce raw materials & pollution

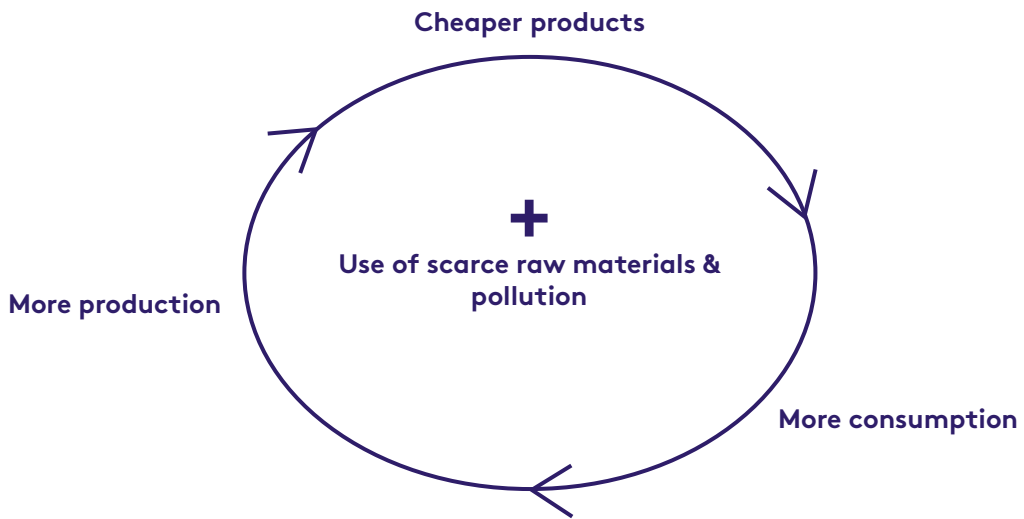**More production**

More consumption

Fig 2. Fast fashion's positive feedback loop. Adapted from Rissanen & Gwilt (2010) and Meadows (2008).

positive feedback loop. A positive feedback loop hastens the process, in this case, cheaper products that lead to more consumption which in return increases the consumption of natural resources and pollution. Positive feedback loop is pictured on the next spread in figure 2.

A better alternative to slow down the feedback loop would be to take into account all aspects of sustainable fashion from consumers and producers perspectives within every new clothing produced. These actions should minimize any undesirable environmental effects, maximize repair, reuse, and recycling of the clothing and respect socio-economic perspectives of the whole supply chain. Green Strategy consultants (2014) argue, that fashion businesses should encourage consumers in adopting more sustainable consumption patterns while simultaneously guiding the consumers with better wear, care and wash practices (Green Strategy 2014).

Greenpeace's report (2016) points out that currently in Europe the typical consumer buys 60% more garments each year, but keeps them

only for half as long as than in 2001. The main part of fast fashion's attraction is to buy clothes and discard them when trends change. Rissanen and Gwilt (2010) argue that major hindsight in achieving more sustainable practices is the consumer with the hunger for cheap and ever-changing wardrobe. This desire for constantly updating wardrobe enables the retailers to continue with their unchanged and unsustainable offering. Effective recycling (such as charity shops, flea markets and over the counter collection) enables continuous shopping as it offers an easy way to get rid of excess and "old fashioned" goods. (Rissanen & Gwilt 2010.)

People often justify their excessive clothing shopping with needs, i.e. "I really need this new jacket for the winter as the old one no longer looks good". Need for novelty is one of human's basic psychological needs. Novelty is an essential part of many aspects of life, such as relationships, work, and free-time. (González-Cutre et al. 2016.) González-Cutre et al. (2016 p 161) claim quite strongly that "if people do not seek novel activities within the tasks they do in the workplace or in leisure time, they will likely experience boredom and maladaptive outcomes like low self-worth, negative affect, low life satisfaction and psychological well-being.".

Sensitivity to novelty is crucial for surviving in the modern world. The phenomenon of people seeking novelty can be described as neophilia and the contrary neophobia as the fear of it. The desire for new has had an evolutionary purpose. It has helped people to learn, create, and adapt to new things and dismiss the non-purposeful stimuli (Gallagher 2012). Fast fashion has adopted this psychology as consumers are attracted to new and fast changing selection, at the expense of old-fashioned or existing clothing of the wardrobe. However, the constant desire for novelty can also be combatted, just like cravings for sweets or binge-watching Netflix. Concerning sustainable fashion, the key question needed to ask is how to provide people with novelties that do not cause

harm to the planetary boundaries? How could neophilia be spurred in a healthy way?

However, even in a society consisting of continuously shopping consumers, not all the blame can be cast solely on consumers, as the industry has done a significant amount of damage too. On the contrary to Rissanen and Gwilt (2010), Sisco and Morris (2012) claim, that consumers may have a major role in pushing the fashion industry towards a healthier and greener future. This could be achieved by demanding more sustainable options and choosing more carefully what and whom to buy the clothing. Other key actions include correct care for clothing and adequate post-consumption. Nevertheless, some preventing phenomena hindering sustainability can be identified. Sisco and Morris's (2012) research found four major barriers that may affect or prevent completely buying sustainable fashion:

1. style barriers
2. price barriers
3. difficulty finding products
4. lack of information about product's impacts (Sisco & Morris 2012).

Wahl & Baxter (2008) state that designing for sustainability not only demands the redesign of our habits, lifestyles, and practices but also requires redesigning the way the whole concept of design is thought. This conclusion proves the necessity of designers in process of creation of better practices. However, paradoxically designers can be major inhibitors of sustainable development as their job is to ensure an increase in sales and growth of the business by designing commercially successful products. Fletcher and Grose (2011) see that the commercial actions, such as ensuring good sales, are keeping up the attitudes and harmful patterns

of consumers and the industry. Often in big companies, the decision-making processes are slow and hierarchical, hence the need and desire for sustainable solutions should penetrate the whole company's hierarchy and operations, not only the design department. In order for the whole industry to change, business models should move away from the fast fashion quarterly and embrace new innovation through the supply chain and business models (Forum for the Future 2009).

　　According to Nixon and Blakley (2012), fashion has a long background of not being taken seriously. Nixon and Blakley (2012) see that this is caused by three attitudes. Firstly, fashion is associated with "women's work". Female gender work counts as superfluous, foundational and supportive, thus less important. Secondly, fashion is seen in a schizophrenic manner, at the same time the society is in awe in front of its wonders and simultaneously its relevance to the society and economy is denied. Lastly, in the design world's hierarchy, fashion comes last after architecture, industrial design, graphic design, digital design and newcomer service design. (Nixon & Blakley, 2012.) The hierarchical position at the bottom of other more "prominent" design and trade fields might make fashion seem less important in the minds of decision makers. This faulty vision might consequently prevent seeing and acting upon the urgent need for more sustainable actions.

Ironically, when compared to "regular fashion", sustainable fashion is seen as opposite of pretty, superficial and fun; as something too unattractive, ugly, serious, boring, unattainable and waste of the effort because the critical mass of consumers behaves in ways that prevent sustainable initiatives from succeeding. Could the solution in achieving better practices lie in finding the right balance between the offering of traditional fashion and sustainable fashion? Or should one dispose of the sustainability labels completely and create a new concept that inherits the best qualities of both concepts?

"Strategy enables design to move beyond mere aesthetics (Stone 2013)".

Pic.2.

5.1.1. The iceberg model

Donella Meadows (2008) has developed the Iceberg model guide to help to contextualize problems as part of a bigger system. Rather than reacting to individual problems, systems thinking looks into relationships to other activities within the system, for repeating patterns and roots that cause the problems (Meadows 2008). The iceberg is a metaphor that illustrates how we usually only "see" events above the waterline. However, the vast majority of the iceberg lies below the waterline. The iceberg model can be used to understand and represent the deeper systems structures and mental models driving the current fashion industry, as they are essential to finding the key touchpoints (or leverage points as Meadows calls them) for change. Leverage points are "places within a complex system where a small shift in one thing can produce big changes" (Silvious 2013 p 82). This makes finding leverage points enticing as they could help to facilitate change within our interconnected ecological, social and economic systems.

The problematics of the fashion industry can be described by using Meadow's iceberg model. These structures can also be described as driving forces. According to Meadows (2008), the focus of view should be shifted away from the symptoms of problems, events and behavioral patterns. Rather the one should target structures and the underlying mental paradigms. (Meadows 2008.) The Iceberg model is adapted to fashion process and pictured in the next page in figure 3.

In the case of sustainable fashion, and the way that it is perceived and acted upon, these mental models are complexly entwined with larger consuming habits, self-expression and esteem, the illusion of disappearing clothing when put to donation box and wider attitudes regarding environmental issues, recycling and also to lifestyle in general. All these issues make the equation of sustainable fashion tricky to solve.

EVENTS
What just happened?
" I just dumped bag of almost unused clothing
to a collection point."

REACT

PATTERNS/TRENDS
What trends have there been over time?
"I've been buying a lot of clothing to
cheer myself up. "

ANTICIPATE

UNDERLYING STRUCTURES
What has influenced the patterns?
"Clothing is cheap and available everywhere, con-
suming makes the economy boom."

DESIGN

MENTAL MODELS
**What assumptions, beliefs and values keep the
system in place?**
"Looks are important, it is crucial to look successful
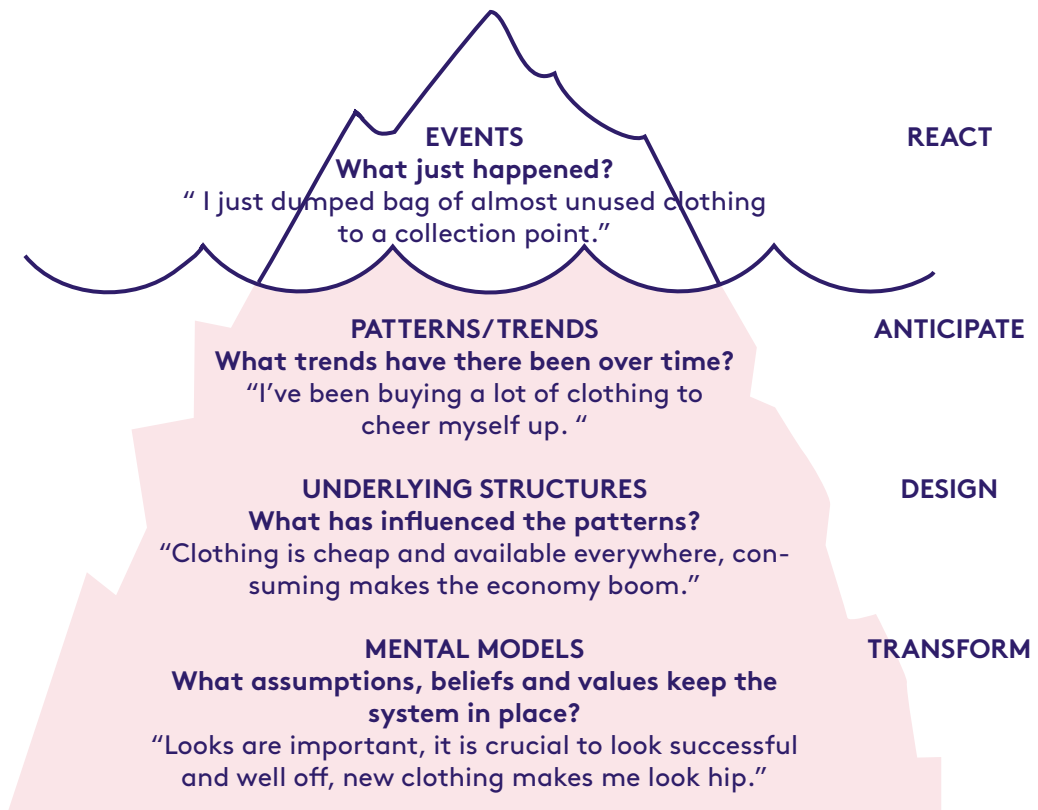and well off, new clothing makes me look hip."

TRANSFORM

Fig 3. Iceberg model in fashion. Adapted from Donella Meadows Institute (2017).

5.2. Fashion Thinking

Thesis' next theoretical framework is fashion thinking, a concept presented by Nixon and Blakley in 2012. They define fashion thinking as a way to add value to products or services through criticality and creativity by employing technology. Nixon and Blakley (2012) see that fashion as "commercial art offers a unique way of merging aesthetics, engineering, and business strategy" (p 158). Businesses in other fields could also benefit from its methodologies and fashion thinking which comprises a set of conventions that rise from fashion industry's best practices (Nixon & Blakley 2012). As a fashion professional, I can personally relate to this thematic and draw from its principles as a mindset of this thesis and for my thinking.

Fashion thinking has evolved of design thinking, a term that has penetrated the businesses globally. Design thinking utilizes user-centered methods in problem definition, identifying new opportunities, and gaining value (Martin 2009). Fashion thinking offers another means for gaining added value. Even though both concepts share similarities, fashion thinking differs from design thinking in dimensions: temporal and spatial. (Nixon & Blakley 2012.)

Nixon & Blakley (2012) claim that fashion thinkers might have the ability to foresee both present and upcoming situations. Due to fast paced cycles, designers must always possess the knowledge of what sells currently but also have an eye on future trends. Nixon and Blakley (2012) see that since fashion is a future oriented

"Adopting fashion thinking may enable companies to be ahead of the curve rather than behind it (Nixon & Blakley 2012)."

field, adopting fashion thinking methods could allow companies to be "ahead of the curve rather than behind it" (Nixon & Blakley 2012 p 161.) I have experienced this mechanism of combining meaningfully both present day and anticipating future events in my own professional experience. The practice of combining temporal dimensions has partly served as inspiration on my thesis futures research as well.

Fashion thinkers are tastemakers and the success of a fashion business is often based on aesthetics (Nixon & Blakley 2012). Unlike fashion thinking, futures research is neutral and tries to remain non-judgmental. Even though fashion thinking and future research are largely different, both approaches share similar temporal dimensions of past, present, and the future. Temporarily fashion thinking can be divided into three parts:

1. Recognising and resourcing history
2. Employing design thinking concept's user-centered approach to better understand current moment
3. Forecasting future events. (Nixon & Blakley 2012.)

This division to three different time settings (the past, present, and future) is the starting point my thesis's research as well. The first part of the thesis looks into the past in the form of literature research, the second part focuses on finding drivers that affect the future from present day and finally anticipation of what is coming next is handled in the future scenarios.

5.3. Design strategy

This thesis aims to study how future scenarios could be used to facilitate the forming of design strategy. Therefore, it is important to understand what design strategy concept actually stands for. Following chapter looks into the definition of the concept.

Derived from the Greek word for leading an army, a strategy can be defined as a method or plan to reach the desired future. Design strategy follows the same principle, the aim is to both immediately and long-term to determine what is the design offering, why and how to implement it. Stone (2013) sees that design strategy is a way for a company to "differentiate itself from competitors' actual or predicted moves".

Turner (2013) defines design leadership as a commercial imperative. According to his notion design leadership helps in defining the future and provides a design management toolkit in in order to reach the goals set. Designer or design manager has the responsibility of making sure that everyone involved in the design process has a clear understanding of the criteria by which the design proposals will be judged when finished. (Turner 2013.)

Duggan (2002 p 139) describes strategic intuition as a "selective projection of past events into a new combination as a course of action". Strategic intuition can be employed while creating strategic foresight. Strategic foresight actions are fuzzy and uncertain of nature as they deal with long term future (Hines & Bishop 2006). Stone (2013) claims that a successful design strategy merges business and creative objectives in a

meaningful way. According to Stone (2013), strategy enables design to move beyond mere aesthetics. Design strategy should be composed of following (Stone 2013):

- – Addressing problems and challenges
- – Leverage points of benefits
- – Customer needs, behaviors and attitudes
- – Emerging ideas and trends
- – Identify future opportunities to differentiate from competitors. (Stone 2013.)

This thesis does not aim to create a successful sustainable design strategy nor to study what makes a viable strategy. Rather the goal is to investigate how the future scenarios could benefit the strategy building and to see what kind tools (if any) the scenario process has to offer for strategy building.

6.

Futures research

6. Futures research

Futures research can increase "lead-time between potential events and current planning" (Glenn 2009 p 3). This skill is much needed in order to successfully steer the changes that the future most definitely will bring us. This chapter looks into the principles of futures research and explains why the methodologies are relevant in the case of my thesis.

6.1. Why futures research methods?

Fashion has to tackle how climate change and megatrends like resource shortage, and population growth will affect the industry and markets in the future. One way of anticipating the future is to use futures research methodologies. Their intention is to explore, create, and test futures in order to facilitate decision making. These methods analyze and examine in a multi-disciplinary way what are the consequences of changing factors and conditions in major areas of surrounding environment. (Glenn 2009.)
    Among the most critical challenges that businesses face is constructing a successful strategy for the future actions. But how can decision-makers tell what is the next step? Fashion retailers thrive when they manage to supply what consumers want before they know that they want it. How can this be achieved? One possibility is to look how the fashion industry has been creating needs and desires for centuries and use the same principles that have driven fast fashion craze for something better and more sustainable. Barbieri states (1993) that it is paramount to understand that events, behavior, and consequences are tied to rapid change that affects all sectors of our lives. Understanding futures can help one to critically determine what it will be the consequences of the

decisions one makes today. (Barbieri 1993.)

It is to be noted that futures research is not a quantifiable science as methods used and the skills of the practitioners can impact the results and the outcome. Futures research methods aim to identify and describe current forces, threats, and possibilities that should be involved in decision-making process. (Glenn 2009.) Futures research is often set to improve the human condition. The aim of futures research is never to predict a specific future, but more likely to challenge one's thinking in a constructive, creative way.

As opposed to more academic futures research, trend-forecasting is often utilized in companies within a shorter lifespan (often 1-5 years vs 10-30 years). Glenn (2009) describes how businesses and companies use futures methods to better understand coming markets. Visions are used to create long-term strategies which may help to achieve desired circumstances. Rather than just responding to challenges, it is often strategically preferred to anticipate upcoming changes and take necessary action beforehand. According to Glenn (2009 p 4), five philosophical assumptions can be made of futures research:

1. You cannot know what the future will bring, but rather a range of possible events.
2. Policies can affect the probability of future events or conditions. Accordingly one can forecast consequences of policies.
3. Certain events are more probable than others; eg. sunrise is more certain than the rise of stocks.
4. Cross-referencing of different methods improve foresight as using only one method isn't reliable by itself.
5. People will have more impact on future events than what they had in the past. (Glen 2009.)

The aim of futures research is not to know the exact future, but rather use its methods to reveal the threats and possibilities of the future changes. When talking about future, the terminology may be confusing as many of them sound similar to commoners. A prediction is a statement one believes will be true as opposed to a more probabilistic forecast which does not imply that forecasted event or condition will necessarily occur. (Glenn 2009.) Forecasting comprises of a broad range of possibilities which are organized and considered and developed to alternative futures (Hines & Bishop 2006).

Further evolving, strategic foresight can be defined as an act of evaluating and anticipating future events strategically on the long term, i.e. combining future methods with strategic management methods. Hines and Bishop (2006) present guidelines of best practices for strategic foresight. They divide the strategic foresight process to six parts: framing, scanning, forecasting, visioning, planning and finally acting. In the first "framing" part one defines the scope and focus of the problem setting and why clear framing is crucial for the end result. In the second part "scanning" is done in order to understand relevant information and trends concerning the framed area. Forecasting envisions possible futures and creates meaningful views. Visioning enables the organization to decide what they aim to be in the future and determine necessary steps to achieve or avoid it. Last two parts planning and acting are about creating a plan and translating the plan into action. (Hines & Bishop 2006.)

While working as a trend analyst, I have always had a strong hunch of coming phenomena. This feeling based intuition is often hard to explain to people who do not possess the same ability. In addition to intuition, rationality and analytics are needed if one wishes to spread the information onwards in a credible manner. Raymond (2010) describes forecasting as "whole-brain" thinking that involves various and emerging creative processes as opposed to linear left brain thinking. Some

individuals are natural talents or develop expert intuition after working in the field for some time. According to Raymond (2010), trend-forecasters are curious, observant and open to new ideas. (Raymond 2010.) This curiosity has driven me to future studies and finally to the topic of my thesis.

