Sustainable craft textile manufacturing in the Netherlands: A case study

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Executive Summary

The objective of this research is to investigate the synergies between Sustainability and Craftmanship from a circular perspective, aiming to identify which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries. This is performed by looking at the economic, environmental, and social perspectives of a sustainable business model using the Triple Layered Business Canvas tool (TLBMC) and Circular Strategies. Data is acquired from two interviews conducted in a company that manufactures sustainable textile crafts in the Netherlands and a literature research on examples of sustainable business models and circular principles in the textile industry.

Problem statement. The thesis focuses on a societal issue of concern. The problem is overconsumption and overproduction effects in the textile industry due to a linear economy, and a prospective solution being a new manufacturing technique toward a circular and carbon neutral path for sustainable development: sustainable textile crafts. To explore this alternative avenue, sustainable business models and circular strategies for sustainable textile crafts are investigated.

Main research question. The research poses the next research question: *Which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries?*

Literature review. This chapter compiles the theoretical background information on where the research is built upon. Starting by what are sustainable crafts and sustainable craft textiles, the reemergence of craft, and the existing literature on sustainable craft and sustainable craft textiles to date.

Literature research. This chapter compiles all the necessary information related to sustainable business models and examples in the textile industry to contrast it with the information extracted from the case study, to draw conclusions and recommendations to companies that are specialized in the manufacture of sustainable craft textiles in European countries.

Methods. The procedures Triple Layered Business Canvas tool (TLBMC) and Circular Strategies have been selected because they are the most recent and complete tools to innovate and create prospective sustainable business models for companies, as well as framing the current business model from a holistic perspective. The methods are based on tools that are widely used by companies to explore business models, but with an extension to cover the environmental and social perspectives as well.

Case study. Data acquisition and qualitative research with sustainable business models tools are conducted to describe the current business model of the company under study, a company that uses craftsmanship as part of its production system in the Netherlands. Then, the future sustainable business model is proposed, considering

the vision of the company, and applying the relevant circular strategies that suit this vision. Recommendations for the company are also provided regarding potential improvements and priorities for next steps in sustainable and circular actions.

Discussion and conclusions. The findings indicate that there is a clear misalignment on the economic side when companies that manufacture sustainable textile crafts embed sustainability and circularity in their businesses. This is because they often apply monetization strategies based on linear economy models, where more consumption is equal to more profit and thus prosperity. However, small-scale production and the durability and high quality of textile crafts do not allow artisans and companies to sell at a competitive pace to scale up their operations. On the other hand, the reemergence of craft originated from technological developments in the information technology sector has opened the possibilities for crafts to acquire customers worldwide. The tradeoffs arise if sustainability is to be pursued by minimizing environmental and social impacts through encouraging local markets. Focusing only on local markets might minimize environmental and social impacts, but hinders the opportunities for greater economic growth in a globalized market and potentially increase the level of life.

The research gap and literature research indicate that more real-life examples of companies need to be researched to contrast the findings of the current study. The research contributes to the existing literature on sustainable business modeling and circular techniques implementation of craft-related ventures by shedding some light on barriers to the implementation of sustainable business models and circular principles, and potential solutions. Results of a real-life case are contrasted with existing literature on the subject providing a holistic approach.

Limitations. The study encounters several limitations, being the most prominent the scarce documentation on sustainable business models applied to sustainable textile crafts and qualitative information about the impacts of sustainable business modeling and circular strategies. The limitations and recommendations chapter explains them in depth.

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Abbreviations

B2B – Business to Business

B2C – Business to Consumer

TLBMC – Triple Layered Business Model Canvas

LCA – Life Cycle Assessment

PSS – Product as a Service

SBM – Sustainable Business Model

1. Introduction

1.1 Problem statement

Currently, governments and organizations cope with many challenges to adapt their existing systems and operations to comply with the Sustainable Development Goals, in order to remain within a 1.5ºC increase of average temperature globally (IPCC, 2018). Mass consumption and fossil-fueled industrialization practices especially hinder the efforts toward a sustainable future, as they threaten environmental, social, and economic prosperity in the long term (IPCC, 2021). In order to address this, new consumption patterns and manufacturing techniques are considered. One of the latest trends is the so-called sustainable craft, where artisanal goods are used as means to guarantee local prosperity: respecting the people, planet, and generating profit simultaneously (Väänänen et al., 2017). These products often have a higher price point than the industrial version. This is because they perform fairer social practices and the core properties of craft products are durability, authenticity, and originality (Gardetti & Coste-Manière, 2020). Moreover, durability is also aligned with sustainable design principles (Amatulli et al., 2017).

Turning now to the case of the textile industry, this sector is facing major challenges due to overconsumption and overproduction. It is the second most pollutant industry in the world, accounting for more than 10% of the total emissions and 20% of polluted water globally, with a consumption of 79T liters of water annually. Regarding waste, it is estimated to generate over 92M tons per year (Niinimäki et al., 2020; Rana et al., 2015). Looking at the social and economic implications of the industry, it generates more than 300M job opportunities worldwide and holds a value of 1.3T dollars (Ellen MacArthur Foundation, 2017). To tackle this, researchers and organizations are investigating how sustainable textile crafts could pose a plausible alternative to standard industrial production practices due to their social and environmental benefits (Korica & Bazin, 2019).

Besides, companies that manufacture sustainable crafts could act as agents of change. They can set the example on how to bring local prosperity to places that otherwise would not have any economic activity, maintaining traditions, and keeping their environments healthy and livable (Jackson, 2017). This may inspire other companies or entrepreneurs to also incorporate such manufacturing practices, as well as potentially restore old industrial hubs that used to operate in the region before the production was outsourced to third countries. Thus, these peculiar companies represent a great opportunity to shift the industry to a more sustainable path. In the European context, this could also be seized as a chance to regenerate and revalue craft, as craftworks have diminished tremendously in the past centuries due to industrialization and craft labor is seen as a low-status position in society, only

remaining resilient and respected in a few countries like Germany (Kuijpers et al., 2019).

In fact, craftworks are usually seen as a reminiscence of the past. Many people still hold an archaic concept of crafts, as devoted artisans that handmade their works (Kuijpers et al., 2019). Breweries where abbots produce their craft beer as centuries ago. But the reality is that in the 21st century, technology and digitalization is changing the industry completely, allowing crafts resurgence globally (Martínez Torán, 2021). The craft beer industry is a brilliant example that illustrates this phenomenon. Only in the US, craft breweries grew from eighty nine in 1978 to more than eight thousand in 2020 (Brewers Association, 2020). And these breweries do use the technology from our century, although they produce on a much smaller scale than the big players of the industry and have differing values. This is important to note, as companies whose values are aligned with craftmanship and its practices are not a romantic vision, but rather a compelling case that contributes to sustainable development while also employing technological developments in its favor (Kuijpers et al., 2019; Sikavica & Pozner, 2013).

Finally, the leverage of authenticity, tradition, and innovation is an ongoing discussion in craft-related studies, and how companies get a competitive advantage from it (Kroezen & Heugens, 2019; Kuhn & Galloway, 2015). However, more research needs to be conducted concerning sustainable business models and craft, in order to show the way forward on how to apply sustainable practices within companies that embed craftmanship in their operations.

1.2 Research gap

So far, literature focuses on defining the concept of sustainable craft (Väänänen et al., 2017) (Väänänen & Pöllänen, 2020), how sustainable crafts in developing countries generate prosperity for communities and society (Lestari et al., 2021), and which management strategies can be undertaken during the exercise of craft (Kroezen et al., 2021).

Due to the resurgence of craft in Western countries, much research has been conducted in particular on craft beer, a sector on the rise in the last few years. 22.087 publications were retrieved by 2021 for ‘craft’, where 956 correspond to ‘craft beer’ through the WorldCat search engine. However, little research has been conducted on circular strategies and sustainable business models in craftmanship or companies that manufacture artisanal goods. Ranavaade (2021) and Dissanayake et al. (2017) do a holistic view of crafts focusing on the handloom industry in India and Sri Lanka respectively. They explore sustainability from a systemic perspective, analyze markets and the state-of-art of the industry in both countries. However, they do not address circularity nor follow sustainable business frameworks in their analyses. Another study from Deepshikha and Yammiyavar (2020) explore textile crafts' potential

through the Internet of Things, attending to digitalization, technological developments applicable, and the transition to digital retail.

Related to conventional textiles and circularity, extensive research is being conducted. Searching for 'circular textiles', 3643 results are retrieved through the WorldCat search engine. Studies range from exploring the challenges of the textile industry and apparel (from an economic, social, and environmental perspective), exploring alternatives to ownership (renting or sharing), the application of the 3Rs (reuse, recycle, reduce) or the design of garments (following Cradle to Cradle design principles for instance). The multitude of studies mentioned are gathered by Muthu (2019) in the most complete collection at the present time.

1.3 Research objective

In view of the above, the synergies between Sustainability and Craftmanship from a circular perspective are proposed as a subject of research, aiming to identify which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries. The study seeks the following objectives:

- Review the research about sustainable crafts, sustainable textile crafts, and sustainable business models of textile companies conducted to date.
- Uncover gaps and possible improvements of the current sustainable business model of a European sustainable textiles manufacturer that embeds craft in their operations.
- Recommend a future sustainable business model taking into account the vision and goals of a European sustainable textiles manufacturer that embeds craft in their operations and applies circular principles.

Regarding generalizability of the results, the next objectives are posed:

- Uncover relevant sustainable business models suitable for sustainable crafts.
- Uncover relevant circularity strategies for sustainable crafts.
- Find out which of the above are relevant for European sustainable textile craft manufacturing companies.

1.4 Research approach and methodology

A literature review and research on sustainable craft textiles and examples of sustainable business models of similar companies are conducted, next to a case study to examine a particular business model of a sustainable textile company that uses craftsmanship as part of its production system in Europe. To this aim, qualitative research is employed through an explanatory and instrumental case study approach assessing a textile company based in Enschede (The Netherlands). For privacy reasons, its name will appear in the study as TextileCompanyStudied.

This type of research has been selected because there is hardly anything described in terms of sustainable business models and circularity regarding sustainable textile crafts. It could be even said that it is a rare case to find. This is why the research is conducted in solely one case, opting for a single case study methodology, as the purpose of the research is to get a deep understanding of a specific case and contrast it with the existing literature. Siggelkow (2007) highlights the strength of single case study research when they come from rare or extreme examples, which applies to the case under scrutiny. These cases can help refining existing theories and identifying gaps for further research.

