

Business models promoting system-level environmental sustainability in the textile domain

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Abstract

Textiles play important parts in various aspects of human life. They protect us from our environment, and fulfil complex individual, social and cultural practices, wants and needs. However, the material-intensive nature of textiles causes significant negative environmental impacts resulting from, e.g., short use time, choice of materials and lack of recycling. Fundamental shifts in operational models are required to reach global sustainability targets, as mainstream business practices currently contribute to the exacerbation of wicked problems such as climate change and biodiversity loss. So far, sustainability improvements in the textile domain have focused on the organizational level, and alternative, fundamentally more sustainable business models remain marginal in market share. Achieving system-level environmental sustainability requires approaches tackling the fundamental aspects related to, for example, the design, goals and world views of the textile domain.

Research highlights business models' roles in system-level, i.e., societal, transitions. However, understanding of business models' contribution to or how they can limit their impact on socio-ecological resilience is still lacking. This study seeks to address this gap in knowledge by investigating what types of sustainable business models could contribute to system-level sustainability by transforming the modus operandi of the textile domain. To answer this question, I adopt an integrative literature review approach of business model, systems thinking and socio-technical transition theory. Both scholarly and grey literature is studied to gain a comprehensive overview of knowledge, as well as critically review and reconceptualize theory.

Based on literature, three phenomena in the global textile domain contribute most to its negative environmental impacts: 1) lack of circularity throughout the lifecycle of textiles, 2) ownership-based consumption, and 3) the nature of fashion that drives consumption of textiles in increasing volumes. Based on the findings I argue that sustainable business models that shift linear processes into circular ones, scale up solutions enabling the extension of use time of textiles, and mainstream sustainable standards in production and consumption, possess most potential for contributing to system-level sustainability by impacting the structures of the textile domain.

In response to the findings, I propose a new framework for evaluating sustainable business models' potential for contributing to system-level sustainability impact in the textile domain. I identify a need for clarifying the use of stakeholder engagement and scalability and their connection to system-level impact in literature. Moreover, I identify a lack in the literature regarding the consideration of the need for reduction in material consumption required for reaching global sustainability. Finally, I also identify avenues for future research and cross-sectoral learning, and implications for practitioners.

Keywords sustainable business models, system-level environmental impact, sustainable textiles

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Tiivistelmä

Tekstiilit ovat tärkeä osa ihmiselämää. Ne suojaavat ympäristöltä ja liittyvät monimutkaisiin yksilöllisiin, sosiaalisiin ja kulttuurisiin, käytäntöihin, toiveisiin ja tarpeisiin. Tekstiilien materiaali-intensiivisyys aiheuttaa kuitenkin merkittäviä haitallisia ympäristövaikutuksia, muun muassa lyhyen käyttöajan, materiaalivalintojen ja kierrätyksen puutteen vuoksi. Vakiintuneet liiketoimintamallit myötävaikuttavat haitallisesti viheliäisiin ongelmiin, kuten ilmastonmuutokseen ja luonnon monimuotoisuuden katoon. Kestävyystavoitteiden saavuttaminen vaatii täten perustavanlaatuisia muutoksia liiketoimintamalleihin. Toistaiseksi kestävyystoimet tekstiilialalla ovat kuitenkin keskittyneet organisaatiotasolle, ja uudet, lähtökohtaisesti kestävämmät liiketoimintamallit edustavat edelleen marginaalista markkinaosuutta. Järjestelmätason kestävyuden saavuttaminen edellyttää muun muassa järjestelmän rakenteeseen ja tavoitteisiin vaikuttavia toimintamalleja.

Liiketoimintamallien roolia järjestelmätason siirtymissä on kirjallisuudessa tutkittu, mutta miten ne voivat rajoittaa haitallisia vaikutuksia sosioekologiseen resilienssiin ei vielä täysin tunneta. Tämä tutkimus pyrkii täyttämään tätä aukkoa tutkimalla sellaisia kestäviä liiketoimintamalleja, jotka voisivat vaikuttaa tekstiilialan muutokseen ja vähentää kielteisiä ympäristövaikutuksia järjestelmätasolla muuttamalla vakiintuneita toimintatapoja. Tutkimusmenetelmänä on integroiva kirjallisuuskatsaus kohdistuen liiketoimintamallien, systeemiajattelun ja sosio-tekniikan siirtymäteorian kirjallisuuteen. Tutkin sekä tieteellistä että harmaata kirjallisuutta kattavan yleiskatsauksen kokoamiseksi, sekä tarkastellakseni kriittisesti ja uudelleenkäsitelläkseni teorioita.

Kirjallisuuden perusteella eniten kielteisiä ympäristövaikutuksia aiheuttaa kolme globaalia tekstiilialan ilmiötä: 1) kierron puute tekstiilien elinkaareissa, 2) omistukseen perustuva kulutus ja 3) muodin tekstiilien määrällistä kulutusta kasvattava luonne. Tulosten pohjalta väitän, että kestävät liiketoimintamallit, jotka pystyvät muuttamaan lineaarisia prosesseja kiertäviksi, skaalaamaan tekstiilien käyttöajan pidentämistä mahdollistavia ratkaisuja, ja valtavirtaistamaan kestäviä standardeja tuotannossa ja kulutuksessa omaavat eniten mahdollisuuksia myötävaikuttaa järjestelmätason kestävyteen muuttamalla alan vakiintuneita ja rakenteita käytäntöjä.

Tulosten pohjalta ehdotan uutta teoreettista viitekehystä kestävien liiketoimintamallien järjestelmätason kestävyysvaikutusten potentiaalin arvioimiseksi tekstiilialalla. Tunnistan kirjallisuudessa tarvetta tarkentaa sidosryhmien sitoutumisen ja skaalautuvuuden käsitteiden käyttöä sekä niiden yhteyttä järjestelmätason kestävyysvaikutuksiin. Lisäksi tunnistan, että kestävyystavoitteiden saavuttamiseksi vaadittavaa materiaalikulutuksen vähentämisen tarvetta ei juurikaan huomioida kirjallisuudessa. Lopuksi esitän myös mahdollisuuksia jatkotutkimukselle, monialaiselle oppimiselle ja keinoja ammattilaisille.

Avainsanat kestävät liiketoimintamallit, kestävät tekstiilit, järjestelmätason ympäristövaikutus

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Titel Affärsmodeller som främjar ekologisk hållbarhet på systemnivå i textildomänen

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Sammandrag

Textilier har en viktig roll i olika delar av människors liv. De skyddar oss från vår miljö och uppfyller komplexa individuella, sociala och kulturella sedvänja, önskemål och behov. Textilernas materialintensiva natur orsakar dock betydande skadande miljöpåverkan som följd av bland annat kort användningstid, materialval och brist på återvinning. Grundläggande förändringar i operativa modeller krävs för att globala hållbarhetsmål ska uppnås, på grund av att etablerade affärsmodeller för tillfället bidrar till onda problem som global uppvärmning och förlust av naturens mångfald. Hittills har hållbarhetsförbättringar inom textildomänen dock begränsats på organisationsnivå och alternativa, i grunden mer hållbara affärsmodeller representerar fortfarande marginalen i marknadsandelen. Hållbarhetsimpakt på systemnivå kräver nya modeller som påverkar de grundläggande aspekterna relaterade till hela systemets upplägg, mål och världsbilder.

Affärsmodellernas roll i övergångar på systemnivå har undersökts i den akademiska världen, men hur affärsmodeller bidrar till eller hur de kan begränsa sin negativa inverkan på socioekologisk resiliens är fortfarande relativt okänt. Syftet med denna studie är att ta itu med detta gap genom att undersöka vilka typer av hållbara affärsmodeller kan bidra till omvandlingen av textildomänen på sätt som minskar negativa miljöeffekter på systemnivå. För att nå syftet antar jag en integrativ litteraturgranskning av affärsmodell, systemtänkande och socioteknisk övergångsteori. Både vetenskaplig och grå litteratur studeras för att samla en omfattande överblick av kunskap, samt kritiskt granska och konceptualisera om teori.

Litteraturen hävdar att det finns tre centrala fenomen inom den globala textildomänen som bidrar mest till den skadliga miljöpåverkan. Dessa är: 1) brist på cirkularitet i textilers livscykel, 2) ägarbaserad konsumtion och 3) naturen av mode som driver konsumtionen av textilier i ökande volymer. Baserat på resultaten argumenterar jag att hållbara affärsmodeller som kan förändra linjära processer till cirkulära, skala upp lösningar som möjliggör förlängningen av användningstid, och integrerar hållbara standarder i produktion och konsumtion har därmed den största potentialen för att bidra till hållbarhet på systemnivå genom att omvandla etablerade praxis och strukturer.

Utifrån undersökningsresultaten föreslår jag ett nytt teoretiskt ramverk för att utvärdera hållbara affärsmodellernas potential för hållbarhetspåverkan på systemnivå i textildomänen. Jag identifierar oklarheter i litteraturen angående användningen av intressentengagemang och skalbarhet samt deras koppling till hållbarhetspåverkan på systemnivå. Jag identifierar också brister i litteraturen angående övervägande av behovet för att minska materialförbrukningen som krävs för att nå global ekologisk hållbarhet. Slutligen identifierar jag frågor för framtida forskning och sektorsövergripande lärande, samt implikationer för företag.

Avainsanat hållbara affärsmodeller, hållbara textilier, hållbarhetsimpakt på systemnivå

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1. Introduction

Clothing accounts for up to 10% of the environmental impact of EU consumption (Sajn, 2019). Though the fashion, clothing and textile industry's growth is forecasted to slightly slow down in the coming decade (McKinsey & Business of Fashion, 2019), the environmental impact of the industry is expected to grow in case operations continue with a business-as-usual approach due to projected growth in the demand for textiles from e.g. population growth and a growing middle class. The textile domain has been awakened by the growing amount of research linking climate change and biodiversity loss to industry practices, and the destabilizing effects these phenomena have on consumption and production projections in the mid and long and. As a result, business leaders in, for example, the fashion industry have started stating sustainability as one of their main concerns for the coming decade (KPMG, 2019; Lehmann et al., 2018; McKinsey & Business of Fashion, 2019) and small, sustainability-oriented fashion and textile companies are emerging in growing numbers to tackle increasing consumer demand for more sustainable alternatives (McKinsey & Business of Fashion, 2019). Though fast fashion and textile companies are still dominating in market share, sustainability-oriented players are working hard to change the exploitative industry's status quo. However, these sustainability forerunners still represent a marginal portion of the companies in the textile domain when regarding volume of products sold and value created. Overall, increased commitment to sustainability, multi-stakeholder collaboration and innovation are needed at grand scale to transform the textile domain on a system-level (Ellen McArthur Foundation, 2017).

Recently, sustainability-oriented business models as vehicles pushing for a system-level transformation towards sustainability have gained publicity as contributors to alleviating the wicked problems of our time, e.g., climate change and biodiversity loss. Pressure for companies to tackle environmental, social and economic issues as part of their business focus has increased both on the policy and the consumer side (Bocken et al., 2014), pushing also incumbent businesses, i.e., industry leaders with largest profitable market shares, to start making changes to the way they operate. Simultaneously, although business model research has gained popularity among academics (Schaltegger, Hansen & Lüdecke-Freund, 2016), it still seems to be relatively unknown to what extent business models are capable of having impact on the system-level, or in other words, contributing to sustainability transitions of

entire industries. As examples, research on environmental and social sustainability in business models for the purpose of innovation (Halme & Korpela, 2014) and business model development (Schaltegger, Hansen, et al., 2016) has increased over the past decade. However, established conceptions of the fundamental conditions required for business models to be called “sustainable” still seem to be lacking (Breuer et al., 2018), which puts practitioners in a constrained position when contemplating on how to develop their businesses in order to reduce negative environmental impacts of their operations and contribute to the system-level sustainability transition of their industry. As textiles and especially clothing, as well as the acts of consuming them fulfill various consumer needs and desires, an array of solutions are needed to shift the textile domain towards a more sustainable foundation. Businesses have been argued to be capable of leading transitions such as this. (Ellen McArthur Foundation, 2017) Fashion retailers and brands possess a unique potential for impact as they control design and sales of clothing, for example, while also determining the cycles of styles produced and introduced to markets. However, a change in the whole value chain is needed to shift fundamental aspects of the domain related to material use, production, consumption and post-use practices.

Due to the complexity of wicked sustainability problems, academics propose that it is unlikely that sustainability actions of individual companies alone will be able to impact or solve these system-level challenges (Whiteman, Walker & Perego, 2013). However, the extent to which business models can contribute to a system-level transformation is of significant interest, as examples from practice, such as business model innovations like Uber and Airbnb, showcase that even single business models can radically disrupt entire industries causing significant changes in the paradigm, i.e., wider societal organization. From an environmental sustainability perspective, finding business models capable of disrupting industries in ways that permanently transform them in ways that reduce negative environmental impacts becomes of interest in this context.

So far, though, research on the environmental sustainability impacts of business models have mostly focused on the organization-level (Williams et al., 2019), despite the system-level being a critical theoretical framework for understanding the socio-technical environment in which businesses operate (Whiteman et al., 2013). Examples from practice also indicate that sustainability-oriented interventions in the textile domain have so far been of incremental scale. For example, businesses have focused on optimizing processes and minimizing waste, instead of tackling fundamental operative models, such as the take-make-waste model of

operating and low use-rates of textiles (Ellen McArthur Foundation, 2017). Scholars (e.g. Dentoni et al., 2020) have argued that understanding of business models' contribution to, or how they can limit their impact on, socio-ecological resilience is still lacking. This is of timely interest, as businesses currently cause significant negative environmental, social and economic impacts (Sajn, 2019), often referred to as externalities, not reflected in fundamental market dynamics, such as prices for example, argued by economic theory to be capable of solving market problems. Simultaneously, though, they have potential for also promoting sustainable development on a local and global scale. (United Nations Department of Economic and Social Affairs, 2019) Given the timeframe for achieving these goals (e.g. limiting global warming to 1.5°C compared to pre-industrial times in the coming decades (IPCC, 2018), and reversing biodiversity loss (Mace et al., 2018; Smith et al., 2019)), it thus becomes of interest to understand what kinds of business models are capable of contributing to sustainable development on a system-level.

Questions regarding the scope of impact of businesses' sustainability efforts are of essence, as the perspective of sustainability is of systemic scale. Global sustainability cannot be brought on nor achieved by single actor alone, rather it requires reconfiguration of system-level dynamics and new ways of collaboration of actors within the system (Geels, 2004), i.e. reorganizing operative models on the level of our global society. Hence, the potential of business models in initiating and, or, contributing to a reconfiguration of systemic scale is of interest, as a systemic perspective on businesses also recognizes limitations to growth determined by, at least, the ecological system boundaries of the planet, as well as business' dependence on society and the global economy (Williams et al., 2017).

In order to answer to the growing pressure for business model reconfiguration towards a more sustainable status quo, it essential to know what kinds of business models can integrate environmental and social value with economic value in the business model concept (Joyce & Paquin, 2016) in a way that could permanently change the status quo of business. Academia is increasingly exploring new business models to help preserve and grow economic value while reducing negative externalities associated with the business-as-usual mode of operation, and even increase positive impacts in the environmental and societal dimensions (Schaltegger, Hansen, et al., 2016) reflected in the handprint concept of business impact (Kühnen et al., 2019). For businesses operating in the textile domain this means focusing on solving the challenges that result in wastefulness of resources, reduces use times of textiles and negative environmental impacts of the materials used.

Comprehensive research on the impacts of modified and completely new business models—that change the fundamental ways businesses operate in—is still scarce (Schaltegger, Hansen, et al., 2016). This thesis thus aims to examine what types of sustainable business models in the global textile domain could have system-level impacts contributing to industry-level sustainability transformation. I aim to research which types of business models have effects on not only the company’s own operations, but the environment and the wider market context to significantly reduce negative externalities and, or, have positive impacts on environmental sustainability. In summary, this study aims to contribute to the scholarly discussion of business models’ role and contribution to socio-technical system transformation for sustainability, by examining sustainable business models in the global textile domain.

1.1. Research questions

The modus operandi of the textile domain causes significant strain on the natural systems constituting the operative environment of businesses. The negative impacts, e.g., increasing resource and energy consumption as well as pollution, contribute to the acceleration of wicked environmental problems, such as climate change and biodiversity loss. Reducing and/or ultimately negating these negative impacts is of paramount importance in order to achieve global sustainable development goals and bring the operations of the domain within planetary boundaries. Achieving this requires change on a system level in the textile domain.

It thus becomes interesting to investigate what role business models in the textile domain can play in promoting a systemic change of this kind, instead of continuing to maintain the unsustainable status quo. This requires understanding which phenomena the negative environmental impacts stem from, i.e., where in the system it would be beneficial to intervene in order to change the system’s overall way of operating. Thus, this study will look into business models with potential to change the textile domain on a system level. In other words, the study aims to identify business models capable of contributing to a socio-technical transformation towards a status quo in line with sustainability goals, in the context of the global textile domain.

The main research question that inspired this study is “what types of business models can contribute to the transformation of the textile domain in a way that reduces its negative environmental impacts?” In order to answer this, two sub-questions need to be examined:

1. What are the system-level phenomena of the textile domain that exacerbate grand environmental challenges?
2. Can business models have an impact on the system level? What types of business models in the textile domain can have impacts on sustainability?

1.2. Key terminology

The definitions of three key concepts used in this study have been summarized below. This sections presents the framing and limitations of these concepts for the purpose of this study.

1.2.1. Sustainability

One of the seminal definitions for sustainability can be drawn from the 1987 Brundtland Commission report that determined sustainable development as development which “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland & Visser, 2013). Since then, more categorical and domain specific definitions and goals for sustainable development have been set based on this general notion. Sustainability has been deemed a holistic concept spanning all three dimensions of human life and society—environmental, social and economic (Jay & Gerard, 2015)—and it is regarded as a process and of systemic character (Hjorth & Bagheri, 2006; Williams et al., 2017), meaning sustainability is concerned with the progress towards a more resilient and socially fair state of living within planetary boundaries, rather than being an end goal in itself. For example, the UN has developed Sustainable Development Goals for 2030 and a global agreement on the reduction of carbon emissions was signed as the Paris Agreement outlining specific targets for sustainable development in the near future.

In this study I regard sustainability as a process towards targets outlined in the UN SDGs 2030, the Paris Agreement and beyond. However, the dimensions of sustainability considered in this study is restricted to environmental and economic sustainability of SBMs. Restricting the analysis to environmental impacts gives an advantage to creating a clearer focus for the study (Pal & Gander, 2018). Although I note that the exclusion of the social dimension results in a partial perspective on sustainability, the exclusion is deemed justifiable for this study due to: firstly the absence of a consensus of which negative social impacts of the domain it would be necessary to include and how they would be measured (Joyce & Paquin, 2016), and secondly due to the scope of this Master’s thesis study.