Out of all possible futures research methods, in my thesis, I have chosen to use environmental scanning, backcasting and future scenarios. These methods can be described both as normative and exploratory forecasting. Normative forecasting addresses desired futures and aims to answer a question like what kind future do we want? As opposed to normative, exploratory forecasting looks at all possible futures regardless of what is desirable. (Glenn 2009.) The methods used in my thesis are mainly qualitative, not quantitative. My aim in this thesis is to study at drivers, threats and possible states of fashion industry, and certainly the goal is not to predict the future. In order to keep the framing of my thesis realistic, I am focusing on the first four parts (framing, scanning, forecasting, and visioning) of the process. If thesis would be done in a commission to a company, I believe that for a company, the most fruitful part of the thesis would be the last planning and acting parts of the strategy.

6.2. Future scenarios
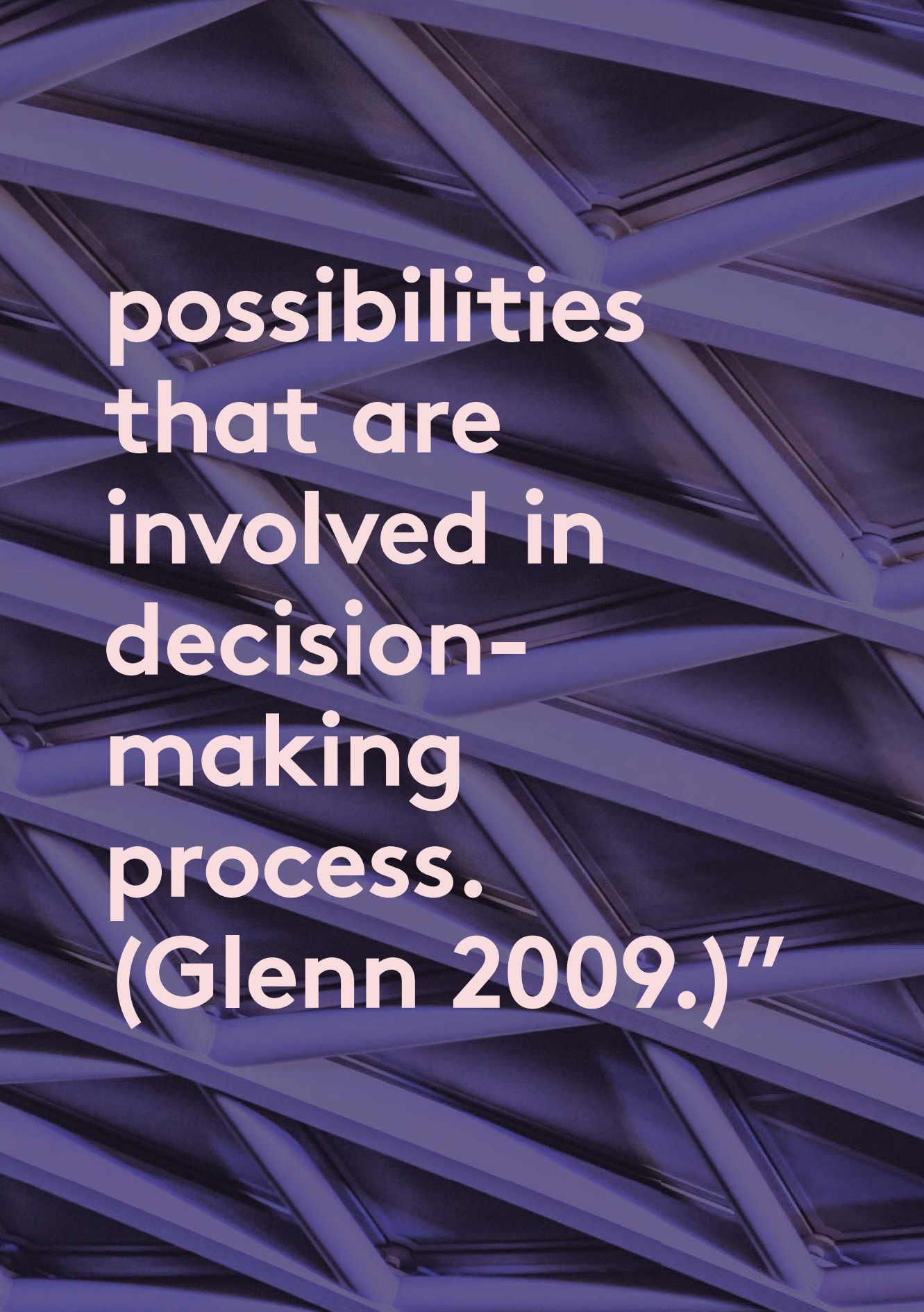
One of the goals of my thesis is to study whether future scenarios can be used in forming of design strategy. My thesis's future scenarios are based on the information retrieved from the literature review and environmental scanning. Main events in the future scenarios are built based on the clustered information of drivers and megatrends and this information is later put to a narrated format. Before proceeding further with the

"Futures research methods aim to identify and describe current forces, threats, and

possibilities that are involved in decision-making process. (Glenn 2009.)"

scenario creation process, this chapter reviews what future scenarios actually are and how are they formed.

A future scenario is a means to organize various statements about the future, rather than being a prediction or forecast (Glenn 2009). Future scenarios are descriptions of different paths, which are presented in a narrative way. They are comprehensible and plausible stories that lead to alternative and at the same time conceivable futures. (Fahey and Randall 1998.) Scenarios are anticipations of what might possibly happen, as opposed to forecasting which aims to identify new and upcoming events (Raymond 2010).

A good scenario illustrates problems, challenges, and opportunities and how they might possibly evolve in the future. Scenarios should be judged by their ability to help decision making not whether they turn out to be right or wrong. However, they should always be plausible and realistic enough to ensure proper strategic actions. Long-term scenario thinking has become a vital part of a creation of innovations. Future scenarios may help to achieve desired future circumstances by facilitating long-term strategy planning. (Glenn 2009.) Future scenarios can offer a viable tool to deal with complex systems, create new perspectives and propose a systematic approach for future innovations. Scenarios can help significantly the design process of new products or services and to pre-test the markets. (von der Gracht & Stillings 2013.) In order to anticipate possible actions, scenario creators must utilize intuition, be historically aware and at times suspend logic in order to envision possible futures. (Raymond 2010).

Foresight is shown to boost the innovation level of a company as well as entire economies. Companies should have an eye for future events and earnestly look for radical innovations as they have proved to provide positive influences on profitability. For the sake of staying competitive in the long-term it is not sufficient to content to previous success. This is

especially crucial in times of crisis and complex and dynamic environment that cause ambiguity to decision makers. (von der Gracht & Stillings 2013.) Rubin (2004) divides the scenario building process to six steps:

1. Analyzing the current status. Analysts list key driving forces thought to be important to the field of study but also organizations' values, hopes, fears, goals and weak signals.
2. Developing the Scenarios based on the information retrieved. Three to five scenarios are ideal to capture a range of future challenges and opportunities and avoid the dichotomy good versus bad. Each scenario logic should be different, yet relevant to the topic.
3. Developing the vision based on scenarios by identifying what strategies might work across possible scenarios, involves also building an action plan based on scenario findings.
4. Developing the mission based on vision by identifying the range of naive outcomes and action plans how they can be reached.
5. A dialogue between vision and mission.
6. Adapting the scenarios based on new knowledge. (Rubin 2004.)

This common scenario process is pictured in figure 4. This thesis focuses on the three parts (1) analyzing the current status, 2) developing the scenarios, and 3) developing the vision). Thesis' future scenarios are built by using the backcasting method. Backcasting and forecasting are both means to estimate the future but the way both approaches to it is very different. In a forecasting process, past and present data is collected and future possibilities are taken in account for estimation for future. As opposed to this, backcasting scenarios are constructed from the distant

SWOT & external factors		Scenario 1		MISSION
Hopes, expectations & fears	Scenario process	Scenario 2	Strategy process	
Values & silent information		Scenario 3		VISION
Meratrends, weak signals & drivers		Scenario 4		
Scientific knowledge		Scenario 5		

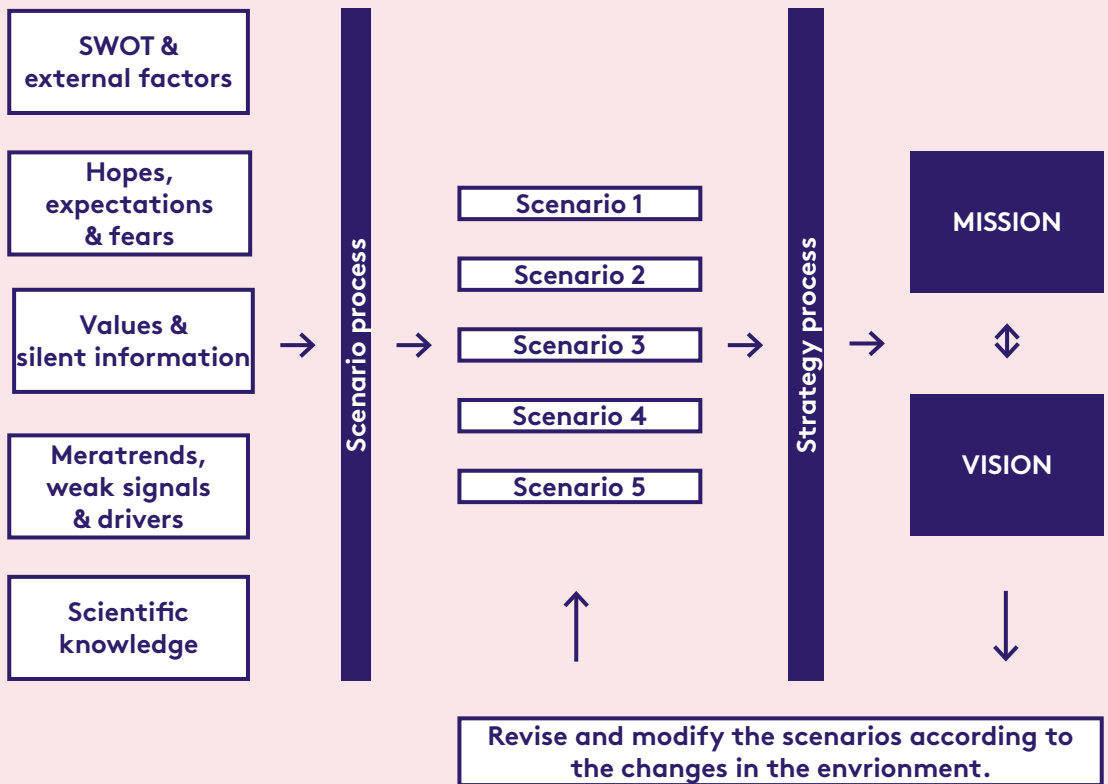Revise and modify the scenarios according to the changes in the envrionment.

Fig 4. Future scenario process. Adapted from Rubin 2004.

future toward the present (Demos 2015). In a backcasting process the starting point is the desired future state and actions are adjusted by asking, "What do we need to do to get there?" in order to reach the target.

Von der Gracht & Stillings (2013) point out that scenario processes offer substantial perspectives on foresight only if diverse stakeholders are included in the process. This conclusion would have been the main reason for having a co-design workshop, however, due to scheduling reasons co-designing the scenarios turned out to be impossible. Von der Gracht & Stillings (2013) recommend the Delphi method for scenario building as it justifies as a good tool. However, the Delphi technique requires the use of expert panels, hence making it impossible to utilize in this thesis as the workload and time frame exceeds one thesis considerably. Instead, I chose to create future scenarios by myself due to time constraints. The whole scenario creation and analysis process is further detailed in chapter eight.

7.

Environmental scanning

7. Environmental scanning

Nothing appears in a vacuum. Similarly, organizations influence and are influenced by their environment. Future scenarios are influenced by a multitude of factors such as drivers, trends, weak signals but also by uncertainties that we cannot know. Often scenario process is launched with an analysis to identify the strongest drivers that shape the future of the researched field. Data and literature review can be used to in these drivers and trends. In the previous chapters, a wide range of literature has been reviewed in order to get a clear picture of the current status of sustainable fashion and other supporting fields. In this chapter, the knowledge is further deepened with research on more current phenomena but also with introduction of drivers and trends that will likely affect sustainable fashion practices in the future.

Environmental scanning refers to monitoring changes in the environment that human actions influence in order discover early signs of future developments. Gordon & Glenn (2009 p 1) describe environmental scanning' aim as to "distinguish what is constant, what changes, and what constantly changes". Environmental scanning can be seen as a central input to futures research. It also feeds the design process and strategic planning. (Gordon & Glenn 2009.) The environmental scanning process is pictured opposite in figure 5, similar process has been used also in the information gathering of this thesis.

Next chapters look into the future and present the key influencers of sustainable fashion's development. Firstly, megatrends are presented as they lay the setting of future milieu by describing structural changes in all aspects of society and have a long-lasting effect. Secondly the information retrieved from environmental scanning is divided and classified to key drivers and uncertainties.

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┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────┐
│ Journals,│  │ Website  │  │Online key-│  │Conferences,│ │   Key    │
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Environmental scanning

↓

ANALYSIS & SYNTHESIS
individual ⟷ Staff ⟷ Management

↓

Collective intelligence

↑   ↓

Feedback & Improvement

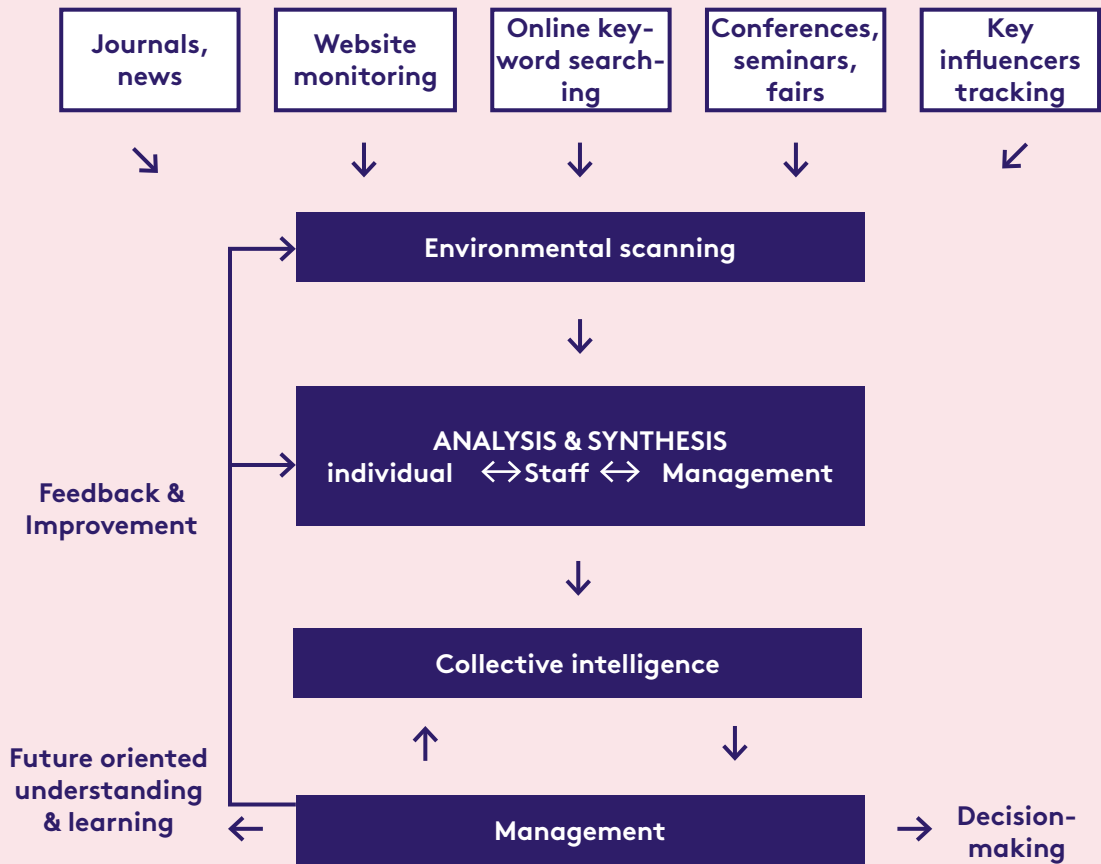**Future oriented understanding & learning** ← **Management** → **Decision-making**

Fig. 5. Environmental scanning process (Gordon & Glenn 2009 p2).

The aim of environmental scanning chapter is to seek an answer to the first research question of the thesis:

What are the main drivers and trends that are expected to impact fashion industry in the next decades?

In order to make the scenario appendix an individual and comprehensive reading, the summary of the of environmental scanning chapter (megatrends, drivers and key uncertainties) can be found in the scenario appendix.

7.1. Megatrends

A trend is characterized as an emotional, cultural or societal direction in which something is developing or changing (Raymond 2010). Whereas megatrends can be defined as a large, transformative global forces and long-term changes that affect governments, societies, economies, and environment permanently and globally over a long period of time. Megatrends are not only global, rather their effects can be felt locally too. Changes in the global demographic, economic or geopolitical developments might influence the availability and price of natural resources in Europe (EEA 2015). Excessive use of natural resources along with the climate change create security challenges and impacts on a global scale (Sitra 2016). Similar influences apply also in Finland.

Many organizations, NGOs, and companies, such as Sitra, European Environment Agency, KPMG and PWC publish megatrend reports on regular basis. Even though most of these reports have diverse views on the implications that he megatrends have on the surrounding organizations, industries, societies, economies, security, and environmental sustainability,

often most reports identify at least following megatrends: rapid urbanization, changing demographics and population growth, enabling technologies, climate change, and scarce natural resources.

While the megatrends are strongly interrelated, interconnected and interdependent, they can broadly be grouped into three clusters as they all share crossing points. These clusters reflect changes in the societies, the global economy, and the physical environment. The clusters have been adapted from reports from Demos Helsinki (2015), EEA (2015), KPMG (2014) and Sitra (2016). The megatrend clusters pictured in the figure 6 are:

1. Megatrend: Environmental crisis
2. Megatrend: Multipolar economies
3. Megatrend: Empowered individuals

The scenarios are set to take place in Finland, 18 years from now, 2035. The division of megatrends to three clusters was made in order to approach to problem-setting in a way that makes the framing more feasible and lays the topic in a setting that is easy to comprehend. I assume that the global changes and possible futures presented here could take place also in Finland in 2035. These megatrends will be the setting of all three future scenarios and information will apply to each scenario. In the following chapters, these three clusters (Environmental crisis, Multipolar economies, and Empowered individuals) are detailed more thoroughly.
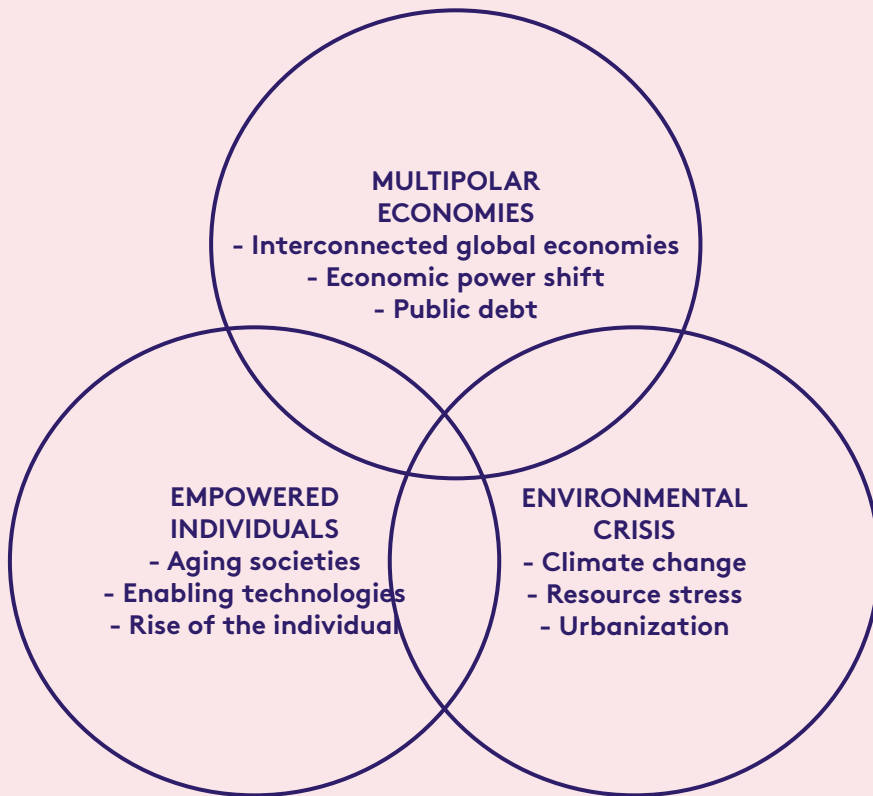
MULTIPOLAR ECONOMIES
- Interconnected global economies
- Economic power shift
- Public debt

EMPOWERED INDIVIDUALS
- Aging societies
- Enabling technologies
- Rise of the individual

ENVIRONMENTAL CRISIS
- Climate change
- Resource stress
- Urbanization

Fig. 6. The megatrend clusters

Megatrend 1: Environmental crisis

40 billion tons of CO_2 were emitted to the hemisphere in 2015. The man-made emissions aggravate the greenhouse effect and in addition, substantial resources originating from the earth such as water, arable land, clean air, and minerals are in peril due to overflows of consumption. If global population would consume natural resources like the Finns, 3.5 Planet Earths would be needed every year. (Sitra 2016.) Climate change is causing erratic changes to the environment and distressing the resilience of ecosystems (KPMG International 2014). Possible impacts may include increases in extreme weather and rising sea levels, that hamper farming, hunting, and fishing (PWC 2013).