The case study is conducted in TextileCompanyStudied because of its characteristics. The pillars of the company are Craft, Innovation, Quality, and Sustainability. They manufacture high-quality durable textiles, incorporating craft and recycling techniques in their production, making it an interesting case to explore the synergies of craft and sustainability. They operate in the last remaining weaving mills of the region. In the past, the city of Enschede used to hold one of the largest textile hubs in Europe. They build upon this legacy of craft by preserving the skills and knowledge of weaving and manufacture sustainable textile crafts using recycled yarns and sustainable practices, showcasing a particular company that produces sustainable craft textiles in Europe (TextileCompanyStudied, 2022).

The insights gained from the case conducted on TextileCompanyStudied and the notions from the literature research, will lay the foundations to discuss which sustainable business models and circular strategies could be applied by manufacturing companies of sustainable craft textiles in European countries.

1.5 Research questions

The main research question – *Which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries?* – has been divided into several subquestions to make possible the separation into attainable steps of the research. The questions are linked to different steps of the thesis and are depicted in the research methodology chart in Figure 1. The subquestions and their corresponding phases are explained hereafter.

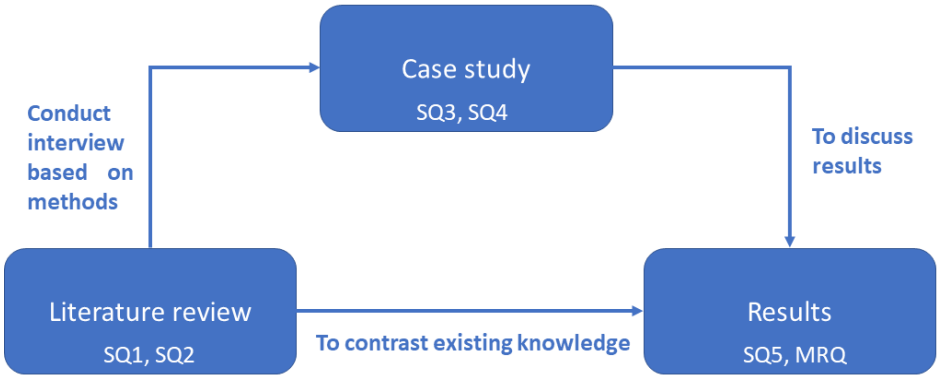


Figure 1: Methodology chart

- *SQ1: What are sustainable crafts and sustainable textile crafts?*
- *SQ2: Which sustainable business models and strategies use companies that manufacture textiles in the most sustainable way possible?*

Firstly, literature reviews on sustainable craft and textile crafts (*SQ1*), and sustainable business models examples from companies (*SQ2*) are performed. This literature research will build the foundation for later steps of the research, where sustainable business models will be applied in a company that manufactures textile crafts in the Netherlands.

- *SQ3: What is the current business model of the textile company studied?*

Secondly, the data acquisition and qualitative research with sustainable business models' tools is conducted to describe the current business model of the company under study, a company that uses craftsmanship as part of its production system.

- *SQ4: What could the future business model of the textile company studied look like taking into account its sustainability goals?*
    - *SQ4.1: Which circular strategies can be implemented in the business model?*
    - *SQ4.2: Which potential improvements are uncovered by the different strategies?*
    - *SQ4.3: Which next steps should be prioritized toward circularity and sustainability?*

Then, the future sustainable business model is proposed, considering the sustainability goals within the vision of the company and applying the relevant circular strategies that suit this vision. Recommendations for the company are provided regarding potential improvements and priorities for next steps, regarding sustainable and circular actions. These are found under *SQ4*, that in turn, are divided into three subquestions.

- *SQ5: Which findings from the textile company studied can build upon or contrast with the existing knowledge on sustainable craft textiles manufacture?*

In the next phase, conclusions are drawn. First, a discussion of what has been learned from the case and the existing literature research is carried out. This question seeks to contrast the notions covered in the literature and the lessons learned from the case study.

- *M-RQ: Which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries?*

Finally, taking into account the findings of the case study and the literature research, the main research question is answered. The goal is to figure out which sustainable business models and circular approaches can be applied to companies that manufacture sustainable textile crafts in Europe, ensuring resource efficiency and long-term prosperity.

1.6 Relevance to Industrial Ecology

The thesis focuses on a societal issue of concern. The problem being overconsumption and overproduction effects in the textile industry due to a linear economy, and a prospective solution being a new manufacturing technique toward a circular and carbon neutral path for sustainable development: sustainable craft textiles.

This study is intended to reveal which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries through the scrutiny of the environmental, technical, and social perspectives. These three layers allow looking at the problem from a system perspective, allowing a complete picture of the case through the holistic view that Industrial Ecology insights provide.

It uses updated relevant methods applied in corporations that seek to find innovative sustainable business models, without compromising society or the environment. These methods and techniques were introduced through the Industrial Ecology master's studies and are used systematically in the thesis. Besides, it looks at two intertwined concepts: craftmanship and sustainability, emphasizing the interdisciplinary nature of the study and Industrial Ecology itself.

1.7 Scientific and societal relevance

This study adds to the limited scientific literature on sustainable textile crafts circularity and sustainability exemplifying the traits and troubles that textile companies rooted in sustainability and craft possess through the unique case of TextileCompanyStudied, a Dutch company that embeds craftmanship, sustainability, and innovation in textile manufacturing.

As a social contribution, recommendations to implement circular strategies and embed more sustainable practices in the business model of TextileCompanyStudied are given, understanding the main challenges the company is facing and how some of them could potentially be solved by the suggestions of this research. Thus, it can help TextileCompanyStudied undertake informed decision-making to further align its sustainable business model with its vision and goals.

Another social contribution is that other European companies of the type can also benefit from the findings of this study. The results can guide and inform about suitable sustainable and circular choices in the business model of these companies to further increase environmental and social benefits without losing economic profit.

It specifically contributes to the existing scientific literature uncovering three promising sustainable business models for textile-crafted goods and revealing the tradeoffs between economic feasibility, environmental impacts, and prosperity in craft-related ventures toward sustainable development in a linear economy context. The results also confirm the findings of other documented studies in Europe. These are the need of synergies and collaboration with other stakeholders toward circularity and sustainability, and the economic barriers that sustainable craft activities experience.

2. Research methods

Regarding methods, two strategies for sustainable business models innovation and circularity are used to identify potential improvements and innovative means to business within sustainable textile crafts manufacturing; taking into account planet, people and profit. The procedures used comprise the Triple Layered Business Canvas Model (TLBMC) (Joyce & Paquin, 2016) and Circular Strategies (Circularity Deck tool) (Konietzko, Bocken, et al., 2020). Section 4.1 to 4.3 describes the methods in detail.

These procedures have been selected because they are the most recent and complete tools to innovate and create prospective sustainable business models for companies, as well as framing the current business model from a holistic perspective.

The methods are based on tools that are widely used by companies to explore business models, but with an extension to cover the environmental and social perspectives as well. In particular, the TLBMC builds upon the Business Model Canvas by Osterwalder et al. (2010). Besides, as companies are already familiar with this tool, the TLBMC eases the creation of sustainable business models in companies aiming to transition to more sustainable practices in their processes.

Circular Strategies has been selected as a tool to ease the ideation of innovative circular approaches from a systems perspective, to incorporate those in the future sustainable business model, increasing circularity, sustainability, and robustness of the future business model proposed.

Both methods help to pinpoint gaps or misalignments among the environmental, social, and economic layers of the business that may interfere with the sustainability objectives of the company. Besides, they help envision the company's goals, by laying down the different components of the business model that will make it possible.

The procedures are employed in the following manner, depicted in Figure 2. Note that the methods used are written in italic.

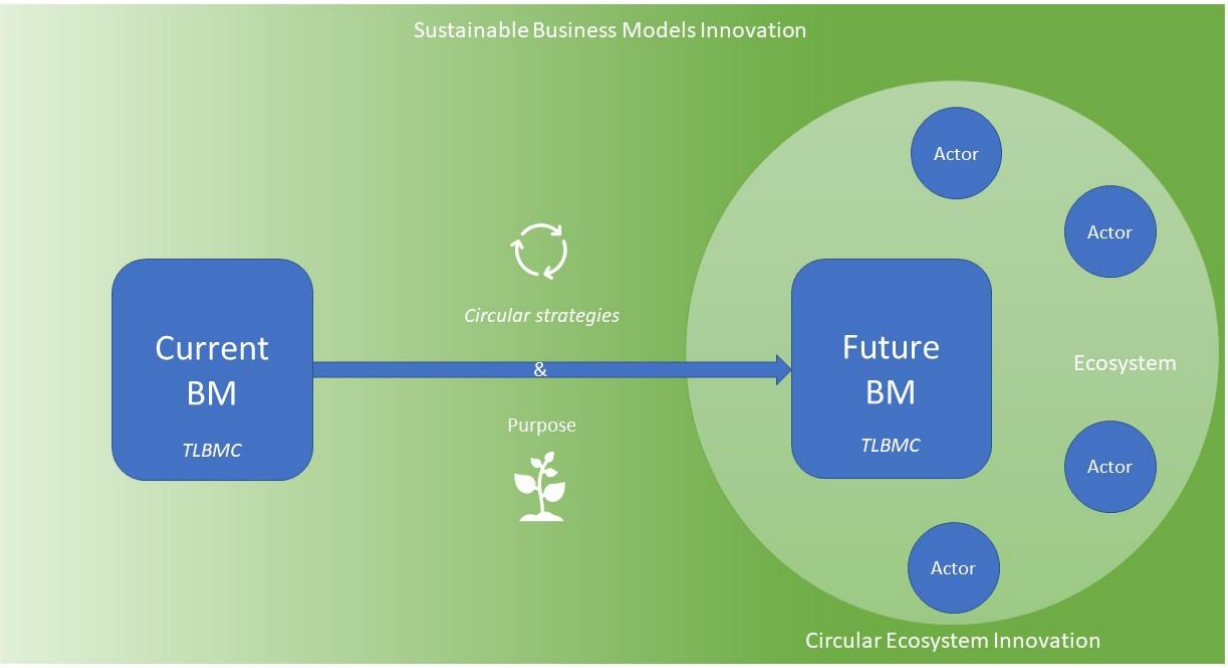


Figure 2: Research approach with methods

In the context of Sustainable Business Models Innovation, the current business model (Current BM) of the company is analyzed using the TLBMC.

Next, the Circular Strategies posed by Konietzko, Bocken, et al. (2020) and the purpose of the company are used to ideate the future business model in the context of a circular ecosystem innovation. Bocken et al. (2018) identify the purpose of the company as the starting point for ideation. It is often reiterated or strengthened. Together with the Circular Strategies, serves as the baseline to help companies transition to sustainable circular business models.

After the ideation, the future business model (Future BM) is constructed using the TLBMC again, now used as a canvas to identify all the necessary building blocks to arrive to the desired circular sustainable business model that was ideated before. As a result, a sustainable circular business model is proposed from an ecosystem point of view, where the company is contributing with other actors to realize sustainable development.