1.2.2. Textile domain

The textile domain is defined to consist of the textile, clothing and fashion industries. The textile industry refers to the production of yarn, textiles and fabrics, whereas the clothing industry refers to the production of garments and other textile products, such as household, technical and industrial textiles. The fashion industry is referred to as also including shoes, bags, jewelry and other accessories along with garments. (M-Brain GmbH, 2020; Sajn, 2019) For the purpose of this study, the textile domain is defined to include all business models, which enable humans to clothe themselves, dress their homes and businesses, as well as those producing textiles for the use of other industries. Regarding materials, all fibers and leathers are included. Product-wise, alongside textiles, bags and shoes are included, but jewelry and other similar non-fiber and non-leather accessories are excluded from consideration.

Though the textile domain encompasses the whole lifecycle of production from raw material to finished garments, approximately 60 % of the environmental impact of the domain can be attributed to the clothing industry (Ellen McArthur Foundation, 2017). Thus, the clothing industry will be of central concern in this study, with attention paid also to the textile and fashion industries.

1.2.3. Sustainable business model

A sustainable business model (SBM) is defined as a business model that integrates consideration of sustainability actions at the core of the business model concept, in order to significantly reduce negative externalities of business operations or incur a net-positive impact through the co-creation of novel production and/or consumption systems with stakeholders.

2. Literature review

The central aim of this study is to examine what types sustainable business models can have impacts to reduce the negative environmental impacts of the textile domain. Firstly, I examine the negative environmental impacts of the textile domain to identify central phenomena causing them. I employ a systems thinking approach to identify leverage points that could be tackled by businesses operating within the domain. Secondly, I identify archetypal SBMs potentially capable of having an impact on the modes of operating that cause the negative environmental impacts. Lastly, I present the theoretical framework employed in this study, which aims to present a new way of looking at what types of SBMs can impact the textile domain on a system level. Based on the literature review, three SBM archetypes seem to possess potential for having system-level impact capable of pushing for a transformation towards a more sustainable status quo in the textile domain. The archetypal SBMs are argued to achieve this by changing production, use and disposal from linear to circular, by changing consumption behavior from ownership-based to use-based, and by establishing more sustainable standards for industries relating to production processes and raw material use. The examined literature argues that system-level impact is mainly achieved by business models engaging in these activities, as they involve building new value networks, with various stakeholders, around technological or non-technological innovations that target the linear nature of textile production and shift it towards a more circular direction, the increasing underutilization of clothing-use due to fashion cycles by aiming to shift consumption from being based on ownership to a use-based model.

2.1. Introduction and context

Climate change (Levin et al., 2010) and biodiversity loss (Sharman & Mlambo, 2012) have been described as wicked problems undermining the sustainability of current levels of human prospering. These problems are characterized by complexity, ambiguity and lack of readily available solutions or insolvability (Sharman & Mlambo, 2012). Human activity is impacting both of these phenomena (IPBES, 2019; IPCC, 2018), pointing out that the way our global society is organized to function is contributing to the exacerbation of these problems. All areas of human activity should thus be investigated when aiming for the reduction of humanity's negative impact on environmental systems.

In order to do this, examining the negative environmental impacts of the textile domain that exacerbate the aforementioned wicked problems is of particular interest. Identifying the modes of operating associated with the negative environmental impacts from a systems perspective allows the contemplation of potential leverage points (Meadows, 1999). These represent potential points of intervention where larger scale impact could be achieved with relatively small actions in the textile domain. This in turn can allow for the examination of textile-related sustainable business models (hereinafter referred to as SBMs) with potential for significantly reducing the negative environmental impacts of the whole domain by changing the modus operandi of related industries.

The following sections of this literature review look at the most significant environmental challenges of the global textile domain, which present acute sustainability challenges when considering the UN Sustainable Development Goals and global climate agreements such as the Paris Accord. Then, I present the systems thinking approach to identify leverage points in the system, where SBMs could potentially intervene, i.e. have an impact, in order to replace or transform existing incumbent, but unsustainable, business models. Lastly, I summarize the theoretical framework of this study, which looks to identify the types of SBMs that can potentially achieve or contribute to system transformation in the textile domain. The overall goal of this literature review is to examine, based on existing literature, what business models can contribute to system transformation and employ this to understand avenues for system-level change in the textile domain.

2.2. Causes of the negative environmental impacts in the textile domain

This section lists the sustainability challenges and negative environmental impacts associated with the different industries of the textile domain. In summary, the central causes of the unsustainability of the textile domain include linearity as status quo in operations, the contribution to increasing levels of consumption caused by the fashion industry, and ownership-based consumption of clothing and textiles.

2.2.1. The negative environmental impacts of the textile domain

The textile domain, encompassing textile, clothing and fashion industries (Sajn, 2019), is in dire need of more sustainable modes of operation (Pal & Gander, 2018). Clothing accounts

for approximately 60 % of the production and consumption of textiles in the domain, and it is projected to maintain its large share in the textile domain (Ellen McArthur Foundation, 2017). The clothing industry will thus receive proportional attention in this study, with attention paid also to the textile industry encompassing the production and sales of yarns, fibers and fabrics, as well as the fashion industry, as these are strongly intertwined with the clothing industry as well.

Looking at the global textile domain's characteristics, high labor-intensity, lack of transparency, significant differences in general cost levels between recipient and producer regions, and communication barriers to name a few, have been argued to predispose operations to a higher risk of violating sustainability norms (Laudal, 2010). This perspective proposes that the nature of the supply chains of the textile domain inherently limit the ability of businesses to address, for example, corporate social responsibility (Pedersen & Andersen, 2015).

Taking an environmental impact approach, clothing consumption alone has been found to account for between 2 to 10 % of the total environmental impact of EU consumption, and the European Environmental Agency (2019) has ranked textiles as the fifth largest source of greenhouse gasses in the EU after housing, direct impact of households, transport and food. Globally, it has been estimated that the clothing industry's annual carbon footprint is close to equal to that of all 28 EU member states combined (global clothing industry 3.3 bn tons vs. EU28 3.5 bn tons) (Environmental Audit Committee, 2019). Clothing production and consumption has been argued to have doubled during the past 15 years to amount to approximately 100 billion new garments being produced annually (Ellen McArthur Foundation, 2017). With an estimated 160% growth in world GDP being forecasted by 2060 (OECD, 2020), the demand for textiles can also be expected to increase. Population growth and a growing middle class contribute significantly to projections of the growth of textile consumption.

Raw material production accounts for a significant share of the environmental impact of the textile domain (Sajn, 2019). The sheer volume of textiles currently being produced exacerbates the environmental impacts of material production associated with natural materials, such as cotton, silk and wool, as well as those associated with synthetic materials, like polyester and manmade cellulose for example (Ellen McArthur Foundation, 2017; Pedersen & Andersen, 2015; Sajn, 2019). Textile and garment production cause

environmental strain also due to its reliance on high energy, water, and chemical use (Global Fashion Agenda & The Boston Consulting Group, 2017). These negative impacts of textile production are attributed to, on top of the impacts from the materials themselves, for example high reliance on non-renewable energy sources and low levels of regulation regarding chemical use and wastewater treatment in low-cost countries, where the majority of production takes place (Global Fashion Agenda & The Boston Consulting Group, 2017).

However, the impact of textiles does not end with production. Waste from garment production and products that never make it to the market has been estimated to account for approximately 12-20% of the clothing industry's material waste footprint (Ellen McArthur Foundation, 2017; Sajn, 2019). Regarding the use phase of textiles, consumer use of clothing has been estimated to be responsible for the largest portion of the environmental impact of the lifecycle of clothing, due to water, energy and chemical use of maintenance activities, such as washing and the microplastics runoff associated with it, as well as drying and ironing practices (Beton et al., 2014). Furthermore, challenges with the disposal phase of textiles causes significant environmental strain. Only approximately 18 % of post-consumer clothing are recovered for reuse and recycling (Global Fashion Agenda & The Boston Consulting Group, 2017), leading to over 80 % of the material input of clothing being landfilled or incinerated (Ellen McArthur Foundation, 2017). In other words, a significant share of textiles is being produced only to be discarded without use, reuse or recycling, and the majority of textiles that do get used never get reused or recycled.

The inefficiency of material use in the textile domain also has business implications. Wasted materials of the textile domain represent a USD 100 billion market potential for businesses (Ellen McArthur Foundation, 2017) signifying the need for change in the status quo even from an economic sustainability perspective. The economic value creation in the clothing industry is also highly uneven – the top 20 companies create over 100% of the industry's economic profit, as the bottom 20 % destroy value (McKinsey & Business of Fashion, 2019) indicating many business models aren't economically sustainable. Moreover, no change in the business as usual approach has been projected to lead to significant reductions in profitability (Global Fashion Agenda & The Boston Consulting Group, 2017), emphasizing the need for alternative modes of operating on a system level in order to maintain profitability in the future. Lastly, projections estimate that the negative environmental impacts of the clothing industry are expected to grow significantly due to tripling of demand by 2050 (Ellen McArthur Foundation, 2017) in case the modus operandi, i.e. the mainstream

way of doing things, of the textile domain doesn't transform to a more sustainable foundation.

A transformation to a more sustainable way of operating is thus needed both from an environmental and business perspective. This study focuses on the role companies can play in the reduction of the aforementioned environmental impacts throughout the lifecycle of textiles from raw materials to garment production and the end-of-life stage, by developing more sustainable business models. Consumer use-phase impacts are not considered in this study as they are outside of the direct scope of control of businesses.

2.2.2. Drivers of the negative environmental impacts of the textile domain

The wasteful nature and negative environmental impacts of the textile domain described above can be attributed to the almost fully linear nature of operations (Ellen McArthur Foundation, 2017). This linear nature of the clothing industry—globalized, complex and fragmented in nature—is maintained by constant consumption of new and the discarding of that which is out of style (Kozłowski et al., 2014) inherent to the cultural and sociological concept of fashion (Barthes, 2013), which has led to changes in clothing production and consumption, such as the decrease in quality of textiles and reduction of use-time (Ellen McArthur Foundation, 2017). Fashion's inherent dynamics contribute to the rising negative environmental impacts by increasing textile consumption due to the increasingly shorter use culture of textiles it encourages (Kozłowski et al., 2014). Coupled with consumption of clothing being strongly ownership-based (Armstrong et al., 2015), fashion consumption presents a difficult sustainability challenge for the textile domain. In essence, more pieces of clothing are produced with lower quality to enable cheaper prices and consumed and used for increasingly shorter time periods without the circulation of the materials used in the textiles, which leads to increasing use of virgin materials and thus the negative environmental impacts associated with materials.

These phenomena identified in both academic and grey literature—linear operations as status quo, underutilization of textiles due to the inherent dynamics of fashion and ownership-based consumption of clothing—represent three central dynamics of the textile domain, which make the textile domain unsustainable from the perspective of planetary boundaries (Rockström et al., 2009) and global sustainability goals (United Nations Department of Economic and Social Affairs, 2019). In combination, the three phenomena at

least maintain the increasing trajectory of negative environmental impacts caused by the textile domain (Ellen McArthur Foundation, 2017). The following sections present these phenomena in more detail.

Unsustainable production – linearity

The way textiles are currently procured competitively is based on linear and opaque logics, which makes it difficult, if not impossible, to address sustainability concerns on a system-level. Above all else, the linear nature presents an acute challenge for the textile domain (Ellen McArthur Foundation, 2017). This is because linear systems of the scale of the global textile domain are inherently unsustainable on a planet with limited renewable resources (Raworth, 2017b), which also predisposes companies to business risks in the long term.

A central statistic highlighting the linearity of the global textile domain is the estimate that less than 1% of the materials—including the recycling of factory cut-off waste and post-use textiles—used to produce clothing globally get recycled into new clothing, (Ellen McArthur Foundation, 2017). A significant reason for this is that the materials most often used in clothing production are not suitable for circular use (Ellen McArthur Foundation, 2017) as they often are of poor quality in material and construction, and consisting of material mixes difficult to separate, resulting in them not withstanding long-term use (Fletcher, 2010), nor recycling. Technological solutions enabling the recycling of textiles in a competitive way are still lacking both for monomaterials and mixed fibers (Pal & Gander, 2018). According to industry experts, recycling of textile fibers is the most significant hurdle the textile domain needs to overcome in order to move towards circularity, as current technologies are not capable of maintaining the quality of the fibers, which leads to textiles being downcycled instead of recycled (Environmental Audit Committee, 2019). From a business model perspective, this technological reality keeps and encourages businesses to stay with a linear business model logic – the way to increase profit is by selling more and more pieces of clothing. Moreover, regional and national differences in collection practices also reduces the volume of textiles that can be collected for reuse or recycling, presenting challenges for developing and establishing profitable circular systems. Currently, for example fast fashion companies such as H&M and Zara achieve growing revenues by producing increasing amounts of clothing for low prices by compromising on quality and recyclability in the materials used.

From a systems thinking perspective, the linearity of the textile domain can be attributed to the design of the system, which refers to the underlying rules organizing it, as well as the goals and world views from which they arise (Fischer & Riechers, 2019). If the measure of success of a textile company is measured solely in the economic value it creates—without consideration for or constraints on causing externalities associated with achieving said value—it incentivizes companies to achieve growth in economic value without consideration for e.g., environmental or social sustainability. An example of the world views guiding unsustainable practices in the textile domain could be derived from the narrative associated also with economic growth – that it can be endless. Currently, many companies in material-heavy industries such as the textile domain can be argued to function in contradiction with limits on growth in resource-use set by planetary boundaries (Rockström et al., 2009) as their operations are organized with such a linear logic, highlighted by the fast fashion business model described in more detail in the next section.

Moreover, this linearity has to do with the more mechanistic characteristics of the textile domain, such as laws, conventions, subsidies and standards, which uphold the status quo. An additional challenge contributing to the linear nature of the textile domain is also the lack of standards in parts of the textile chain and absence of holistic planning from design to post-consumer use (Ellen McArthur Foundation, 2017). For example End-of-Waste definitions (European Commission, 2020) can hinder certain materials from being reused, and subsidies may discourage the recycling of materials compared with virgin alternatives, while established standards may keep new recycled and recyclable materials from being utilized. Thus, so far the industries in the textile domain have been primarily focused on driving down costs and increasing efficiency of production (Ozek, 2017) as the dominant business paradigm shaping operations encourages and enables growth, i.e. economic success, based on linear processes (Fletcher, 2010). In essence, the rules, i.e. laws, regulations, conventions etc., along with established production technologies favor linearity over circularity, due to linear operations being established and well-functioning from an economic perspective. This paradigm shaping global economics and markets influences the linearity of industries embedded in it (Raworth, 2017b).

Increasing consumption – fashion

While the linear nature of the textile domain can be attributed mostly to the state of technological and mechanistic factors, fashion can be considered as a sociocultural system

(Arnould & Thompson, 2005), characterized by various countervailing interpretations of cultural discourses (Thompson & Haytko, 1997), creativity, taste and social status (Barthes, 2013). The sociological perspective determines that fashion arises from cultural exchange and dynamics of society. If clothing is heavily coded, i.e., cultural rules dictate who gets to wear what, there is no fashion. However, when members of a society have the opportunity to move and identify themselves with certain groups, such as aristocracy or pop-stars, fashion can emerge as it is based on imitation to some extent. It should also be noted that the popular conception of 'fashion' is strongly based in Western cultures, and the history of fashion often described as the progression from European nobility enjoying the privilege to consume different types of clothing, to the development of haute-couture fashion houses led by individual designers whose garments were enjoyed by members of higher socio-economic classes, ultimately to today when fashion has been democratized largely to fast fashion, in terms of more people having the ability to follow and afford the cycles of fashion. (Barthes, 2013; Rosa, 2014) In other words, fashion presents a social and cultural system influenced by the values, needs, desires and aspirations of humans.

Fashion is thus symbolic product providing social value (Kaiser, 1997), whereas clothing provides material value in regards to physical needs, such as protection and function (Armstrong et al., 2015). This highlights the central difference between clothing and fashion products. Dressing oneself has been deeply intertwined with the sociocultural dimensions of human societies (Thompson & Haytko, 1997) signifying that clothing in many contexts have deeper meanings than the functional values they provide. As a sociocultural system, fashion drives material consumption through humans' social need for using symbols to project social standing from both an individual and group perspective (Gronow, 1993; Thompson & Haytko, 1997).

Looking at the fundamental dynamics of the fashion system, it can be characterized as counterproductive to sustainability due to the "relentless production of obsolescence" (p. 9 Parmentier & Fischer, 2011) of styles, i.e. clothing, which it requires to maintain itself. This is because fashion as a system is founded on the creation of a perpetual desire for newness enabled by the regular appropriation of style innovations from e.g. cultural (Barthes, 2013) and consumer identity contexts (Parmentier & Fischer, 2011). In other words, the fashion system takes inspiration from culture and spins it into desirable immaterial fantasies represented by material clothing, marketed to consumers based on real and created wants more often than needs. This essentially means that without the constant cat-and-mouse

dynamic of certain actors setting trends and other imitating them, fashion as a system would not exist. This is best represented by the contradiction inherent to “fashionability”: a style simultaneously needs to be widely adopted to be considered “fashionable”, yet simultaneously it becomes “unfashionable” as it is widely distributed amongst a group of consumers, creating the need for creating new trends in order to maintain “fashionability” (Armstrong et al., 2015). The commercialized nature of the fashion industry (Parmentier & Fischer, 2011) leading to paradigmatic business interests, i.e. profit and growth as the primary goals and metrics of business success, also influencing the maintenance and development of the dynamics of the fashion system, and thus also the textile domain, in ways counterproductive to sustainable development goals.

The fashion industry has been criticized for its contribution to the negative environmental impacts of the textile domain. The concept ‘fast fashion’ is described as “a new accelerated fashion business model that has evolved since the 1980s. It involves increased numbers of new fashion collections every year, quick turnarounds and often lower prices. Reacting rapidly to offer new products to meet consumer demand is crucial to this business model” (p.6 Environmental Audit Committee, 2019), highlighting that it is a business model first and foremost. Especially the fast fashion business model is dependent on mass production and large volumes of sales of low-price and low-quality items that imitate trends in luxury or high fashion, leading to increasing consumption of natural resources and energy, and production of pollution and waste (Joy et al., 2012; Sajn, 2019). Examples of companies utilizing the fast fashion business model include Asos, H&M and Zara.

The increasing turnover of seasons, attributed to the dynamics of the fast fashion industry, has led to what Kozłowski et al. (2014) note as “[u]nnecessary consumption, which runs contrary to the principles of sustainability” (p. 8). The impact the fast fashion business model has had on clothing use can be seen in statistics showing how clothing use has decreased over the past 15 years while sales of clothing has simultaneously doubled (Ellen McArthur Foundation, 2017). This means that clothing has become a readily available and affordable consumption object, that has enabled a transgression from consumption based on needs to consumption based on wants. The fashion system contributes to increasing consumption of clothing by manipulating the desires of consumers through, e.g. marketing, leading to unsustainable dynamics from an environmental sustainability perspective.