Resource (such as water, food, arable land, and energy) stress is caused and further aggravated by population growth, economic growth and climate change (KPMG International 2014). The demand for food is expected to increase by 50 percent until 2050 (Demos 2015). Fashion industry depends on water, currently, it consumes yearly a volume equivalent to fill nearly 32 million Olympic-size swimming pools. It is forecasted that water use will increase by critical 50% by 2030. China and India are main cotton-producing countries which are already suffering from resource stress. (Pulse of the Fashion Industry 2017.)

Asia and Africa are expected to foster 90 % of the population growth (Demos 2015). 2/3 of the world's population will reside in big mega-cities by 2030, and most of this urban growth will occur in developing countries. Housing, transportation, and alimentation constitute most of the households' energy consumption. (Demos 2015.) This adds stress to development of infrastructure and ever-growing needs of resources, most notably energy (KPMG International 2014).

Megatrend 2: Multipolar economies

The focus of global growth has shifted, and to describe the event of globalization, trade, and politics, the term geo-economy can be used. New multipolar world leaders are the US, China, and the EU but the developing countries in Asia and some parts of Africa might become more prominent (Sitra 2016). Developing countries will account for more than half of global GDP, which lifts millions of people out of poverty (KPMG International 2014). Public debt is expected to become an important restraint in the future. Governments' will be faced with a challenge to control debt levels in order to ensure the proper continuation of public services. (KPMG International 2014.)

Economic regions are intertwined through trade, investments, and financial systems. People, goods, ideas, and services circulate around the world fluently (Sitra 2016). However, if international conventions are not secured, not all economic benefits of free circulation can be achieved (KPMG International 2014).

Pic. 4.

Megatrend 3: Empowered individuals

The global population has become more urban, wealthier, and more educated than before (Demos 2015). By 2022 more people are part of the middle class than poor. Precipitated changes in education, health, and technology globally have led to empowered individuals who are seeking for transparency and participation in the politics and in communal goods. 75% of global population will own a mobile phone, making the number higher than access to clean water, electricity or a bank account. (KPMG International 2014.)

In 2030 8.5 billion people will need to have clothing to wear. Aging populations, fewer children, migration, and urbanization will lead to a discrepant world in 2035. The proportion of elderly people within the populations is increasing globally due to higher life expectancy and falling birth rates. This is causing stress to the social welfare systems such as pensions and healthcare. (KPMG International 2014.) A Growing global middle class will increase the demand for food, water, and energy considerably.

The pace of technological advancement is exponential. Existing institutions are confronted by the grown volume and enhanced access to information which is creating new markets, business models, and disruptions. (KPMG International 2014.) Digitalization facilitates solving problems regarding urbanization, resource scarcity and aging demographics (Demos 2015). Novel industries and automation may have a significant impact on world's manufacturing systems and the companies that operate within them (PWC 2013). Technology can reinforce the empowerment of people within the planetary boundaries by the aid of novel forms of sharing economy and innovative initiatives (Sitra 2016).
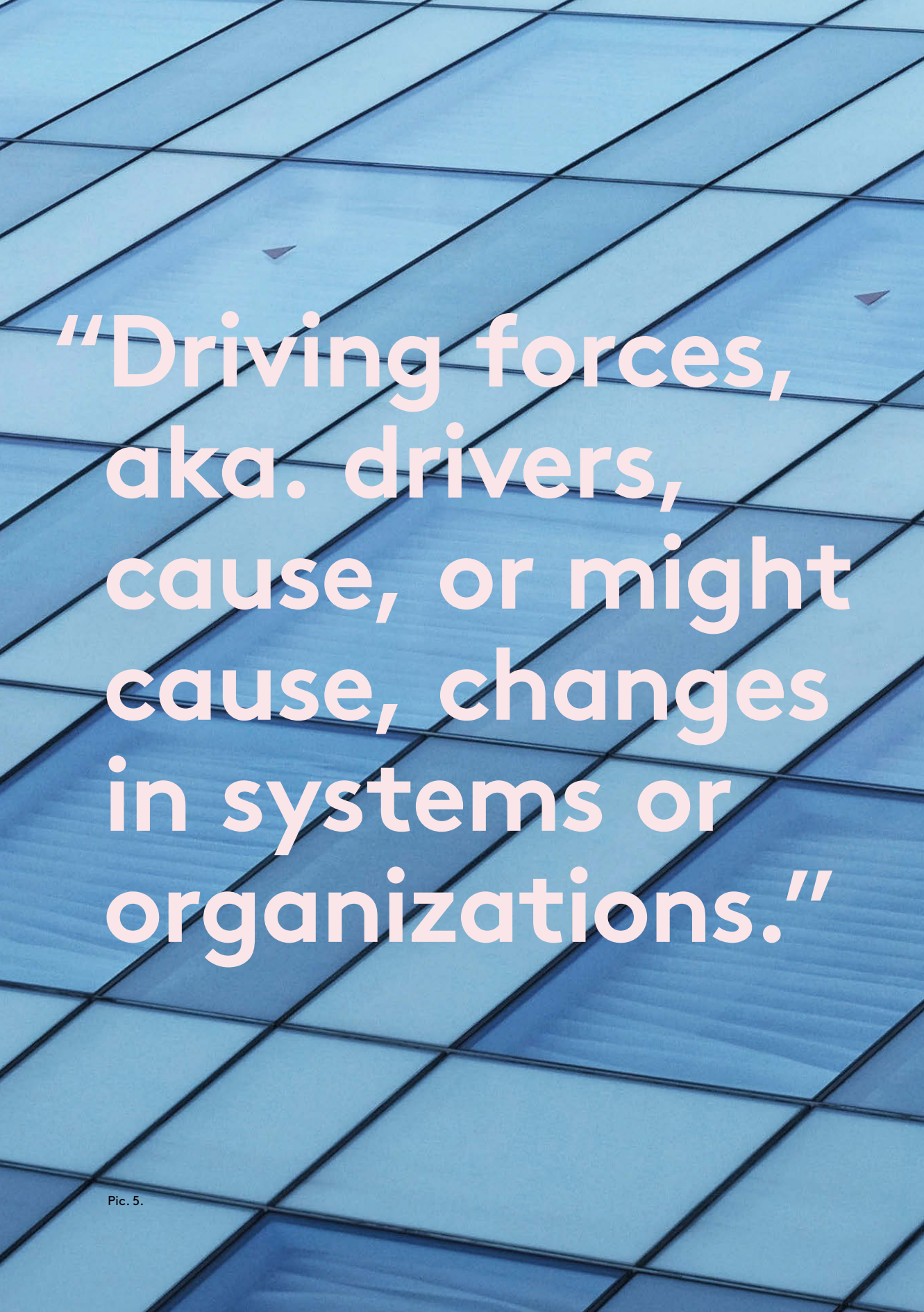
7.2. Drivers

This chapter looks into the crucial part of environmental scanning; drivers and their principles.   These drivers may be changes in social, technological, environmental, economic and political factors. (Rubin 2004.) Briefly put, drivers can be described as "internal forces (knowledge)) and external forces (economy, competitors, technology) that shape the future" (Business Dictionary). Drivers are closely related to trends. Although they do share some similar aspects, drivers differ from trends. Whereas a trend is a statistically explanatory variable, a driver justifies this statistic change of direction. (Rubin 2004.)

Drivers that are hereby monitored in this environmental scanning chapter are used in the scenario building process to serve as a platform for further information. Gathering drivers for scenarios is a complex and long-term process that combines analytical and intuitive methods to retrieve and analyze information from literature, magazines and online sources. Following drivers presented below have been collected from various sources, mainly online, as the latest information on the subject is quickly updated. They were identified with following question in mind: what are main drivers that are expected to impact fashion industry in the next decades? Many of these drivers are highly interconnected and share similar aspects, but to serve the thesis and scenario building process, they have been divided to eight different driver clusters. The drivers are:

1. Technological advancements
2. Transparent & improved supply chains
3. Close the loop
4. Reinventing recycling
5. Innovative materials
6. Changing the paradigm
7. Extending lifecycles
8. Support girls

Drivers are sorted in a way that creates a flow of connected phenomena. First five drivers depend strongly on technological advancements. They are essential requirements when it comes to enhancing and making the supply chains more efficient. Technological advancements are also crucial to circular processes, innovations in material sciences and novel practices of recycling. The last three drivers (changing paradigm, lifecycles, and supporting girls) are more related to shifting behavioral patterns. The initial idea was to sort the drivers in a ranking list, however, it soon became clear that all eight drivers are crucial to the sustainable development in their own manner. Being strongly interlinked, they could neither be ranked by importance.

Naturally, during times of information obesity, an abundance of phenomena linked to sustainability could be found. The drivers presented here are ones that I have chosen to be the most crucial to the thesis' framework and creation of future scenarios. Next chapters explore the eight main drivers linked to sustainable fashion development that in my opinion can be characterized as particularly strong and most likely to affect the future.

"Driving forces, aka. drivers, cause, or might cause, changes in systems or organizations."

Driver 1. Technological advancements

Until now the full potential of digitization has not been reached in an optimal manner within the fashion industry. Audacious technologies are creating disruptions that might cause a vast impact. 3D printing could be a key enabler to a better future by contributing to personalized clothing, rapid prototyping and local, on-demand and no waste production. (Pulse of the Fashion Industry 2017.) Digitalization might offer better means to work towards transparency in the supply chain (Future of Sustainable Fashion 2017) by enhancing "garment traceability and automated material sorting in the textile recycling process" (Pulse of the Fashion Industry 2017 p 98).

Classically technology in fashion has been regarded as wearables. However, this driver is not solely about wearables, rather it is related to garments that may help to make life a bit better by monitoring and staying connected to the internet of things (Future of Sustainable Fashion 2017). Along with other advancements, 3D printing is expected to become a huge disruption of the way fashion is produced and consumed. Adidas is one of the first big companies to launch a mass-produced product that utilizes 3 D-printing. The sneaker called Futurecraft4D has a 3D-printed sole and it is expected to come out in 2018. (Business of Fashion 2017.)

Driver 2. Transparent & improved supply chains

Transparency can be named as an essential and must-have driver that advances the change of the industry. Consumers are demanding more and more for comparable and trustworthy information about sustainability initiatives (Mistra Future Fashion 2016.) It is not enough to make efforts in the sustainability because if these efforts are not effectively communicated to the consumers, they remain vain.

Disruptive business models and much demanded systemic change require not only transparent supply chains but also joint critical mass intentions in order for the industry to reach viable advancements. A commonly built sustainable ecosystem might boost the industry to collaborate for a more substantial impact. (Pulse of the Fashion Industry 2017.) Possible actions to reach the ecosystem might be:

– Utilizing renewable energy and ensuring that all parts of the supply chain are efficient.
– Reducing pollution and shifting away from conventional materials (such as cotton) to reduce water usage.
– Creating collective standards for recycling and waste management.
– Deviating from "sell what you create" to "create only what can be sold" by reducing over production and sale markdowns. (Pulse of the Fashion Industry 2017.)

American fashion brand Everlane has successfully initiated a disruptive business model that highlights transparency throughout its supply chain by presenting its factories and revealing its pricing visible for everyone to see. They have been followed by numerous companies, i.e. Swedish Asket, who clearly has been highly inspired by Everlane's model.
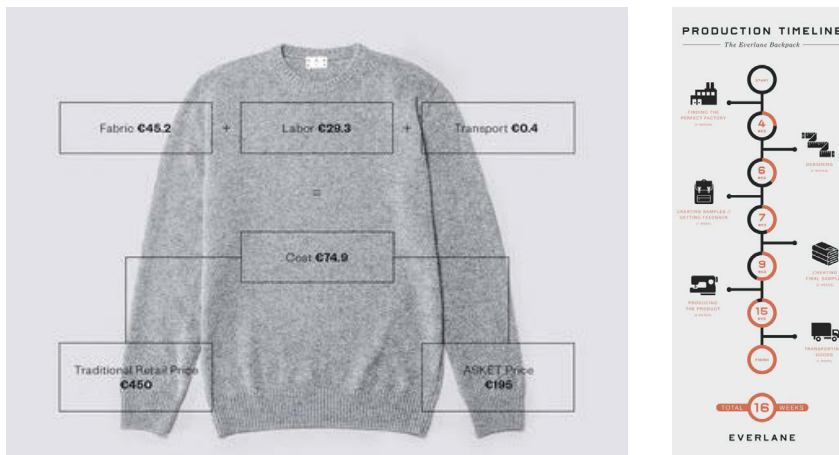
Fig. 7. Asket shirt pricing (Asket 2017) & Everlane production roadmap (Pictochart).

Everlane has still a lot of work to do when it comes to environmental sustainability but they are one of the forerunners with social responsibility and disruptive and transparent business models. The pricing models and transparency in the supply chain are illustrated in figure 7.

Driver 3. Close the loop

Circular design guide (2016) foresees boldly that circular design has the ability to drive innovation and reshape our lives. Traditional fashion supply chains are wasting resources by focuses solely on the end user. Circular design thinking is designing clothing like software, evolving products based on the data and feedback. . Adopting circular design thinking means designing clothing like software, moreover evolving products based on the data and feedback. (Circular design guide 2016.)

Circular Fashion wants to avoid cherished natural resources and raw materials ending up as waste in landfills after garments are no longer worn. Circular fashion aims to create holistic products that are to be used for as long as possible and later returned safely to the biosphere. (Circular Economy club 2017.) Fashion industry's footprint could be reduced closing the loop fully (Pulse of the Fashion Industry 2017).
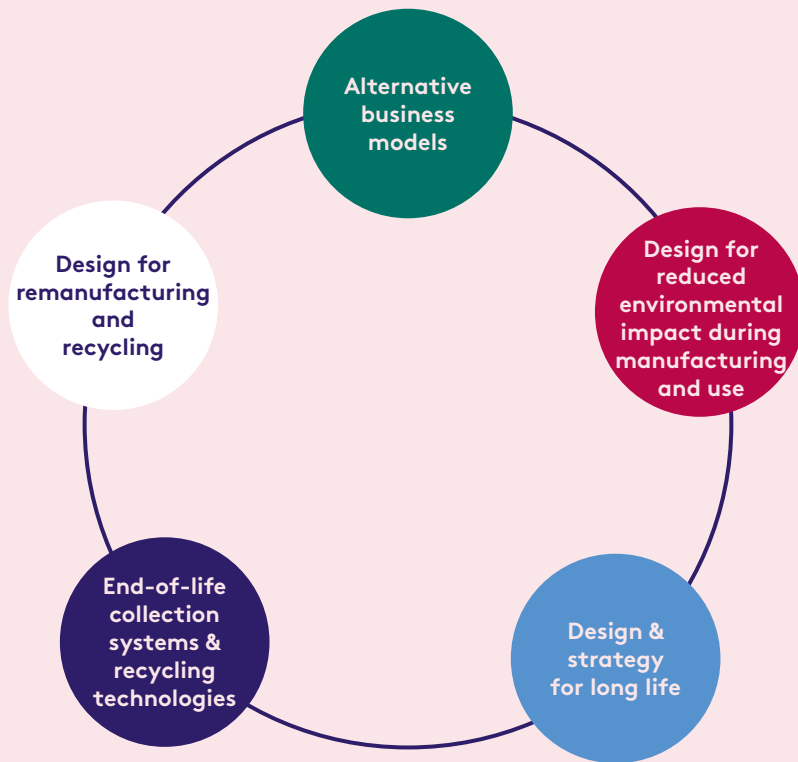
Fig. 8. Holistic framework for slowing and closing the loop (adapted from Greenpeace 2017).

Figure 8 visualizes the circular framework for the fashion industry (Greenpeace, 2017). Concretely shifting to a circular business model means commencing the design with a focus on the garments next use phase, effectively exploiting the products potential uses, and finally taking out the materials and components at the end of the lifecycle, and then to utilize the resources for other garments' lifecycle. A good example of one of the first mass produced circular fashion items were presented in 2016 when Dutch brand C&A launched two Cradle to Cradle certified t-shirts costing 7 . The product's materials allowed re-utilization and are made in safe working conditions. (BOF 2017.)

Driver 4. Reinventing recycling

A staggering 95% of discarded clothes could have been recycled or worn again. In order to fully take all the benefits from precious natural

raw materials and proceed with circular cradle to cradle initiatives, it is important to create innovative and disruptive means to reorganize the whole textile recycling. (Future of Sustainable Fashion 2017.) Currently, the recycling market is not functional, ie. some overseas countries in Africa that until now have received most of the western world's out of style clothing donations, are refusing to import them (Resource 2017). A solution for the dilemma could lie in technology that could enable large-scale mass recycling to penetrate the markets. An example of this would be allowing machines to detect fiber types digitally for further processing. Although end-of-use phase recycling has proved to be somewhat functional, the recyclability should initiate already in the design phase with clear guidelines for designers and decision-makers. (Pulse of the Fashion Industry 2017.)

A new potential player in the recycling field could be Finnish innovation IONCELL-F, a technology developed in collaboration between the University of Helsinki, Aalto University and the VTT which won the H&M Global Change Award in 2016. It is expected that the production process of the fiber could possibly revolutionize the recycling of textiles by turning waste cotton to new fibers. (Aalto University 2016.)

Driver 5. Innovative materials

Increased use of sustainable materials and finding proper substitutes for conventional polluting materials (such as cotton) is crucial for a better future. Substituting cotton might cut down garments' negative impacts by half. Out of already existing fibers, viscose and lyocell but also recyclable polyester are environmentally preferable options. (Pulse of the Fashion Industry 2017.)

Another alternative to cotton is to find completely new sources

for fibers and fabrics. Innovative cow manure-based fabric is under research. Other natural materials which were anteriorly considered as waste, i.e. citrus fruit, banana, pineapple, and sugarcane fibers might be used to make clothes in the proximate future. (Future of Sustainable Fashion 2017.) These processes utilize non-consumed waste into fiber resource. However, in order to make this sort of alternative and innovative materials work at broad scale masses, a shift in consumer mindset needs to be created so that they understand that new fibers can be as convenient as cotton (Pulse of the Fashion Industry 2017.)

Even more disruptive possibility for using novel materials could be to utilize plastic eating worms at the end of garments life cycle. The larvae could eat synthetic fibers which would reduce the risk of microplastics ending up in landfills and oceans (The Guardian 2017). Another possibility is to program fibers to utilize proteins derived from yeast, making a synthetic silk that can be machine-washed (Ecouterre 2017). Most of the radical innovations in fabrics are waiting to be further researched and commercialized.