Finally, the results of the applied methods together with the literature research on sustainable textile crafts and sustainable business models examples will be harnessed to elucidate which sustainable business models and circular approaches can be applied to companies that manufacture sustainable textile crafts in Europe.

2.1 Data acquisition

The data required to apply the TLBMC has been gathered through a questionnaire, where the current business model characteristics and vision are covered. These data are qualitative and quantitative. For instance, in the economic layer the Value Proposition category −the value that the company is delivering with its service or product to its customers− is a qualitative category. In the case of Nespresso, the example provided by Joyce and Paquin (2016) in Figure 6 of section 4.2.1 is "High-end restaurant quality espresso at home". However, the Costs and Revenues may be quantitative depending on the level of detail the company aims to represent. In the environmental layer and social layer, as explained before, it depends on the data the company has already collected due to its sustainability path. The data may be quantitative or qualitative. For instance, the Environmental Impacts category in Joyce and Paquin (2016) example in Figure 7 of section 4.2.2 is quantitative "46,6% of carbon footprint from use phase".

In the case of Circular Strategies, the data is mainly qualitative, because ideas that could potentially suit any of the strategies of the business are ideated in a qualitative manner.

To gather the data, the questionnaire was administered to the core team of the company. First, the interview with the founder took place, where questions about the current business model using the TLBMC tool and her vision of the company were asked.

Next, a second interview with all core team members of the company was carried out to find out the common vision of the company. The founder was present but barely intervened in the discussion for the sake of not influencing the vision expectations of the rest of the core team. The questionnaire can be found under section 13.1.

Lastly, the future business model is created taking into account the current business model areas for improvement after the TLBMC is employed, together with the circular strategies and the vision of the company.

3. Literature review

This chapter compiles the theoretical background information where the research is built upon. Starting by what are sustainable crafts and sustainable craft textiles, the reemergence of craft, and the existing literature on sustainable craft and sustainable craft textiles to date.

3.1 Sustainable development and circularity

The greatest challenge of the century is to *'meet the needs of the present without compromising the ability of future generations to meet their own needs'*. This statement is known as sustainable development and was defined by Brundtland (1987). Other more modern definitions that build upon the sustainable development concept are for example the planetary boundaries by Rockström et al. (2009) outlined as the safe environmental limits humanity can operate or the doughnut economy proposed by Raworth (2017) that seeks in general terms the same outcome: meeting human needs while preserving the environment and the planet life-supporting systems and fulfilling the future generations' needs.

But to achieve sustainable development, a new production system must be undertaken. The industry standard has been for decades the linear economy, where products are bought, used, discarded, and substitute by others in a short period of time, generating massive amounts of waste and pollution from the own production and supply chain. To tackle this, a circular economy approach is proposed to counteract resource depletion and waste. Imitating nature's natural cycles, the circular economy aims to recover all discarded materials, products, and components that are discarded and keep them in a close loop forever, so that resources are not extracted anymore in non-renewable quantities, giving enough time to renovate them and avoiding resource depletion as a result (MacArthur, 2013). The cycles described by MacArthur (2013) are depicted in Figure 3.

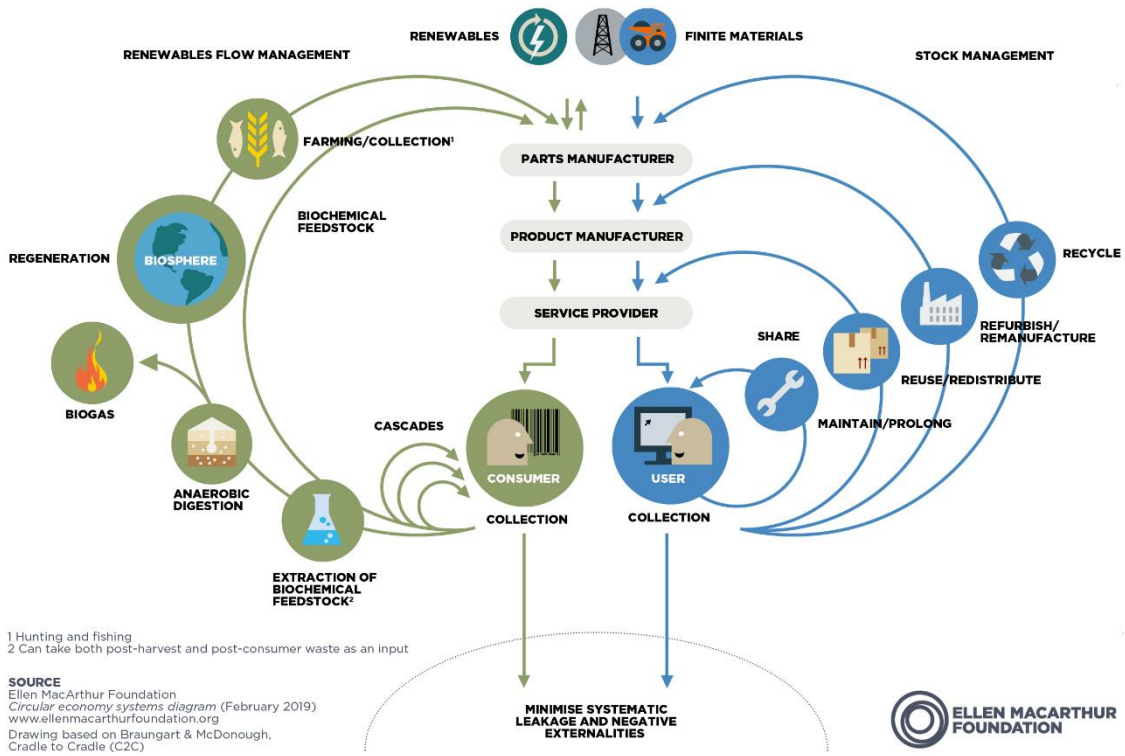


Figure 3: The Circular Economy Diagram, from Ellen MacArthur Foundation (2019b)

The Circular Economy approach creates many opportunities from an economic point of view. What before was considered a waste –meaning that all economic value was lost– now economic value can be maintained and even added to discarded components, materials, and products. This new conception is illustrated through the Value Hill described by Achterberg et al. (2016) in Figure 4. The left hill of the figure shows how value is created in a linear economy, where value is added in the manufacture of a product through the supply chain starting with the extraction of resources until the sale by the retail sector. Once the consumer obtains the product, the value starts to decrease rapidly in a short period of time, going downhill. The right hill of the figure however depicts how businesses that implement circular strategies are able to hold the highest value possible of their products for longer, so that once the product is discarded by the consumer they can reuse, refurbish, remanufacture or recycle it and the materials, components or products are kept in the economy without generating waste. It is worth mentioning that the strategy that retains more value is repairing or maintaining the product. After that, the value decreases downhill, being the less valuable and the least circular to recycle products (without including incineration or landfilling, that destroys any remaining value if any).

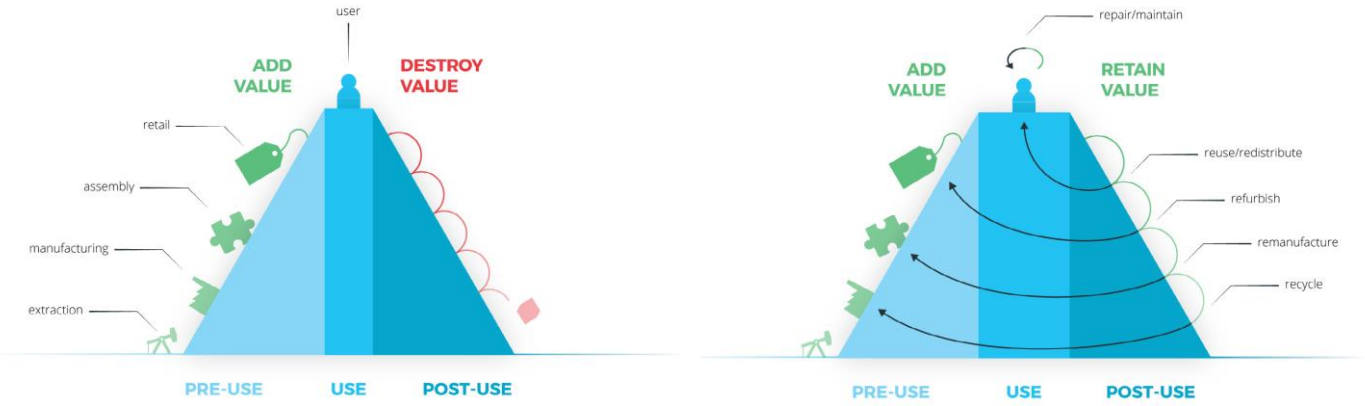


Figure 4: Value hill in the Circular Economy, from Achterberg et al. (2016)

3.2 Reemergence of craft

Currently, academics are discussing the relevance of craft-based ventures and their interplay with sustainability and innovation toward sustainable development. The 21st century technology and digitalization developments are changing the industry completely, allowing crafts to revive globally (Martínez Torán, 2021). This has led to a phenomenon that scholars have termed as the "reemergence" or "resurgence" of craft (Bell, 2019; Kroezen & Heugens, 2019). This trend is noticeable in the market size and expansion of crafts. In the UK for instance, crafts are a mainstream established market. In 2020, 31.6M people are craft consumers, corresponding to 73% of the total British population. Textile crafts account for the third-highest volume of sales in the craft market, corresponding to a total of £5.7M in 2020 (Crafts Council, 2020). In 2020, Etsy.com −the biggest online platform for craft sales − obtained a revenue of more than 11 billion dollars. Interestingly enough, it is estimated that this revenue represents less than 1% of the market share for crafts globally (Graebner, 2022).

The craft trend is also reshaping industries. Following the revival of local craft and economies in Europe, Kroezen and Heugens (2019) have spotted the craft resurgence in the Dutch beer brewing industry, Raffaelli (2019) and Oertel and Thommes (2018) in the Swiss and German watch-making industry respectively, Weber et al. (2008) in the food sector and Korica and Bazin (2019) in the fashion industry. Most importantly, this new wave of craft originated mainly in industrialized countries in the last decades constitutes a compelling alternative to industrial production due to its not only economic, but social and environmental benefits (Sikavica & Pozner, 2013) that could contribute to sustainable development (Adamson, 2010; Cox & Bebbington, 2015; Ferraro et al., 2011). Lastly, Katarzyna and Brodowicz Dominika (2021) have observed in Poland that the new wave of craft has also the potential to generate local economic prosperity, boosted by international markets through the use of information technology and online platforms. They conclude that as well as the 2008 crisis craft-

related jobs generated opportunities to decrease the unemployment rates, the post-covid pandemic era can also benefit from them.

3.3 Sustainable craft

The imperative sustainability demands of the industry and the resurgence of craft opened the discussion on how craftworks could contribute toward sustainable development (Väänänen et al., 2017). To this day, scholars disagree on the definition of sustainable craft yet and which characteristics make craft sustainable.