A movement opposite to that of fast fashion, presenting a more sustainable approach to the system, has been described as slow fashion. “Slow” in this context, emerging from the slow food movement (Fletcher, 2010), has been associated with durability, traditional production techniques and design as well as “seasonlessness” in regards to style. However, in opposition to how the concept has been used by incumbent fashion businesses to market different styles of clothing, Fletcher (2010) argues that the slow fashion concept should be regarded as an opposing world view to that which fast fashion is built upon and perpetuates, along with a vision of different economic and business model logics, values and processes. According to this perspective, achieving a more sustainable fashion system requires changing the underlying culture, world views, values and goals, of the textile industry. This perspective presents an avenue for considering systems change in the fashion industry through rethinking fundamental business logics, goals, values and worldviews embedded in the system, which in itself is situated in the global system of economics, society and natural environment (Fletcher, 2010). This highlights the importance of looking at deeper dynamics of systems, when determining what constitutes as system-level impact for sustainability in a global industrial domain.

From a systems thinking perspective the dynamics of fashion can also be attributed to the design and intent of the socio-cultural dimension of the textile domain, i.e. the social structures, values and world views associated with it as described above (Abson et al., 2017; Fischer & Riechers, 2019). In essence, this refers to, for example, beliefs held by consumers associated with fashion, such as “imitating new trends gives me more social capital and emphasizes my status among my peers” and “buying fashion makes me feel better”, as well as “new is always better than second hand”. These beliefs are also perpetuated by the fashion industry in order to maintain its market. Beliefs such as these guide consumption behavior and thus altering them requires looking at the fundamental mindsets from which they arise.

Ownership-based consumption

The third central phenomena impacting the textile domain’s environmental impacts regards the consumption dimension perpetuated by incumbent business models. Clothing can be considered as intimate consumption objects, as they are used to build one’s identity and communicate, among others, social status and class to social reference groups, on top of providing us with functional value in protecting ourselves from the views of others and weather for example (Armstrong et al., 2015; Kaiser, 1997; McCracken, 1990). In other

words, the material-heavy nature of clothing and the experienced social value provided by fashion are strongly linked, which presents a sustainability challenge as the consumption of fashion perpetuates growing consumption of natural resources. This highlights the importance of shifting modes of consumption for achieving reductions in the negative environmental impacts of the textile domain.

The decoupling of these values and the material side of consumption has been argued to present opportunities for sustainability benefits, which is a transition product-service-systems (PSS) aim to make a reality (Armstrong et al., 2015; Maxwell & Van der Vorst, 2003). On a conceptual level, PSS strives to replace ownership-based consumption, with alternative consumption models potentially capable of also reducing material consumption (Briceno & Stagl, 2006). The PSS concept can be divided into two main categories: product and use-oriented PSS. Product-oriented services sell material products along with product-related services to add value, such as clothing maintenance and take-back schemes (Armstrong et al., 2016). Use-oriented services focus on offering functionality instead of ownership through, for example, renting or sharing schemes with ownership of the product staying in the hands of the service provider, often called producer ownership. The latter has been described as possessing higher potential for achieving significant sustainability benefits, as it presents opportunities for the development and scaling of new business models resulting in the overall reduction of raw material consumption (Armstrong et al., 2015).

In their literature review and study, Armstrong et al. (2015) synthesized the challenges for the scalability of use-oriented consumption of clothing. The removal of ownership can be difficult due to the links to personal emotional experiences of, for example, status, self-control and self-expression, as well as memory keeping associated with clothing. Moreover, hygiene concerns and trust issues with the service providers seem to play a role in consumer skepticism against non-ownership-based consumption of clothing (Armstrong et al., 2015). Though convenient solutions would be available, consumers seem to prefer ownership-based consumption of clothing due to these aforementioned hygiene, emotional and social value aspects that this form of consumption offers to them.

From a systems thinking perspective, use-oriented consumption solutions to clothing and fashion could help solve environmental challenges of the textile domain, as they alleviate material consumption perpetuated by fashion and by necessitating changes in the design and production of clothing to make them withstand longer-term use (Armstrong et al., 2016). In

other words, ownership-orientation in clothing consumption seems to result from both the values and design of the textile system, highlighting the importance of considering both the structure of the system and the values guiding it.

2.3. Systems perspective – leverage points

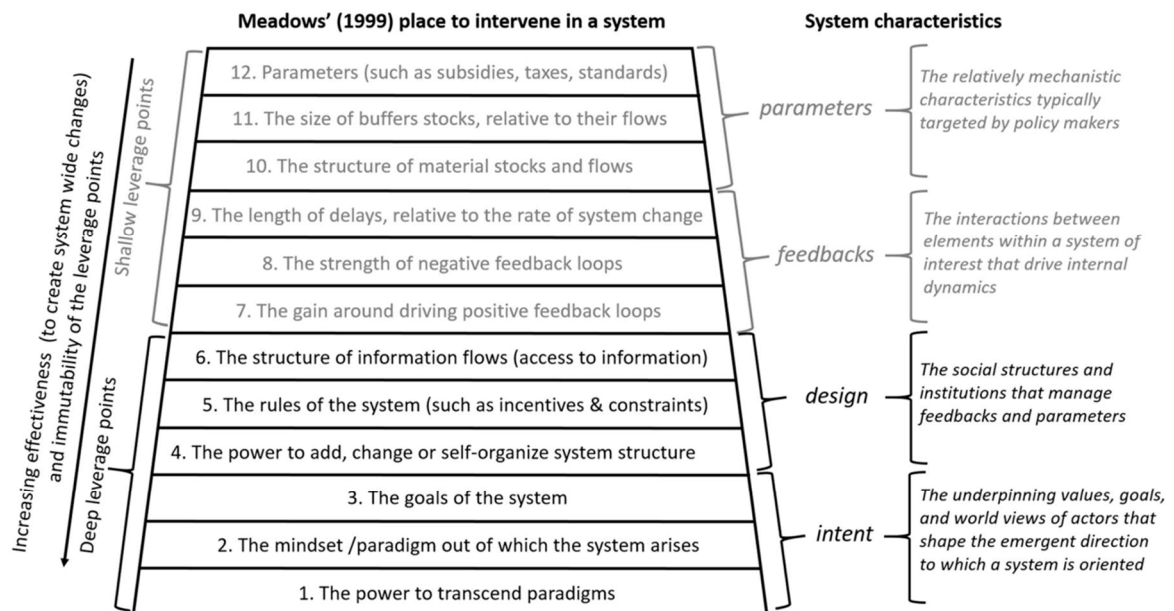
A positive development, however, has been the growth in consumer interest for sustainability, which can be seen at least in social media statistics – it grown faster than overall social media growth between 2015 and 2018, indicating consumer interest for alternative solutions, which increasingly impacts purchasing decisions (Lehmann et al., 2019). However, businesses operating with alternative, more sustainable fashion business models remain in niches and at small scale (McKinsey & Business of Fashion, 2019), arguing for change on the system-level that would enable these new business models to scale up to wither replace incumbents or encourage change in established modes of operating.

In the report *A new textiles economy: Redesigning fashion's future*, the Ellen McArthur Foundation (2017) outlined a vision for a more sustainable and circular global textile system. Realizing this vision, the authors argue, necessitates bringing about four central transitions: 1) the phasing out hazardous substances and microfiber runoff in production, use and consumption; 2) transformation of clothing design, sales and use to make clothing less of a disposable consumption object; 3) radical improvement of recycling through transforming clothing design, collection and reprocessing; and 4) the more effective utilization of resources and a transition to renewable material input. The environmental benefits that could be achieved through transitioning to a textile system of this kind could be the significant reduction of greenhouse gas emissions, reduced consumption of non-renewable and virgin materials as well as energy, increased land productivity and health of environmental systems, reduced plastic pollution in oceans, reduced hazardous chemical pollution in environmental systems and reduced pressure on water use especially in water-scarce areas. This highlights the need for addressing the global and local sustainability challenges of the textile domain from a holistic and systemic approach (Pedersen & Andersen, 2015).

Three of the four transitions can be linked to the system-level phenomena described above. Transitions two, three and four can be linked with the linearity, fashion and ownership-based consumption characteristics of the textile domain. Thus, these three phenomena will be considered as central points of leverage for achieving reductions in negative environmental

impacts in this study. The first transition can be attributed to be brought about by more regulative actions and will thus be excluded from consideration in this study, as regulations regarding hazardous substances and standards, for e.g. wastewater treatment, are outside of the scope of businesses' direct realm of influence, unless the industries themselves agree on Green Deal type of commitments on scaling back and banning certain chemicals as well as reducing pollution.

A leverage points perspective present an avenue for identifying approaches capable of system-level change (Fischer & Riechers, 2019). As a concept, leverage points indicate places in complex systems where relatively large impacts for certain outcomes can be achieved with relatively minor interventions (Meadows, 1999). 'Shallow' leverage points indicate places where interventions are easier to make, but where the potential for system-level transformation is limited, whereas 'deep' leverage points denote places in a system where it is hard to make interventions, but where the potential impact for system-level transformation is more significant (Meadows, 1999). Abson et al. (2017) have proposed four system categories of leverage points based on the hierarchy presented by Meadows (1999), that describe four realms of leverage where interventions with different scopes of impact may be made (see figure 1).



The four system characteristics represent a nested hierarchy of, tightly interacting, realms of leverage within which interventions in a given system of interest may be made. Deeper system characteristics constrain the types of interventions possible at shallower realms of leverage

Figure 1 Hierarchy of leverage points from a systems thinking perspective (Abson et al., 2017)

2.3.1. Shallow leverage points

The categories of system parameters and feedbacks represent shallow leverage points (Abson et al., 2017; figure 1). System parameters represent the more mechanistic characteristics in systems, which can be affected by, for example, policy makers. They include tools such as taxes and subsidies, material standards influencing production locations, prices and material choices. Also, the size of material flows in the textile domain, exemplified by for-example just-in-time production processes with small buffer stocks allowing for flexibility in cases on demand fluctuations, as well as the structure of material flows – production is heavily centered in low-cost countries while large portions of demand that influences production happens in Western countries. Fischer & Reichers (2019) argue that shallow leverage points explain phenomena in systems in causal terms, i.e. feedbacks, for example, describe the processes that dampen or reinforce feedback loops in the system. In other words, this refers to the ways different elements in the system interact and how these interactions drive the system's internal dynamics in ways that either maintain the status quo (strengthen the stability of the current way we consume textiles) or drive it towards a new state of balance (e.g. by a novel business model disrupting the way clothes are consumed, which results in a change in the regimes laws, conventions and/or culture). An example of dampening, or negative, feedback loops is the textile market, where prices are established based on supply and demand principles, as long variables influencing prices are kept clear, unambiguous and truthful (Meadows, 1999). An example of reinforcing, i.e. positive, feedback loops is the success of the fast fashion business model in the current economic paradigm, which has led to its global expansion – the new model replaced old ways of consuming clothing and established a new status quo. These leverage points are relatively easy to affect through, for example, altering legislation or creating new material standards. However, the sustainability impact that has and can be achieved with them is argued to be limited due to them resulting often in only partial improvement in the system. In other words, they don't fundamentally change the system, but rather they essentially only tweak the dynamics between actors within it (Abson et al., 2017). Thus, actions and business models targeting parameters and feedbacks are deemed as having potential for incremental impacts and not of primary interest in this study.

2.3.2. Deep leverage points

In contrast to shallow leverage points that represent a causal approach to systems thinking, deeper leverage points revolve around teleology, i.e. describing phenomena in the system in terms of the purpose they serve rather than in terms of the causes they arise from (Fischer & Riechers, 2019). Deeper leverage points thus have to do with the impacts e.g. knowledge, values, and world views have on organizing, maintaining and developing a system.

The design of a system refers to the social structures and institutions that affect parameters and feedbacks. It includes the concepts of information flows and who has access to them, rules establishing the incentives and constraints for certain behaviors, and the power to influence the system's structure (Meadows, 1999). Examples in the textile domain can be the information flows regarding negative environmental impacts of production practices, established institutions defining the purpose of businesses to be about economic growth and profit without consideration for environmental externalities, shifting consumer sentiment for new more sustainable products or services, and power to influence what types of business models are scalable. System intent, on the other hand, signifies the fundamental values, goals and worldviews of actors that guides the system, i.e. it is the foundation of the system and the direction towards which the system evolves (Abson et al., 2017). Examples of system intent include the fundamental goal of businesses in the minds of regulators and consumers, which under the dominant paradigm is mostly concerned about increasing economic value, and beliefs related to clothing and fashion such as "new is better than secondhand". Finally, the ability to understand that no paradigm is "true" or "the right one", i.e. transcending paradigms by understanding they're only different ways of organizing society and they all are limited understandings of the universe and "reality", makes up the deepest leverage point (Meadows, 1999). It is more difficult to have an impact on these deep leverage points, but the impact they can have on the system is significant compared to that of shallow leverage points. Thus, actors, actions and approaches targeting system design and intent are considered as capable of significantly contributing to system-level transformation for the purpose of this study.

Looking at the leverage points perspective more closely, an important dynamic should be acknowledged. A central tenet of the leverage point perspective is the recognition that shallow leverage points alone are unlikely to bring about system-level transformation, but that making interventions in deep leverage points is difficult in practice (Fischer & Riechers,

2019). This is due to the nature of systems increasingly resisting interventions affecting deeper leverage points (Meadows, 1999) as systems strive to maintain their current state of balance. An example of this could be changing subsidies for businesses versus changing the fundamental purpose of business in society, or changing to a system without an economy based on money. However, chains of leverage consisting of lower leverage points may be able to ultimately achieve system-level change through leading to changes in deeper leverage points. This presents actionable opportunities for actors with potential for impacting shallower leverage points to ultimately impact deeper leverage points and achieve system-level impact (Fischer & Riechers, 2019). This could be exemplified for example through new EU directives that would change legislation in all member states to achieve a goal, such as establishing collection of textile for recycling, which then could lead to the development of circular processes with the help of new corporate subsidies and taxes working to make circularity a reality, and ultimately new ways of thinking of business. However, this master's thesis study will focus on actions aiming to primarily impact deeper leverage points.

2.3.3. Leverage points with potential for accelerating system-level change in the textile domain

Thus, the textile domain is in need of both technological, cultural and teleological approaches, which tackle deeper leverage points in order to push for a transition into a more sustainable status quo, i.e. a new paradigm. Focus should lie in reducing consumption of natural and manmade resources by tackling overproduction and excessive consumption (McKinsey & Business of Fashion, 2019) in order to achieve sustainable development goals and reduce the negative environmental impacts associated with the textile domain. Another focus area should be reduction of waste through changing to more circular modes of operation, along with innovation of more sustainable textiles (McKinsey & Business of Fashion, 2019). These aforementioned focus areas are more targeted at the technical aspects of the domain. Hence, business models that enable the reduction of used resources and circulation of materials are regarded as examples of more technology-oriented solutions potentially capable of system-level impacts, as they could potentially impact the way systems in the textile domain are designed.

On the socio-cultural side, encouraging sufficiency and providing functionality instead of ownership have been proposed as a potential tools for reducing negative environmental impacts of businesses (Bocken et al., 2014), as they aim at reducing both consumption and

production from current levels. Sufficiency as a cultural thematic could affect the textile domain by reducing the material consumption intensity of fashion as proposed by the slow fashion concept (Fletcher, 2010). Providing functionality instead of ownership, on the other hand, could present an avenue for changing established consumption models from ownership towards use, which could ultimately change consumers' attitudes towards clothing consumption. Notably, interventions both in the form of technologies and cultural changes need to be scalable, i.e. widely adoptable within the societal and economic framework, in order to replace incumbent ways of operating and have system-level impact for sustainability.

By taking a systems perspective, Fischer and Reichers (2019) argue that the deep leverage points presented by Meadows (1999) and Abson et al. (2017) highlight the role of human agency in fundamentally shaping outcomes in complex systems, indicating that man-made subsystems can fundamentally impact for example our environment. Business models can be regarded as man-made systems. They have been described as important vehicles for achieving systemic change by academia and practitioners, due to their industry-disrupting potential (Bidmon & Knab, 2018). Business models as a concept have also been argued to represent a way to inspect business systemically, as they manage interactions between multiple actors across the production and consumption side, and facilitate the distribution of innovations into markets (Bidmon & Knab, 2018; Zott et al., 2011).

This dynamic of innovations replacing incumbent modes of operating has been researched and described in systems thinking literature. From a systems theory perspective, transitions and transformations in a socio-technical system, such as the textile domain, can be viewed through a tri-layer framework called the multi-level perspective (MLP) (Geels, 2002) (see figure 2). The 'landscape' level can be referred to as the megatrends prominent in our global society and planetary environment. Examples of these include climate change, biodiversity loss and digitalization. The 'regime' level, on the other hand refers to the societal status quo embodied by different institutions, such as incumbent business models, culture related to clothing consumption, legislation and policies. Lastly, the 'niche' represents the grassroots level of the system where innovations are created, for example, by startups and civil society organizations. Socio-technical transitions and transformations happen as landscape-level phenomena exert pressure on the regime and niche, and viable innovations that utilize the momentum of this pressure gain foothold by presenting alternative configurations of organizing the regime. In other words, transformation happens when new ways of organizing

the system or parts of it gain traction and replace established processes and dynamics by being institutionalized, for example through new legislation or cultural norms. (Geels, 2002) The rise of the fast fashion model can be argued to represent an example of a niche innovation that gained foothold and shifted the way clothing and fashion is consumed in society. Bidmon and Knab (2018) describe a socio-technical transition as “the shift from one socio-technical system to another and is characterized by a co-evolution of technical, economic and behavioral change in the spheres of production, distribution, consumption and ways of life” (p. 904). Fundamental changes in the paradigm can ultimately have an influence on the landscape level (Geels & Schot, 2007) by altering the modus operandi on industries for example, presenting a perspective on how niche actors can have impacts on the system-level.