Driver 6. Changing the paradigm

Education and awareness building is key when it comes to building a successful circular fashion system (Circular Economy club 2017) but also in all steps regarding promoting sustainable initiatives. Americans produce 40 times more CO_2 emissions than Bangladeshi, making western over consumption a critical issue to be addressed (Guardian 2017). However, with the growth of the global middle class, the demand for clothing and apparel will only increase in the coming years also in the developing countries. In order to avoid these new and becoming generations of consumers to adopting harmful habits, education and

awareness building should be started immediately and globally.

Changing consumer habits is certainly a challenge as people are vain and often behave in erratic ways. Shopping can provide adrenaline-like rushes and make people feel good. Often people buy new clothing out of impulses, without thinking if they are of any long-term use. This results in a poor product-person attachment which in turn results in low amounts of wearing. However, some signs are proving that it can be done. More and more millennials (people born approximately between 1982 and 2004, years varying from reference) are turning away from fast fashion apparel and searching for sustainably produced goods. Eco-minded consumers are adding pressure on fashion companies to change their unsustainable actions (Bloomberg 2016). Current consumers have become more conscious of environmental, social, and ethical issues concerns than before. The paradigm of consuming more and faster might possibly be shifted via education. Hopefully providing information will lead consumers to better habits and diminishing their own footprint. (Pulse of the Fashion Industry 2017.)

Two customer (and age) groups are expected to grow considerably in the future. These groups are the elderly and the millennials. In order for a fashion company to succeed in sustainable initiatives and in general, the companies should target both of these very different cohorts. (Business of Fashion & McKinsey & Company 2016 p 32.) The millennials are claimed to be the most sustainability-conscious generation so far. They constitute ¼ of the American population and billions of buying power. Millennials can make a difference by influencing the fashion industry with their habits & requests, thus impacting also the environment. One of the brands that speak to millennials is Reformation, a trendy and ethical brand. (Nylon 2016.) They communicate about sustainability in a manner that is easy to comprehend and relate to (Reformation 2009-2017). Similar and easily comprehensible

communication mode will hopefully lead to a more widespread awareness of sustainable practices and spark millennials to commit and do more when it comes to sustainable initiatives.

Driver 7. Extending lifecycles

One key to a more sustainable future is extending lifecycle of clothing. This can be achieved by laundering and caring for clothing correctly, repairing, and re-styling out-of-style clothes. Clothing libraries and other subscription concepts make the garment utilization rate higher consequent in a more efficient and longer lifecycle. Circular ecosystem, digital platforms, and performance economy initiatives create novel business models that allow consumers to have access to clothes without having to own them. (Future of Sustainable Fashion 2017.) In a performance economy service, the value is gained from paying only for the use of the good (= its performance) not from owning the good. These businesses can be described utilizing business models that to prefer access over ownership. Especially Millennials prefer having access to a product, instead of owning it. For them, the principle of access over ownership is quickly becoming the new norm. (Business of Fashion 2017.)

The main reason not to use the clothing in one's wardrobe is that it no longer fits properly (Future of Sustainable Fashion 2017). This conclusion could offer a potential to new business by offering consumers adjustable clothing. Ideally, people would stay the same weight and height throughout their adult lives. But since this is quite challenging to achieve by external factors, sustainable business ideas could come in useful. Sproutfit is making baby clothes that grow along with the baby, offering two sizes in baby's first 24 months instead of commonly used seven sizes (Sproutfit 2017). Danish Vigga is an example of

performance economy company, offering monthly renting subscriptions of baby and maternity clothes bags. Their slogan hashtag is telling "#TheDayYourBabysWardrobeBecameBetterThanYours!". (Vigga 2015.)

Companies can also try influence the lifecycle length by advising the consumers to act responsibly. A classic example of this is Patagonia which has adopted an educative and conscionable approach. They are advising customers to wash less and keep using the clothing for longer periods of time in order to get maximum use out of the bought clothing (Patagonia 2017). H&M's new brand Arket illustrated the desire to prolong lifecycles for in their children's wear neck tags (Fig 9). They claim the collection to be designed to endure playing of multiple children, and handed over to the next kid when outgrown. (Arket Instagram 2017).

Fig. 9. Arket children's wind jacket necklabel (2017). Pic. 6.

Driver 8. Support girls

At a first glance, it might seem that this driver is not directly linked to sustainability. However, when inspected it becomes clear that advances towards equality and girls' education are advances for climate change and a more sustainable future in general. To realize a broad spectrum and full potential of innovations from all genders, women's' beliefs in their technical innovations should be supported. Research (Future of Sustainable Fashion 2017) showed that females underestimated the value of their fashion innovation ideas when compared to males. I believe that if all commercial innovations are ideated by men, the world will remain male dominated with technological advancement often only concerning male issues. Fashion is generally seen as a phenomenon connected to female gender, which could potentially diminish the interest of male's technical innovations regarding sustainable fashion initiatives thus reducing the number of innovation that could advance sustainability initiatives.

Girls and women play a critical role in combatting climate change and sustainable development or as described by Wheeler & Hammer (2010 p 15) "Female education (combined with family planning) is cheaper and provides larger impacts on carbon emissions abatement than direct low-carbon energy options". An efficient strategy to diminish global carbon emissions is to slow population growth and overpopulation which can be achieved through education. Education empowers females which in turn makes families more resilient to climate change. (Girl Effect 2015). This conclusion can be derived to address fashion sustainability issues as well, as they are strongly interlinked with climate change problematics. Educating girls will potentially (and hopefully) increase awareness of sustainable fashion initiatives as well.

An example of a novel technological fashion innovation with low

interest in males comes from a close perspective. In 2015, together with Sumy Choi we developed a concept a wearable tech called Hottie. The concept was designed to relieve menstrual pain relief by a programmed heating pad on the abdomen in a shape of a skirt. Hip hugging skirt allows the heat of far infrared pad to fully penetrate the tissues, thus relieving the pain efficiently. The most male did not find the idea noteworthy. However, most females thought that the concept was truly needed and wanted to see it commercialized. During the creation process, we assumed a bit exaggeratedly and in generalizing manner that if men suffered from menstrual pain (4 years of pain in an average woman's life) it would surely have been cured ages ago. If most innovation regarding female matters is welcomed in a similar manner by men, it becomes obvious that innovations from both genders are truly needed in the future as well.

Pic. 7.

7.3. Key critical uncertainties

Future scenarios are influenced by a multitude of factors such as drivers, trends, weak signals but also by uncertainties that we cannot know. Predictability is a distinguishing factor, ie. megatrends are often determined by factors that are fairly certain to happen. (ICRA 2015.) Uncertainties can be distinguished as factors we are less certain about. Shocks or risks can also be labeled as unpredictable drivers. In the development of scenarios, threats, shocks or risks represent important shapers of events. Often it is challenging to determine probable or uncertain futures, as some factors may seem inevitable today, but might become unpredictable or not likely to happen in the future. When dealing with uncertainties, it is paramount to consider the probability of events and the possible impacts on the situation if these improbable events occur (ICRA 2015.) While thinking of fashion's future sustainable development some uncertain factors to be considered could be:

- How might megatrends such as resource scarcity, climate change, and demographic change affect the clothing industry?
- How might technological advancement develop and what are the consequences?
- What will consumer attitudes regarding sustainable consumption be and how much income will they have, and what will it be spent on?
- Could changes in the legislation impact the fashion industry? (Future of Sustainable Fashion 2017.)
- How might increasing terrorism, growing nationalism and post globalization affect the world order and economy?
- How much will the attitudes towards ownership change if at all?

Not all events affecting the possible futures are positive. I see that potential risks and threats of fashion's future sustainable development might possibly be:

- Consumers' lack of desire to adapt sustainable attitudes and consumption modes (such as continuing to embrace fast fashion businesses)
- Consumers' lack of willingness to give up ownership of clothing
- Lack of attainable sustainable choices (mainly affordable and accessible) or that the offered choices are undesirable to the consumers
- Lack of innovative materials that have a positive or neutral effect on environment or that these options are of low quality or undesirable
- Governments regulations that deny the importance of eco-design, resource scarcity, and transparency
- No longer having access to water (as the industry depends on it) because available water funds are restricted to alimentation purposes.

8.

Scenario process and methods

8. Scenario process and methods

This chapter looks into the actions, reasons and principles that lie behind the scenario creation process. The scenario report "Mending fashion - Future scenarios of sustainable fashion in Finland in 2035" can be found in a separate appendix at the end of the thesis. The report was made in a manner that allows it to work independently without the rest of the thesis.

Thesis' future scenarios are built by using the backcasting method. Backcasting and forecasting are both means to estimate the future but the way both approach future events are very different. In a forecasting process, past and present data is collected and future possibilities are taken into account for estimations for future. As opposed to this, scenarios using the backcasting method are constructed from the distant future toward the present. (Demos 2015.) In a backcasting process, the starting point is the desired future state and actions are adjusted by asking, "What do we need to do to get there?" in order to reach the target. The scenario creation process is described below in figure 10, however, in reality, the process was not linear and involved many steps back and forth.
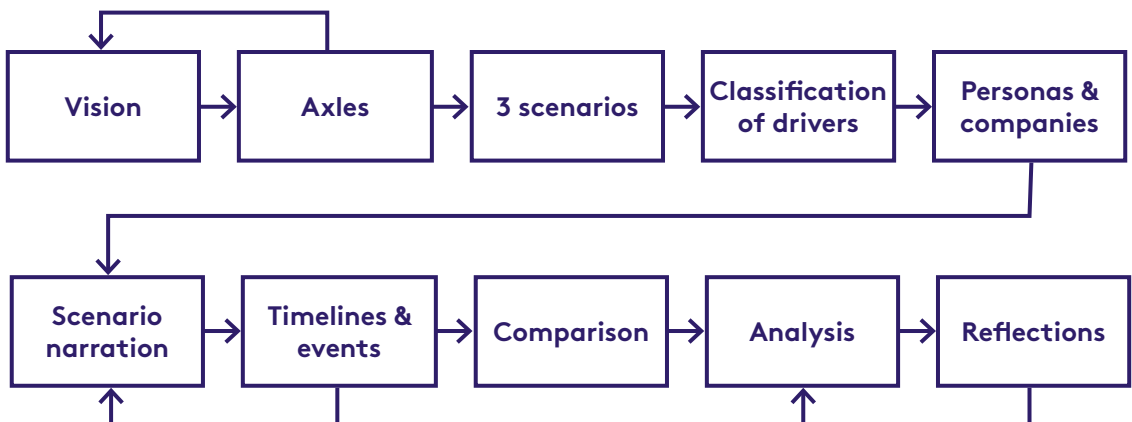

Figure 10. The scenario creation process

After the necessary information was gathered from literature review, online research and environmental scanning, the next step involved a vision that was created for all scenarios. Next, in order to obtain an outcome with different scenarios, a table with two different two-way axes was formed. I decided to utilize two different attributes that are of high importance and similar uncertainty to the thesis' scenarios. These two attributes form a tension between them. The tension is utilized to create a quadruple table. The attributes are:

– How sustainable is the industry?
– How advanced is the technology?

Based on these attributes quadruple table was formed. The table (pictured on the next spread in figure 11) enabled identification of four distinct scenarios. The scenarios are guided by the vision and are trying to find ways to reach the vision. The vision goes followingly:

"Fashion industry will be fully circular by 2035 and use only recycled or other sustainably sourced materials and respect social needs of people throughout the whole supply chain."

The fourth possible scenario with low levels of sustainability and low levels of technological advancement does not support this vision. Also in the light of current knowledge, a scenario with these premises does not seem very likely to occur, making it more like a dystopian story than a viable scenario for strategy building. Thus, it has been left out of the final three scenarios. Three scenarios that are further developed are:

1. Scenario patches: high sustainability, low technology
2. Scenario sensors: high sustainability, high technology
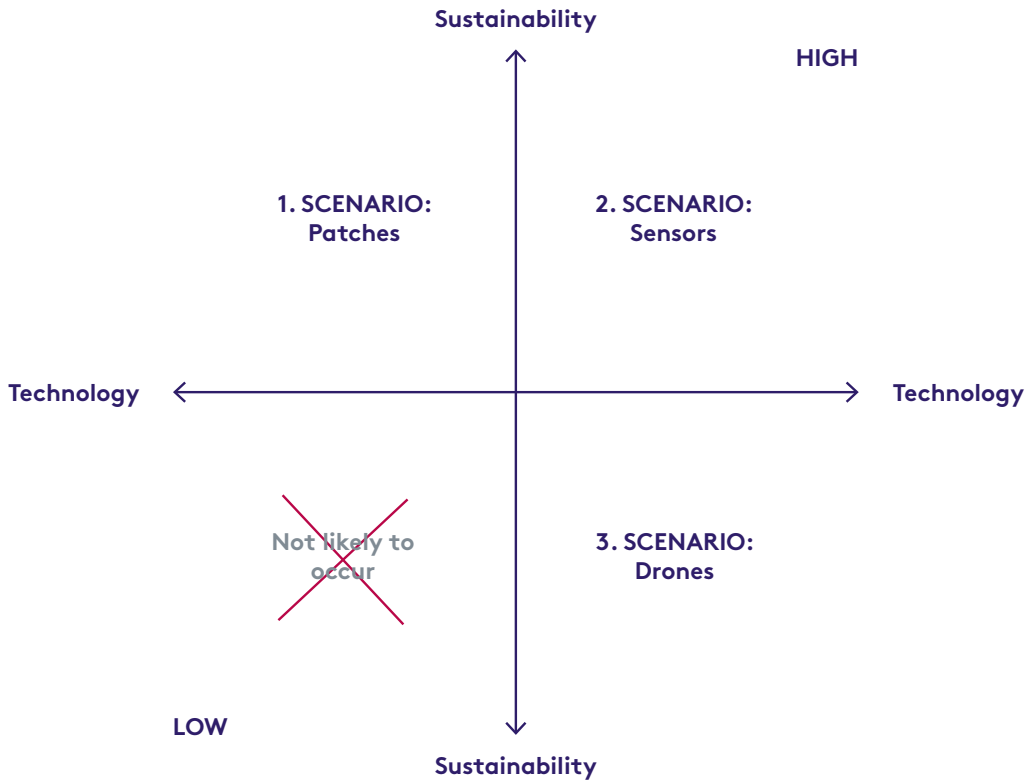3. Scenario drones: low self-expression, high technology

Figure 11. The quadruple scenario table

In order to build functional, purposeful structure, and similar attributes to all three scenarios, I used the drivers (presented in chapter 8) in forming of scenarios paths. Drivers are separated into two or three parts, mainly with the division of "low-some-high. The table is pictured in figure 12 on the next spread.

       In the first scenario "PATCHES" the sustainability level is high and technology level is low. The name of the scenario originates from the use of patches to mend clothing.

In the second scenario "SENSORS" both sustainability and technology levels are high. Sensors represent the constantly connected society where everything is monitored and measured.

In the third scenario "DRONES" the sustainability level is low and technology level is high. Drones deliver products to the doorstep in an increasing pace and represent the high speed and hyperconnected shopping habits.

The driver "support girls" was left out of the final outcome. Having this driver in the scenarios proved to be too value charged and resulted in feminist/chauvinist world views that took the attention and focus away from the original starting point of fashion sustainability. Thus, the driver was removed from the scenarios. However, despite the removal from the final scenarios I feel that "support girls" driver should be left in the thesis because is still a crucial phenomenon to be included in the future fashion's sustainable development.

After the identification of the characteristic of the scenarios, three personas and three example companies were created in order to facilitate narration and comprehension. In general, personas are used to represent a group of customers. Having a persona and a company makes comparisons between the three scenarios easier to perceive as similar factors are kept throughout all three scenarios. Later, the main events were created on the timeline by using the backcasting method. Lastly, the information gathered from the finished scenarios was compared and analyzed.

The scenarios are mainly focused on Finland. However, since fashion is a global industry, it is impossible to discard the global changes in the economy, environment, and attitudes. Thus, the scenarios deal also with a larger image of the state of the sustainable fashion in general, not just Finland. The events in the scenarios are reflected not only in larger Finnish society but also to the persona and company.

While the scenarios are fictional, they do draw on drivers and wider ecological, technological, demographic and governance megatrends.

At this point the reader is asked to familiarize with the final scenarios which can be found at the end of the thesis as a separate appendix report.

When finished reading the scenario report (in appendix 1) the reader is requested to return to the thesis' chapter 9. The scenario report includes summaries of megatrends, drivers, and uncertainties in order to create an understanding of the necessary grounding information and background for the reader if the report is read without the help of the thesis.

	1. SCENARIO: PATCHES	2. SCENARIO: SENSORS	3. SCENARIO: DRONES
Sustainability & technology	High sustainability & Low technology	High sustainability & High technology	Low sustainability & High technology
Transparent supply chains	Some efforts	Fully transparent & effective	No transparency
Innovative materials	Only traditional materials	Substituted materials, no cotton	Substituted & traditional
Extending lifecycles	Long lifecycles	Circular lifecycles	Clothing dumped in landfills
Reinventing recycling	Traditional recycling	All materials are recycled	Low level of recycling
Technological advancement	Low advancement	Medium advancement	High advancement
Close the loop	Traditional production methods	Circular fashion methods	Some initiatives
Changing the paradigm	Consuming habits changed	Some habits changed, some remain	Consuming craze

Figure 12. The driver table

9.

Analysis

9. Analysis

The literary review allowed me to answer the first research question "What are the main drivers and trends that are expected to impact fashion industry in the next decades?". Studying relevant literature, along with the conducted online research of the most current reports, enabled me to identify the latest developments, as well as the main drivers and trends that are expected to impact fashion industry in the next decades. It was concluded that the most relevant drivers that were identified are:

1. Technological advancements
2. Transparent & improved supply chains
3. Close the loop
4. Reinventing recycling
5. Innovative materials
6. Changing the paradigm
7. Extending lifecycles
8. Support girls

Taken together the information retrieved from literature and online research, the results suggest that identified drivers and megatrends are relevant and plausible. They are expected to have a great impact on both Finnish and global fashion industry but also in consumer behavior and business strategies. The choice of these factors means a certain direction to the scenarios and also to the conclusions of the thesis. The drivers and megatrends guide the development of the scenarios, if they were others, the scenarios would be different also.

The second aim of this study was to investigate whether the future scenarios can help in crafting sustainable fashion design strategy. The fulfillment of this second research question is further inspected in

chapter 9.1. The present study was designed to determine the effects of drivers and megatrends on Finnish fashion industry's sustainable development. Overall, this study strengthens the idea that scenarios may offer diverse perspectives that can be useful in planning future actions. The full analysis of the scenarios is divided into three parts (process, takeaways, and meaning for design strategy) and further detailed in the coming chapters.

9.1. Observations of the scenario process

Futures research is not an exact and quantifiable science as the result of the scenarios depends on methods used and the skills of the practitioners involved. Initially, I assumed that co-designing the scenarios would affect the end result of the thesis highly, not only because the process involves various people but also because not everyone taking part in the process is a professional of the field (also customers were meant to take part in the process). Co-designing the scenarios add to the challenge level of the process. As more people are involved, more variable factors there are to be looked into. Hence due to time restraint and other resource challenges, I was forced to create the scenarios on my own. One can merely guess if the end result would have been more complex, than just with my own individual input. To say the least, the outcome would have certainly been different. However, as I assumed already in the beginning of the process, one cannot deny that there is also a risk of not fulfilling the goal of co-creation and that is what occurred. Nonetheless looking at the end result of finalized scenarios I am content at it regardless the lack of co-designing.

Using more than just a few futures research methods (environmental scanning and backcasting) might also have benefited the scenarios and possibly brought more diversity and depth to them. Possible

methods used could have been analysis of weak signals, which might have given additional information to drivers. Delphi is a good tool in future forecasting, however, for the means of this thesis, the process is too long and laborious. While creating future scenarios it is to be noted that the background of the forecaster always affects the end result. In my case also the education, values, expertise and personal views have surely impacted the outcome as subjective view guides the process and research even though proved neutral methods and tools were used. Forecasting does not take place in a sterile vacuum, rather it is affected by constantly changing external and internal factors.