However, they see a clear connection between craft and sustainability. Much research has been conducted from a product perspective, regarding aesthetics, design, and materials. Koskennurmi-Sivonen and Anttila (2007) claim that crafts turn into sustainable products by the use of design and technique and quality materials. On top of production and materials, Cox and Bebbington (2015) highlight the relationship between craft and sustainability by means of the development of knowledge and skills, timeless aesthetic, and preservation of material culture. Through sustainable craft, artisans contribute toward sustainable development by selling durable long-lasting products that will extend the end-of-life of a product or by selling directly to the customer, shortening the supply chain and transport associated (Yair, 2010). Design is also a relevant topic toward sustainability in craft. Zafarmand et al. (2003) argue that for a product to be sustainable, it must comply with twelve characteristics. These characteristics focus on the use of energy and materials, user-product relationship, design (e.g. modularity, simplicity), recyclability, and maintenance. These attributes are aligned with the findings of Yair (2010), Blackburn (2009), and Fletcher (2013) that find materials and the lifecycle of products pivotal for environmental performance.

The most recent literature builds upon the definition of craft as a solely physical outcome by including an external non-physical influence on the crafted goods that affect the decisions made by the artisan related to sustainability. After sixteen interviews with craft practitioners in Finland, Väänänen et al. (2017) and Väänänen and Pöllänen (2020) define sustainable craft as a configuration of three intertwined elements: *product, practice,* and *immaterial* craft. Craft as a *product* is defined by the techniques employed, its design, and materials chosen. *Practice* refers to skill, ideology, and knowledge. Ideology in this context attends to responsibility and fair practices. And *immaterial* craft is composed of the values and the attitude of the artisan toward its creations, being the result of *practice* and *product*. According to the authors, *Immaterial* craft influences the process of craftmanship and ultimately the impact of the craft product on an environmental, social, economic, and cultural level.

The discussion is still open to debate but a broader focus than the physical crafted outcome and the revival of craft through innovation is witnessed on what sustainable craft entails and what could imply to sustainable development.

3.4 Sustainable craft textiles

Regarding sustainable craft textiles, little research has been conducted on circularity and business modeling. Sustainable craft textiles and their potential to achieve sustainability in the textile industry have been predominantly analyzed in developing countries and communities of weavers. Ranavaade (2021) explores craft design systems in the Indian handloom weaving industry and recognizes the importance of sustainable craft design to allow the reemergence of handloom weaver groups and how communication about the process and authenticity are capital to attract customers to the slow fashion movement. Dissanayake et al. (2017) conducted a single case study of a company from the handloom industry of Sri Lanka and demonstrate that by applying fair trade principles focusing on empowering poor, women, or marginalized people and strategies to prevent landfilling or incineration of textile waste by creating a variety of products from the handloom waste, this craft has the potential to benefit the environment and society. Moreover, some key properties are drawn from the paper for a potentially viable business model, these being having a community-centered manufacture, access to international markets by fair-trade labelling, ensure a minimum fare resulting on a fair and stable income for employees, and respect for the environment by reducing the environmental impact of dyes and waste from the textiles manufactured. However, the economic perspective is not scrutinized fully. The potential economic benefits of the sector and the development of local economies are underestimated in the traditional economic accountability (Becchetti et al., 2020).

In Europe, the perceptions of sustainable craft textiles of practitioners and textile craft teacher students in Finland reveal that they find capital to add more education regarding sustainability to craft education because of how intertwined both concepts are in practice. This is because although they acquire certain skills and competencies to make craftworks and craft culture, they have some gaps in their education that could be filled by greater education on materials and life cycle knowledge, allowing craft to be more aligned with sustainability concepts. In the same study, Vartiainen and Kaipainen (2012) uncover that students also found important to teach about sustainable development and the study suggests taking a broader context, adding other foreign traditional crafts to the Finish traditional craft curricula.

In Scotland, the study of Ferraro et al. (2011) conducted in the region of Fife, a dominantly rural area of East Scotland has found out that although the revenues craftspeople make from their activity normally need to be supplemented by other sources of income, 68% of them undertake their craft as a home-based production. This leads to not only strengthening and connecting local communities and generating local prosperity, but also helps reducing the carbon footprint associated with the goods that otherwise would be produced industrially and its distribution impacts.

Regarding sustainable textiles, much research has been conducted. Ranging from LCA studies of environmental impacts of supply chains (Blackburn, 2009), (Sustainable

Apparel Coalition, 2022) to design (Fletcher, 2013) and circularity applied to the textile and apparel industry (Muthu, 2019).

4. Literature research

4.1 Sustainable business models

The current research aims to identify suitable sustainable business models and circular strategies for companies that manufacture sustainable textile crafts in Europe. A sustainable business model is defined by Bocken et al. (2014) as a business model that takes into account a large scope of stakeholders and incorporates the triple bottom line through an economic, social, and environmental approach. They are considered capital in implementing and driving sustainable innovation within organizations, assisting in embedding sustainability into an organization's processes and purpose, and providing competitive advantage.

Hereafter the business model tool and circular strategies employed in the research are described in detail in sections 4.2 and 4.3 respectively. Lastly, the examples of sustainable business models of companies in the textile industry are described and illustrated in section 4.4.

4.2 Triple Layered Business Canvas Model

The Triple Layered Business Canvas Model (TLBMC) by Joyce and Paquin (2016) is made up of three layers with a similar layout as the Business Model Canvas by Osterwalder et al. (2010). It includes an economic, environmental, and social layer to support organizations to take a holistic view of the business and help them transition to a sustainable-oriented path. It helps to find the misalignments among the different layers and gaps the business may have.

4.2.1 Economic Layer

The economic layer uses the original Business Model Canvas by Osterwalder et al. (2010). Like all business models, it takes into account *Value proposition, Value capture, Value creation,* and *Value delivery* categories (Bocken et al., 2018). The *Value proposition* category refers to the value that the company is delivering with its service or product to its customers. *Value capture* comprises how the company makes profit and the costs involved in delivering the value proposition (*Cost* and *Revenues* in TLBMC). *Value creation* concerns the different elements to create the product or service that will be delivered to the customer (*Partners*, *Activities* and *Resources*) and *Value delivery* is composed of the transactional elements to deliver the product or service to the customer (*Customer relationship, Customer segments* and *Channels*). The sections under *Value capture, Value creation* and *Value delivery* are explained hereafter. Figure 5 shows the value categories of a business model and Figure 6 shows an example of the economic layer of the canvas.

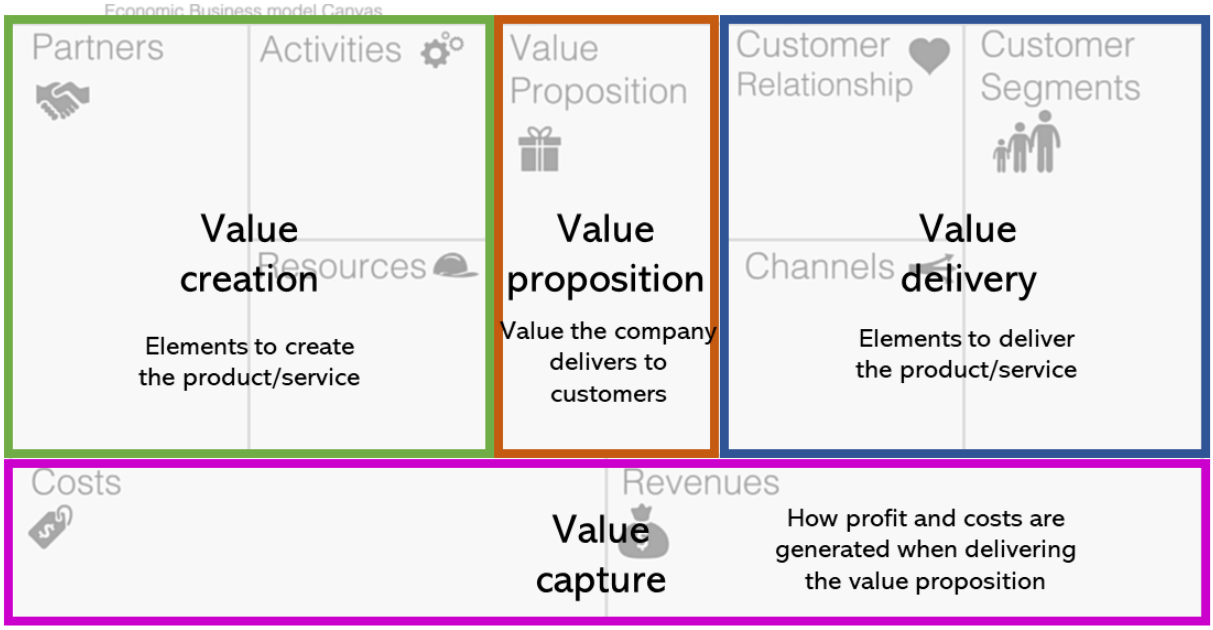


Figure 5: Business model categories. Adapted from Bocken et al. (2018) and Osterwalder et al. (2010)

Value delivery

Customer segments:

Corresponds to the customers that the company is targeting. Segmentation is a strategy to focus on a particular target audience of the product or service. It can be approached by interests, age, preferences, etc.

Customer relationship:

Describes the type of relationships the company wants to create or has established with its customer segments at any stage of the production, sales, distribution, or post-purchase process. Some examples are personal assistance, co-creation, or self-service.

Channels:

It addresses how the value proposition is delivered to the customers. It entails the delivery of the product or service and also how the customer is reached to get informed about the product or service.

Value creation

Activities:

Comprises all that is needed to perform to execute the value proposition. For instance, problem solving and production.

Resources:

Corresponds to anything that is needed to create value for the customers. It can be physical or nonmaterial, like patents, data, human or financial resources for example.

Partners:

Comprises the key partnerships that are needed to reduce risk and optimize operations

Value capture

Costs:

Captures all costs that are involved when delivering the value proposition.

Revenues:

Involves all different ways on how the company is generating income from its customer segments (its revenue streams) as well as how customers are currently paying or would prefer to pay (pricing strategies) and what customers are valuing more and have more willingness to pay for.