Increasing structuration
of activities in local practices

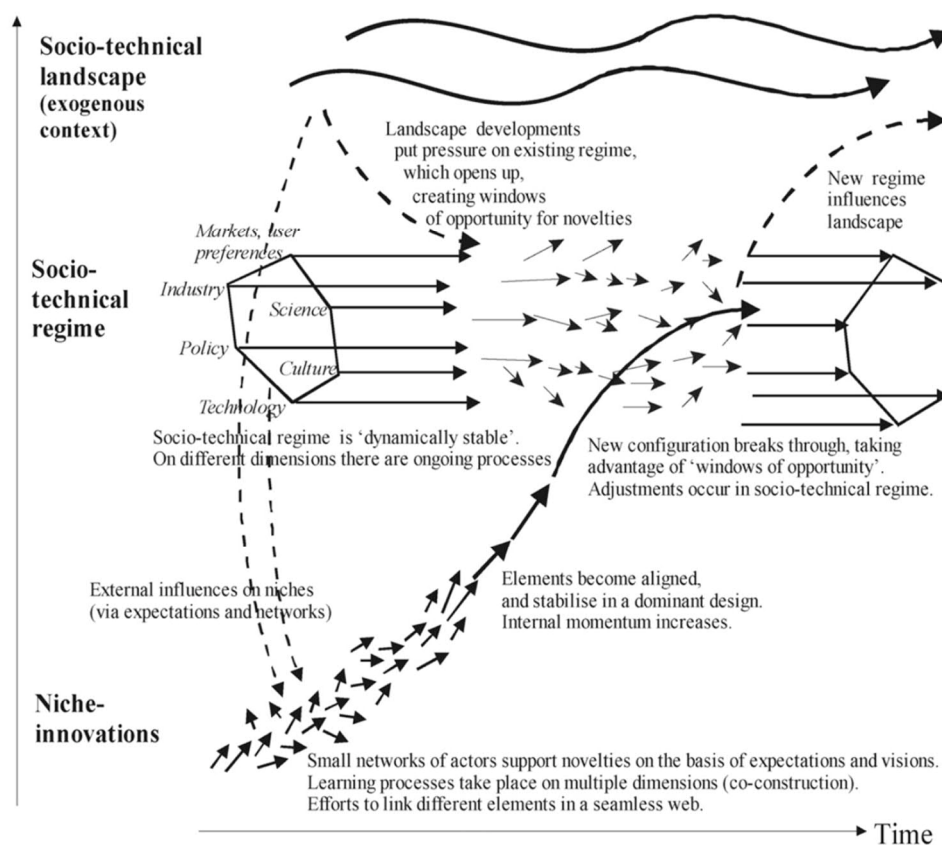


Figure 2 Multi-level perspective on transitions by Geels (2002)

Business models represent an integral part of the organizations making up the niche and regime levels of a socio-technical system, such as the textile domain, as well as promoting sustainable transitions in systems (Geels, Sovacool, Sorrell & Schwanen, 2017). This is because they can link local-level dynamics with global, system-level dynamics (Bidmon & Knab, 2018). This link is enabled by business models' capability of engaging multiple stakeholders needed for achieving enough momentum for system-level impact and system-wide change. In their research integrating business model theory with the MLP perspective, Bidmon & Knab (2018) argued for business models' ability to significantly contribute to societal change, as these can serve as the vehicles for accelerating, facilitating and distributing innovative technologies from the niche level into the regime. The authors even argue that business models possess larger potential for systemic change than technology, as new technologies require business models to scale up (Zott, Amit & Massa, 2011) and be distributed in our global economic system. For example, a business model with novel technologies enabling the recycling of various fibers can help scale up the use of recycled materials in the whole textile domain by increasing the stock of high-quality recycled fibers, i.e. by solving technological barriers and by enabling new ways of organizing production, which can ultimately have significant sustainability impacts.

From another perspective Dentoni, Pinkse and Lubberink (2020) argue that due to the complexity of socio-technical systems, business models cannot be regarded as having capability for achieving system-level impacts directly – rather, they should be considered as capable of contributing to system-level change by adding to the momentum pushing for change. Nonetheless, literature and practice speak for the potential and significance of even business models' ability alone to influence and have impacts on whole industries and systems, proposing that business models are relevant units of analysis when inspecting systems change towards sustainable development goals. Uber exemplifies how a single business model can disrupt an established market and the way labor relationships are organized by shifting taxi drivers from employees to entrepreneurs, without novel technologies or change in legislation.

Bringing this discussion into the context of the textile domain, technological innovations enabling circularity in production, for example, will not achieve system-level impact without accompanying business models. The potential impact of business models is also highlighted by their ability of pushing for paradigm change by distributing non-technological innovations (Bidmon & Knab, 2018), which for the textile domain could be exemplified by

business models providing alternative consumption models or distribution channels for clothing and fashion.

However, a notion central to the systems thinking literature is that no single actor alone can impact system-level challenges on the landscape level (Dentoni et al., 2020; Geels & Schot, 2007), such as climate change or biodiversity loss. Literature argues for the need for extensive stakeholder collaboration and engagement to achieve system-level impact and system transformation, as a mass of actors in various dimensions of the system are needed to change in order to create a critical mass that is capable of altering.

Moreover, achieving system-level impact capable of transforming a system has been argued to require a “window of opportunity” where the niche and landscape levels exert enough pressure on the dominant regime, instigating change in incumbent institutions. These windows of opportunity, to be utilized, require a change leader to spearhead and push forward institutional change in support of the favored transition, which ultimately can enable influence on landscape-level phenomena. (Geels et al., 2017) In terms of the textile domain, this could mean policymakers noticing emerging niche innovations such as maturing circular technologies, in the face of environmental pressure caused by climate change, and taking action in form of shaping markets with legislations supporting the competitiveness of circular business models over incumbent linear ones. However, the windows of opportunity could be argued to be utilized by innovative business models as well to scale up and disrupt industries, as practice has shown with well-known examples such as Airbnb and Uber in the platform economy.

These perspectives argue for the consideration of business models as a relevant unit of analysis. In the case of the textile domain, Ellen McArthur Foundation (2017) claim that there is a need for more research to support successful implementation of novel business models. Bidmon & Knab (2018) argue that researching the intersection of business models and system transformations presents promising avenues for increasing understanding of system-level transitions in society. The textile domain is characterized by various clothing and consumer segments with different needs, as well as regional differences all impacting the success of alternative modes of operating, meaning that there are various business models in the different industries of the domain. The next sections take a closer look at the business model concept, its link with sustainable development and potential for contributing to a transition towards a more sustainable paradigm in the textile domain.

2.4. The Business Model concept

Business models have been increasingly researched for the past few decades (Schaltegger, Hansen, et al., 2016) and a general consensus that has permeated the field is that all businesses employ some sort of business model either explicitly or implicitly (Teece, 2010) and that business models are important units of analysis for management practice, theory and policy (Massa, Tucci & Afuah, 2017). Unifying models and definitions have been proposed, but scholars still argue the field to be somewhat heterogenous and fragmented, and that there's a need for deeper understanding of the business model concept itself (e.g. Biloslavo et al., 2018; Massa et al., 2017; Zott et al., 2011). Still, some widely cited works can be identified in the literature. A common definition for the business model, from a firm's perspective, includes three central dimensions related to value – how a business creates value, delivers it to customers, and captures it to produce profit (Osterwalder & Pigneur, 2010; Teece, 2010). From a customer-oriented perspective, the business model concept can thus be viewed as describing what managers of a firm believe their customers want, how they want it, how the business can deliver it to the customers in ways that entice payments, and ultimately how those payments are translated into profit (Schaltegger, Hansen, et al., 2016; Teece, 2010). Relating the concept to innovations, the business model thus conceptualizes the way in which organizations commercialize technological and non-technological innovations (Zott et al., 2011). A more qualitative ontology has been proposed by Upward & Jones (2016), defining the business model concept “as a description of how a business defines and achieves success over time, such that it provides: A description of the logic for an organization's existence: who it does it for, to and with; what it does now and in the future; how, where and with what does it do it; and how it defines and measures its success” (p. 106), offering a systems-thinking perspective on the matter through essentially arguing for the potential of considering the business model as a result of values, worldviews and goals of the actors involved (Abson et al., 2017). Moreover, it presents an avenue of regarding the impact of business models from a more holistic perspective than economic success only.

The business model concept has also been developed further in the form of a series of elements: the value proposition, activities, resources, distribution channels, key partners, cost structure and revenue model (Osterwalder & Pigneur, 2010). Based on their extensive literature review, Zott et al. (2011) propose that the business model can be regarded as a

system of activities, arguing for an activity-based perspective on the business model concept, in contrast to a static one. The authors also argue that the business model as a unit of analysis presents a systemic perspective on how business is performed (Zott et al., 2011), thus extending the perception of how a business can have an impact on customers, stakeholders, the natural environment and society, not only on its own operations and direct stakeholders. This has been emphasized by later studies finding that business models have both positive and negative impacts on and in their physical operational environment (Pal & Gander, 2018). The business model concept has also been studied in various different academic fields, lending it the ability as a concept to transgress disciplinary boundaries (Chesbrough & Rosenbloom, 2002) like the concept of sustainability. Taking a complex adaptive systems perspective, Dentoni, Pinkse & Lubberink (2020) argue that business models represent sub-systems, within the broader socio-ecological system in which they reside, capable of achieving system-level impact. These perspectives highlight the systemic nature of the business model concept.

However, a traditional business model approach characterized by frameworks such as the Osterwalder and Pigneur (2010) Business Model Canvas, has been argued to be insufficient for ensuring the development of successful or globally scalable businesses in the current paradigm of unsustainability. França et al. (2017) argue that “[w]ithout the addition of sustainability principles and guidelines for how an organization can support sustainable development while strengthening its own competitiveness, businesses will run into emerging limitations from today's unsustainable development and also risk being outcompeted by businesses that more skillfully navigate the necessary and accelerating shift towards global sustainability” (p.164). This highlights the need for integrating sustainability considerations into business model research, which the growing field of sustainable business model literature has been aiming to establish.

2.5. Sustainability and the Business Model

As described above, business models in the textile domain are in dire need of a sustainability-oriented transformation in case sustainable development goals are to be achieved, and in order for the domain to be brought onto a more sustainable foundation both environmentally and economically. An insight further arguing for a reboot of the textile domain is one described in the State of Fashion 2020 report (McKinsey & Business of Fashion, 2019),

detailing that the majority of fashion businesses destroy value instead of creating it, but that the “super winners”, i.e. the 20 largest companies, of the industries make up for the losses of others in practice. The value concept referred to here is mainly economic value. This argues for a transformation of how business is done in the textile domain in terms of all three pillars of sustainability: environmental, social and economic.

The push for change doesn't only come from the impending physical limits of the ecological system of our planet, but also from consumers. Consumer demand for more sustainable business models combatting overconsumption at least in the fashion context has increased, though business models focusing on sustainability still account for only a minority share of the total market (McKinsey & Business of Fashion, 2019). Statistics of this sort seem to imply that incumbent linear ways of operating still are more profitable and create more value within the dominant paradigm compared to more sustainable alternatives. Moreover, these accounts can be interpreted as implying that a “window of opportunity” (Geels et al., 2017) for system change could be at hand, presenting opportunities for scalable business models to replace incumbent modes of operating.

To discuss business models' contributions to sustainability, a brief look at the concept of sustainability is in order. Firstly, sustainability is regarded as a process and of systemic character (Hjorth & Bagheri, 2006; Williams et al., 2017) for the purpose of this study. This means that sustainability is not considered as an ultimate goal or static state but rather an ever-changing process that happens in and through the interactions and dynamics of and between actors and the socio-ecological environment in which they reside. This perspective emerges from the concept of resilience, closely tied to sustainability.

Resilience is defined as the ability of a system to withstand shocks and its capacity to change while retaining its fundamental structure (Pisano, 2012). Sustainability thus refers to a resilient state of a system, in which functions maintain the system's overall structure and ability to conform to changes without undermining its capability to maintain this fundamental structure also in the future. From an environmental perspective this could mean the “maintenance” of an ecological system in a way that enables it to withstand shocks and evolve at a pace that maintains resilience. Maintaining a rich biodiversity for examples increases the resilience of an environmental system (Folke et al., 2004; Peterson et al., 1998). A sustainable economy could thus be described as one that is able of withstanding shocks in the socio-ecological environment and evolve without a need for fundamental reconfiguration

with detrimental impacts on human or ecosystem wellbeing over the short or long term. From a sustainability perspective this could mean an economic system that is built upon a social foundation ensuring human wellbeing within the physical realities of the environment, i.e. planetary boundaries as well as a social foundation (Raworth, 2017b). Figure 3 below visualizes the doughnut of a sustainable area of operation for humanity in combination with planetary and social boundaries. Figure 3 also showcases humanity's shortfalls in reaching areas of the social foundation, and areas where we are exceeding ecological boundaries (Raworth, 2017a). According to this view, all agents, i.e. businesses, consumers, etc., should be able to function in ways that do not undermine their nor future generations' ability to function similarly in the future.

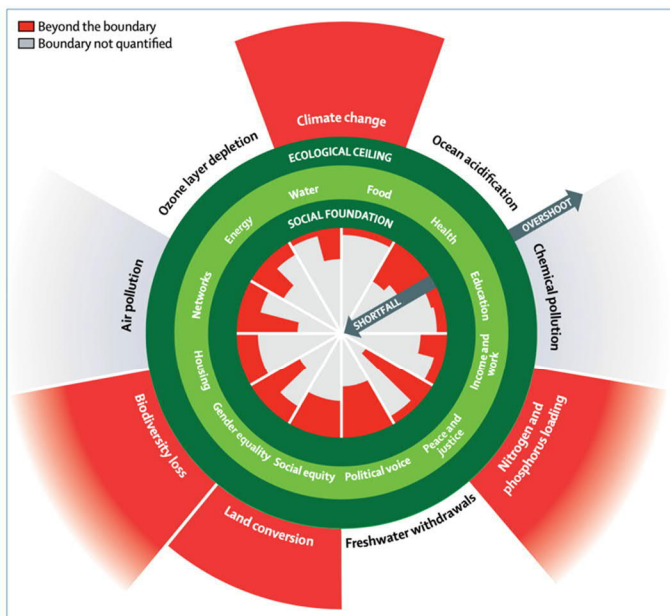


Figure: Shortfalls and overshoot in the Doughnut
 Dark green circles show the social foundation and ecological ceiling, encompassing a safe and just space for humanity. Red wedges show shortfalls in the social foundation or overshoot of the ecological ceiling. The extent of pressure on planetary boundaries that are not currently being overshoot is not shown here (see appendix for all graphics).

Figure 3 A Doughnut for the Anthropocene (Raworth, 2017a)

Currently, research in climate, ecology and society are indicating that the global society is not on track for sustainability (e.g. Raworth, 2017; Rockström et al., 2009). The socio-ecological system all businesses operate in is characterized by non-linear development on a systemic scale. This necessitates viewing the economy and industries, including the textile domain, and natural environment as systems having dynamic properties in contrast to regarding them as static, which could be argued to have been the paradigmatic view of the ecological environment in dominant business literature (Raworth, 2017b). Perceiving the global market environment as a dynamic socio-ecological system, where businesses need to

take into account the planetary boundaries and in which sustainability is a process, proposes the need for considering the systemic impacts of business models, which need to evolve and function within the limitations of the socio-ecological system in order to reach long-term sustainability.

Sustainable development thus requires transforming, among others, markets onto a more sustainable foundation. According to scholars, companies, big and small, and their business models play a central role in bringing about this transformation (Schaltegger, Lüdeke-Freund, et al., 2016), as business model reconfiguration presents an avenue for the mainstreaming novel business models that integrate sustainability (Bocken et al., 2014). Many of the companies pushing for this sustainability transformation by incorporating aspects of sustainable development into the core of their business models are still considered niche actors, i.e. small businesses, which limits their ability to have a system-level impact, and creates different challenges for establishing more sustainable business models than what incumbent business models face (Schaltegger, Lüdeke-Freund, et al., 2016). However, business model research has largely focused only on the organizational level and not given much attention to the system-level links pushing for societal transformation, which requires a more long-term approach (Bidmon & Knab, 2018). Scholars (e.g. (Breuer et al., 2018) argue that in practice this has led to business model concept taking a more single-actor approach to business, while academia is emphasizing the importance of multi-actor concepts and extended value concepts for achieving sustainability goals.

The historical neo-classical paradigm of business, characterized by beliefs in optimized behavior based on rationality and profit-maximization for shareholders (Stubbs & Cocklin, 2008), has been argued to have established a short-term focus on financial value creation regarding business models in the global market context, which still permeates the dominant market and business logic (R. Adams et al., 2016; Schaltegger, Hansen, et al., 2016). Despite being considered a systemic concept, the links between the business model concept and the socio-ecological system, and thus its impacts on sustainability, have not been taken into account by the most influential business model frameworks, such as the Osterwalder & Pigneur (2010) Business Model Canvas (Lüdeke-Freund et al., 2018; Williams et al., 2017). However, as the pressure grows for organizations to tackle systemic challenges (Bocken et al., 2014), such as anthropogenic climate change and biodiversity loss, a call for the stimulation and vitalization of old and new business philosophies (Schaltegger, Hansen, et

al., 2016) to change the way businesses operate has been made in both academia and practice. As the business model concept “draws from and integrates a variety of academic and functional disciplines” (Chesbrough & Rosenbloom, 2002, p. 533), it can be argued to present an appropriate unit of analysis for examining the sustainability of organizations, as sustainability research in academia also employs an interdisciplinary perspective (Schoolman et al., 2012). Moreover, the business model concept as a unit of analysis can be regarded as bridging firm-level operations with the wider system (Zott et al., 2011), in which it is embedded. Looking explicitly at the textile domain, Pal and Gandar (2018) argue explicitly that business models can be regarded as sustainability change agents in the fashion industry.

The literature on sustainable business models (hereinafter referred to as SBMs) has expectedly grown over the past decades, as academia and practitioners have worked to interlink and embed sustainability considerations with the modus operandi of business. Stubbs & Cocklin (2008) have been regarded as having created the seminal paper on SBMs, in which they formulated the ‘ideal type’ of a SBM based on case studies of companies Interface and Bendigo Bank. The authors proposed that a SBM should contain the following ‘ingredients’: employing economic, environmental and social consideration in determining the purpose of the business, using a Triple Bottom Line (TBL) approach to measure performance, consideration for the needs of all stakeholders, treating nature as a stakeholder and promoting environmental stewardship, driving cultural and structural changes needed for achieving sustainability, and encompassing a systems perspective alongside the firm-level perspective. The SBM concept could thus be regarded as expanding the scope of the stakeholders considered, from the shareholder and profit maximization narrative towards a more systemic, stakeholder approach, which regards environmental and social sustainability alongside economic sustainability as a strategy in itself (Stubbs & Cocklin, 2008).

Various definitions and terms for SBMs have been used in literature. Despite the variety in terminology, the definitions prominently include the expansion of the value concept to encompass environmental and social value alongside economic value. In their editorial for the 29th volume of *Organization & Environment* dedicated to sustainability-oriented business modeling, Schaltegger et al. (2016) propose that a SBM “helps describing, analyzing, managing, and communicating (i) a company’s sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and

how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries” (p. 6). Expanding the value perspective argues that the SBM concept acknowledges the realm businesses are situated in within the socio-ecological system. As described by Upward and Jones (2016), “[t]hus, the business model is reformulated as a systemic model of necessary and sufficient concepts that both describe and guide the business as a social system within its containing systems of economy, society, and environment.” (p. 105)

Scholars (e.g. Biloslavo et al., 2018; Joyce & Paquin, 2016) have also proposed developments to the widely used business model canvas (Osterwalder & Pigneur, 2010) to align it with, for example, the Triple Bottom Line approach in order to describe how business models have impacts on the natural environment and society. These frameworks aim to integrate consideration of stakeholders and society at large (the social layer) and the natural environment (the environmental layer) into the business model concept through consideration of social and environmental capital alongside financial capital, which Schaltegger, Hansen et al. (2018) argue to be necessary in order for a business model to be considered sustainable. This value perspective proposes that “[a] sustainable BM maintains and when possible enhances the whole stock of capital [financial, manufactured, intellectual, human, social & relationship, natural], rather than depleting or degrading it” (Biloslavo et al., 2018, p. 755).