The advisor suggested that the scenarios would be tested with a panel consisting of fashion professionals. Testing the scenarios would probably add value to the scenarios and certainly offer precious feedback in order to determine whether the scenarios are viable future developments. However, even when tested the level of professionalism and personal views would also affect the feedback given. Feedback given might lead to an open discussion of the benefits of the phenomena described in the scenarios. While dealing with sustainability issues, a discussion should always be welcomed as an outcome. These observations point out well the nature of futures research and scenarios. It is almost impossible to create objective paths when different individuals with diverse viewpoints are involved. Regarding the panel discussion, it is always a possibility to arrange the feedback discussion after the thesis is finished.

How can one then tell whether the scenarios are good and useful for strategy building? It is to be noted that the scenarios should always be reviewed by their ability to facilitate decision making and certainly not by the accuracy of the forecast (Glenn & Gordon 2009).

Glenn & Gordon (2009 p 3) state that good scenarios should be:

- Conceivable and rational.
- Consistent by addressing comparable issues throughout the scenarios.
- Compelling enough to evoke strategic actions. (Glenn & Gordon 2009 p3.)

The evidence from this study suggests that all of the three above points can be judged as passed. However, an implication of this is, the possibility that this only my own personal and subjective view. But naturally, an external critic could give a more objective verdict.

9.2. Implications of the scenarios

Like mentioned earlier, sustainability is a fuzzy topic with a multitude of complex factors to be looked into. The deeper meanings of the scenarios can be noticed by investigating and comparing them. Further inspecting the differences, but also the similarities of the scenarios enables understanding the complexity of the sustainable fashion. In order to advance sustainable initiatives, there are several possibilities and different paths for both the consumers and companies. Observing potential future paths facilitates clarifying and categorizing the most relevant prerequisites of sustainable development. A single solution that could fix all problems does not exist as the challenges are complex, hence so are the solutions as well, at least for the time being. However, a few generalized guidelines could be identified from the scenarios. The remarks are findings that, as the evidence suggests, might possibly add value to any company operating

within the fashion field and/or affect the mindsets of the consumers.

Even if only one of the scenarios (number 2 Sensors) showed capabilities in adopting circular economy principles, it does not diminish the importance of circular fashion business models, rather on the contrary. Companies should move away from the current linear 'take, make, waste model' to a circular model, where natural resources are employed effectively. Concretely, shifting to a circular business model means commencing the design strategy with a focus on the next use and recyclability of the finished product and its components. This should be achieved by choosing adequate materials that can be fully exploited in a circular production process. If one wishes to design new products for recycling already, potentially a groundbreaker in company strategy as it should be implemented already in very grounding parts of all actions. The current linear process can simply be described as in fig. 12:

Figure 12. Linear & circular processes
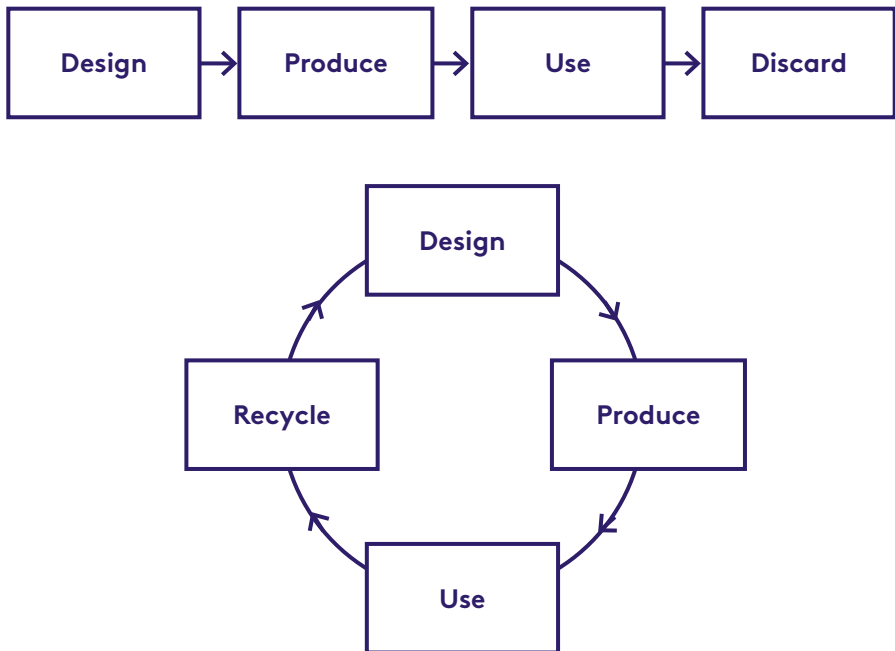
Scenario number 1 Patches describes a society where technology isn't a key enabler of sustainability, but despite the lack of major innovations, positive attitude towards sustainability drives initiatives already considerably. Scenario number 1/Patches points out the abilities of senior citizens consuming powers. Too often they are not seen as valuable assets with purchase power, but with prolonging lives maybe this faulty assumption could be seen otherwise. If more companies would offer attractive products to elderly the impact could be noteworthy as often they are responsible consumers and willing to recycle and sort waste. Interest in various makers movements could also offer business opportunities to supporting businesses and services and also to the suppliers of the raw materials - be them recycled or virgin or both.

The scenario number 1 Patches also touches on paradigm change. Instead of getting rushes from shopping new clothes, the focus of interest is moved towards new experiences and making with your hands. Handicrafts are proven to efficient in combating stress, which is a very welcomed ability in western societies. Good memories from cherished experiences also tend to last longer than modern day clothing. However, it should be noted that when driving successful sustainability initiatives, proper use of technologies could speed up the process considerably. Changing mental models, although crucial, is not enough, as resources and industrial innovations are also required.

Scenario number 2 Sensors portrays a technology and innovation driven society, where advances in technology are combined with an environmentally positive mindset from governance to the grassroots levels and harnessed for the good of the planet and its inhabitants. Scenario number 2 Sensors presents a situation where circular design principles have successfully been spread among companies as well as the consumers. The good for environment and technology are not mutually exclusive, both can reside and support each other simultaneously. For fashion

companies, adopting circular design principles would be a revolutionary turn. Steps to reach this major change should be done little by little. In achieving the goal, technology plays a major role, however, it requires human-led innovations and also a demand from consumers to drive the desire of companies to invest in circularity. In a situation, where raw materials have become scarce, adopting circular design principles is the only viable option existing if one wishes to respect the planetary boundaries while ensuring economic growth of both businesses and societies and keeping the growing global population clothed.

As opposed to the previous scenario, number 3 Drones illustrates the downside of focusing only on technological and monetary benefits. If the economy is placed before environment on the governance level, there is a potential risk that the good of business will exceed the sustainable initiatives, thus harming the environment even further. If the state of the society would continue to develop like pictured in the scenarios, it would finally lead to overuse of natural raw materials, an evolvement which the Earth is not able to sustain. The scenario number 3 Drones describes business opportunities to various logistics companies, 3D printing and software specialists. All of these are fields, where Finland has traditionally been quite strong and competitive, could seek further succeeding in the future as well. This scenario number 3 Drones can be perceived as somewhat negative. However, in order to grasp a holistic view of sustainability, diverse views are needed. Unfortunately, development like this is not a mere utopia, but could happen anywhere in the world, and to my knowledge it is already taking place.

9.3. Meaning of the scenarios for the design strategy

The second research question was "Can future scenarios help in crafting sustainable fashion design strategy?". As the process went on and was close to the finishing, it became obvious that further research would be needed in order to find a proper answer to the second research question. Due to some limitations of the study, mainly in a qualitative research that could not be executed within the resources and limitations of the thesis, direct evidence proving whether the scenarios can facilitate fashion design strategy work, could not be drawn from the thesis's outcome and scenarios. Whilst this study did not confirm the usefulness of scenarios for strategy creation, it did substantiate my initial assumption. Despite the lack of concrete evidence, I still see that the scenarios can offer at least food for thought and valuable novel perspectives that might facilitate strategy creation process.

When creating sustainable design strategies, holistic view of the lifecycle of the products but also on the whole system of the fashion industry is required. According to Rubin (2004) scenario work supports strategic thinking and decision-making, helps making the strategy more flexible and smarter and also encourages creative thinking. Scenario work can be used to design the organization's operations and to establish strategies in times of uncertainty when more conventional methods and tools for strategic planning prove to be unreliable. (Rubin 2004.) According to these conclusions, any company operating in the current challenging fashion field could thus only gain from future scenario processing.

Often when processes are highly complex and intertwined, multidisciplinary cooperation is needed in order to exploit of the whole systemic viewpoint. In my opinion, sustainability should always be a holistic starting point of all of the companies that require will and

commitment that starts at company's strategy. Decision-makers should be provided with information (eg. like one in this thesis) in order to make well educated and far sighted choices. In order for sustainable initiatives to take place at the core of businesses' strategy and in the end to make the sustainable design strategy realistic, imagining alternative possibilities and future envisions is needed.

Even if the company is not very future oriented or ready to adopt novel technologies such as wearables or adding chips or adopting circular methods, I assume that the scenarios might offer some very concrete future steps for the strategy building. These steps could for example orient the choice of fibers/materials used in current day and direct the future development. Scenario creation might offer tools and ideas not only to the managers but also to the individual designers. A designer could contribute by designing products that ie diminish washing if not able to make structural changes to the company. For example, this kind of product could be a jersey sweatshirt with a multicolored pattern where dirt stains would blend in.

Like mentioned earlier, the adeptness of the use of future scenarios for strategy building would require further research. Since the process did not involve the co-created scenarios like originally envisioned I could not find evidence that would clearly state, that the scenarios are useful for strategy building. However, my assumption of their usefulness has grown stronger since they have proved to be an excellent tool for providing new thoughts, information and novel viewpoints. Scenarios, especially if co-created with diverse stakeholders, engage different stakeholders and actors far more than one linear strategy, thus offering more complex ideas that are easier to commit to.

"Scenario work supports strategic thinking and encourages creativity (Rubin 2004)."

10.

Reflections and discussion

10. Reflections and discussion

The thesis process has allowed me to gain a holistic understanding of the systemic changes that sustainable fashion is facing, but also the possibilities and chances that lie within those challenges. Like discussed in the previous chapters, the aim of futures research is never to predict a specific future, but more likely to challenge one's thinking and mental models in a constructive and creative way. This thesis has discussed the various and diverse ways that sustainability could develop in Finland in 2035. The purpose of the current study was to determine the relevant trends, drivers and uncertainties that affect sustainable fashion in in Finland in 2035, both from the viewpoint of consumers and businesses. The literary review in chapter five, enabled me to identify the most relevant trends, drivers and uncertainties. They are fully described the in chapter seven and later summarized in the scenarios appendix (found at the end of the thesis book).

The second aim of this study was to investigate the effects of the scenarios in creation of design strategy. The evidence from this study suggests that, question of whether the scenarios can facilitate fashion design strategy work or not, would need further research. Maybe quantitative research could offer more precise insights, whether the companies can really draw value from futures research and foresight. After finalizing my thesis with the futures research methods my assumption remains unchanged. Overall, despite its limitations, this study strengthens the idea that scenarios are a valuable tool in provoking novel mindsets and innovations. In my opinion, all companies could benefit from strategic foresight gain value from correctly aimed future scenarios.

Initially, I thought that many companies would rejoice in taking part in a future scenario process. However, as the process went on it became clear that companies contacted were reluctant. Mostly and

surely this was due to lack of time and being busy. However, it also crossed my mind that maybe fashion companies I contacted were not optimal to address the issue with. Maybe they are so tied up in their daily businesses that future visions in 18 years from now do not seem like an urgent matter to discuss. This might of course lead to lack of vision and "bumper" against future challenges. Even if the visions of the scenarios cannot (and should not) be implemented in their exact form, certain trends, applications and technologies relevant to any company within the fashion field could be identified. I see that most companies could benefit at least from the awareness of the megatrends, drivers and the uncertainties.

During the thesis process, it became clear that the result and the process might benefit from few alterations. The alterations are explained in the previous chapter also, but summarized here: Using more than just few futures research method (environmental scanning and backcasting)) might benefit the scenarios and bring more diversity and depth. The scenario process could further benefit from being co-created instead resulting from an individual output. Also, testing could offer potential development comments that could be used to enhance the final outcome. Quantitative methods could potentially also offer value to the research.

Many sustainably inclined people and organizations often propose reducing consuming as a solution to sustainability issues and dilemma. They also recommend having clothing made to measure and only choosing curated and classical pieces to one's wardrobe. However, to my ears, these suggestions sound like richsplaining, a term that can be described as a wealthy person explaining to a poorer in a condescending and/or patronizing way. Not everybody can afford to choose high quality (=expensive) clothing without even going to think about tailor-made garments. Even though these pieces would become cheaper in the long run, the statement sounds hypocritical, since most people on the planet are not privileged enough to make this sort of choices, and are "forced" to

turn to cheaper and more available options.

That is the reason that we still need affordable and mass produced sustainable clothing. Performance economy and all sorts of clothing service will surely spread more widely and become more popular, but they are not enough to solve the whole equation. Accordingly, I see that future scenarios could offer possible hints of solutions on ways how to reach sustainable mass-produced fashion and also describe how the adoption of performance economy could be enhanced.

Mass-production could be made healthier by adopting circular methods. Currently, most fashion design production and supply chains are linear. They start from design and move through the process a straight line. The environment could largely benefit from turning this linear process into a circle. The devotion for advancing circularity is one of the main takeaways of this thesis. Even though circular fashion cannot answer to all of the fashion industry's current sustainability challenges, it is the most crucial resolution that the industry can offer within the scale of mass produced garments for the growing global population. The scenario 2/SENSORS touches on implications that circular production methods could offer to Finnish companies. Circular production requires heavy investments but also shift of consuming habits of both companies and customers.

Fashion has always been a dream builder and a seller of an ideal that should be chased after. This ability to provide needs and create desires and dreams should be harnessed for the good of the planet instead of destroying it. The fashion industry is great at triggering impulses, now these desires should just be directed to more sustainable consuming patterns.

In addition to the contemplation above, the thesis process also evoked other interesting questions, thought, and topics. As a continuation to this thesis it might be interesting to address following as research topics

in the future.

While starting the thesis process, my goal was to benchmark existing successful sustainable business models. As the process went on, it became clear that this could be a topic of a thesis on its own, hence making it impossible to keep within the framing of the thesis. In the future, it would be interesting to assess what really is the key differentiator in building a successful sustainable fashion business model?

Further, concerning sustainable fashion, the key question needed to ask is how to provide people with novelties that do not cause harm to the planetary boundaries? How can the need for neophilia (which is almost a basic need and linked to human curiosity, thus very unlikely to disappear) is very like be spurred in a healthy way? Sparking novelty needs in a sustainable manner could be worthwhile and interesting topic to research.

When talking about sustainability, systems thinking is often referred. I assume that systems thinking is not a familiar concept to many working within the fashion field, although the industry would benefit largely from adopting a more systems inclined way of thinking and seeing the world. As a further study, it would be useful to enhance understanding of the systems that relate to fashion and their interlinkage to other systems.

According to my opinion, there is no one quicker to criticize and find multiple aspects on matters than sustainability-minded people. Business growth is seen as evil, no advance is ever good enough, there is always a downside to new initiates, always a more optimal solution and guilt free options do not exist. This might create frustration and despair among people who are seeking for more sustainable options and finally lead to fatigue, indifference, and anxiety causing people to stop caring and acting upon. The phenomena can be described a s cognitive bias, or a negativity bias, where the brain shows more sensitivity to disagreeability,

meaning that bad new affect the brain and its attitudes easier than positive (Psychology Today 2004). We simply remember negative things better and in the future, do everything to avoid the issue. That is the reason that sustainability as a concept should be neutral, something that is built within all our actions. When taking all this to consideration, next interesting topic could be to research how sustainability could be better addressed, instead of guilt and worry with positivity and energy. Would it make a difference, could more positive approach trigger desire for change?
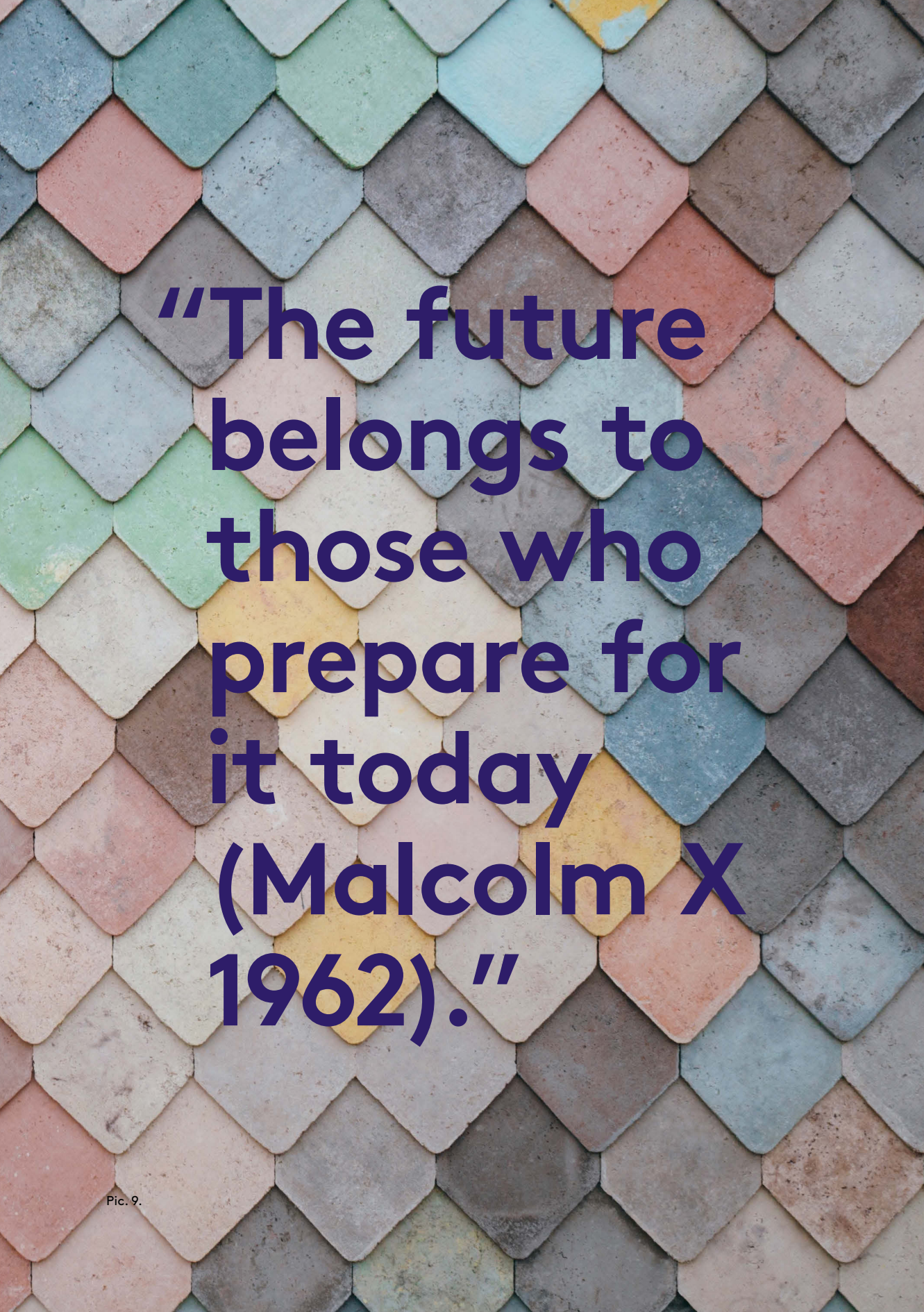
11.

Afterword and acknowledgments

11. Afterword and acknowledgments

This thesis would not have been finished without the faith, discussions and endless support from Sami, for that I am very grateful. Thank you also babysitters, mum and Tipi, who enabled the whole thesis. I also want to thank Kirsi, my advisor, for your comments and support throughout the process. Thank you Selja, my dearest daughter, for bringing joy and putting things to perspective.

Finishing the thesis while being on parental leave sometimes felt like a gigantic endeavor that required faith, sheer stubbornness and finding the long-lost ability to concentrate. I believe that this feeling can be mirrored on a tiny scale to match the way that consumers and companies (at least the ones that have at least some amount of awareness) are currently feeling while facing the massive challenge of sustainable fashion. Having a desire to advance sustainability is almost like possessing simultaneously a rare mix of naivety and cynicism. However, enthusiasm and sometimes even naivism is needed in order to keep up an entrepreneurial mindset in a cynical world, while trying to combat sustainability challenges.