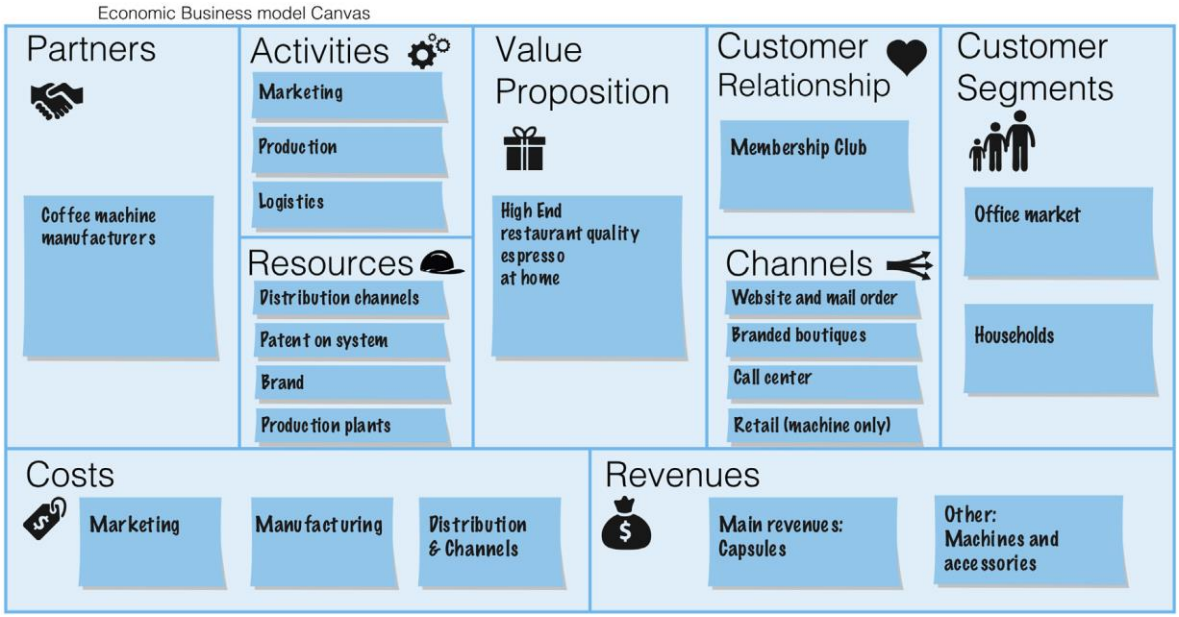


Figure 6: Economic layer of TLBMC (Joyce & Paquin, 2016)

4.2.2 Environmental layer

The environmental layer aims to evaluate how the company outweighs its environmental impacts and benefits. By doing so, the biggest impacts are pinpointed and organizations become aware of which environmentally-oriented measures they must prioritize.

The environmental layer takes a similar approach than the economic layer but it uses the *Functional value* as the starting point. The *Functional value* is the baseline used to evaluate the environmental layer performance. It is defined by a quantitative description of the product or service that is consumed during a given timeframe. For instance, in the case of the company Nespresso analyzed in Joyce and Paquin (2016) the functional value is defined by the total of coffee pods consumed daily during a year, having each coffee pod 40 ml of espresso. The rest of the categories belonging to this layer are *Materials, Production, Supplies and outsourcing, Distribution, Use phase, End-of-life, Environmental impacts,* and *Environmental benefits*. The *Environmental impacts* and *Environmental benefits* refer to the total environmental costs of the company activities, and the ecological positive impact or ecological impact reduction the company has respectively. Figure 3 depicts an example of the environmental layer of the canvas. The rest of the categories are described hereafter:

Materials:

It refers to highlighting the most relevant materials used by a company and their environmental impact.

Production:

Comprises the impacts associated with the actions performed to manufacture products and/or provide services.

Supplies and outsourcing:

Corresponds to the environmental impacts of the rest of the activities or materials that are not core to deliver the functional value but are necessary to deliver it. They can be embedded as part of the company's action or outsourced to third parties. Energy or water are utility services that are usually outsourced for instance.

Distribution:

Addresses the types of transport, weights, and distances traveled of the shipping involved to deliver the functional value.

Use phase:

Focuses on the customer's environmental impact during usage of the product or service as part of the company's functional value. It considers the energy requirements and material intake during use as well as maintenance and repair of products if appropriate.

End-of-life:

Describes the impacts associated with the products once the consumer decides to discard them. It is intended to support companies in expanding their responsibility beyond the lifetime of their products.

Lastly, the environmental layer takes a life cycle perspective to estimate the contribution of the overall activities' environmental impact. It arises from Life Cycle Assessment (LCA), which quantifies formally the environmental impacts associated with the life cycle of a product or service following ISO standards in the industry (Guinée & Lindeijer, 2002). However, it does not integrate a formal LCA but rather helps the company to pinpoint its impacts. Besides, depending on what stage of the sustainability journey a company is at, data types may vary. The higher the development, the greater the detail and therefore it will tend to be quantitative rather than qualitative. Therefore in the case study conducted, once the company is inquired, the data will depend on the level of detail of the impacts the company knows.

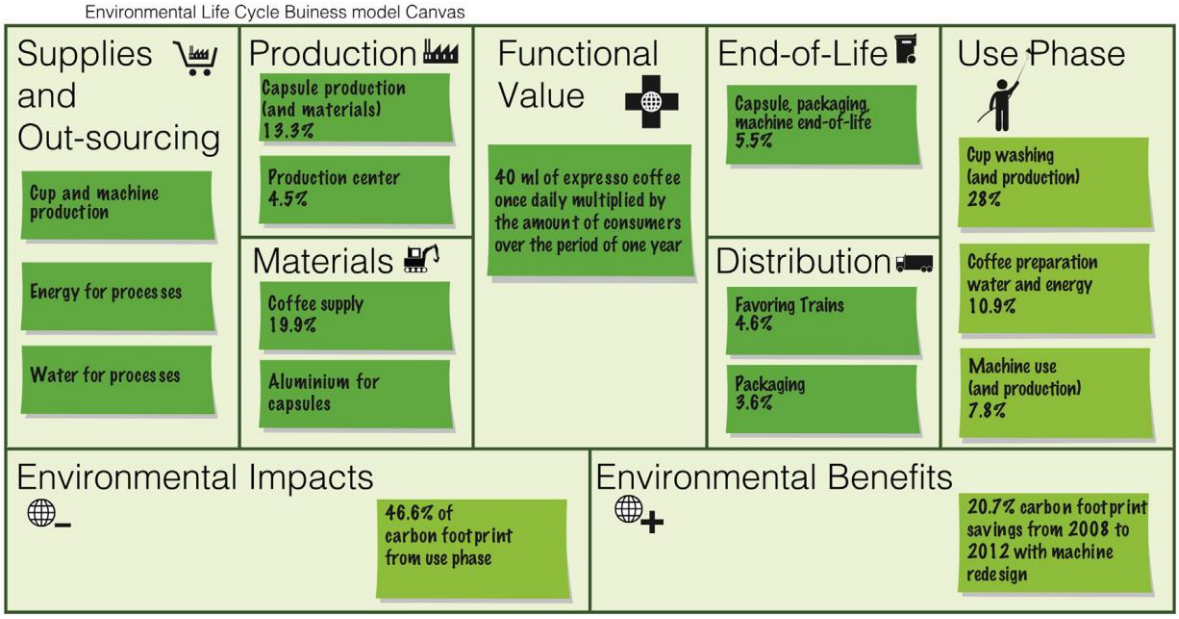


Figure 7: Environmental layer of TLBMC (Joyce & Paquin, 2016)

4.2.3 Social layer

The social layer aims to identify the social impacts of the company and help exploring new avenues for value creation in this matter. The starting point is the *Social value*, which entails the organization's purpose and how it creates societal benefit. From there, the social impacts on stakeholders and their relevance are estimated. The rest of the categories that this layer has are *Employees, Governance, Local Communities, Societal Culture, Scale of out-reach, End-user, Social Impacts,* and *Social Benefits*. The *Social impacts* and *Social benefits* refer to the total social costs of the company activities and the social positive impact the company has respectively. Figure 4 depicts an example of the social layer of the canvas. The rest of the categories are described hereafter:

Employees:

Concerns the function of employees in the organization. It relates to demographics, education-oriented programs for employees and/or other relevant aspects that are key for the realization of the business model.

Governance:

Describes decision-making policies and the organizational structure the company is adopting.

Local Communities:

Relates to the social interaction with a company's local communities and stakeholders.

Societal Culture:

Corresponds to the potential impact on society that a company can have with its operations.

Scale of out-reach:

Corresponds to the outreach of the organization (global, national, or local) and how they conform with the social and cultural differences that their stakeholders may have.

End-user:

This section refers to the consumer of the value proposition and how if by consuming the product or service, its needs are met and its quality of life improved.

Finally, as in the previous layer, depending on the level of development of sustainable practices within the company, the data may be quantitative or qualitative.

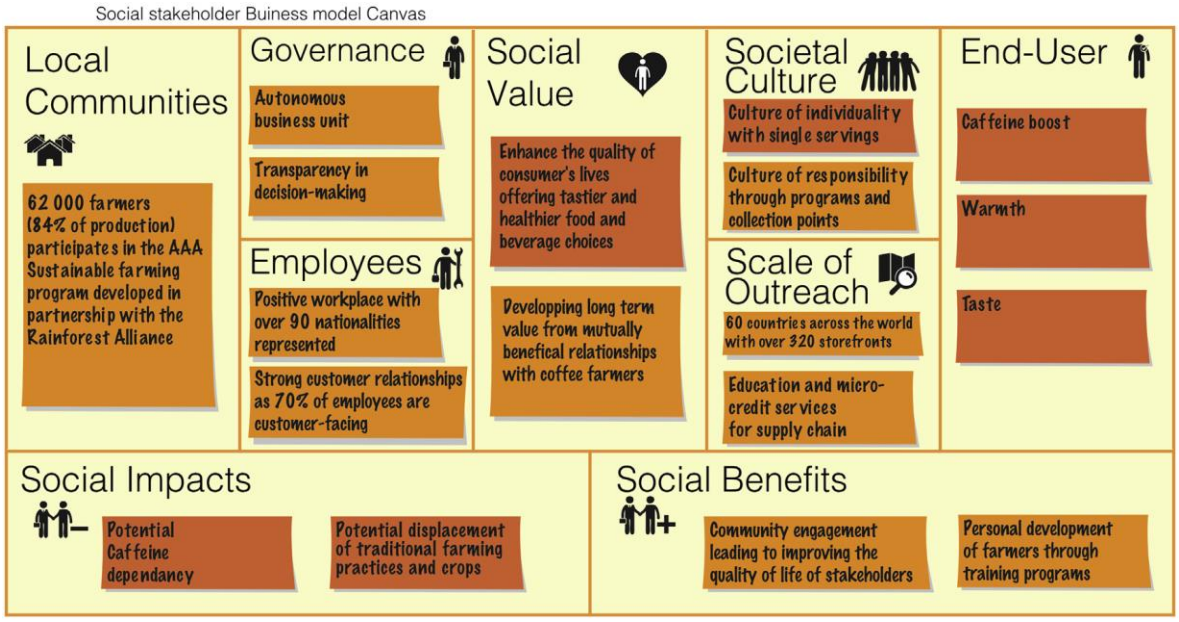


Figure 8: Social layer of TLBMC (Joyce & Paquin, 2016)

4.2.4 Vertical and horizontal coherence

The TLBMC is designed to support a horizontal and vertical coherence between the elements of each layer (economic, environmental and social) highlighting the key relationships and operations. Horizontal coherence is given when within the same layer, the categories do not clash or hinder each other. Vertical coherence is provided by the relationship between the analog categories among layers. When these three are aligned, vertical coherence occurs (see Figure 9). The analog categories among layers are placed in the same position in each layer. For instance, the *Value Proposition*, *Functional Value,* and *Social Value* categories are analogs.