To clarify the definition of the SBM concept, Lüdecke-Freund, Carroux, Joyce, Massa & Breuer (2018) executed a wide reading of SBM literature to develop a comprehensive taxonomy of 45 SBM patterns, defining that a SBM pattern “describes an ecological, social, and/or economic problem that arises when an organization aims to create value, and it describes the core of a solution to this problem that can be repeatedly applied in a multitude of ways, situations, contexts, and domains. A sustainable business model pattern also describes the design principles, value-creating activities, and their arrangements that are required to provide a useful problem–solution combination” (p. 148). In summary so far, the SBM literature thus acknowledges that under the current paradigm, business models often incur negative environmental, social and/or economic externalities while striving to create value for the business, and that these externalities and effects should be considered, integrated and solved by the organizations to the best of their ability by employing a more holistic approach to the dimensions of the business model concept in order to make operations more sustainable. The SBM concept should thus present a way for organizations

to align their economic interests with the sustainable development of environment and society (Lüdeke-Freund et al., 2018). Examples of businesses focusing on increasing their handprint as part of their business model, such as Tentree (<https://tentree.co.uk>) who produce clothing from sustainable materials and plant trees in collaboration with charitable organizations to rehabilitate natural ecosystems.

However, while studies argue that SBM's create sustainable value, the extent of the impact businesses can have has been debated in literature. Jay & Gerard (2015) argue that the fundamental characteristics of sustainability, e.g. multi-dimensionality of targets, dispersion of the effects of sustainability innovations and amount of scientific uncertainty regarding the dimensions of sustainability, make defining and measuring the impacts on sustainability goals of actors on a macro system very challenging. Determining the impacts of sustainability-oriented innovation (SOI) activities is inherently difficult, as the effects of SOI activities are dispersed over time and space. This notion is echoed by Dentoni, Pinkse & Lubberink (2020), who claim that the impacts SBMs can have are limited to supporting socio-ecological resilience, rather than being capable of directly impacting it. Hence, SBMs should be regarded as being capable of contributing to addressing problems and challenges in the macro-level socio-ecological system that is outside of their direct scope of influence. Dentoni et al. (2020) examined SBMs impacts from a complex adaptive systems (CAS) approach, detailing the complexities and interdependencies of between actors in a system. The socio-ecological system, e.g. the textile domain or the global society withing which it resides, can be described as dynamic, self-organizing and path-dependent, where the impacts achieved by SBMs are interdependent and entangled (Dentoni et al., 2020). However, as exemplified above with the cases of platform business models such as Uber, single business models seem to possess potential for significantly disrupting entire industries in ways that can ultimately shift how they are organized. In other words, SBMs can be considered as being capable of significantly contributing to system-level sustainability impacts, alone and in collaboration with other businesses or societal actors.

Thus, for the purpose of this study, SBMs that tackle the deep leverage points of the textile domain will be considered as having most potential for contributing to system-level impact that could push for system transformation. This includes, for example, SBMs that are able to reduce raw material consumption by shifting from linear operations towards circular ones,

change how clothing is consumed and influence the cycles of fashion consumption (Ellen McArthur Foundation, 2017).

2.6. Sustainable business models

For the purpose of this study, a SBM is defined as a business model that integrates consideration of sustainability actions at the core of the business model concept, in order to significantly reduce negative externalities of business operations, or incur a net-positive impact through the co-creation of novel production and/or consumption systems. The following sections take a closer look at SBMs in the textile domain with impacts on sustainability based on the literature presented in previous sections.

Scholars have argued that SBMs can initiate and facilitate innovations that contribute to system-level sustainability by explicitly considering the natural environment and wider society as key stakeholders (Bocken et al., 2014; Stubbs & Cocklin, 2008). Business models should thus go beyond changing the value proposition for the customer (Bocken et al., 2014) to extend product and process innovation to fundamental changes in the way the business ‘does business’ (Amit & Zott, 2012), and integrate sustainability consideration into the business model concept (França et al., 2017) in order to have system-level impacts (R. Adams et al., 2016).

Alongside defining the SBM, scholars have looked into SBMs emerging in practice. Some frameworks centering around the SBMs’ sustainability impacts have been made from the innovation perspective (e.g. Adams et al., 2016; Bocken et al., 2014) for example. A prominent abstracted framework for the categorization of SBMs has been proposed by Bocken, Short, Rana & Evans (2014) as an effort to unify SBM literature and develop paths and capabilities for innovation for sustainability. The typology proposes eight archetypal SBMs: 1) Maximise material and energy efficiency; 2) Create value from waste; 3) Substitute with renewables and natural processes; 4) Deliver functionality rather than ownership; 5) Adopt a stewardship role; 6) Encourage sufficiency; 7) Re-purpose the business for society/environment; and 8) Develop scale-up solutions (see figure 4). The archetypes are grouped according to the dominant context of change in the business model concept: technological, social and organizational (Boons & Lüdeke-Freund, 2013). Archetypes 1-3 represent technological innovation based SBMs (e.g. manufacturing and

product design solutions enabling incremental and/or radical sustainability impact), 4-6 represent SBMs with a social focus (e.g. solutions enabling the changing of consumption behavior), and 7-8 represent SBMs with emphasized organizational innovation (e.g. solutions reconfiguring the purpose of the organization) (Bocken et al., 2014).

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Groupings	Technological			Social			Organisational	
	Maximise material and energy efficiency	Create value from waste	Substitute with renewables and natural processes	Deliver functionality rather than ownership	Adopt a stewardship role	Encourage sufficiency	Repurpose for society/environment	Develop scale up solutions
Archetypes	Low carbon manufacturing/solutions	Circular economy, closed loop	Move from non-renewable to renewable energy sources	Product-oriented PSS - maintenance, extended warrantee	Biodiversity protection	Consumer Education (models); communication and awareness	Not for profit	Collaborative approaches (sourcing, production, lobbying)
	Lean manufacturing	Cradle-2-Cradle	Solar and wind-power based energy innovations	Use oriented PSS- Rental, lease, shared	Consumer care - promote consumer health and well-being	Demand management (including cap & trade)	Hybrid businesses, Social enterprise (for profit)	Incubators and Entrepreneur support models
Examples	Additive manufacturing	Industrial symbiosis	Zero emissions initiative	Result-oriented PSS- Pay per use	Ethical trade (fair trade)	Slow fashion	Alternative ownership: cooperative, mutual, (farmers) collectives	Licensing, Franchising
	De-materialisation (of products/ packaging)	Reuse, recycle, re-manufacture	Blue Economy	Private Finance Initiative (PFI)	Choice editing by retailers	Product longevity	Open innovation (platforms)	
Increased functionality (to reduce total number of products required)	Use excess capacity	Biomimicry	Design, Build, Finance, Operate (DBFO)	Radical transparency about environmental/ societal impacts	Premium branding/ limited availability	Social and biodiversity regeneration initiatives ('net positive')	Crowd sourcing/ funding	
	Sharing assets (shared ownership and collaborative consumption)	The Natural Step	Chemical Management Services (CMS)	Resource stewardship	Frugal business	Base of pyramid solutions	"Patient / slow capital" collaborations	
	Extended producer responsibility	Green chemistry			Responsible product distribution/ promotion	Localisation		
						Home based, flexible working		

Figure 4 Bocken et al. (2014) SBM archetypes

Bocken et al. (2014) define SBMs through a business model innovation lens, by concluding that SBMs involve “[i]nnovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver value and capture value (i.e. create economic value) or change their value propositions” (p. 44). The authors argue that SBMs often simultaneously impact multiple sustainability aspects and ‘blocks’ of the business model concept, do this at multiple stages and with various actors in the value chains (Bocken et al., 2014). Despite the system-level orientation of this definition, the authors do not explicitly define the extent of the impacts potentially achievable by the SBM archetypes but argue for the potential system-level impact potential of each archetype. This argues for further examination of the reach of impact. Moreover, many of these SBM archetypes are

based on the neoliberal business logic, presenting challenges for actually achieving system-level sustainability impact—as the unsustainability of the current business and economic paradigm has to some degree been attributed to the neoliberal business logic—arguing for careful consideration of what types of business models can truly be defined as sustainable and capable of contributing to system-level transformation (R. Adams et al., 2016) towards a more sustainable regime. However, as the archetypes present a widely cited categorization of SBMs with potential for contributing to system-level transformation, the SBM archetype framework will be used as a foundation for this study to further look into answering the research question “what types of business models can contribute to the transformation of the textile domain in a way that reduces its negative environmental impacts?”

On the other hand, frameworks for evaluating the extent of the sustainability impact of SBMs have also been proposed in literature (e.g. Adams et al., 2016; Bidmon & Knab, 2018). Adams et al. identify innovation related SBM components related to transformative systemic change with the potential of promoting sustainable development. The authors present a framework for looking at the extent of potential impact business models can have on the system level. SOI, which needs to be supported and commercialized by SBMs (Boons & Lüdeke-Freund, 2013) in order to contribute to system-level impact, “involves making intentional changes to an organization’s philosophy and values, as well as to its products, processes or practices to serve the specific purpose of creating and realizing social and environmental value in addition to economic returns” (Adams et al., 2016, p. 180). Based on their study, Adams et al. (2016) propose a framework as a Scientific Model for examining the extent of impact of SOIs, which consists of three categories for businesses’ approaches to SOI ranging from incremental to system-level impact potential: 1) incremental improvements to business as usual (Operational Optimization), 2) fundamental shift in firm purpose (Organizational Transformation), and 3) extending beyond the firm to drive institutional change (Systems Building) (figure 5).

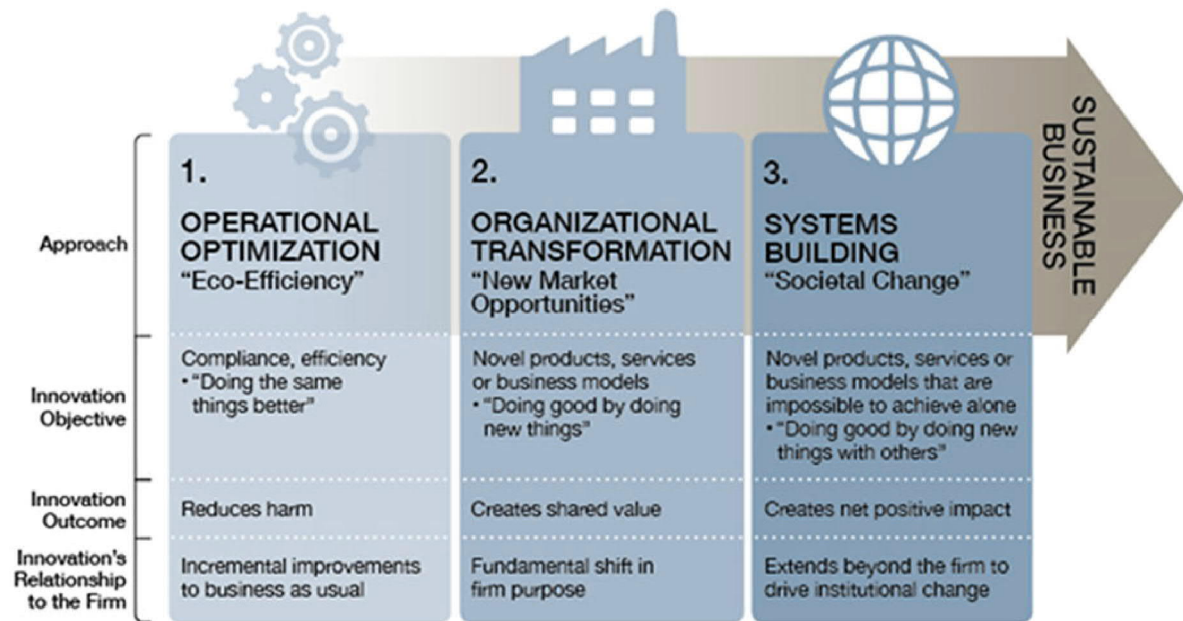


Figure 5 Adams et al. (2016) SOI framework.

Operational Optimization denotes mainly reactive and incremental innovations being made to a company's operations, often resulting from compliance or a proactive pursuit of efficiencies orientation (R. Adams et al., 2016). The activities in this category rarely venture outside of the firm, meaning activities are largely internally focused. The sustainability impact of innovations of this caliber often only result in a reduction of harm per unit produced mainly as a result of technical, stand-alone and insular improvements, such as innovations reducing resource use intensity, improving waste management and product content or packaging redesign. Organizational Transformation moves a step further by being characterized by a shift in mindset and purpose of the company, which entails a focus on co-creating shared value for society (R. Adams et al., 2016). Innovations in this category are more deeply integrated with sustainability but are still mostly internally oriented, extending only to immediate stakeholders. Innovation in this category is often driven by values, aspirations and concerns for sustainability of business leaders. Examples of Organizational Transformation include serving new markets with novel sustainable products and delivering services to unserved consumer groups, servitization and transparency, and they're characterized by inter- and intra-organizational collaboration. Lastly, Systems Building denotes a radical shift in the company's fundamental philosophy of purpose in society (R. Adams et al., 2016). Extensive stakeholder collaboration brings about systems-shaping innovations through integrating social and ecological value with economic value, aimed at creating a net positive impact in the socio-technical system. Activities in this category are

aimed at building new systems and processes to change production, consumption and behavior patterns in order to achieve sustainability benefits. Examples include open innovation platforms, closed-loop production, circular approaches, and net-positive contribution, i.e. adding more value to society and environment than is extracted/destroyed in the process.

Despite presenting distinctive categories for SOI activities in regard to their potential contribution to system transformation, Adams et al. (2016) do not define clear threshold values to the three categories. This leaves some room for ambiguity in interpreting what types of SOI activities and SBMs can be allocated in each category. In spite of this, the tripart categorization presents a guideline for evaluating which types of SBMs could potentially contribute most to furthering sustainability targets, demonstrated by the allocation of the Bocken et al. (2014) SBM archetypes into this framework.

Adams et al. (2016) argue that despite many of the Bocken et al. (2014) SBM archetypes following neoliberal business logics, which may be counterproductive to sustainable development goals as they could be argued to support maintenance of the dominant paradigm, only one of the archetypes fall into the Operational Optimization category – the Maximize material and energy efficiency archetype. Create value from waste and Substitute with renewable resources and natural processes are claimed to be oriented towards the Systems Building category, and the remaining five archetypes are reflective of the Organizational Transformation and Systems Building categories (R. Adams et al., 2016). The authors do not explicitly categorize the eight archetypes nor explicitly argue for the extent of the potential for contributing to system-level impact of each archetype, other than through indicating which categories each of the archetypes could fall into. This presents an avenue for further looking into the potential impacts of the archetypes in order to establish a more rigid categorization and consideration of SBMs with potential for contributing to system-level sustainability transitions.

Another useful framework for examining the impact of business models on the socio-technical system they reside in, has been presented by Bidmon & Knab (2018), who argue that “[g]iven their boundary-spanning nature, business models seem to be a particularly interesting unit of analysis in this regard because they allow zooming in on organizations without losing the systemic perspective” (p. 913). The authors differentiate three systemic functions, or roles, of business models relevant for considering system-level transformation

(see Table 1). According to the framework, business models can represent 1. *industry recipes*, i.e. the dominant industry logic of how to function as a business in a particular industry and the best forms of creating and capturing value within the context of all organization in said industry; they act as 2. *devices to commercialize technology*, i.e. business models allow the commercialization and thus distribution of technological innovations; and as 3. *subject to innovation*, i.e. the business model concept itself can undergo innovation independent of technological development and contribute to societal change (Bidmon & Knab, 2018). In essence, business models can act to stabilize and strengthen the rules and systems of the dominant regime, or they can challenge it by introducing novel technological or non-technological innovations to replace incumbent models of operating. The framework thus represents three ways or avenues business models can take to impact the socio-technical system they reside in.

Table 1 Business models' roles in and impacts on societal transformations (Bidmon & Knab, 2018)

Business models' roles in and impacts on societal transitions: Conceptual integration of business model and transition theory.

Role and impact	Key transition concepts and dynamics	Key business model characteristics and functions	Conceptual integration
<p>Role 1 Business models as part of the socio-technical regime. Impact Barrier to societal transitions: Existing business models reinforce the current regime and add to its stability.</p>	<p>Socio-technical regimes</p> <ul style="list-style-type: none"> are both dominant rules and resource structures that have developed around a technology. span a variety of actors, such as organizations from interrelated industries, financiers, users, authorities and research institutions. are dynamically stable as rules and structures are continuously reproduced and reinforced among regime actors. 	<p>Business models</p> <ul style="list-style-type: none"> are both material exchange relations of an organization and a cognitive frame of how value is created and captured. span the boundaries of a focal organization and connect a variety of actors within a value network. become embedded in a <i>dominant business model logic</i> (i.e. an established way an organization works over time). become <i>industry recipes</i> (i.e. an established way organizations in an industry work) when their dominant logics converge. 	<p><i>As industry recipes, existing business models are part of the regime and reinforce its stability because they</i></p> <ul style="list-style-type: none"> reproduce the regime's dominant rules and resource structures, connect various interrelated industries and other regime actors, co-exist and interact with complementary industry recipes and other actors' working logics, are aligned to a <i>dominant regime logic</i> (i.e. an established way the system works that is shared by all regime actors).
<p>Role 2 Business models as intermediates between the technological niche and the socio-technical regime. Impact Driver of socio-technical transitions: Existing or novel business models facilitate the stabilization of new technology and its breakthrough from niche to regime level.</p>	<p>Niche innovations</p> <p>can break through the regime if rules and structures around them stabilize via</p> <ul style="list-style-type: none"> the articulation of expectations and visions, learning processes to improve performance, the building of social networks. 	<p>Business models</p> <ul style="list-style-type: none"> function as devices to commercialize technology, and as such they serve as a reference language and facilitate collective sense-making, allow the discussion of market and user preferences and support the attraction of funding, link technology to various actors within a value network. 	<p><i>As devices to commercialize technological innovation, existing or novel business models support the stabilization of rules and structures around a niche technology because they</i></p> <ul style="list-style-type: none"> facilitate the articulation of expectations and visions among niche actors, allow the demonstration of the value of novel technology to regime actors, link technology to more and more actors and support the emergence of a value network around the technological innovation.
<p>Role 3 Business models as non-technological niche innovation. Impact Driver of societal transitions: Novel business models build up a substantial part of a novel regime without relying on technological innovation.</p>	<p>Niche innovations</p> <p>have a higher level of stability if</p> <ul style="list-style-type: none"> expectations and visions are robust (i.e. shared by more actors), specific (i.e. able to provide guidance), of high quality (i.e. substantiated by projects), learning processes enable second-order learning (i.e. the change of cognitive frames), social networks are broad (i.e. involve multiple stakeholders), deep (i.e. able to mobilize resources). 	<p>Business models</p> <p>can be <i>subject to innovation</i>, and as such they</p> <ul style="list-style-type: none"> can emerge independently of technologies, challenge the way an organization works by building a novel cognitive frame that guides the formation of a value network, committing multiple actors to act in an orchestrated fashion and making adjustments to their own business models. 	<p><i>As subject to innovation, novel business models emerge at a higher level of stability than technological niche innovations and build up a substantial part of a novel regime because they</i></p> <ul style="list-style-type: none"> can emerge independently of technologies, challenge the dominant regime logic, imply that rules and structures on a novel way to create and capture value have emerged among a critical mass of actors in a novel value network.