The goal of this thesis was to create alternative views on sustainable fashion's development in Finland and a vision how the challenge of mending current fashion systems could be completed without hampering planetary boundaries. Diverse and parallel views on sustainable fashion in Finland were built in order to shed light on glimpses of potentially possible futures. Some hope on how this arduous sustainability dilemma could be probably be solved was beamed, in the way how the drivers discovered could be utilized. Change-makers attitude should be harnessed for the big future shift advancing the change for a more sustainable future.

"The future belongs to those who prepare for it today (Malcolm X 1962)."

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Picture references

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Mending Fashion

Future scenarios of sustainable fashion in Finland in 2035

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Preface

This report presents three future scenarios of sustainable fashion in Finland in 2035. The objective of the scenarios is to illustrate how the relevant trends, drivers and uncertainties might affect sustainable fashion in Finland in 2035 and also to develop a long-term view of a more sustainable future development. The scenarios are presented in a narrative and fictional but still plausible manner with a view on three diverse and possible futures. Each of the three scenarios reveals new aspects and diverse prospects of sustainable fashion in Finland in 2035. Even though scenarios represent diverse perspectives, at least some parts of them they could take place simultaneously in a Finnish society in the year 2035.

This appendix was designed to be read as an independent report of my thesis "Mending fashion - Future scenarios of sustainable fashion in Finland in 2035" (Hovi 2017). However, despite the report's independent nature, in order to grasp the full analysis and further conclusions, please see the thesis book.

Contents

1.

Introduction

1. Introduction

The world's second most polluting industry, fashion, is currently facing a massive challenge: how to design and produce clothing for an increasing global population without further harming the environment. This scenario report presents three diverse future scenarios of sustainable fashion in Finland in 2035. The objective of this scenario report is to illustrate how the relevant trends and drivers might affect sustainable fashion in Finland in 2035. The goal is also to develop a long-term vision of a more sustainable future development and in addition, to study if the three scenarios are able to reach this vision. The vision goes:

"Fashion industry will be fully circular by 2035 and use only fully recycled or other sustainably sourced materials and respect social needs of people throughout the whole supply chain."

Foresight and futures research methods, such as scenarios, are known to support in shaping the future (Bontoux & Bengtsson 2015). This report presents the relevant trends and drivers affecting global sustainable fashion field as well as points out Finland's particular strengths and weaknesses within it. The report lays out possibles changes in the field and provides food for thought in order to reach a more sustainable future.

Scenarios are created using the backcasting method. Even though the scenarios are presented in a narrative way, the purpose is to illustrate both plausible and possible futures. Each of the three scenarios highlights diverse views and aspects on sustainable fashion in Finland in 2035. The topic is firstly familiarized with literature review and further continued with an online study. Following, an environmental scanning is

performed in order to identify relevant trends, drivers, and uncertainties that are likely to affect sustainable fashion in Finland in 2035. Next, the acquired understanding is used as the basis of the future scenarios. For each scenario, personas and exemplary companies are created in order to facilitate the narration and comprehension of the possible future paths. Finally, scenarios are compared and their possible effects are analyzed. The principle behind the scenarios is that, although it is not possible to know what future will bring, it is possible to influence some elements of it.

1.1. Finland in 2035

In the year 2035 Finland is an independent country and part of the EU. Finland's population has reached 5.8 million and at the same time the population has gotten older, as the number of people over the age of 65 has risen from 20 % in 2015 to 26% by 2030. Dropping birth rate has caused the number of children and youngsters under the age of 15 years to be poorest since the year 1894. (Tilastokeskus 2015.) Rising number of immigrants and refugees has impacted the falling birth rates by increasing them slightly. In 2035, the global population has reached 8.6 billion which has caused stress to already scarce raw materials and energy (Bontoux & Bengtsson 2015).

Due to the climate change, global warming has sadly reached +2°c, causing the sea levels to rise and hampering agriculture and surrounding infrastructures (Bontoux & Bengtsson 2015). In Finland, the climate change can best be noticed during winter time. The southern parts of Finland rarely get to see any snow. Lack of snow makes winter's darker and rainier. Also, due to the climate change, taxation on all animal products has been increased, augmenting the price of meat and also animal based fibers considerably. Meanwhile, vegetarian diets have

become more popular hence increasing also the use of insects as human alimentation. (Helsingin Sanomat 2017.) Veganism has also decreased the demand for animal based textile fibers, such as wool.

Continuous urbanization has led to ever enlarging cities in Europe and also to huge megacities in the developing countries (Bontoux & Bengtsson 2015). Following similar development, Helsinki is now a rapidly growing city. The enlarged city center is connected to other developing suburban centers with a focus on rail transport networks. Helsinki city is on its way to reaching the goal set to become greenhouse emission-free by 2050. Helsinki has gained almost 250,000 new residents and at the same time, the city has become nearly car-free thanks to the decision made in mid-2010's to emphasize sustainable transport modes such as walking, cycling, and rail operated public transport. (City Planning Department of Helsinki 2013.)

The World has become hyperconnected. The change has been enabled by exponential technological and scientific development. In 2035 the decision-makers in power are the first generation of digital natives who master digital technologies with ease. (Bontoux & Bengtsson 2015.) In a hyperconnected Finland, the Finnish language still has solid grounds, but the position of Swedish language has weakened (Helsingin Sanomat 2017). English is widely used in the service sector but also in media and workplaces. Due to hyper connected society, the country borders have become vaguer allowing goods and people to circulate freely. Intelligent systems have penetrated the society, intelligent housing, automation, and self-driving vehicles are all widely utilized. Owning a car (and also other consumer goods) is no longer a necessity because renting is cheap and easy. (Helsingin Sanomat 2017.)

In 2035 Finland remains as a country of high technology, especially health technology is a rapidly growing business area. Service exports, especially expertise services, have exceeded the value of goods

exports. Workers are increasingly required to adopt new tasks and skills. Advances in artificial intelligence have caused the ability of the robots to auto learn and develop independently. New technologies can also easily modify the genetics of people, animals, plants, and microbes. Discussion of the ethicality of genetically modified humans is heated. (Helsingin Sanomat 2017.)

2.

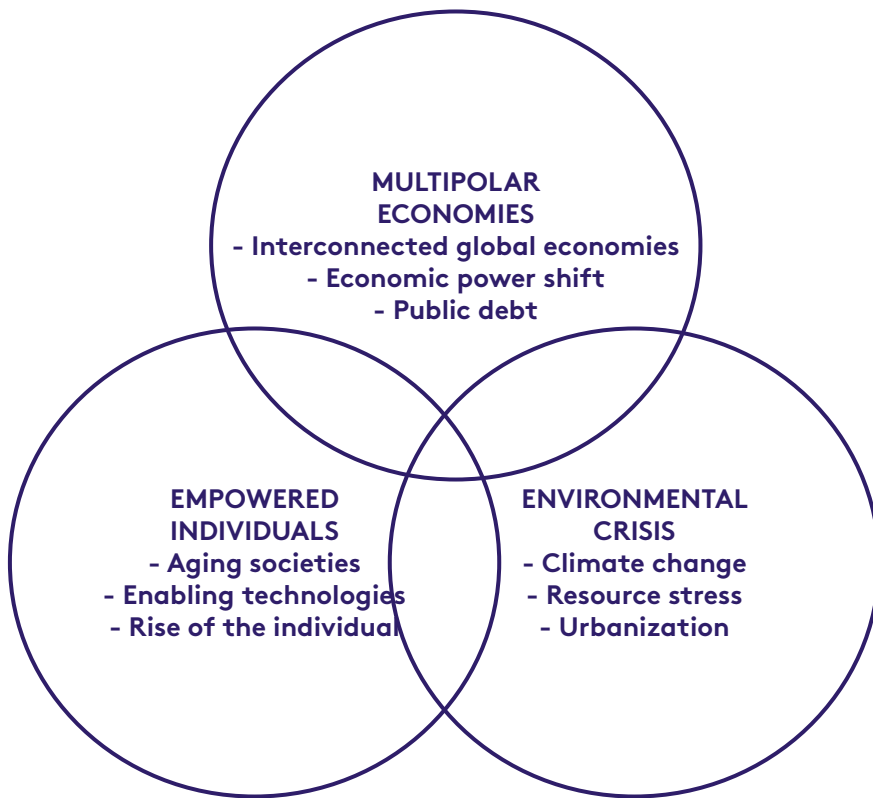# Megatrends, drivers and uncertainties

2. Megatrends, drivers and uncertainties influencing sustainable fashion in Finland in 2035

Future scenarios are influenced by a multitude of factors such as megatrends, drivers and also by uncertainties, things that we cannot know. This chapter presents the key factors that are expected to influence sustainable fashion in Finland in 2035. Firstly, megatrends are presented as they lay out the setting of the future milieu by reflecting long-lasting structural changes of society. Secondly, drivers and uncertainties are familiarized. The aim of this chapter is to seek an answer to the question:

"What are the main drivers and trends that are expected to impact fashion industry in the next decades?"

2.1. Megatrends

A megatrend can be defined as a large, transformative global force and a long-term change that affects governments, societies, economies, and environment permanently and globally over a long period of time. Megatrends are global, but their implications are local. Changes in the global demographic, economic or geopolitical developments involve Europe and Finland as well. The megatrends affecting this report are grouped into three clusters that reflect changes in the societies, the global economy, and the physical environment. The megatrend clusters are pictured in the fig. 1 .

MULTIPOLAR
ECONOMIES
- Interconnected global economies
- Economic power shift
- Public debt

EMPOWERED
INDIVIDUALS
- Aging societies
- Enabling technologies
- Rise of the individual

ENVIRONMENTAL
CRISIS
- Climate change
- Resource stress
- Urbanization

Fig. 1. The megatrend clusters.

Megatrend 1: Environmental crisis

Climate change is causing erratic changes to the environment and distressing the resilience of ecosystems (KPMG International 2014). Possible impacts may include increases in extreme weather and rising sea levels, that hamper farming, hunting, and fishing (PWC 2013). Substantial natural resources like water, arable land, clean air, and minerals are in peril due to overflows of consumption. If global population would consume natural resources like the Finns, 3.5 Planet Earths would be needed every year. (Sitra 2016.) Resource (such as water, food, arable land, and energy) stress is caused and further aggravated by population growth, economic growth and climate change (KPMG International 2014). Asia and Africa are expected to foster 90 % of the future global population growth (Demos 2015). 2/3 of the world's population will reside in big megacities by 2030, and most of this urban growth will occur in developing countries.

Megatrend 2: Multipolar economies

The focus of global growth has shifted, and the new multipolar world leaders are the US, China, and the EU but the developing countries in Asia and some parts of Africa will become more prominent (Sitra 2016). Developing countries will account for more than half of global GDP, which lifts millions of people out of poverty (KPMG International 2014). Territories are a complex economic mix consisting of trade, investments, and financial systems. People, goods, ideas, and services roam around the world fluently. (Sitra 2016.)

Megatrend 3: Empowered individuals

In 2030 8.5 billion people will need to have clothing to wear. The population has become more urban, wealthier, and more educated. (Demos 2015.) By 2022 more people are part of the middle class than poor. Advances in education, health, and technology lead to empowered individuals. 75% of global population will own a mobile phone, making the number higher than access to clean water, electricity or a bank account. (KPMG International 2014.) Growing global middle class will increase the demand for food, water, and energy considerably. Aging populations, fewer children, migration, and urbanization will lead to a discrepant world in 2035.

The pace of technological advancement is exponential. Digitalization will facilitate solving problems regarding urbanization, resource scarcity and aging demographics (Demos 2015). Novel industries and automation may have a significant impact on world's manufacturing systems and the companies that operate within them (PWC 2013). Technology can reinforce the empowerment of people within the planetary boundaries by the aid of novel forms of sharing economy and innovative initiatives (Sitra 2016).

2.2. Drivers

Drivers, cause or might cause, changes in systems or organizations. These drivers may be changes in social, technological, environmental, economic and political factors. (Rubin 2004.) They can be described as internal forces, such as knowledge, or/and as external forces such as an economy, competitors and technologies used, that shape the future (Business Dictionary).

Gathering drivers for scenarios is a complex process that combines analytical and intuitive methods. Information is retrieved from literature, magazines and online sources and later analyzed and clustered. Many of these drivers are highly interconnected and share similar aspects, but to serve the thesis and scenario building process, they are divided into eight different driver clusters. The drivers are:

1. Technological advancements
2. Transparent & improved supply chains
3. Close the loop
4. Reinventing recycling
5. Innovative materials
6. Changing the paradigm
7. Extending lifecycles
8. Support girls

Drivers are sorted in a way that creates a flow of connected phenomena. First five drivers depend strongly on technological advancements. The last three drivers, changing paradigm, lifecycles and supporting girls are more related to shifting current behavioral patterns. Next chapters explore the eight main drivers of sustainable fashion development that in my opinion, can be characterized as most likely to affect the future.

Driver 1. Technological advancements

Until now the full potential of digitization has not been reached in the fashion industry. Audacious technologies are creating disruptions that might cause vast impact (Pulse of the Fashion Industry 2017.) 3D printing

could be a key enabler to a better future by contributing to personalized clothing, rapid prototyping and local, on-demand and no waste production (Pulse of the Fashion Industry 2017).

Classically technology in clothing has been regarded as wearables, but garments might help to make life a bit better by monitoring and staying connected to the internet of things (Future of Sustainable Fashion 2017). Digitalization might offer better means to work towards transparency in the supply chain (Future of Sustainable Fashion 2017) by enhancing "garment traceability and automated material sorting in the textile recycling process" (Pulse of the Fashion Industry 2017 p 98).

Driver 2. Transparent & improved supply chains

Transparency can be named as an essential and must-have driver that advances the change of the industry. Consumers are demanding more and more for comparable and trustworthy information about sustainability initiatives (Mistra Future Fashion 2016). It is not enough to make efforts in the sustainability because if these efforts are not effectively communicated to the consumers, they remain vain.

Disruptive business models and much demanded systemic change require not only transparent supply chains but also joint critical mass intentions in order for the industry to reach viable advancements. Steps that could lead to advances are:

- Utilizing renewable energy and ensuring that all parts of the supply chain are efficient.
- Reducing pollution and shifting away from conventional materials (such as cotton) to reduce water usage.

- Creating collective standards for recycling and waste management.
- Deviating from "sell what you create" to"create only what can be sold" by reducing overproduction and sale markdowns. (Pulse of the Fashion Industry 2017.)

Driver 3. Close the loop

Circular Fashion wants to avoid cherished natural resources and raw materials ending up as waste in landfills after garments are no longer worn. Circular fashion aims to create holistic products that are to be used for as long as possible and later returned safely to the biosphere. (Circular Economy club 2017.) Fashion industry footprint could be reduced by achieving a fully closed loop (Pulse of the Fashion Industry 2017).

Circular design guide (2016) foresees boldly that circular design has the ability to drive innovation and reshape our lives. Traditional fashion supply chains are wasting resources by focusing solely on the end user. Adopting circular design thinking means designing clothing like software, moreover evolving products based on the data and feedback. Adopting circular mindset requires rethinking, questioning goals and actions and commencing examining the possibilities. (Circular design guide 2016.)

Driver 4. Reinventing recycling

A staggering 95% of discarded clothes could have been recycled or worn again. It crucial to create innovative and disruptive means to reorganize the whole textile recycling process in order to establish circular cradle

to cradle initiatives. (Future of Sustainable Fashion 2017.) A solution for the recycling dilemma could lie in technology that could help large-scale mass recycling to penetrate the markets by allowing machines to detect fiber types digitally for further processing. Although end-of-use phase is important, the recyclability should initiate already in the design phase with clear guidelines for designers. (Pulse of the Fashion Industry 2017.)

Driver 5. Innovative materials

Increased use of sustainable materials and finding proper substitutes for conventional polluting materials, such as cotton, is crucial for a better future. Substituting cotton may cut down garments' negative impacts by half. Out of already existing fibers, viscose and lyocell but also recyclable polyester are environmentally preferable options. (Pulse of the Fashion Industry 2017.)

      Another alternative to cotton is to find completely new sources for fibers and fabrics. Innovative cow manure-based fabric is under research. Other natural materials which were anteriorly considered as waste, ie. citrus fruit, banana, pineapple, and sugarcane fibers might be used to make clothes in the proximate future. (Future of Sustainable Fashion 2017.) However, in order to make alternative and innovative materials work at broad scale masses, a shift in consumer mindset needs to be created so that consumers understand that new fibers can be as convenient as cotton (Pulse of the Fashion Industry 2017.)

Driver 6. Changing the paradigm

Education and awareness building is key when it comes to building a successful circular fashion system (Circular Economy club 2017) but also in all steps regarding promoting sustainable initiatives. Changing consumer habits is certainly a challenge as people often behave in erratic ways. However, some signs are proving that it can be achieved. More and more millennials are turning away from fast fashion apparel and searching for sustainably produced goods. Eco-minded consumers are adding pressure on fashion companies to change their unsustainable actions (Bloomberg 2016). Current consumers have become more conscious of environmental, social, and ethical concerns than before. The paradigm of consuming more and faster might possibly be shifted via education. Hopefully providing information will lead consumers to better habits and diminishing their own footprint. (Pulse of the Fashion Industry 2017.)

Americans produce 40 times more CO_2 emissions than Bangladeshi, making western over-consumption is a critical issue to be addressed (Guardian 2017). However, with the growth of the global middle class, the demand for clothing and apparel will only increase in the coming years also in the developing countries. In order to avoid these new and becoming generations of consumers adopting harmful habits, education and awareness building should be started immediately and globally.

Driver 7. Extending lifecycles

One key to a more sustainable future is extending lifecycle of clothing. This can be achieved by laundering and caring for clothing correctly,

repairing, and restyling out-of-style clothes. Clothing libraries and other subscription concepts make the garment utilization rate higher that will consequent in more efficient and longer lifecycles. Circular ecosystem, digital platforms and performance economy services create novel business models that allow consumers to have access to clothes without having to own them. (Future of Sustainable Fashion 2017.) In a performance economy service, the value is gained from paying only for the use of the good (=performance) not owning the good. Especially Millennials prefer having access to goods instead of ownership. Companies can also try influence the life cycle length by advising the consumers to act responsibly and teaching correct methods for clothing care.

Driver 8. Support girls

In order to realize a broad spectrum and full potential of innovations from all genders, women's' beliefs in their technical innovations should be supported. Research (Future of Sustainable Fashion 2017) showed that females underestimated the value of their fashion innovation ideas when compared to males. I believe that if all commercial innovations are ideated by men, the world will remain male dominated with technological advancement often concerning male issues. Fashion is generally seen as a phenomenon that is connected to female gender, which could potentially diminish the interest of male's technical innovations regarding sustainable fashion initiatives thus reducing the number of innovation that could advance sustainability initiatives.

Girls and women play a critical role in combatting climate change and sustainable development or as described by Wheeler & Hammer (2010 p 15) "Female education (combined with family planning) is cheaper and provides larger impacts on carbon emissions abatement

than direct low-carbon energy options". An efficient strategy to diminish global carbon emissions is to slow population growth and overpopulation which can be achieved through education. Education empowers females which in turn makes families more resilient to climate change. (Girl Effect 2015.) This conclusion can be derived to address sustainability issues as well as they are strongly interlinked with climate change problematics.

This driver is in the background of this report's three future scenarios. However, in order to keep the scenarios neutral is was not specifically expressed in the narrations.

2.3. Uncertainties

Uncertainties are factors influencing future that we are less certain about. In the development of scenarios, threats, shocks or risks represent important shapers of events. While thinking of fashion's future sustainable development some uncertain factors to be considered could be:

- – How might megatrends such as resource scarcity, climate change, and demographic change affect the clothing industry?
- – How might technological advancement develop and what are the consequences?
- – What will consumer attitudes regarding sustainable consumption be and how much income will they have, and what will it be spent on?
- – Could changes in the legislation impact the fashion industry? (Future of Sustainable Fashion 2017.)
- – How might increasing terrorism, growing nationalism and post-globalization affect the world order and economy?