These relationships help uncovering possible actions taken in one layer that are hindering other layers' sustainable operations while identifying opportunities to align the company's actions toward its sustainability objectives. To pinpoint the current business model improvements, both horizontal and vertical coherence dynamics will be assessed. Figure 9 depicts the vertical and horizontal dynamics originated by the TLBMC.

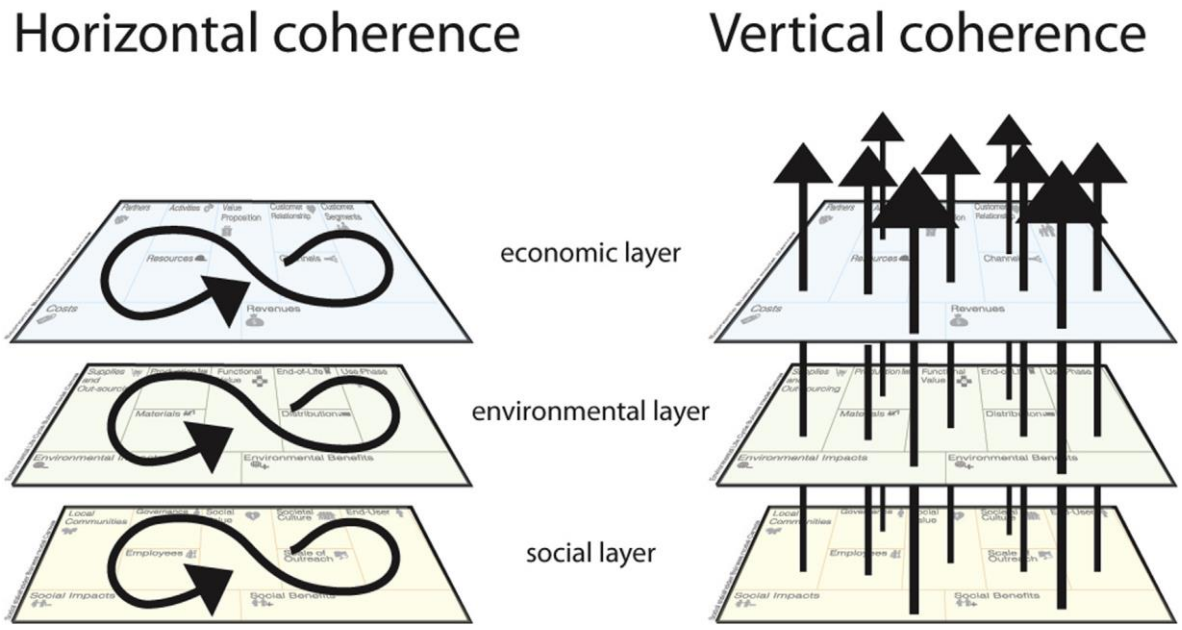


Figure 9: Horizontal and vertical coherence in TLBMC (Joyce & Paquin, 2016)

4.3 Circular strategies

The Circular Strategies by Konietzko, Bocken, et al. (2020) is designed as a practical tool for the ideation of innovative circular business models from an ecosystem perspective.

An ecosystem in this context refers to a set of multiple actors (suppliers, consumers, public organizations, regulators, etc.) contributing to a 'collective outcome', which in this case is circularity. In other words, approaching sustainability from a systems point of view to achieve circularity and sustainability. The tool is based on circularity principles extracted from a literature review conducted by the authors and practical examples of how companies have applied them in their businesses. Konietzko, Bocken, et al. (2020) identify more than fifty circular strategies that help toward reducing materials intake and closing resource loops. They are organized into five main categories depending on the intended circular strategy. These are *Narrow*, *Slow*, C*lose*, *Regenerate* and *Inform* as seen in Figure 10. The description of the categories and examples are explained below.

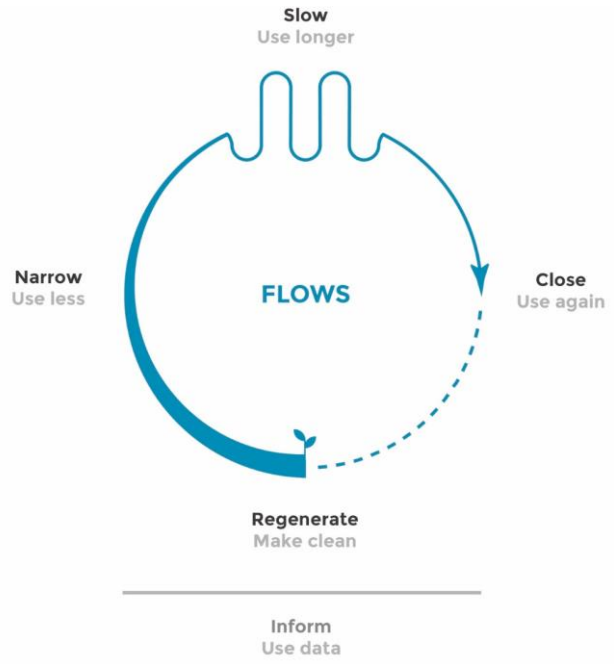


Figure 10: Circular strategies categories (Konietzko, Bocken, et al., 2020)

Narrow:

Narrowing entails using less materials, products, components, or energy during business activities, usage phase, and recovery. For instance, by *Designing with low-impact inputs*, products are composed of materials that require less energy, land, water, or resources in the production.

Slow:

Slowing entails using materials, products, or components for a longer period of time. For example, by *Providing the product as a service* the ownership of the product is kept in the company and only the usage of the product and the results are offered. By doing so, less products are needed as it encourages that companies extend the lifetime of the products offered to their customers.

Close:

Closing entails recovering the materials, products, or components once the product reaches their end-of-life and introduce them again in the economic cycle. *Designing with recycled inputs* is an example of a closing strategy. It refers to designing products from recycled materials, components, or products.

Regenerate:

Regenerating entails sustaining and managing natural ecosystems through the use of non-toxic and renewable materials, and renewable energy. *Produce and process with renewable energy* is an example of a regenerating strategy. It focuses on strengthening

the capacity of the company to manufacture and run its operations with renewable energy, to avoid the higher environmental impacts produced by non-renewable energy sources (Shafiei & Salim, 2014).

Inform:

Informing entails making use of the data extracted through technology to help with the circularity of the product. *Using artificial intelligence to develop new materials with circular properties* is an example of an informing strategy. It entails using artificial intelligence to analyze datasets of material properties and structures and suggest novel alternatives based on circular conditions.

4.3.1 Example of application

An application example can be found in Figure 11. For instance, a company as a retail store or restaurant can apply a *Narrow* perspective using *Design with low-impact inputs* by reducing the offer of animal-based meals and replacing it with more plant-based, resulting in a lower impact because of dietary choices (van Dooren et al., 2014). Applying a *Slow* strategy using *Turn disposable into a reusable service ecosystem* the company can deploy a system to return packaging; collecting, cleaning, and reusing it many times, using packaging for a longer period of time. In a *Close* strategy, the restaurant or retail store could apply *Reuse and sell components and materials from discarded products* and find alternative ways to food waste by looking into new meals or other products. *Regenerate* can be seized for instance for the *Recovery of nutrients from urban areas* so that food leftovers are composted in local hubs and brought back into soils to further develop crop production. Lastly, the *Inform* strategy can be used through *Market circular products, components and materials through online platforms* by employing online platforms to give a second life to food that is close to being thrown away.

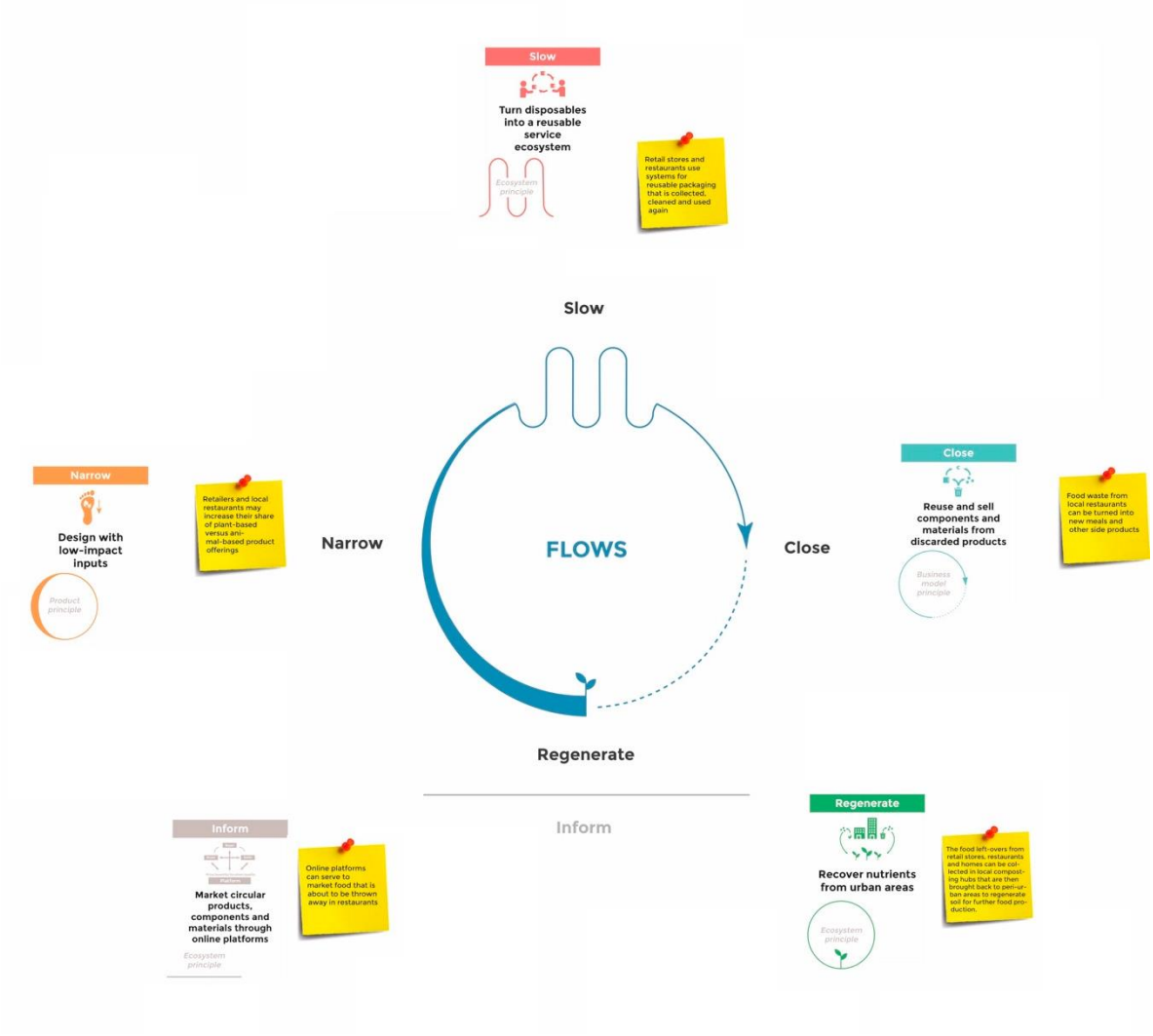


Figure 11: Example of application of the Circularity Strategies. Adapted from Konietzko, Bocken, et al. (2020)