Of these three, Role 2 and Role 3 signify business models' capabilities in challenging the established regime, i.e. potentially contribute to system change. As intermediates between the technological niche and socio-technical regime (Role 2), business models drive socio-technical transitions by supporting the stabilization of the system around novel technological innovations through, among others, demonstrating the value of the novel technologies to incumbent regime actors, and linking the novel technology to different actors, thus supporting the building of new value networks around it. An example of Role 2 business models could be new recycling technologies that have been integrated into circular value systems, which could replace linear operations by making circulation of materials more cost-efficient. Business models as non-technical niche innovations (Role 3) on the other hand drive societal transitions by establishing new regimes without relying on technological innovations, but by challenging the dominant regime's rules and logics, by, for example, implying that a critical mass of actors in the system have already adopted novel rules and structures in new value networks, which can create push for transformation. (Bidmon &

Knab, 2018) An example of Role 3 business model could be novel business models offering alternative ways to consume products, for example clothing-as-a-service, and business models challenging established conceptions and beliefs associated with textiles, clothing and fashion. Thus, business models aiming to distribute novel technological and non-technological innovations by building new value networks capable of replacing dominant modes of operating in a given regime, could be argued to be capable of contributing to system-level impact.

SBM literature (e.g. Adams et al., 2016; Bidmon & Knab, 2018a; Bocken et al., 2014) thus argues that in order for companies to contribute to systems change, their business models need to deliver (novel) solutions, either technical or non-technical, that aim to solve sustainability challenges at scale and over the long-term. Simultaneously, sustainability literature argues that reducing carbon emissions and the material intensity of consumption, which contributes to emissions, are central requirements for achieving sustainable development goals (United Nations Department of Economic and Social Affairs, 2019; Whiteman et al., 2013), especially when considering material-intensive industries such as the ones within the textile domain (Ellen McArthur Foundation, 2017). Scalability of SBMs and their contribution to the reduction of material consumption could thus be argued to present central requirements for business models' potential for contributing to system-level impact, at least when inspecting material intensive industries.

However, despite arguing for the potential system-level impacts of each archetype, Bocken et al. (2014) have separated Encouraging sufficiency and Develop scale-up solutions as distinct archetypes in their typology. Unlike the other archetypes in the typology, Develop scale-up solutions is explicitly described as “being built on sound sustainability principles using combinations of the aforementioned archetypes” (p.53, Bocken et al., 2014). Literature on business model scalability argues that the concept of scalability denotes achieving profitable growth from “exponentially increasing returns to scale in terms of growth from additional resources applied” (p. 4, Nielsen & Lund, 2018). Scaling shouldn't be confused with growth that denotes increasing revenues at the same pace as resources are added (Carucci, 2016). This indicates that scalability is an attribute of business models that find a successful formula for creating, delivering, and capturing value in the market context, and in a way that can be replicated with investments that enable higher value capture in relation to the capital used. Moreover, commercially relevant business models are argued to “most

likely become financially and economically sustainable, scale and attract/ generate cascading innovations” (Jay & Gerard, 2015, p. 15). Literature on sharing and platform business models (e.g. Acquier et al., 2019), associated with both the Deliver functionality rather than ownership and Create value from waste archetypes, argues that scalability enables sustainability impact, but that scalability requires employing a for-profit market logic, as non-profits are deemed as possessing limited scaling potential within the economic paradigm. This could argue for the importance of considering scalability and for-profit logic as a requirement for businesses aiming to achieve or contribute to system-level impact for sustainability, as gaining a large market share gives businesses an opportunity to impact other players, consumers and policy. An example of a scalable business model from the textile domain are the fast fashion companies. In order for SBMs to contribute to sustainability transitions, they need to be scalable in order to replace incumbent modes of operating in an economic system favoring economic value creation.

The literature presented in this review seems to argue that instead of being considered as distinct archetypes, encouraging sufficiency and developing scale-up solutions should be traits of SBMs considered to be capable of achieving system-level impacts in consideration of sustainable development goals. It could be argued that this is because the SDGs emphasize the need for reductions in GHG emissions and material consumption, and systems change literature argues that business models need to be scalable in order to replace incumbent modes of operating. The encouraging sufficiency thematic emphasizes the need for, among others, alternative production and consumption systems in order to establish a more sustainable economy. Scalability on the other hand represents a requirement for distributing these alternative production and consumption systems in the current global economic system, in order to contribute to system-level change. Literature thus seems to indicate that contributing to system-level impact requires development of novel solutions that can be widely distributed either by finding a winning formula for scaling the business model alone, or by creating and developing value networks with extensive stakeholder engagement (Dentoni et al., 2020), further supporting the notion of ‘developing scale-up solutions’ as a requirement for business models aiming to achieve system-level impact. Regarding these two as thematics or requirements for business models to be considered as having potential for system-level impact for sustainability, instead of as distinct archetypes, could allow the consideration of which of the rest of the archetypes by Bocken et al. (2014) can be regarded as capable of significantly contributing to sustainable development on a system-level. In

other words, which of the archetypes could be categorized as System Builders (Adams et al., 2016).

In summary, SBMs with potential for having system-level sustainability impacts, as well as frameworks for considering how business models can impact the system-level and categorizing the extent of this impact have been identified and discussed in literature. However, definitions of what types of SBMs could contribute most to bringing about a new more sustainable paradigm, i.e. business models with most potential for system-level impact that pushes for sustainability transformation, seem to be lacking in literature. The findings section of this study aims to examine what kinds of SBMs could have most potential contributing to system-level sustainability transitions through integrating the above presented frameworks an literature.

3. Methodology

The research question that inspired this study was “what types of business models can contribute to the transformation of the textile domain in a way that reduces its negative environmental impacts?” This chapter presents the methodology used in this study as well as in the development of the theoretical framework.

3.1. An integrative literature review approach

In order to approach the research question with a literature review methodology, a base of knowledge on SBMs, business models’ role in socio-technical transitions and potential from a systems thinking perspective needed to be established. Literature on the topics associated with the research question exist in various research areas. As industrial practice is often ahead of academia regarding the exploration and development of business models (Bocken et al., 2014), the inclusion of examples of SBMs in practice was deemed a crucial part of the study. Grey literature from established and influential organizations in the fashion, consulting and circular economy research was included as well, to define and contextualize current phenomena in the textile domain related to sustainability, as potentially relevant information may not yet be adequately reported in academic literature (Adams et al., 2017).

Answering the research question necessitates looking at different research areas in order to evaluate the current view of academia and practice knowledge on the topic at hand. This is why an integrative literature review approach was chosen as the methodology for this study. Integrative literature reviews can be used to gain an overview of the knowledge on a particular topic, to critically review and even reconceptualize theoretical frameworks in the process of research topic development. Assessing the collective knowledge of a particular research area is especially critical in the case of business studies, in combination with sustainability, where knowledge production is rapidly increasing yet staying fragmented. (Snyder, 2019) Literature reviews can be considered as more or less systematic methods for gathering and assessing existing literature, and as tools for creating understanding necessary for knowledge and theory development (Tranfield et al., 2003; Webster & Watson, 2002).

Multiple electronic databases were utilized in the identification and collection of literature. Firstly, search engine optimization was utilized to procure relevant grey literature related to

the research question in order to gain a timely understanding of SBMs in the textile domain and how sustainable development goals are considered in the related industries. An initial search utilizing Google Scholar identified the state of current research on the topic. Initial, broad search terms of peer-reviewed primary sources yielded highly cited articles on sustainable business models and socio-technical transitions. Additional searches with additional descriptors was executed using the databases Scopus and EBSCO Business Source Complete. As the literature review took an integrative approach, well-cited literature from established journals in the different the research areas were identified in this initial stage and studied in detail by going through their references to obtain an understanding of the state of the research topic in each field. More articles were obtained by searching articles that had cited these central pieces of research identified as foundational sources for this study. Moreover, M. Halme, S. Patala, O. Sahimaa and E. Miller (personal communication, April 1, 2020) at the Aalto university School of Business were also consulted to obtain relevant articles and knowledge of research areas concerning the research question. The Snowball method was used to obtain further articles and identify central researcher, articles and perspectives related to the research question. This was done until a point of saturation was reached regarding the relevant research areas needed to answer the question as well as regarding the relevant articles in each field.

The descriptors used to procure literature for this study consisted of: *Sustainab* business model, textile, fashion, slow fashion, apparel, garment*, cloth*, systems theory, MLP, systems thinking, leverage points, sustainability-oriented innovation, system transformation, systemic change, system-level impact, business impact, circular*, sufficiency, reduction of consumption, ownership-based consumption*. Various combinations of the aforementioned terms with “AND” commands yielded more narrowly defined articles on the topic.

Relevant sources were selected based on a) the journals’ prominence and relevance in the research areas of SBMs, systems thinking, socio-technical transitions and sustainability, b) the authors credentials and history of research and/or expertise on the topic, and c) time of publication. The procedure for ultimately analyzing sources started with a wide gathering of literature based on search results with the descriptors described above. Title relevance and number of citations in relation to year of publishing were used as initial criterion for choosing relevant articles. Next, the relevance of articles was estimated based on abstracts of the articles, the merits of the publication and authors history of research on the topic. Year of publication was also used to choose articles – the majority of sources have been published

during the past six years, however, established research from earlier on has also been included to establish a historical foundation of research avenues continuing to this day. Most importantly, the sources' alignment and relevance with the research question was used as a criterion for choosing literature for consideration. Literature reviews, meta-analyses and theory-synthesizing articles were preferred for the purpose of conducting an integrative literature review and gain a holistic understanding of the current state of knowledge related to the research question.

3.2. Development of theoretical framework

The theoretical framework proposed by this study was synthesized from the foundational pieces of literature identified most relevant for the research question. Adams et al. (2016) was determined to be an appropriate foundation for the framework synthesis as it discussed the Bocken et al. (2014) archetypes determined as a relevant source of SBM research for this study. The Bidmon & Knab (2018) categorization was used to compliment the framework by providing a lens for investigating the avenues through which business models can impact the system level. The allocation of archetypes within the new framework was done through examining their link to the systems perspective and by evaluating their potential impact in terms of the deep leverage points identified in the context of the textile domain.

4. Findings

This section presents the findings of the integrative literature review. An integrated theoretical framework created based the literature studied is presented along with examples from practice of the SBMs falling within the framework. The framework built by this study aims to present a new way of evaluating the type of SBMs potentially capable of influencing system-level environmental sustainability in the textile domain by impacting deep leverage points. The section is concluded with a summary of the findings of the literature review.

4.1. Business models with most potential for reducing negative environmental impacts in the textile domain on a system level

In order to inspect and establish a theoretical framework for considering what types of SBMs have most potential for system-level sustainability impacts, I propose a combination of the frameworks presented in the previous sections of this literature review. The new framework (presented in table 3) proposes a way of examining the scope of business models' potential for contributing to system-level sustainability transformation by looking at how the business model contributes to sustainable development (Bidmon & Knab, 2018; table 1) and the scope of the sustainability actions in terms of creating new value networks (Adams et al., 2016) i.e., systems necessary for a transformation. The allocation of SBM archetypes (Bocken et al., 2014) into the framework was founded on Adams et al. (2016) and complimented the deep leverage points (Abson et al., 2017; Fischer & Riechers, 2019; Meadows, 1999) identified earlier in the review in the context of the textile domain.

Table 2 Conditions of SBMs with potential for system-level sustainability impact (adapted from Adams et al. (2016))

Adams et al. (2016)			
	Operational optimization / "Eco efficiency" ("Doing the same things better")	Organizational transformation / "New market opportunities" ("Doing good by doing new things")	Systems building / "Societal change" ("Doing good by doing new things with others")
<i>SOI outcome / Impact</i>	Reduces harm (single issue and related to 'technical fixes')	Creates shared value (call for action, clarity of long-term goals & strategies, importance of sustainability in the context of company purpose)	Aims to create net positive impact & shared value, in which the causes of eco- and social systems are advanced as equivalents to economic returns through collaborations Targets transforming established societal relationships and interactions between industry, consumer behavior and lifestyles, institutional orientations, and even the very aims of business.
<i>Scope of activities</i>	Incremental improvements to business as usual (technical, stand-alone, insular in character)	Fundamental shift in firm purpose (more people oriented, integrate sustainability more deeply into the organization, less insular)	Involves developing relationships between a wide range of private, public and civil society partners. Situates firm in industrial ecology with mutually affecting relationships with multiple stakeholders in networks, collaborations, community, partnerships.
<i>Extent of orientation for developing value networks</i>	Internal orientation (targets for change are internal)	Largely internally oriented, diffusing and suffusing sustainability throughout the organization, extends to immediate stakeholders	Internal and external orientation, willingness to lead & inspire wider change through visionary leadership & mobilization of dynamic capabilities. Extends beyond the firm and immediate stakeholders to drive institutional change.
<i>Encourage sufficiency and/or reduction of material consumption</i>			Business models encourage sufficiency in consumption and/or significantly reduce material consumption to achieve system-level sustainability impacts.
<i>Scalability</i>			Business models distributing SOI are scalable to the extent that they disrupt the market they're situated in.
<i>Examples</i>	Reducing intensity of resource use, better waste management, pollution capture/control, recycling	Social entrepreneurship, treating nature as a stakeholder, changing the nature of the deliverable (e.g., servitization), embedding sustainability metrics with financial reporting	New platforms. Industrial ecosystems, sustainable supply chain system certifications (a result of system builder partnerships), B Corporations, closed loop production, circular economy, restorative industrial models, net positive contributor model

Table 2 “Conditions of system-builder SBMs” presents the conditions used for evaluating where in the new framework (table 3) the examined archetypal SBMs could be located. The conditions were adapted from Adams et al. (2016) and complimented with conditions that emerged from in the study. Two additional conditions were added to the Systems Building category in order to examine potential for system-level impact of business models: encourage sufficiency and/or reduce material consumption, and scalability have been added to better consider material-intensive industries such as the textile domain. The two additional conditions have been determined only for the Systems building category, as this study focuses primarily on examining business models tackling deep leverage points, and based on the literature presented in this review, business models in this category seem to possess most potential for achieving system-level sustainability impacts.

Based on the categories, System builders aim to create net positive impact and shared value. They target transforming established societal relationships and interactions between industry, consumer behavior and lifestyles, institutional orientations, and even the very aims of business. They achieve this by developing relationships between a wide range of private, public and civil society partners by, for example, situating the firm in an ecosystem with mutually affecting relationships. Thus, they are internally and externally oriented towards leading and inspiring wider change through visionary leadership and mobilization of dynamic capabilities, by for example creating new value networks. (Adams et al., 2016) In order to have sustainability impact, they encourage sufficiency of consumption and/or reduction of raw material consumption (Ellen McArthur Foundation, 2017). Moreover, they are scalable enough to disrupt established markets to push for change in the status quo (Bocken et al., 2014; Nielsen & Lund, 2018). The avenues through which business models can become Systems builders are either by distributing novel technologies from the niche level to the regime or by driving societal transformations with the help of novel, non-technological business model innovations (Bidmon & Knab, 2018). The activities and the resulting impact need to tackle the deep leverage points—linearity of operations, increasing consumption driven by the fashion system, and ownership-based consumption of textiles—in order to be considered capable of contributing to or achieving system-level impact for sustainability. Based on these conditions, the SBM archetypes are allocated into the framework (table 3).

Table 3 Matrix of archetypal SBMs with potential for contributing to system-level sustainability impact (based on Adams et al., 2016; Bidmon & Knab, 2018, Bocken et al., 2014)

	Adams et al. (2016)		
Bidmon & Knab 2018	Operational optimization / "Eco efficiency" ("Doing the same things better")	Organizational transformation / "New market opportunities" ("Doing good by doing new things")	Systems building / "Societal change" ("Doing good by doing new things with others")
Role 1: BM as part of the socio-technical regime	Maximize material efficiency		
Role 2: BM as intermediate between technological niche and socio-technical regime		Substitute with renewables and natural processes	Create value from waste
Role 3: BM as non-technological niche innovation		Repurpose for society/environment	Deliver functionality rather than ownership Adopt a stewardship role

The Maximize material efficiency archetype is categorized as the business model with least potential for system-level sustainability impact, as it represents incremental internally focused sustainability improvements (R. Adams et al., 2016) to incumbent business models within the dominant paradigm (Bidmon & Knab, 2018). An example of a business model falling into this category could be any of the incumbent fast fashion companies, e.g. Inditex engaging in improving material efficiency in production and energy efficiency in stores, and changing to sustainable or recycled materials (Inditex, 2019), however simultaneously committing to increasing sales of their products, meaning the fundamental business model isn't undergoing change.

Taking a step towards higher potential for contributing to system-level impact, Substitute with renewables and natural processes, and Repurpose for society/environment archetypes (Bocken et al., 2014) represent the Organizational transformation category. An example of the substitute with renewables and natural processes is Harvest & Mill, who produce clothing from heirloom varieties of cotton that eliminate the need for dyeing, as the colors are already present in the material used (Harvest & Mill, 2020). An example of the Repurpose for society/environment archetype is Hara the Label, whose “mission is to use the label as a platform to bring change, awareness and education to the issues within the fashion industry” in order to “empower lives and rejuvenate the earth” with clothing e.g. produced from sustainable materials using natural dyes (Hara the Label, 2020). Hara also focuses on sharing information on physical, psychological, emotional and spiritual wellbeing as part of their business. These archetypes are allocated in the Organization transformation category due to the novel sustainability-oriented business model innovations they represent, but in terms of scope these remain largely internally oriented regarding the extent of new value networks engaging various stakeholders that is necessary for System builders, keeping them from extending to the System building category. Moreover, Bocken et al. (2014) make the claim that the organizations in the Substitute with renewables and natural processes archetype seldom are economically viable, presenting challenges regarding scalability required for a firm to be located in the System building category. The same applies for the Repurpose for society/environment archetype (Bocken et al., 2014) – SBMs in this category are argued to not be scalable within the current global economic system. Literature argues that the archetype includes organizations such as social enterprises, that are generally not profit maximizing, non-profits depending on external financing presenting challenges for long-term economic viability, and hybrid organizations where for-profit business models fund not-for-profit ventures. Not being scalable or not integrating sustainability actions at the heart of the business model keep businesses such as these from being categorized in the System building category. The Substitute with renewables and natural processes archetype is more technologically oriented whereas the Repurpose for society/environment archetype presents non-technological solutions, innovations distributed by SBMs (Bidmon & Knab, 2018). Despite the latter also involving changing world views, values and the fundamental purpose of the business, which tackle deep leverage points, the lack of scalability keeps the archetype for being located into the System building category.