Not all events affecting possible futures are positive. I see that potential risks and threats of fashion's future sustainable development might possibly be:

- Consumers' lack of desire to adapt sustainable attitudes and consumption modes (such as continuing to embrace fast fashion businesses).
- Lack of attainable sustainable choices (mainly affordable and accessible) or that the offered choices are undesirable to the consumers.
- Lack of innovative materials that have a positive or neutral effect on the environment or that these options are of low quality or undesirable.
- Governments regulations that deny the importance of eco-design, resource scarcity, and transparency.
- No longer having access to water (as the industry depends on it) because available water funds are restricted to alimentation purposes.

In conclusion, these uncertainties influence each scenario. The uncertainties affect how potential developments might occur and what impact the risks related to other phenomena.

3.

The scenarios

3. The scenarios

Two axes were used to build the scenarios in order to obtain diverse outcomes. The axes are society's technological advancement (high or reduced) and the actual framework (supportive of sustainable initiatives or not). I decided to utilize two different attributes that are of high importance and similarly uncertainty to the thesis' scenarios. These two attributes form a tension between them. The tension is utilized to create a quadruple table. The attributes are:

– How sustainable is the industry?
– How advanced is the technology?

Based on these attributes and the quadruple table (pictured below in fig. 2) with four distinct scenarios were identified.

Fig. 2. The 4 scenario possibilities
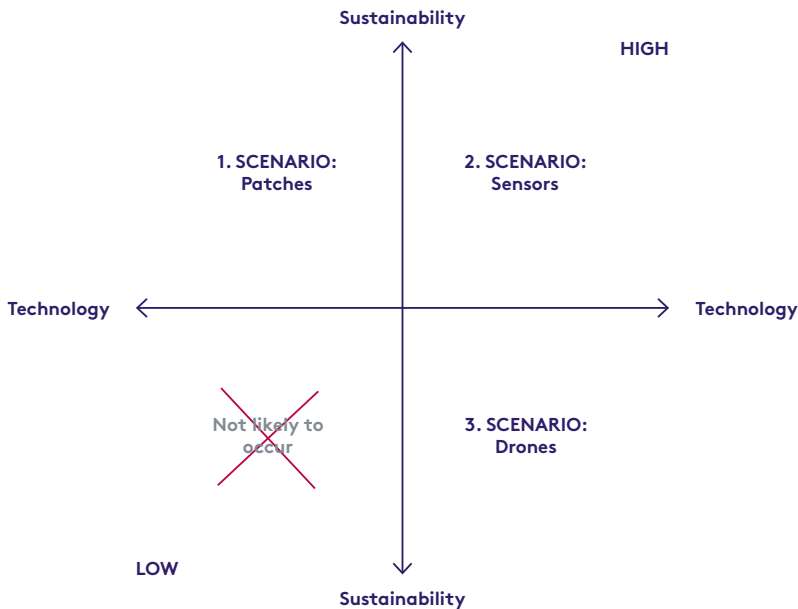
The scenarios are guided by a vision and are trying to find ways in order to reach the vision. The vision goes followingly:

"Fashion industry will be fully circular by 2035 and use only fully recycled or other sustainably sourced materials and respect social needs of people throughout the whole supply chain."

The fourth possible scenario with low levels of sustainability and low levels of technological advancement does not support this vision. Also in the light of current knowledge, a scenario with these premises does not seem very likely to occur, making it more like a dystopian story than a viable scenario for strategy building. Thus, it has been left out of the final three scenarios. Three scenarios that are further developed are:

1. Scenario: Patches: High Sustainability, Low Technology
2. Scenario: Sensors: High Sustainability, High Technology
3. Scenario: Drones: Low Sustainability, High Technology

In order to get a well functional structure and similar attributes to all three scenarios, I used the drivers in forming of scenarios paths. Drivers are separated into two or three parts, mainly with the division of "low-some-high". The table (figure 3) can be found on the next page.

	1. SCENARIO: PATCHES	2. SCENARIO: SENSORS	3. SCENARIO: DRONES
Sustainability & technology	High sustainability & Low technology	High sustainability & High technology	Low sustainability & High technology
Transparent supply chains	Some efforts	Fully transparent & effective	No transparency
Innovative materials	Only traditional materials	Substituted materials, no cotton	Substituted & traditional
Extending lifecycles	Long lifecycles	Circular lifecycles	Clothing dumped in landfills
Reinventing recycling	Traditional recycling	All materials are recycled	Low level of recycling
Technological advancement	Low advancement	Medium advancement	High advancement
Close the loop	Traditional production methods	Circular fashion methods	Some initiatives
Changing the paradigm	Consuming habits changed	Some habits changed, some remain	Consuming craze

Fig. 3. Table of scenarios paths.

In addition, three personas and three example companies were created in order to facilitate the storytelling. In general, personas are used to represent a group of customers. Having a persona and a company makes comparisons between the three scenarios easier to comprehend as similar factors are kept throughout all three scenarios. The events of the scenarios were created on the timeline by using the backcasting method.

The scenarios are mainly focused on Finland. However, since fashion is a global industry, it is impossible to discard the global changes in the economy, environment, and attitudes. Thus, the scenarios deal also with a larger image of the state of sustainable development, not just Finland. The events in the scenarios are reflected not only in larger Finnish society but also to the persona and company.

While the created scenarios are fictional, they do draw on drivers and wider ecological, technological, demographic and governance megatrends. A set of eight key drivers of sustainable development and three megatrends presented in the previous chapter will affect all three scenarios.

3.1. Future scenario 1: PATCHES 2017–2035

In the first scenario, the sustainability level is high and technology level is low.

Transparent supply chains	Innovative materials	Extending lifecycles	Reinventing recycling	Technological advancement	Close the loop	Changing the paradigm
Some efforts	Only traditional materials	Long lifecycles	Traditional recycling	Low advancement	Traditional production methods	Consuming habits changed

Snapshot of Finland in 2035: Hyperconnected and technology driven society also has its reverse side. More and more people have become fatigued by the information obesity and are choosing to live alternative lifestyles, either by choice or unwillingly. Due to the decisions made by the bourgeois government in the late 2010's, the income gap has continued to increase. Even though technology has become widely accepted and an incremental part of Finnish society and public services, digitalization in its most functional forms is not accessible to everyone.

Technology and devices evolve constantly, hence not everybody is able to update their devices and skills at the same pace. Aging people, poverty, and other sorts or marginalization have led to digital dropouts, thus excluding some citizens out of active participation in the society. Higher education, such as universities, nowadays have tuition fees, free Finnish schooling remains as a utopist memory.

However, not all technology-handicapped are poor and marginalized, some people just choose to live differently. A slow living movement that started in the beginning of the 2000's has gained substantial momentum. Improved and more effective healthcare systems,

awareness of wellness and nutrition prolonged retirement aged have all enabled senior citizens' proactive membership of the society. Since they are in good health and with a steady income, they participate eagerly in various activities. Although the latest technology and media remains a mystery, most of the seniors are good with old fashioned tablets and desktop computers and also olden days' social media, sharing their lives, unlike the younger people who prefer to stay inclusive to smaller groups of close people. As the rate of pensioners grows, the societal value is no longer associated with financial success nor work.

Surprisingly for the engineering savvy and environmentally conscious Finns, China has become the model country and a sustainable development leader. Chinese have for long been accustomed to regulation and rules. Ever since the Chinese government imposed environmental legislation, quotas for transparent products and fining to pollution in 2022, sustainable initiatives finally penetrated Chinese and foreign businesses operating there with rigor. After the legislation change, as one of the key world powers, China has been able to spread the sustainable ideas and circular methods globally.

As traditional values of making your own life are becoming more popular, Martta association is busy with providing and passing on good practices of grandmothers' grandmothers to younger generations. People grow their own food, bake their own bread and also harvest cells from their bodies in order to produce medicine and auto-healing yeasts. Craftsmanship and artisan goods are valued and various analogical makers movements are popular. Also, industries benefit from this desire of back to the roots.

Due to climate change and restricting arable land to the farming of edible plants, the farming of cotton as clothing materials was banned in 2025 in the main producing countries China and India. Finnish agricultures' (as water was still almost boundlessly usable for them)

saw their opportunity come in the form of hemp. Hemp requires a good soil, but on the other hand, it can be farmed without pesticides. Hemp farming is very cost efficient as the crop can produce four times the mass per hectare than a forest could. New finishing and weaving methods have refined the look and handfeel of hemp products to be more appealing and less hippy. Customers have been slow to adapt hemp clothing, but a good reputation as a domestic luxury has given them a new spur.

However, due to expensive raw materials and laborious and costing production processes, the price of industrially made clothing has risen. Only few can afford it. The quality demands for clothing are very high, as during their lifecycle they need to endure through multiple users. Clothing is repaired diligently, the seams have large allowances and often clothing comes with extra buttons and fabric for patches. Although new products have become rare, people still possess some of the new clothing and cherish them like precious gems. It is common to have a mixed wardrobe with a variety of new and secondhand, rented or borrowed clothing. Due to these circumstances, previously known fast fashion shopping habits have disappeared almost completely.

Clothing & textile waste are seen as valuable assets. Recycling methods have become more effective, people nowadays take pride not putting to waste any materials that could be further processed and utilized. Clothing hackathons, swapping events and fleamarkets of many sorts are popular ways to spend time. Customization and mending of clothing can be studied in schools as elective courses. Local services, such as cleaners, shoe repair shops, sewers and tailors, benefit highly from this novel form of fashion austerity. Valuing clothing, shoes and other goods means more jobs and opportunities for the repair and maintenance services. Cleaners, sewing shops, shoemakers and other SMEs have seen their businesses booming for the last decade.

However even when new clothing from virgin materials has

become a scarcity, many consumers still have strong desires for new and trendy clothes. Only the rich can afford new clothing bought from a store with a real sales person. Live contact with a salesperson and fitting inside a store have become a luxury. Teens and other fashion forward minded people want their clothing to look industrial made, too crafty looks are considered uncool. A lot of replicas and fakes circulate black markets, but artisanal details often reveal non-industrial origin.

Homemade clothing out of mushrooms sounded like science fictions in the early 2020's but despite its unappealing start, it has quickly gained popularity. The process allows growing 100% biodegradable textile on molded torsos. The process enables skipping spinning yarns and weaving cloth completely and allows people to design and biohack their own clothing. Growing own clothing has led to product attachment that was unseen before. Fungus pieces of clothing are proudly worn and when no longer usable, they are composted at the backyard. The timeline of the development of the scenario 1/Patches is pictured in fig. 4.

"Craftsmanship is valued."

Persona: Lumi

Lumi was born on a cold February morning in 2005. She lives just outside Seinäjoki with mom, stepdad, and 2 stepbrothers. Now, in 2017, at the age of 12, more than anything she adores YouTube vloggers, tubesters. Like many of her peers, she finds it cool to wear Adidas and other 90's inspired clothing. Ever since before school she has read princess magazine that offers plastic toys with subscriptions and playing top model runway was a favorite when younger. On birthdays, she often receives gift cards to clothing shops and spends them with great joy. Shopping is a great pastime when she comes to Helsinki to visit family.

Pic. 1.

Company: RHapu

RHapu was founded in 2011. They first started with children's wear with quirky and playful unisex prints but quickly added womenswear to the line as well. Headquarters are based in Espoo and products are manufactured in Portugal, India, and Estonia. RHapu is a fast growing mid-sized company with a desire to develop sustainable initiatives. RHapu likes to claim themselves as a sustainable and ecological choice.

Pic. 2.

Lumi is 12 years old and receives 70-euro gift card to Zara for her birthday, what joy to spend it all on new school clothes <3. She bought an embroidered pastel colored bomber and a silver skirt to match it.

Finland: The interest rises in hemp farming.

2020

RHapu has managed to launch printed cotton leggings and tunics that cause internet hysteria for a few consecutive years now. They utse more and more Tencel and ecological cotton in their collections.

Finland: Digitally illiterate organize demonstrations against heavy digitalization of public services. The demonstrations are bypassed with a shroud of shoulders from the decision makers.

Lumi is 16 and studying coding and clothing mending in school. Lumi finds wool and leather unacceptable, since being a vegetarian for a few years she now turns to full veganism. Gone are woolen accessories and leather shoes, her mom is forced to pass them on to recycling.

RHapu launches rental service packs of newborn clothing; all baby's first year's clothing in a pack. After a year's use, the year pack is returned and clothing is mended and laundered and further rented.

Finland: Martta association is awarded as a cultural act of the year due to their sharing and passing on the legacy of making it by yourself.

2025

Fig. 4. Timeline Patches

Lumi is 20 and a second-year student of political sciences at the University of Helsinki. Her cohort is the last still to benefit from tuition-free university entrance, as the tuition fees become compulsory in 2026. In September Lumi takes part in fashion hackathon that tries to resolve the challenge of analogical circular systems.

2030

Lumi is 24. After finishing her master studies in only a year, she has been looking for a job. After 3 months of active searching, she was able to land a freelancer position of a junior sorting service consultant in Helsinki city's recycling center.

Finland: Tuition fees are regulated as compulsory in all education levels beyond the "peruskoulu".

RHapu presents new soft spun hemp jersey. Sustainable cotton constitutes around 35% of the collection, the rest is divided between tencel, linen and hemp. The recycling rate of both clothing that can be resold and also the waste is growing: 65% of the goods are returned when new items are bought.

Finland: Cotton farming is banned in its major producing countries China, India & Pakistan. The USA still produces some cotton, but that is mainly reserved for domestic use. This forces even the most laggard Finnish manufacturers to seek novel solutions.

RHapu opens its archive favorite pieces from back in the days. The pieces can be rented and patterns and fabrics are available for DIY sewing. The service is hugely successful. Hence since cotton is no longer available like in the early days of RHapu, it has been replaced by hemp and other viscose derived fibers.

2035

Finland: Climate change and Helsinki's example as a coal-neutral city are adding pressure to the rest of the country to finally replace the use regular electricity and coal based heating with solar energy incentives. Most industrial processes have however adopted renewable energy sources a decade ago.

Lumi is 30 and feeling fatigued of endless temporary jobs. She finally (and many years after her peers have done the same thing) embarks on a tinder-like start-up that joins people with medical textile companies. The company employs people that willing to use their bodies as growing compounds for textile fungus.

RHapu has shifted from being a manufacturer to a collective community and a provider of recycling knowledge and ideas. RHapu organizes analog makers events & provides spaces and materials, participants pay depending on what they want to make.

3.2. Future scenario 2: SENSORS 2017–2035.

In the second scenario, both the sustainability and technology levels are high.

Transparent supply chains	Innovative materials	Extending lifecycles	Reinventing recycling	Technologi-cal advance-ment	Close the loop	Changing the paradigm
Fully transparent & effective	Substituted materials, no cotton	Circular lifecycles	All materials are recycled	High advancement	Circular fashion methods	Some habits changed, some remain

Snapshot of Finland in 2035: Finland is a society where technology has been able to evolve without major obstacles. Technology prices have continued their declination throughout the 2000's. Sensors, big data and its transferring have increased the constant connectivity. Novel infrastructures connect users to buildings, transportation and to wider society and its services. Hyperconnected society enables individuals to proceed with their talents. People prefer to have access to ideas and assets instead of owning products. Communities are flexible and spontaneous and filled with able individuals which make creativity and agility valued qualities. Even though sometimes live human-to-human connections have become sparse, paradoxically people are more engaged to communal good.

Use of solar panels has been commercialized, the solar, wind and hydro energy are cheap and available anywhere. Ikea is one of the main energy providers. Shifting to green taxation has enabled the clean technology prices to decrease and made them a more prominent choice and increased their availability for larger audiences.

Due to changing demographics, Finnish society has had to open

its doors to immigrants, despite the growing nationalism and racism. Formerly as a very homogeneous nation, Finland's rising number of immigrants has increased country's diversity. More diverse society has pushed the liberal and environmental values to the forefront. Government's investments in the resilient economy that were made in the early 2020's, especially in clean technology, research, and design innovations, have certainly paid off. New clothing factories have opened all around Finland, even in Lapland, since efficient wind-powered transportation has enabled greener and faster logistics.

Global fashion market has fragmented due to growing demand and a more agile and reactive supply, which has been enabled by data-driven supply chain systems that endorse quickly adapting offering. Rapid fashion cycles have even further accelerated, but data driven production enables companies to provide new styles of clothing constantly and offer only products that have a certain demand. Clearance sales are no longer needed because overstock of goods no longer exists. Price margins have dropped, but sales volume makes up for the loss. Sustainable clothing has now become a cheaper and available choice due to efficient use of resources and companies that have adopted the circular design principles.

Advancements in technology and automation have enabled the production costs to lower to an affordable level even in western countries, enhancing the shift in attitudes and allowing companies to move all fiber and clothing production back to Finland. Finland has become the leading country in circular fashion technology, providing services within the whole circle to global markets. Service offering starts from consultation to fiber sorting, manufacturing, and fiber production. Local Finnish production has allowed fully transparent supply chains. Finnish companies are proud to present their infrastructure and production methods to anyone interested as there is no risk of copying since the production methods require highly specialized machinery and resources.

Clothing and its components can all be traced to their manufacturers and origin of the material. Competition and open source innovations are embraced, which has allowed spreading of ideas instantly.

Tampere region, once famous for its textile industry has returned to its olden day's glory and is now a pulsating industrial city and home to many alternative lifestyles. City's suburbs and nearby regions are boosting with textile and clothing factories. These factories have developed commercial advantages compared to their rivals in Asia and Africa by adopting circular fashion design practices. In order to be fully competitive, the companies have allied in their processes and types of machinery against cheaper production in developing countries. Company A is specialized in the sorting of recycled and handed clothing and other textile waste, as the company B processes this waste further and weaves the fibers to fabrics. Company C finally assembles the clothing.

However, despite the major advancements, not everything is picture perfect. Climate change has forced many people to leave their homes in Middle-East and Africa. The climate refugees are a cheap and ever-growing labor force allowing companies to lower the wages and increase overtime. The rest of the production not handled by cheap labor, is mainly automated by robots and powered by renewable energy sources and residues from of the closed loop production. However, in addition to the immigrants and automation, jobs are also plentiful for the local communities in rural Finland. In order to boost the economy and retain national purchasing power, people still execute many jobs that could be automated. Processes need to be watched after and the plots secured. Elevated pension ages have brought up the age of the workers, most have worked in the factory since their 50's and will continue until they are 72 years old. Sometimes at coffee breaks, they gather to tell tales about times when clothing was still poorly made in China. Consumers are happy to buy locally produced goods since they can see how it boosts the economy.

Sometimes workers enjoy leaving virtual marks in the chip to greet the future owner of the garment.

For a bit of extra income, some workers have even gone as far as swallowing tiny robots that harvest body's natural yeasts. After collecting yeasts, robots are finally defecated. Harvested yeast cells are later used to produce a synthetic silk. Regular silk and other animal based fibers such as wool have been banned due to animal activism. Ever since the banning of "real silk", man-made synthetic yeast silk is the ultimate luxury like described by the latest virtual Vogue.

All major cities have on-demand recycling services. This allows effortless recycling and people receive extra recycling points that make transactions in governmental bureaus even more seamless. Once collected, the recycling of the fibers is automated and all fibers can be effectively used in closed loop production. All pieces of clothing and textiles have chip alarms in them and the previous owners can be traced and given fines for littering if not properly recycled. Tracing has practically enabled 98% rate of total recycling.

Diverse platforms offering clothing sharing services, both from companies and directly from customers are booming. Clothing libraries and rent-runways are popular. Some haute couture and ready to wear designer offer parts of their collection exclusively to high-end rentals. Ques for the exclusive rental collections are long, and the hit pieces and new classics circulate for years. Maison Margiela has even designed a coat where everyone renting it can leave their signature on, the coat is highly coveted and waitlist to rent takes three years.

The scarcity of natural resources and arable land has led to a replacement of many formerly widely used natural fibers such as cotton, linen, and wool. New clothing fibers are developed constantly, food waste, such as fruit peels and fish skin, has been discovered to be one of the most suitable for clothing use. Technology enthusiast people have

been eager to adopt new materials once the benefits to the planet have been clearly proven. New sprayable washing detergents are widely used, which has enabled clothing to become rarely washed, as the stains and odors are sprayed away instantly.