4.4 Sustainable business models in the textile industry

Finding sustainable crafts and companies that embed craftmanship in their operations is challenging. Normally, crafts are found as a group of independent artisans working on traditional craft in a particular area or in companies grouped in cooperatives. Examples of the former are found globally, with a special mention to studies analyzing the impacts of sustainable and ethical crafts in communities in developing countries (Dissanayake et al., 2017; Hai et al., 2021; Lestari et al., 2021). This thesis however looks at the latter to elucidate which sustainable business models and circular strategies can be applied to companies that manufacture sustainable textile crafts in Europe, looking at sustainable textile crafts as an alternative to transition to a more sustainable textile industry.

To do this, the Sustainable Business Model Archetypes from Bocken et al. (2014) and the study of Pal (2017) that implements them in the textile and fashion industry are employed, showcasing real business examples of the textile industry. Bocken et al. (2014) aid framing the different types of sustainable business models described in the existing literature and cluster them in archetypes to enable further research on sustainable business models and helping in the adaption of sustainability within enterprises. Therefore, this categorization provides a coherent framework that will be harnessed to identify the strategies sustainable companies in the textile industry are following to build their business models.

Bocken et al. (2014) identify eight archetypes that are creating, delivering, and capturing value while driving sustainability. The archetypes are described below together with examples. Figure 12 depicts the archetypes.

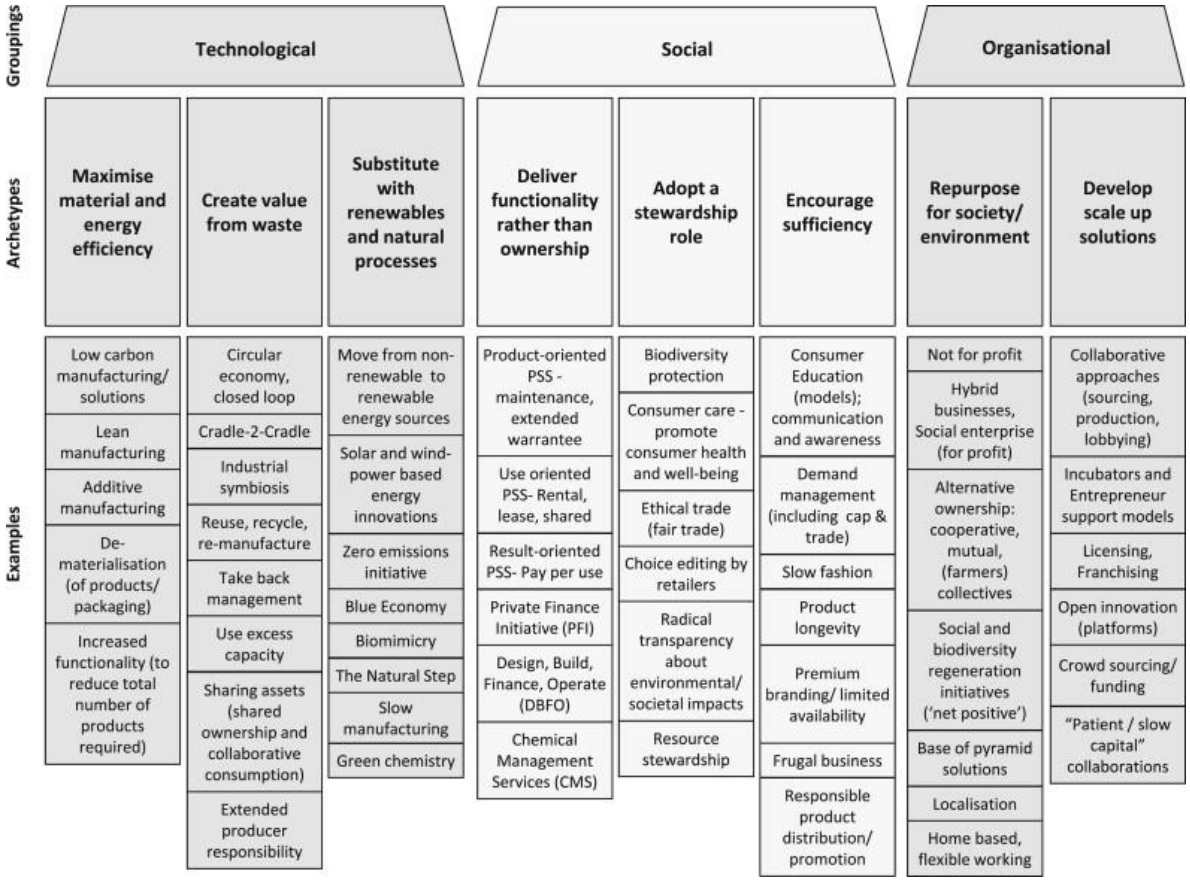


Figure 12: Sustainable Business Model Archetypes from Bocken et al. (2014)

1. **Maximize material and energy efficiency**

   This archetype is related to resource efficiency, material productivity maximization, and waste reduction. It seeks to reduce environmental impacts through redesign principles; using eco-efficiency, lean and cleaner production strategies for instance. As a result, the demand for energy and resources in the industry is reduced decreasing ultimately landfill waste, emissions, resource depletion, and primary extraction.

   Examples in the textile industry are the case of Continental clothing a UK-based fashion company that has as part of their apparel an EarthPositive collection which is 100% organic and with a reduction of 90% CO_2 emissions. These results are achieved by combining efficient manufacturing and transportation, organic farming, and running their operations with renewable energy (Continental Clothing Co., 2022).

   The manufacture with mono-materials leads to an increasing recyclability of the final product and its circularity. This is because the purity of recycled materials is decreased with blends and some finishing processes add contamination (Gwilt, 2020). By using additive manufacturing − or in other words 3D printing technology − mono-materiality can be achieved. A case in the apparel industry is the Belgian company Continuum that has developed N12, a 3D printed bikini collection from Nylon 12 (Continuum).

2. **Create value from 'waste'**

   This archetype concerns reinterpreting the concept of waste and employing it as an input or raw materials for production. In this way, value is created for what it was supposed to be currently perceived as invaluable. It seeks to reduce environmental impact through closing loops of materials and optimizing resource efficiency, leading to a decrease in resource demand and ultimately reducing resource depletion, primary extraction, emissions, and landfill waste.

   Many approaches to the archetype are identified by Bocken et al. (2014) but ultimately all of them focus on recovering the materials already extracted for the manufacture of existing products and keeping them in the economic loop, extending their lifetime as much as possible as part of the alternative paradigm to the current linear economy: the circular economy (MacArthur, 2013).

   Examples in the textile industry are for instance Teemill, a company specialized in the circular production of t-shirts. Once the customer wants to get rid of its t-shirt, the logistics to recover it start with scanning a QR code that generates a post label to send the item back to their factory. Then, the t-shirt is refurbished or turned into recycled yarn and the customer gets a credit to spend on the next purchase. In

this way, the t-shirt is kept in the loop and the value of the t-shirt materials is held (Ellen MacArthur Foundation).

Looking at industrial symbiosis, the waste streams from one company can be harnessed by other company as inputs, resulting in a great reduction of environmental impacts. One of the most successful examples to date of this practice is the Kalundborg Eco-industrial Park (Jacobsen, 2006). The Kalundborg Park saves annually 100GWh of energy, 87,000 materials, and 635,000 tons of CO_2 (ENGIE Impact, 2022).

In the textile industry, one case with great potential for industrial symbiosis is the Gaziantep industrial park in Turkey, where an important textile industry cluster operates. If industrial symbiosis was applied and waste streams shared, 295,760 tons CO_2/year could be potentially saved (Uludag-Demirer & Demirer, 2017). In Europe, the project RESYNTEX employs innovative technology that creates chemical by-products from textile waste, serving as raw materials for the chemical industry. By engaging in industrial symbiosis, the greenhouse (GHG) emissions are approximately half the emissions that would be created by a conventional incinerator textiles facility and chemical manufacturing industries (Magaud, 2019). Figure 13 shows the GHG emissions of the systems.

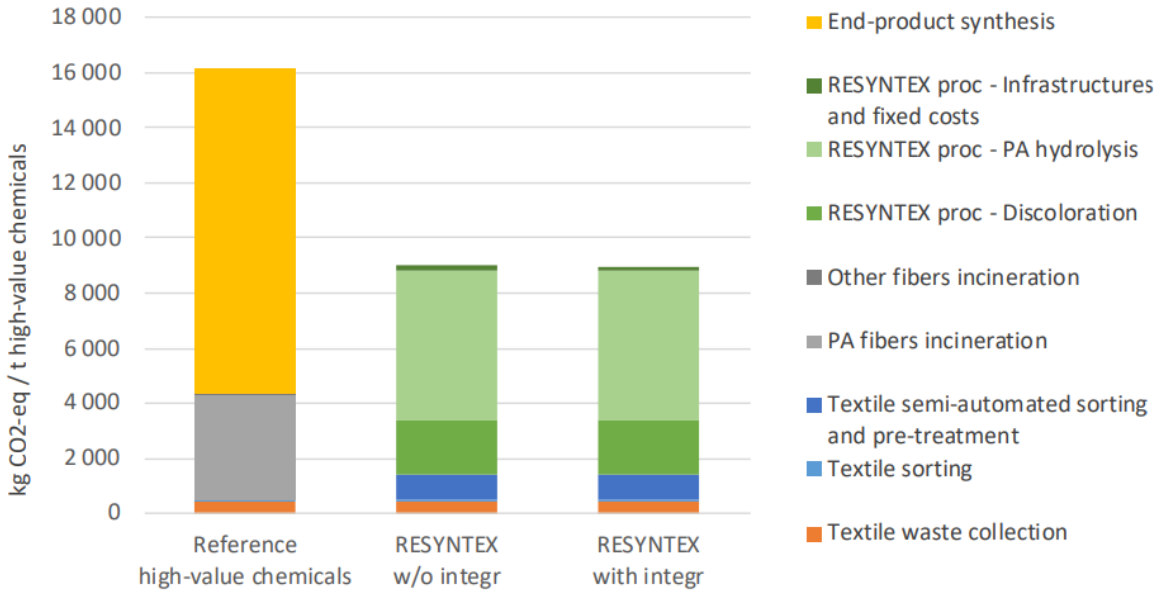


Figure 13: GHG emissions related to the synthesis of 1 tonne of high-value chemicals using the reference system (conventional supply chain) and using PA material recycled through the RESYNTEX system with or without integration, with detailed contributions of the different inputs and outputs, from Magaud (2019)

3. **Substitute with renewables and natural processes**
   This archetype addresses the ability of humanity to live with finite resources, by getting inspired from natural processes and using renewable resources more reasonably. It seeks to reduce environmental impacts through imitating nature systems and cycles and substituting non-renewable energy resources with renewable alternatives to tackle resource depletion, pollution, and waste.