The remaining three archetypes—Create value from waste, Deliver functionality rather than ownership and Adopt a stewardship role—are attributed to the Systems building category. The Create value from waste archetype is considered part of the System building category as developing circular solutions requires radical rethinking of business models and value chains as well as the whole industrial system in which they're developed in (Ellen McArthur Foundation, 2017). Moreover, it requires the creation and development of novel technologies, new value networks and ecosystems engaging various stakeholders in establishing new production systems. A shift from linear thinking to circular thinking represents a change in world views, indicating potential for affecting deep leverage points (Abson et al., 2017). As a solution, the archetypal business model aims to scale circular technologies enabling potentially significant reduction of raw material consumption, by closing loops in the production, use and collection faces in the lifecycle of textiles. Examples include Evrnu that creates circular ecosystems for textiles with technological innovations enabling the recycling of discarded clothing into new textiles (Evrnu, 2020), as well as The Infinited Fiber Co. whose technological innovation allows the recycling of bio-based fibers (cotton, cardboard, agricultural or wood-based pulp) into new textiles (Infinited Fiber Company, 2020).

The Deliver functionality rather than ownership archetype on the other hand presents non-technologically oriented solutions aiming to create alternative consumption systems through changing, for example, established practices and conceptions of ownership-based consumption of physical consumer goods. Having to do with servitization, this archetype could be allocated to the Organizational transformation category according to the Adams et al. (2016) framework. However, when considering this archetype from the leverage points perspective and literature presenter earlier regarding the challenges of the textile domain, this archetype presents a potential fundamental shift in firm operations and purpose, characteristic of the System building category. Moreover, it represents an alternative way of organizing the consumption of clothing in a way that could reduce raw material consumption by tackling deep leverage points: this archetype requires rethinking of established ways of delivering value to consumers, as well as potentially changing incumbent worldviews and culture associated with textiles. For example, it requires a shift towards producer ownership of textiles, i.e., that the producer owns the good even as it is being used by the consumer, which entails different types of valuation of products and agreements between involved parties, as well as new income models. Delivering functionality rather than ownership

regarding physical and material intensive products also requires the creation and development of value networks and ecosystems engaging various stakeholders across the value chain, in order to ensure functional and profitable business models. For example, clothing rentals need logistics systems to allow the shipment and collection of the products, cleaning and maintenance services, as well as new funding channels that cater to new income structures not necessarily recognized by traditional funders such as banks. As a solution, this archetype aims to reduce raw material consumption by scaling alternative consumption systems that, for example, decouple consumption from ownership and the perpetually growing need for raw materials in delivering value to consumers, simultaneously potentially altering world views related to clothing and fashion. Examples of this archetype include Lindström Group who offer textiles, e.g. carpets and grocery shopping bags, as well as hospitality, industry and medical textiles as a service (Lindström Group, 2020). Also, Mud Jeans, who offer consumers the opportunity to lease jeans instead of owning them and managing the whole loop (Mud Jeans, 2020), and Tulerie, a peer-to-peer clothing and accessory rental platform that allows lending fashion clothing from other consumers (Tulerie, 2020).

Lastly, the Adopt a stewardship role archetype possesses potential for sustainability impact by pushing for and creating new standards and values regarding popular consumers goods, ultimately establishing new status quos for business model value chains by growing value networks and engaging multiple stakeholders for the purpose of sustainability. Archetypal SBMs of this kind have the potential to solve critical challenges in the textile domain, such as lack of standards in parts of the textile system, as well as the nonalignment between clothing design and life-after-use phase. As a solution, it represents a business model approach to regulating industry practices – by establishing standards for e.g., chemical use, material alternatives and production methods, this archetype aims to shift unsustainable practices towards more sustainable ones. Ultimately, this may lead to changes in consumer behavior, as consumers are provided with easy to understand cues for choosing more sustainable alternative, and to changes in production practices for example once a certification reaches critical mass and displaces non-certified products and processes (Bocken et al., 2014). When these business models reach critical mass, i.e., scale up, they can change industry standards and thus establish more a more sustainable foundation for the whole textile domain. Examples of this archetype include certifications such as the Cradle to Cradle certification, “a globally recognized measure of safer, more sustainable products

made for the circular economy” (Cradle to Cradle Products Innovation Institute, 2020), which assesses products on material health and reutilization, renewable energy and carbon management, water stewardship and social fairness.

4.2. Summary of the literature and findings

Based on scholarly (R. Adams et al., 2016; Bocken et al., 2014; Pal & Gander, 2018) and grey literature (Ellen McArthur Foundation, 2017; Global Fashion Agenda & The Boston Consulting Group, 2017; McKinsey & Business of Fashion, 2019), the SBM archetypes capable of contributing to system-level impact are ones within the Delivering functionality rather than Ownership to change established consumption models, Creating value from waste i.e. pushing for circular operations, and Adopting a stewardship role to establish more sustainable operations and materials as the status quo. These business models tackle the systemic challenges of underutilization of clothing leading to growing material consumption, reducing waste by tackling the linear nature of the textile system, and by establishing new standards and processes of production aimed at reducing established unsustainable resource use and consumption practices. Tackling these deep leverage points linked to the negative environmental impacts of the textile domain could amount to drastic reduction in raw material inputs and the GHG emissions associated with them in the whole system (Ellen McArthur Foundation, 2017). The other SBM archetypes represent more incremental impact potential, as they focus more on the individual organizations and immediate stakeholders only or are not yet economically viable in order to scale up and extend the impact. However, it should be noted that these SBMs can potentially, in combination with the ones tackling deeper leverage points, increase the contribution to system-level impact for sustainable transitions (R. Adams et al., 2016; Bocken et al., 2014).

In summary, the literature presented in this review argues that SBMs can achieve or contribute to system-level sustainability impacts by building new value networks, with various stakeholders, around technological or non-technological innovations that target the linear nature of textile production and shift it towards a more circular direction, the increasing underutilization of clothing-use due to fashion cycles, as well as the ownership-based consumption model of textiles.

5. Discussion

This section presents a discussion of the findings of this study. The core message from literature is that SBMs engaging in circularity, providing functionality over ownership and adopting a stewardship role to reduce negative environmental impacts have potential for at least contributing to system-level sustainability impact needed for transforming the textile domain. As the framework was created based on existing literature and tested with examples from practice, the findings of this study focus on evaluating the current state of knowledge on the topic of business models' potential for system-level sustainability impacts, as well as needs for further consideration and research in order to contribute to the development of SBM theory. The following sections will discuss what an environmentally sustainable transformation in the textile domain would include. How the SBMs identified by the literature manage to contribute to making it a reality is contemplated on, and lastly, observations of fuzziness in literature are discussed in order to contribute to development of the scholarly discussion.

5.1. Elements of system-level sustainability in the textile domain

Essentially, a sustainable transformation in the textile domain would include at least four elements necessary for ensuring the reduction of environmental impacts on a system level: 1) increased sustainability of materials and their use, 2) longevity in use, and 3) circularity in lifecycle. In addition, reduction of overall material consumption is a requirement for reducing negative environmental impacts on a system-level and to meet global sustainable development targets. These four elements build upon each other and are strongly interlinked in term of business models. What they mean in terms of consumption, production and business models is discussed below.

5.1.1. *Increased sustainability of materials and their use*

Increased sustainability of materials and their use is an essential requirement for a more sustainable textile domain (Ellen McArthur Foundation, 2017). This would mean that products sold by businesses operating in the textile domain are produced from sustainable

materials and that the way textiles are produced doesn't cause environmental strain to the degree that it does today. The sustainability of materials and their production processes would need to be evaluated based on at least their carbon, water, energy, chemical and material footprints. Materials used the most should represent fibers that do not cause environmental strain to the same degree as the fibers most used today, e.g. cotton and polyester. Increasing the sustainability of materials used in the textile domain should also happen by increasing the share of recycled fibers. Business models allowing the development and scaling up of technologies allowing this, possess potential for system-level sustainability impacts as presented by the literature review – linearity of current practices and lack of technologies enabling circularity present acute challenges for the textile domain in terms of environmental impact (Pal & Gander, 2018). Circular processes can allow the reduction of production related footprints, e.g. water, chemical and energy, if processes are designed with circular principles that design out waste.

A barrier to the increased use of recycled and more sustainable fibers in the textile domain is the availability of these materials in comparison to for example cotton and polyester, as well as the ease these widely used fibers present producers, as changing to alternative fibers most likely will require significant investments in the development of, for example, new production facilities. Technological lock-in thus presents barrier for SBMs to overcome on the path for system-level impact. Moreover, a major hurdle is the availability of quality textiles for recycling. Collection of post-consumer textiles is still in its infancy, which presents challenges for businesses aiming to increase the amount of recycled fibers in their products. Currently, as described in the literature review, textiles are often produced using mixed fibers and not with the full lifecycle and recycling in mind. More sustainable fibers will thus need to also be recyclable and technologies to do this will need to be developed.

The SBM with most potential for impacting this are the ones belonging to the Adopt a stewardship role archetype. If able to scale up, these business models have the potential of shifting the status quo in regard to materials and production processes used in the textile domain. Thus, they could ultimately impact the deep leverage points concerning values as well as established incentives and constraints guiding actors' behavior in the system. An example of this is the Higg Index by the Sustainable Apparel Coalition (Sustainable Apparel Coalition, 2020), which is being used by Zalando to make sustainability assessment mandatory for the brand's private labels and partner brands, in an effort to accelerate the adoption of sustainable standards in the fashion industry (Zalando, 2020). As the leading

online fashion retailer in the EU, Zalando has the opportunity to shift brands' sustainability efforts in case the level of sustainability they demand for brands sold on their platform is ambitious.

5.1.2. Longevity in use

In a more environmentally sustainable textile domain, textiles are used for longer time periods than they currently are. Use time of textiles presents a deep leverage point for business models in the textile domain aiming to achieve system-level sustainability impact, as it requires rethinking the fundamental dynamics of value creation for business models, as well as involving for example cultural and skills changes for consumers of clothing.

Longevity of textile products starts with the choice of material, where the durability has to be weighed against the recyclability of the material, the design of the product as well as the quality of production. Longevity thus ties in with the first element regarding sustainability of materials and adds the dimensions of design and quality to the equation. From the perspective of textile production, more sustainable textiles can be produced by considering the whole lifecycle of the product already in the design phase and contrasting it with the choice of material. For example, mixing synthetic and natural fibers allows for greater durability, but often reduces the recyclability of the product as recycling technologies currently aren't able to recycle mixed fibers into new ones with such quality that they could be reused in e.g., clothing production. Thus, development and scaling of technologies closing the loop are needed for transforming the textile domain sustainability-wise.

Textiles, and especially clothing and fashion products will need to be designed and produced with higher quality in order to become more environmentally sustainable. This requires designers assessing the lifecycle of the product. For example, product could be designed with several consumers' use in mind. In the production phase, increased quality will need to be focused on in order to provide longevity of use. For example, more time allowed for the production of each piece could aid in increasing the quality of output.

For the consumer side, longevity in use results from increased skills and effort put into proper maintenance of textiles, for example cleaning different materials accurately and mending or using repair services to extend the life cycle of the textiles. Moreover, longevity of textile use can result from, and needs, a cultural shift in which short use time of textiles, e.g., fashion products is less desirable. Short use times of especially fashion products are

impacted by many cultural phenomena, such as trends on social media, which encourage rapid turnover of clothing in one's wardrobe and which one presents to their peers. A change away from increased turnover of trends could happen through grassroots pressure that instigates a cultural shift away from the excessive consumption of clothing, or from fashion companies shifting their narrative—and following it with changes to their business models—to that of sufficiency, e.g., less is more.

Most importantly, the longevity element challenges business models' fundamental value creation, delivery and capture methods. Currently, the most economically successful business models in the textile domain achieve their success by increasing the number of physical products sold. One way this is achieved is by planned obsolescence in both quality and style, which decreases, or even prevents, consumers' and producer's ability for using products for longer time periods and recycling them into new textiles. Increasing longevity challenges the way businesses in the textile domain can make profit, thus pushing for a system-level sustainability transformation.

SBMs contributing to the increase of longevity are represented by the Deliver functionality rather than ownership and Create value from waste archetypes (Bocken et al., 2014). Delivering functionality over ownership changes the logic of value creation, delivery and capture from selling products to delivering services. As the ownership of the product is retained by the company, an incentive for creating long-lasting quality products becomes inherent to the business model. This incentivizes companies to, for example, produce textiles that last longer in use. Companies producing fashion products could achieve significant sustainability impact by reducing the amount of styles they create, i.e. reducing the number of seasons, as a result of each staying in use for longer, and from producing fewer products overall, as to company can deliver value to several customer with a single product. Examples include online and offline clothing libraries.

Moreover, even if the ownership of the product was sold to customers, increased quality in products can allow for the reselling of items – a producer could sell the same product twice by collecting it back from the consumer for resale as vintage for example. An example from the homeware industry is Iittala, who buys back their own old tableware products and resell them as vintage products in their brick-and-mortar stores. Iittala also collects tableware from other producers to recycle them back into ceramics or to distribute them to be recycled in other industries (Iittala, 2020). Second-hand platforms such as Vestiaire Co. allow

consumers the opportunity to resell their fashion products on a global market (Vestiaire Co., 2020).

This, however, may not work for more personal items, such as home textiles and basic clothing, such as underwear considered as more intimate garments. For these types of products, increasing the quality and maintenance options along with circular lifecycles allows for longevity. SBMs educating consumers correct maintenance of products, and offering services to aid in the correct maintenance of products, as well as providing options to recycle the products, can contribute to a system-level sustainability transformation by reducing material consumption while changing use culture of textiles. Examples of business models providing these kinds of alternatives include Nudie Jeans, who provide gratis repair services and free repair kits for their jeans (Nudie Jeans, 2020), as well as Mud Jeans who offer jeans-as-a-service with a circular business model – old jeans are recycled into new ones and offered for purchase or lease (Mud Jeans, 2020). SBMs that are able to scale up technological or non-technological innovations capable of increasing the use time of textiles and changing the way textiles are consumed can be argued to be capable of contributing to system-level sustainability impact.

5.1.3. Circularity in lifecycle

Linearity represents one of the most significant and fundamental challenges of the textile domain (Pal & Gander, 2018). It reflects how the whole textile system is structured, representing a deep leverage point for achieving sustainability impacts. Changing away from the take-make-waste model of operating thus requires changes in all parts of textile value chains.

In order for the production of textiles to move to circularity, fibers and products should be designed to be recycled. This requires solving challenges in the collection and technological barriers in the recycling of textiles. A major challenge for the use of recycled fibers is the unavailability of uniform quality and continuous stream of post-consumer textiles, as current recycling technologies aren't capable of maintaining the quality of the fiber, or recycling mixed fibers. Promising examples such as Evrnu and The Infinited Fiber Company present solutions to closing the loop in the recycling process, and the EU's amendment of the directive on waste (Directive (EU) 2018/851) mandating all 28 EU member states to organize separate collection of textile waste indicate that niche and regime-level changes are

undergoing in favor of the creation of a more sustainable textile system at least in the EU. Thus, in the future the production process of textiles will need to consider the full lifecycle of textiles from the design phase forward to ensure circularity. For example, solutions—microchips or better tags detailing the material used in the products—for helping the identification of fibers used in post-consumer textiles could benefit the establishment of circular systems.

From an environmental standpoint, improving the production and recycling processes of textile is also key for reducing the environmental strain of circularity. Circular use of fibers can aid in the reduction of virgin materials, however, processes involved in the recycling and production of textiles cause environmental strain as well. Thus, in order to contribute to system-level sustainability impact, innovations enabling circular processes will need to also reduce the negative environmental impacts associated with water, energy, chemical and material use in textile production.

Regarding consumption of textiles, circularity requires changes in consumption models and habits. As with longevity, solutions aiding the maintenance of textiles supports circularity by keeping the material in better condition up to the point of recycling. Furthermore, it requires changes in disposal behavior, where reuse and reselling should be incentivized in order to keep textiles in their primary use for longer, after which correct disposal for recycling needs to happen.

For SBMs, this means creating business models that include the circulation of produced materials, which necessitates, for example, the integration of take-back schemes and the use of recycled materials. Creating SBMs with potential for system-level impact will benefit from combinations of different business modes represented in the other SBM archetypes (Bocken et al., 2014), as they are necessary for system-level transformation (Jay & Gerard, 2015) based on literature. System-level sustainability impact can emerge from large players in the textile domain shifting to the use of the three archetypes identified as possessing most potential: Create value from waste, Deliver functionality over ownership and Adopt a stewardship role. These business models can and should be complemented with elements from the other SBM archetypes, such as Substitute with renewables and natural resources and highlighted by the first element of increasing sustainability of materials and production processes. The creation of circular business models can be made easier by combining them with service-based models to enable the circulation of raw material and products in the hands

of the producer. This requires rethinking the ownership and funding models, exemplified by the producer ownership model, where instead of selling products, companies sell use time of long-lasting products to customers for as long as they need. After, products are returned to the company to repair and reuse for the next customer. This, however, may require change in the regime-level, e.g. legislation or accepted funding and accounting practices, as for example financial flows may differ from established models quite radically, which can make applying for funding challenging.

Regarding the textile domain, it is often new, small-scale SBMs, which experiment with radical innovations. A reason for this is that incumbent companies experience significant barriers to shifting away from the predominant manufacturing and consumption patterns, as their operational model has become institutionalized in the regime. (Pedersen & Andersen, 2015) Business model literature highlights this challenge. Thus, significant system-level sustainability impact potential is possessed by the large, incumbent business models in the textile domain. Yet it is acknowledged, that transforming their business models to the degree argued necessary by global sustainability targets on a voluntary basis is quite unlikely.