As Finnish population has aged, middle aged people are seen as the key purchasing force, even if they mostly nowadays buy clothing for their grandchildren. It is common to lend clothing through the sharing economy services. Booming second-hand markets have added pressure to retailers as well. Clothing needs to be resilient and strong enough to be passed on multiple times to multiple users. This has helped to achieve better quality goods despite the fast changing fashion trends. The timeline of the development of the scenario 2/Sensors is pictured in fig. 5.

"People prefer to have access to ideas and assets instead of owning products."

Persona: Niko

In 2017 Niko is 25 and currently, he studyies computer sciences and pedagogy to become a teacher. He lives with his boyfriend in the southern part of Helsinki, nearby the sea. Together with his boyfriend, Jani, he likes to grow vegetables in their communal backyard and go clubbing on weekends. Niko is a vintage freak, he loves to mix 70's and 90's pieces to more expensive labels such as again en-vogue Gucci. For him looks are important, but lately, since working with children he is beginning to realize that there are some problems behind the cool and fashionable looks.

Pic.3.

Company: Highpeak

Active wear label Highpeak was founded in 1973 in Tampere. Currently it is one of the biggest active wear manufacturers in Europe. The company has millions of turnover, employs 400 people and exports to 10 countries. Highpeak has developed their sustainable communications and their garments are produced in accordance with the REACH regulations for industrial chemicals.

Pic. 4.

Finland: New performance economy services are boosted with lower green taxation that allows cheaper consumer prices.

Highpeak shifts all of its manufacturing from Asia to the Baltics in order to create ethical and fully transparent supply chains. Transparency has been demanded by the ever-growing number of environmentally conscious customers.

2020

Niko is finalizing his master's studies. He will start as supporting teacher in coding aided crafts after he finally finishes his thesis.

Finland: 10-15 % of global financial transactions are conducted through virtual currencies. This adds challenges to e-commerce, both domestic and international, but at the same time allows e-commerce businesses to spread globally.

Niko organizes recycling hackathons in the school where he works. He challenges the pupils to teach their parents better attitudes towards recycled materials.

2025

Finland: The climate refugees go on strike for better working conditions in the textile factories.

Highpeak's fast adapting manufacturing has been automated to fit the demand which has been enabled by data-driven systems. Data chips are woven into the fabric in order to allow sorting at the end of the lifecycle.

Fig. 5. Timeline Sensors

2030

Niko has mixed feelings about the school uniforms that are nowadays regulated as compulsory. On the other hand, the uniforms advance equality between the pupils as not all can afford the latest hip wearables, but on the other hand, he feels that pupils are losing a way to express themselves through clothing. The uniforms are made of a pleated polyester blend, it suffices just to pull the fabric and the clothing adapts from ages 7-12 years.

Finland: Most restaurants have a 3D food printer that covers at least some parts of the meal preparations. Household 3D printers are commonly used and in most cases, with consumer goods, it suffices to buy a license and print it at home.

Highpeak sets up a factory in Tampere suburbs. The factory is set to employ the circular design methods using recycled clothing and previous collections cutting waste as raw materials. However, starting poses a few challenges since the stream of raw materials is not sufficient.

Finland: After decades of discussions, universal basic income is finally available for all Finnish people (excluding the immigrants). Combined with automated healthcare, these lifts thousands of out techno-poverty.

2035

Niko rides his bike to nearby school where he works. Niko has a special bicycle that can spin polyester like yarn from plastic bottles while pedaling. A week's commuting spins yarn for one t-shirt. He takes the yarn to the 3D printing shop and ends with a brand-new t-shirt.

Highpeak manages to balance the circular processes' material inputs and ready garments' outputs and wins a national award for advancing clean technology.

3.3. Future scenario 3: DRONES 2017–2035

In the third scenario, the sustainability level is low and technology level is high.

Transparent supply chains	Innovative materials	Extending lifecycles	Reinventing recycling	Technologi-cal advance-ment	Close the loop	Changing the paradigm
No transparency	Substituted & traditional	Clothing dumped in landfills	Low level of recycling	High advancement	Some initiatives	Consuming craze

Snapshot of Finland in 2035: The technological advancement has continued in Finland and everywhere else in the world with exponential speed throughout the 2000's. New technologies have driven growth and changed the surrounding societies. In 2035 internet of things is a common part of everyday life. Some of these technological phenomena include robotics, self-driving transport, artificial intelligence, and biotechnology. However, despite the advancements, the economic growth has become stagnant.

In Finland, most innovations, communal decision-making, and high political positions are led by men. After a short period of popularity, feminism became an out-of-fashion fad in the beginning of 2020's. Traditional values and heterosexual marriages have been in the vogue since the mid-2010's. This has led to drop off in the female working levels. More and more women and renouncing careers and staying home taking care of the children and the robotic dog. Even though household androids and robotic housing appliances are commonly used, women choose to stay at home as this has allowed them to have more time to focus on fashion, fitness, nutrition, and beauty. Fashion is an integral part of stay-at-home women's lives and outfit-of-the-day feeds and apps are boosting with popularity. Some clothing library services were offered in

the beginning of 2020's, nevertheless, they did not succeed in the quest for fresh and new out of the box attitude driven Finland.

All Finnish apartments have trash spouts that are directly connected to dumpsters. People can just place the rubbish in the spout and it disappears without a trace or smell. This has led to an illusion of magically vanishing waste and people that have resigned with the laborious task of recycling and separating the trash. Material sorting sensors do not function in the bulk of non-separated trash; thus, they have been removed as ineffective. Landfills are fully in use nowadays, luckily Finland is sparsely inhabited country and there is a lot of space for new landfills that are established yearly. Some parts of the ever-growing piles of waste are dug next to nuclear waste in order to provide an isolation cushion from radiation. The bourgeois government decided to fully invest in nuclear power in the mid-2010's, making the number of nuclear plants rise up to 20 by 2035.

Water has become scarce and the culture of cotton has been banned in many countries. Cotton has been replaced by polyester and polyamide. However, this did not lead to more sustainable initiatives, just merely replacing one unsustainable fiber with another. Mostly used synthetic fibers are virgin, not recycled. Since the 2020's the fashion industry has been reluctant to adopt the circular design principles because previous fast fashion methods are still proving to remain profitable.

Most of the local customizing and repair services have had to file for bankruptcy since no one was using them. Only a few old shoemakers still prevail in the city suburbs, but acquiring components and spare-parts has become really tricky in the past few years. Some dry cleaners are also able to pursue their businesses since luckily for them, not everyone has adopted the disposable-clothing attitude, even though looking at the streets it might seem so.

As the costs of labor have increased in Asia the production has

been moved to Africa, where the cheap labor force is still easy to find in megacities of millions of people like Lagos in Nigeria. Cheap labor alongside intelligent automation has led to faster than ever supply chains that respond quickly to demand. Unfortunately, poor working conditions still exist as the supply chains have only shifted geographically, not with more responsible mental attitudes.

Products are often speed shipped airways with self-navigating planes because the demand for new goods is constant and urgent. Captains are located in offices thousands of kilometers from the ship or plane that they are maneuvering. In developing countries, the slums are growing alongside with megacities, and their enlarging populations are stuck with clothing donations from wealthier countries even though most countries have denied accepting donated clothing since early 2020's. The discarded clothing is used as insulations of the shacks to provide shelter from the extreme weather phenomena, thus making the facades of the shacks reflect the patchworks of long gone fashion fads.

The rate of microplastics is growing in the oceans, some pessimistic go as far as forecasting that there will be more plastic than fish in the oceans in a few years. Cleaning of the oceans is creating new industries, businesses, and labor in developing countries. Even robots are working to clean up the ocean. This has allowed diminishing of plastic recycling, as cleaning the environment now provides jobs for millions. However, unfortunately, the cleaning initiatives have so far remained ineffective and the pollution levels are constantly augmenting.

After a small drop in popularity in early 2020's, fast fashion giants like H&M and Inditex still rule the market with weekly capsule collections. Unlike four fashion seasons a year like in the beginning of 2000's, new products are available every day of the year. Most Finnish fashion consumers are speed and novelty obsessed. High unemployment rates in Finland have lowered the buying capacity, but cheap goods

still enable continuous shopping. Finnish fashion with its small brands has not been able to compete with international fashion chain stores, but specialized and technology augmented goods like sportswear and healthcare wearables and textiles have been able to penetrate the western markets.

The lively Helsinki based startup scene is providing with innovations with augmented reality, most of them utilizing some sorts of wearable technologies and sensors. This has allowed new business opportunities to the otherwise stagnant fashion industry. Everyday life is intensified by augmented reality hence mixing virtual elements to actual time has become highly accepted. Textile goods with sensors, such as data gloves and data bodysuits, connect sensorial experiences to computers and other people virtually. Datawear has proven to be popular, and they are often used also for autonomous sensorial pleasures.

3D printers are a household must. One can buy outfits directly off the catwalk and print them at home, customized to fit one's individual body type, biensûr. However, some talented hackers have long been able to hack the buying systems and are now spreading the styles for free. 3D printing allows a perfect fit to individual body type since the measures are scanned and clothing can be scaled to fit. Cellulose based 3D fibers have not been succeeded, thus plastic based paste is still used in the printers. Drones can deliver anything from another part of the world in six hours maximum, all imaginable goods in the world are available with just one click. Most people have at least 3 parcels a week delivered to their door by drones. Fashion in Finland is seemingly an individual choice but its' laws remain driven by rapidly changing trends. The timeline of the development of the scenario 3/Drones is pictured in fig. 6.

In 2017 Maija-Leena is 44 and working as a freelance graphic designer after she got laid off from her previous job as a fashion art director in big department store chain Kokmanne. She currently lives in Espoo with her newly found partner Taneli and Taneli's son Keke. Last year they were on a sabbatical and embarked on a world tour traveling in 17 countries from Europe to Asia and Australia. Ever since the trip Maija-Leena is struggling to find meaning in work and turns to her old pastime of online shopping to ease the boredom.

Pic. 5.

Company: Kokmanne

Kokmanne is a department store chain founded by a Dane Martin Skopje in 1878 in Helsinki. The flagship store in downtown Helsinki has more than 60 000 square meters and in addition, the company has 4 other department stores in Finland. During its history, the company has acquired many businesses varying from car sales to book shops, grocery store chains, and fast fashion but in recent years Kokmanne has been forced to let many of the subsidiaries go in order to remain competitive.

Pic. 6.

Pic. 7.

Finland: Due to grown demand, more international fast fashion chains are launching stores all around Finland.

As an expert on fashion photography and editorials, Maija-Leena advises vloggers on a media fair event on tricks how to get good and flattering lighting and best angles for mobile videos. Vloggers seem to be content on the presentation but when leaving start talking about "the oldie that thinks that she knows something".

2020

Kokmanne has struggled to remain profitable for years now and it has had to change its strategy from international department store chain to a national operator. A positive turn was seen when the emphasis was placed on women's' fashion in the late 2010's but the turn has slowly shifted to negative sales.

Finland: Driverless cars are used as in rural areas for more subdued parts of local transport and in logistics.

Maija-Leena reads an article describing the poor working and living conditions of the fashion factory workers in Lagos. After reading it she starts to boycott H&M for a few months but soon the whole idea of boycott slips her mind.

Finland: An average Finn has 4 packages a week delivered to the door with flying drones. Drones operate with the wind and solar energy, this has allowed delivery costs to drop.

2025

Kokmanne sales are further dropping. The department store's buying and retail systems are not reacting fast enough to trends ever adapting customer demands.

Fig. 6. Timeline Drones

2030

Kokmanne offers 3D printing services and individual customization of ready to wear collections. The service is successful but not enough to rescue the whole company from falling sales figures. Kokmanne decides to found a new subsidiary company focusing on 3D fashion design software for customers.

Maija-Leena has a dress for Keke's graduation 3D printed at Kokmanne. The dress fits well although the material is a bit itchy and makes one sweat. Good news is, that it can be re-printed to fit again if Maija-Leena gains a bit of weight.

Finland: 80% of doctor visits are handled by automated exams and medicine is hyper-individualized to treat the exact spot needed. Finland is a leading country when it comes to healthcare technology and textiles.

Maija-Leena's retirement is nowhere to be seen and she continues as a freelance content producer. At 62 years she is in good health as during the last five years she has exercised on a treadmill at least an hour a day while working at the same time.

2035

Kokmanne has had to renounce from its last retail units but has become profitable due to its good real estates in busy business locations. The large real estate property in Helsinki city center is now fully occupied by tenants. The drone logistics company has enlarged its tenancy and now has three underground stories and the rooftop terrace to its logistic systems.

Finland: Helsinki city employs people for the strategic posts in the fields of integrated big picture thinking and emotional intelligence creatives. These posts are aimed to fill the need for a more empathic and reacting city space.

4.

Comparison and meaning of the scenarios

4. Comparison and meaning of the scenarios

The three scenarios, Patches, Sensors and Drones, describe different perspectives of what sustainable fashion could look like in the year 2045. All three scenarios include both of encouraging and controversial issues and visions. The scenarios should be seen as enablers of understanding of potential future developments, not as exact predictions, which they naturally are not. One could say that scenario 2/Sensors would be the ideal future development as it has the highest amounts of both sustainability and technological advancement. Unfortunately, I believe that future Finland will not be as simple and straightforward as the scenario 2/Sensors is portrayed. Rather, I assume that there will be signs of all three scenarios visible at the same time. Initially, the goal of the scenarios was to study if the three scenarios are able to reach the vision of circularity. The vision that the scenarios were aiming to meet is:

"Fashion industry will be fully circular by 2035 and use only fully recycled or other sustainably sourced materials and respect social needs of people throughout the whole supply chain."

The vision proved to be quite challenging to reach, because circular fashion processes require both the will to advance sustainable attitudes and proper technologies. That is the reason that both scenarios 1/Patches and 3/Drones do not meet the ambitious vision. If the scenario 1/Patches would develop as portrayed, the proper evolvement of circularity would require much more technological efforts and financial resources. In the scenario 3/Drones, technological requirements of circularity could be met, but there is not enough desire to change the

current consumer paradigm nor the fast fashion -like business models. Only the scenario 2/Sensors would have the prerequisites to fully foster circular fashion business models.

If one would wish to draw conclusions of the scenarios for a businesses' design strategy one would need to study them closely and compare them to the company's values, visions, and hopes for the future. On the other hand, if interpreted correctly (loosely, as enabler for contemplation), scenarios could offer concrete tips for which materials (hint found from drivers) or customer segments (hint found from megatrends) to favor. The meaning of the scenarios varies largely from the person interpreting them and of the personal abilities (professional experience, other knowledge, position etc) of the interpret.

The table (fig. 7) presented on the following spread illustrates how the vision, key questions, and uncertainties evolve and differ in the three scenarios. The implications of the scenarios can be noticed by comparing them closely. Further inspecting the differences of the scenarios enables understanding the complexity of the sustainable fashion issue and further portrays that there is no single answer when it comes to sustainable fashion. In order to advance sustainable initiatives, there are several possibilities and different paths for both the consumers and companies.

	1. SCENARIO: PATCHES	2. SCENARIO: SENSORS	3. SCENARIO: DRONES
Is the fashion system fully circular and using only recycled or sustainably sourced materials?	No, but recycled or other sustainably sourced materials are widely used.	Yes, at least partly/ mostly circular and using only fully recycled or other sustainably sourced materials.	No, materials used are mostly virgin, only a few recycled or other sustainably sourced materials used.
What is valued?	Making it yourself & authenticity.	Creativity, agility & access to ideas.	Fast variation & self-expression.
How to maintain fashion businesses without harming the environment?	By developing recycling methods and extending lifecycles by increasing education of correct care and mending of clothing.	By adopting circular fashion methods.	Needs a lot of consideration and development if things continue like in this scenario.
What happens to ownership of clothing?	Clothing is seen as a precious asset that is valued.	Product attachment is low as the flows of clothing come and go.	3D printers allow constant updating of the wardrobe.
What is the relationship to fashion and consuming?	Mending and customization of clothing are appreciated; new clothing is not available for most.	Fashion is consumed a bit less than in 2017, but the majority of it comes from a sustainable offering.	Consuming craze and fast fashion rule the markets.
What is the technological advancement level and what are the consequences?	Low, advancement is not available for all, the meaning is found from making and communal good.	High, advancement is harnessed for finding optimal solutions for both the planet and businesses.	High, advancement serves the growth of the markets and businesses.

Fig 7. Differences of the scenarios.

"The scenarios should be seen as enablers of understanding of potential future developments."

5.

Main takeaways of the scenarios

5. Main takeaways of the scenarios

Sustainability is a fuzzy topic with a multitude of complex factors to be looked into. However, by describing potential futures it is possible to identify important matters regarding the prerequisites of sustainable development.

Scenario number 1/Patches points out the need for a proper attitude when it comes to spreading sustainable initiatives. In this scenario, technology isn't a key enabler of sustainability, but a bunch of good will and can-do attitude can advance sustainability already considerably. Scenario 1/Patches aims to prove that attitudes towards novel clothing and continuous shopping can be shifted, however it requires subtlety and patience. Instead of adrenaline rush from shopping, the focus is shifted to experiences and making as the memories often last longer than modern day clothing. However, even if the scenario includes many positive initiatives, spreading of sustainability could be rushed with proper use of technologies. Adopting a more sustainable lifestyle does not necessarily mean turning into austerity like one possibly could interpret from this scenario.

Scenario number 2/Sensors describes how advances in technology could and should be harnessed for the good of the planet and its inhabitants. In my opinion, circular design principles are the only viable option existing if one wishes to respect the planetary boundaries while ensuring economic growth of both businesses and societies while providing clothing for the growing global population. Scenario number 2/Sensors presents a situation where circular design principles have successfully penetrated the global economy and also consumers with ease. In many cases this would be the ideal situation, however, before it can be reached, there are many obstacles to be cleared. One and certainly not the least of the obstacles, it to convince the decision makers and managers

of the importance of circularity. Another substantial challenge is to get the consumers to act upon the principles. Are masses ready for effective recycling? However, I believe that once the financial abilities, technical resources and prerequisites have been obtained, the interest in the circularity of the consumers will follow.

Scenario number 3/Drones illustrates the downside of focusing solely on technological advancements. If there is no desire to drive environmental aspects there is a risk that monetary benefits will exceed the sustainable initiatives. That is realistic and even probable risk on the governance level if the economy is placed before the environment. The development of the scenario will finally lead to overuse of natural raw materials which the Earth is not able to sustain. Despite the continuous shopping habits, the scenario number 3/Drones could also offer clues of more sustainable initiatives as well. 3D printing is bound to be a game changer and printing goods only to a need, with reusable "ink" could provide consumers with the novelty that they crave, with a lower impact on environment (when compared to fast fashion). This scenario number 3/Drones can be seen as somewhat negative but a similar angle is needed in order to grasp a holistic view of sustainability.

"By describing potential futures it is possible to identify important matters regarding the prerequisites of sustainable development."

Epilogue & references

Epilogue

All three scenarios include both positive and negative aspects and only one of them is able to meet the ambitious vision of fully circular fashion system. However not one of the scenarios is fully desirable or fully avoidable as itself. Nevertheless, all scenarios include plausible situations, events, and potential developments. In 2035 Finnish society could possess qualities, aspects and events from each of the scenarios as signs of some of the developments portrayed are already taking place as we speak. The scenarios are certainly not mere science fiction but rather proper food for thought and a glimpse of alternative futures.

On account of making educated decisions regarding the future of sustainable fashion's development, it is crucial to understand the drivers and trends of change and their potential implications. My goal with these scenarios was to illustrate the potential future progress of sustainable fashion with comprehensive and relatable examples and personas in order to drive the needed transition from current unbearable situation to a more desirable future. In order to create change-making attitudes, we need to step out of our current position and look what tomorrow brings. Today, in the year 2017, it is impossible to forecast exactly what future will bring in the field of sustainable fashion's development in Finland 2035. Nonetheless, it is still possible to influence some elements of the future, the future scenarios presented here might offer a viable tool for peeking into the days to come.

"Three diverse scenarios of sustainable fashion in Finland shed light on possible futures."

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