The main finding in relation to the identified SBM archetypes is that contributing to system-level sustainability transformation in the textile domain requires the establishment of more holistic business models that take into account the full lifecycle of the products and aim to reduce their negative environmental impacts in production, use and post-use phases. Moreover, they need to influence the way that textiles are consumed in ways that reduce the consumption of textiles by, for example, increasing use time. It represents a holistic change in operations and value creation for businesses operating in the textile domain, that inevitably also demands change in the regime, e.g. policy and infrastructure developments.

5.2. Reduction of overall material consumption

A central tenet of a more sustainable textile domain is the need for reduction of overall material consumption. Reducing the use of raw material in the textile domain is necessary for reducing the negative environmental impacts associated with material extraction, production, disposal and circulation (Ellen McArthur Foundation, 2017; Sajn, 2019). Moreover, when considering the ambitious sustainability goals in combination with the growing global population and global middle class—as people rise in income class, they can afford to consume e.g. fashion to a greater degree—material consumption should be reduced

as well, which inevitably means reduced production and consumption of textiles per capita. This perspective seems to be quite absent in both academic and grey literature concerning textiles. Literature speaks of solutions for maintaining value within the system with circular and service-based business models, yet there seems to be an assumption that keeping more material value in circulation along with sharing economy solution could allow for the status quo of consumption growth to continue, just by different means. However, environmental impacts of recycling and textile maintenance remain – if the number of textiles in circulation and use grows, so do environmental impacts. A sustainable transformation within the framework of global sustainability targets such as the Paris Agreement and Sustainable Development Goals, argues for the overall reduction of production and consumption of clothing. This could be afforded by a transformation that would include the phasing out of unsustainable production practices, reduction of annual fashion cycles, change in consumption models, increase of use-time of textiles, and higher degree of circularity in the whole textile domain. Currently, however, the status quo in the textile domain still seems to be centered on the conception that production can increase, if the domain just shifts into more circular and sharing based practices.

SBM and fashion literature seem to not have discussed this perspective so far. Yet, the transformation needed based on international sustainable development targets creates a framework within which topics such as continuous growth of the economy, profits and business should be discussed, especially concerning research focusing on examining SBMs in material intensive industries, such as the textile domain. This is essential, as the way that growth in for example the textile domain is considered, impacts the assumption made concerning business models' potential for contributing to climate targets and SDGs.

Thus, the solution to having system-level impact for sustainability won't come alone from scaling up circularity in production and consumption, as well as shifting consumption to use from ownership. For example, fast fashion companies shifting to completely circular processes in production, sales, collection and reuse of their own products plus offering consumers the opportunity to borrow or use products instead of having to purchase them, will still incur growing negative environmental impacts in case limitless growth is held as a world view in relation to business.

Another dimension reflecting neoliberal views on business in the literature concerns the discussion of non-profit (sustainable) business models. The general notion seems to be that

non-profit organizations are in principle written off as able to scale and thus have impact due to the nature of their operations in relation to the dominant economic paradigm. Some scholars (e.g. Bocken et al., 2014) explicitly argue that the SBM archetype Repurpose for environment/society is not scalable within the prevailing economic landscape. Examples from practice however indicate that non-profits can scale and achieve sustainability impacts. For example one of the world's leading eye hospitals Arawind Eye Care System has showcased that by creating alternative value delivery and capture models, and by reinvesting profits into developing and scaling the business model, even non-profit organizations can achieve significant impacts: the business model has contributed significantly to the eradication of cataract related blindness in India. (Arawind Eye Care System, 2020).

This may indicate that literature so far hasn't examined the influence of notions relating to "[t]he prevailing neoliberal economic paradigm [that] privileges profit maximization as the critical value dimension in firms' business models" (Adams et al., 2016, p. 191) deeply enough in consideration to SBMs potential for contributing to system-level sustainability transformation. From a leverage point perspective (Fischer & Riechers, 2019; Meadows, 1999) not acknowledging the way the prevailing paradigm may influence consideration of available options or solutions predisposes evaluation to being limited.

It should be recognized that a transition such as this would most likely present significant reductions to the negative impacts currently caused by the textile domain. However, from the perspective of the global sustainable development agenda and goals, reduction of raw material consumption is an integral dimension required for transforming our global society to a more sustainable state in the long terms. Thus, this presents a wicked problem for businesses to solve, as decoupling material consumption from economic growth is something not easily achieved within the current economic paradigm. For the most successful businesses in the textile domain currently, measured in market share and economic value creation, value creation is strongly tied to increasing material consumption. This is due to the fact that scaling up and growing operations requires the sale of products to an increasing group of consumers, market share measured in the number of products sold. As the products of the textile domain are so material intensive, increasing market share with this incumbent logic is in contradiction to global sustainability goals. The findings of this study highlight the grand challenge of combining ambitious climate targets and sustainability goals with a societal system and economy built upon a notion of limitless growth that is in contradiction with the environmental reality (Raworth, 2017b).

A system-level transformation thus requires a change in the fundamental way value is created and measured. Alternatively, businesses in the textile domain would need to shift to the production of less material-heavy or immaterial products, which some fashion companies have already tried: Carlings has launched a completely digital collection, where consumers could purchase clothing that would be edited into photos they had chosen, offering the opportunity to consume fashion in a fully digital format (McDowell, 2019). This could present an opportunity for the fashion industry to reduce its negative environmental impacts, in case increasing amounts of new collections would be produced digitally, i.e. without the creation of material replicas. Especially as fashion consumption is increasingly driven by social media, this can represent a partial solution to the growing consumption of fashion products. However, this would not be an alternative solution to clothing needed for physical needs, or other textiles needed to dress businesses and homes, or textiles needed in the production of other products, such as cars for example, as the value they provide cannot be replaced by digital alternatives. Potential for system-level sustainability impact could thus lie in shifting fashion production to immaterial products, i.e., finding business models creating superior value to consumers of fashion items based on completely digital consumption, but in combination with other business models enabling the reduction of environmental impacts of the production of material textile products.

5.3. Scalability, stakeholder engagement and sustainability impact in the textile domain

A foundational assumption guiding this study is that system-level changes to incumbent models of production and consumption need to change in order to move towards a more sustainable textile domain. Scholars have recognized the potential of SBMs for promoting such a shift (Bidmon & Knab, 2018) and discussed ways by which SBMs can contribute to or achieve system-level impacts (e.g. Bocken et al., 2014; Dentoni et al., 2020) pushing for a transformation towards a more sustainable textile domain. However, in contrasting scholarly SBM literature with examples from grey literature and practice, the ways in which businesses seem to be able to contribute to system-level sustainability transformation, and who is considered as having potential for it, seem to differ between discussions in academia and practice.

A finding from the literature review concerns the concepts of scalability and stakeholder engagement, that essentially refers to the nature and distribution of the SBMs. Business model scalability literature (Acquier et al., 2019; Nielsen & Lund, 2015) claims distinct definitions for the concept, signifying that it essentially has to do with the profits and size of operations – a scalable business is one that can grow exponentially in regards to input put into scaling operations. In the current market context, the way to achieve power to influence the regime comes from achieving large market share. Scalability of SBMs impacting deep leverage points could thus be considered as a requirement for achieving or contributing to system-level sustainability impact. However, SBM literature, especially concerning business models potential for contributing to system-level impact, uses the term scalability quite infrequently. A more often used term in the literature is stakeholder engagement, which seems to be used as a leverage for scalability. In other words, stakeholder engagement seems to be considered as the mechanism for scalability of SBMs. It seems to be regarded as the main way companies can contribute to achieving system-level sustainability impact, as it is claimed to enable the creation of value that individual organizations can't achieve alone. In other words, individual business models are deemed incapable of instigating change in the regime fundamental enough to affect the system level.

This notion arises from literature tied to for example system theory and system transformation, where system-level change is considered to require fundamental reorganization of the regime, i.e., dominant paradigm. Individual business models are not considered capable of achieving change in the regime alone, as different dimensions such as policy or infrastructure, would also need to change in order for the regime to change substantially enough to affect the system level (Dentoni et al., 2020). Literature argues that institutional change can be brought about by novel collaborations of various actors, which can create value that organizations individually are incapable of creating. An example from this is the ACT (Access to COVID-19 Tools) – Accelerator collaboration: a platform for engaging governments, scientists, civil society, philanthropists and industry as well as global health organizations to accelerate the development, production, and equitable access to COVID-19 tests, treatments and vaccines established April 2020 (World Health Organization, 2020). This platform has changed and could be argued to change permanently dynamics in global health collaboration. It can mark the establishment of a permanent collaboration platform for the development of diagnostics, pharmaceuticals and vaccines for current and future diseases, while also changing the way organizations in the health sector

work as well as share information and platforms with each other for speeding up the processes, enhancing equal access to and accuracy of care even during times of non-crises. Research on and learning from the potential of these kinds of global collaborations in the textile domain seems to still be scarce, presenting an opportunity for future research in literature on SBMs and systems transitions and transformations. Whether organizations capable of instigating global collaboration platforms or ecosystems in the textile domain exists, still seems to be unresearched to a large degree.

However, examples from practice seem to indicate that individual, highly scalable business models have the potential of significantly disrupting the regime in ways that ultimately lead to changes in the paradigm, and thus can lead to impacts on the system-level. Companies such as Uber and AirBnB represent examples of individual, highly scalable business models that have been able to disrupt the regime level in fundamental enough ways to instigate institutional change required by System builders, but only argued by literature as being possible by engaging various stakeholders (e.g. Adams et al., 2016; Dentoni et al., 2020). Another example is the emerging COVID-19 vaccine by Rokote Laboratories: a nasal virus vector based vaccine deliverable, which entails a new way of creating vaccines in an innovatively organized ecosystem including the whole value chain from research to logistic (Lampela, 2020). This innovative platform has potential for disrupting vaccine development and distribution in the future, and it potentially represents an innovation developed to utilize existing networks to deliver superior value.

This business model seems to have found a way to scale by utilizing existing networks for superior value creation, delivery and capture without the engagement of a wide range of stakeholders. This could argue for the potential of novel, individual, and highly scalable business models' capability of affecting the system-level by fundamentally disrupting the regime. At the moment, no examples of business models in the textile domain present potential for achieving this sort of impact, and there is always the potential that these kinds of business models cannot emerge in the context of the textile domain. Examples such as described above challenge notion of stakeholder engagement as a requirement or precedent for institutional change, i.e., regime-level transformation capable of impacting the system level. They represent business model innovations that are able to scale in networks, and which can achieve greater impact potential by engaging stakeholders to, for example, change the way certain goods or services are produced, delivered and consumed.

Thus, stakeholder engagement shouldn't be understood as a sufficient measure or requirement for achieving institutional change with SBMs and SOIs in the textile domain. Companies and entrepreneurs may use copious amounts of time and funds for engaging a wide number of stakeholders, yet without a scalable business model all the effort may be exerted in vain. SBMs capable of scaling up in, for example, networks may benefit from the engagement of various stakeholders. This may indicate that stakeholder engagement in combination with novel, scalable business models can contribute significantly to the establishment of new value networks capable of contributing to regime-level change necessary for a sustainable system-level transformation. For example, a term such as "widely/quickly networking model" could be a more accurate way of describing SBMs with potential for contributing to system-level sustainability transformation, as it describes the intent of the model, i.e., to achieve scalability through efficient distribution in either existing or new networks, to a higher degree compared to stakeholder engagement.

6. Conclusions

A transformation of the regime level is required in order to achieve impacts on the system level. For the textile domain, this means achieving a transformation in the materials that are used and how they are used, significantly increasing use time of textiles and thus altering the cycles of fashion that influence consumption, shifting the fundamental logic of operations from a linear to a circular way of thinking, and ultimately reducing overall material consumption of textiles, in case global sustainability targets are to be met within given timeframes.

In order to contribute to a transformation of this kind, SBMs in the textile domain should engage in creating scalable solutions that focus on establishing circularity in operations, shifting established consumption patterns and supporting the instilling of ambitious sustainability standards in all parts of the textile system.

Based on the integrative literature review, wide stakeholder engagement is being used as a leverage, or mechanism, for scalability, as the involvement of many actors is believed to be necessary for achieving institutional change, i.e., change in the paradigm which can ultimately lead to influence on global wicked problems. However, I argue based on examples from practice that a better term may be something along the lines of “a widely/quickly networking model” as it may represent a more accurate way of describing an element fundamental to SBMs that have potential to contribute to system-level sustainability impact.

6.1. Outcomes

The outcome of this study is a proposition for a new theoretical framework for investigating SBMs’ potential for system-level impact in the textile domain. The study contributes to existing literature by:

- Identifying archetypal business models capable of contributing to the sustainable transformation of the textile domain in regard to current global sustainability targets.
- Challenging widely used terminology concerning scholarly and practice related literature on scalability, stakeholder engagement and their connection to system-level impact.

- Identifying avenues for future research and cross-sectoral learning
- Identifying lack of scholarly discussion relating to reduction of material consumption and its implications on theories in SBM literature.

This study aimed to answer the question “what types of business models can contribute to the transformation of the textile domain in a way that reduces its negative environmental impacts?” by conducting an integrative literature review to establish the current state of knowledge on the topic. The findings, especially the last one presents implications for further research within the topics of SBMs and system transformation.

6.2. Practical implications, limitations and avenues for future research

The findings of this study present at least three practical implications to practitioners. Firstly, the findings present three concrete archetypal SBMs that have potential to transform industry practices towards a more sustainable paradigm. Thus, the study sheds light on which avenues to focus on for developing existing or building new business models in the textile domain for establishing significantly more sustainable operations: 1) ensuring circularity throughout the value chain, 2) developing and scaling ways of delivering the value of textiles without the consumer having to own them, and 3) establishing and scaling sustainable standards to replace unsustainable material choices and production practices by, for example, influencing consumers.

Secondly, the findings indicate that despite literature calling for emphasis on wide stakeholder engagement, scalability doesn't automatically result from it. A way to scale SBMs could emerge from finding a widely networked model, that can efficiently scale the business model and disrupt incumbent models of operating. For practitioners, this can mean finding existing networks of production, delivery or consumption infrastructure, into which textile related SBMs could be integrated in order to quickly scale up operations.

Thirdly, a practical implication of the study is that there currently seems to not exist any business models capable of fundamentally disrupting established ways of operating the textile domain. This means business model innovation is required to solve the sustainability challenges of the textile domain, from both an environmental and financial sustainability

perspective. Related to this, a significant characteristic required of sustainable solutions is the reduction of material consumption. Optimizing processes and shifting to the use of more sustainable materials, for example, are insufficient measures for reaching global sustainability targets unless consumption of raw materials is also reduced. Business models in material-heavy industries such as the textile domain will need to develop alternative ways of creating, delivering, capturing and maintaining value in order to decouple value creation from the consumption of raw materials causing significant environmental impacts.

6.2.1. Limitations and avenues for future research

A significant avenue for future research concerns the reduction of overall material consumption theme. In case raw material consumption has to dramatically be reduced in order to meet global sustainability targets, business model research will need to explore several questions related to the theme. What does the requirement of reduced raw material consumption mean in practice for businesses operating in material-intensive industries such as the textile domain? How will value creation, delivery and capture mechanism need to change? What does an economy that supports the meeting of sustainability targets, with reduced raw material consumption, look like? How should economic growth and the growth paradigm of businesses be considered when moving towards these targets, and for example a carbon-neutral or negative circular economy?

Neoliberal economics, argued to be the dominant economic paradigm (Wanner, 2015), proposes that markets can fix negative environmental externalities if left to their own devices – however, the existence of perfect markets capable of this seem to only exist in theory (Kumi, Arhin & Yeboah, 2014). An integral dimension concerning the topic of business models is this wider economic framework within which they function, and how it is believed to be able of solving externalities and market failures. What is measured in in the macroeconomic context influences what business models use as a metric for success. Due to the nature of the study, the consideration of alternative measures to success than economic growth, i.e., essentially business models contributions to GDP, was delimited. Future research could examine this in more detail: is the measurement of the economy of a future sustainable system with GDP sufficient enough to integrate social and environmental value alongside economic value, or are other measures needed.

Relating to neoliberal economic mindsets, this study wishes to challenge conceptions of non-profit organizations capability for scaling and contributing to system-level sustainability impact. Based on examples from practice, scaling of business models can happen without profit maximization for shareholder dividends. What is essential for this is considering a change in the value concept and ideas of value creation, instead of contesting or denying growth – what would constitute a sustainable growth and scaling paradigm for material-intensive industries such as those in the textile domain? Future research could look into the differences of non-profit organizations, how they could be integrated in SBM literature, and how non-profit logics could be used in the scaling of business models that encourage a sustainable transformation of the textile domain.

Regarding system transformation, changes coming from regime actors are also needed to enable the scaling up of business models that can support the meeting of sustainability targets. Phasing out incumbent and unsustainable systems through policy measures can accelerate desired system-level transitions by removing barriers for the diffusion of innovations and novel business models (Geels et al., 2017). This, however, might not be as easy an option to take as the structure of the textile domain is heavily globalized, whereas binding legislation capable of system-level sustainability impacts is national, or at most regional (e.g., EU level). For example, a significant portion of production happens in less-developed countries with less environmental regulation, yet a significant portion of the consumption driving production of textiles happens in more developed countries. Even if societal and business support for system-level transformation would exist in a country, which is needed for successful transition-enabling policies (Geels et al., 2017), the likelihood for achieving system-level impacts is low as long as the majority of production resides outside country borders and thus the reach of national or even regional policy measures. System-level impact in the textile industry could thus be achieved with actors in the textile domain agreeing on global, Green Deal kind of initiatives pushing for standardization of production and circular processes for example. Future research could thus look into which kinds of policies, incentives and constraints currently inhibit or slow down the scaling up of SBMs.

The need for novel collaborations and ecosystems involving multiple actors was a central finding of the study. However, how these collaborations can emerge and what is required to bring companies together in ecosystems to develop value still needs research. The logic of ecosystems can be considered as quite far away from current dominant business logic, that

encourages competition instead of collaboration in value creation. Moreover, it is unclear whether ecosystems can emerge by themselves if incentives support the creation of collaborative value systems, or whether they need specific actors that facilitate them. Future research could thus look into which kind of partnerships, ecosystems etc. of SBMs, public sector and NGOs, and other actors, would be beneficial for achieving system-level sustainability impacts. Moreover, studies could look into how these sorts of collaborations can be brought about and what sorts of incentives are required to incentivize businesses to develop and engage in ecosystems.

A central dimension to the textile domain is the fashion industry, which operates in strong linkage to the cultural dimension of society. Due to the scope of this study, the element of culture and culture change needed for bringing about a system-level transformation was omitted to a large degree. However, the way culture and developments in for example consumer behavior can influence the acceptance and scalability of SBMs presents interesting avenues for further research. For example, companies' power in shaping consumer sentiments and use culture of textiles could be researched. Understanding of needed cultural change is also required for reducing material consumption and extending the use time of textiles. Future research could for example study how and what types of cultural norms encouraging sufficiency in consumption, and behavioral sciences the increased maintenance of textiles could aid in the achievement of reduced environmental impacts in the textile domain.

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