   Examples in the textile industry regarding renewable energy are currently widespread. Even the big players of the clothing industry like H&M ran 90% of their operations with renewable energy in 2020 (H&M Group, 2020). Patagonia uses 100% renewable energy in its offices, stores, and distribution centers across the US and 76% across the globe (Patagonia Inc., 2022).

   Regarding bioinspired materials, the company Sprintex Engineering has developed an alternative to silk by artificially synthesizing spider silk without hazardous chemicals and under room temperature, as a spider creates it. It helps avoiding 21.163 kg of CO_2 eq per ton of the production of silk fiber from cocoons (Giacomin et al., 2017) and it is one thousand times more efficient than synthetic fibers from petroleum-sourced materials (The Biomimicry Institute, 2022).

4. **Deliver functionality rather than ownership**
   This archetype focuses on keeping the ownership of the product in the company and offering the usage and the function of the product, so that consumers only pay per use. These business models are known as product as a service (PSS) and correspond to an alternative to customer ownership that can potentially encourage companies to manufacture longer-lasting products or extend the lifetime of their products through design for upgradability or reparability and reducing production eventually (Pal, 2017; Tukker, 2004). Ultimately, this archetype seeks to reduce environmental impact through the reduction of material intake and production (Reim et al., 2015). Nevertheless, renting and leasing models may not have the ability to shift the purchase of new products by consumers unless they are combined with other archetypes like *"Encourage sufficiency"* that focuses on changing consumer behavior by buying less and of better quality (Bocken et al., 2014).

   Multiple leasing and renting business models have emerged in the textile and clothing industry in the recent years. One pioneering example of the leasing strategy is the Dutch company MUD Jeans. They offer to pay for the performance of their jeans, leasing them for a monthly fee during one year. Once the year is over, MUD Jeans sends an email to the customer offering to keep, switch or return the jeans (MUD Jeans, 2022). Some examples of the renting model are for instance the rent of special occasion wear like Circle Closet in the Netherlands (Circle

Closet, 2022) or Rent the Runway which rents designer brands with multiple renting schemes.

Regarding lifetime extension of products, some companies have opted for offering maintenance and repair services. The Scandinavian denim company Nudie Jeans offers for instance free repair services in their stores and a free DIY repairing kit for customers that are not able to come by a store (Nudie Jeans Co., 2022). Although in this case the customer holds the ownership, offering a service to improve durability and product lifetime results in a variant of a PSS called product-oriented (PO-PSS) (Pal, 2017).

5. **Adopt a stewardship role**

This archetype comprises proactively engaging with stakeholders to ensure long-term prosperity. Prosperity in this context refers to impact positively on the environment and society, ultimately contributing toward a thriving planet and society (Jackson, 2009).

This is usually done through joining upstream stewardships where companies join a program that works usually at the grass-roots stage by applying more sustainable and ethical methods. Some examples of these practices are fair wages and employee welfare, improve community education, livelihoods and health, biodiversity regeneration and protection, and minimization of hazardous chemicals, emissions, soil erosion, and resource consumption (Bocken et al., 2014).

An example in the textile industry is the Better Cotton Initiative, where through a membership, civil society, suppliers and manufacturers, retailers and brands, and other stakeholders come together to ensure cotton harvesting best environmental and social practices. Their work is focused on crop protection, water stewardship, soil health, biodiversity, fiber quality, decent working conditions, and management systems to enable the improvement and learning of farmers (Better Cotton, 2022).

6. **Encourage sufficiency**

This archetype involves seeking the reduction of goods consumption leading to a reduction in production eventually. An increasing number of scholars argue that to pursue a sustainable future, initiatives are also needed to rely on addressing consumption habits and patterns (Ehrenfeld, 2008; Jackson, 2009). They argue that it is because merely focusing on the production side falls short to counteract the negative impacts of our unsustainable way of living. This archetype could potentially shift customer behavior from overconsumption, reducing energy and material demand (Jackson, 2009). It can be achieved by increasing durability and longevity through modular design and redesigning with more durable materials instead for obsolescence. It will also require changing promotion strategies like

overselling and discounting as well as educating consumers on using less products for longer.

Examples in the textile industry are product durability and longevity, second-hand goods, and the slow fashion movement (Bocken et al., 2014). In the second-hand and slow fashion movement, collaborative consumption through sharing and collaborating is shifting the consumption paradigm and reducing environmental impacts. In recent years, a plethora of online second-hand platforms have arisen. Companies like ThredUp or Vinted are enabling consumer-to-consumer sales. Buying second-hand clothing reduces its waste, water, and carbon footprint by 82% (ThredUp Inc., 2022).

7. **Repurpose for society/environment**
   This archetype corresponds to shifting toward a social enterprise approach, where environmental and social benefits are prioritized over economic profit. It seeks to maximize the benefits through collaboration and profit sharing (Bocken et al., 2014).

   Examples in the textile industry in Europe are for instance small fashion social enterprises that support refugees, recovering addicts, or the elderly. In the UK the company The North Circular produces premium knitwear employing local skilled workers which are mainly aging women and the lingerie company Who Made Your Pants? employs refugee women. It is established as a cooperative and any profit made returns to the company. The spillover is shared between the members and decisions are democratically agreed (Reddy, 2014). In this way, this archetype focusing on ethical fashion creates the opportunity of uplifting local communities and empowering marginalized artisans while reducing environmental impacts (Bocken et al., 2014; Pal, 2017).

8. **Develop scale up solutions**
   This archetype describes scaling the existing sustainable business to maximize the environmental and social benefits and drive systemic change. Sustainable businesses are often low-scale businesses with limited access to attract the attention of dominating investors and grow significantly. This leads to a challenging position for sustainable-driven enterprises to reach a significant critical mass to trigger social and environmental changes at a global scale (Nerkar & Shane, 2003). On the other hand, multinationals might be better positioned to shift toward more sustainable practices globally but might opt to make the change when competition oblige them. In the shorter term however, small businesses and start-ups are more likely to lead and undertake disruptive innovations, and these in turn need breakthroughs to scale (Giarratana, 2004). For instance, in the textile industry H&M although it is a forerunner of sustainability within the industry, some of its initiatives are immature at the moment compared to the impact of its

traditional business model. H&M cooperates with I:Co to collect discarded clothing from its customers. In 2014, they recovered 7,600 tons but it represents a tiny share of what is globally produced per year and disposed: 150M tons approximately (Pal, 2017).

To foster the scale-up of small sustainable businesses, Bocken et al. (2014) identify collaborative approaches, open innovation, and crowdsourcing/founding. Through collaborative approaches, organizations are open to exchange value and co-create products and/or ideas. Co-creation forces the active involvement of users, that can acquire the role of makers. These crowdsourced activities have been benefited from information technology to connect suppliers, producers, and customers and open the co-creation possibilities among them globally (Liu et al., 2014; Romero & Molina, 2011).

Examples in the textile industry in Europe are the Open Garments initiative. In this project the user customizes, orders and even sells clothing items, then a manufacturing network − built mostly by microenterprises with particular manufacturing technologies − manufactures the goods and the online platform Open Garments provides the service to connect them (Open Garments, 2019). Open innovation platforms of these characteristics not only convert the role of the user to a creator but also aim to shift production means upstream and downstream and consumption patterns by being the interface between consumers and companies and fostering further systemic change than as a single sustainable enterprise as a result (Mina et al., 2014).

5. Background information

5.1 Company information

TextileCompanyStudied is a manufacturing company of high-quality durable textiles, that incorporates craft and recycling techniques in their production. It is a small-sized company that started its operations eight years ago in the center-east region of the Netherlands, in the Overijssel Province. They operate in the last remaining weaving mills of Enschede, a city that until the sixties, it used to house one of the largest textile hubs in Europe. They build upon the legacy of craft of the region through innovation and sustainability, preserving the skills and knowledge of weaving and manufacturing sustainable textile crafts using recycled yarns and sustainable practices (TextileCompanyStudied, 2022).

They offer an array of products to business to consumer (B2C) and business to business (B2B) as well as consultancy services, being the B2B the greatest share of income of the company (65%). These products are characterized by having a high percentage of recycled natural fibers and being dyed only with the dye coming from the recycled content. They are meeting the needs of their customers by offering good

quality sustainable fabrics, customizing the fabric meters desired, and providing authenticity and traceability of their local and European suppliers.

The Foundation

Part of their production concerns including recycled content from post-consumer waste in their textiles. To do so, they are part of a foundation with five other partners specialized in circular textiles. The foundation operates in a local supply chain of textiles recycling in the Overijssel region (Foundation, 2022). It starts with the disposal of fabrics, where Twente Milieu collects the clothing and textiles disposal from textile containers throughout the region. Next, it goes to the Regionaal Textielsorteercentrum. There, textiles are sorted for sale, recycling, or waste disposal. The companies Het Goed and De Beurs give a second life to the textiles for sale and the textiles for recycling go to Frankenhuis, the next partner. They process textiles using mechanical fiberization, transforming textiles into non-wovens, where fibers can be seen. Next, if the composition of the non-wovens is cotton, chemical recycling takes place. The partner Saxcell creates strong and colorfast fibers from cotton waste. Dyes are not added, but the own coloring of the recycled cotton is used to tint the final product. Then, the fibers are spun into yarns. Lastly, TextileCompanyStudied closes the loop by weaving recycled yarns into fabrics. The brochure with all the steps and partners can be found under section 13.3 of the Appendix.

5.2 Procedures information

This section explains the steps followed to arrive at the results presented in section 6. All visuals are made in MIRO to ease the design process using sticky notes and taking the templates from the TLBMC and Circular Strategies papers as the baseline to fill all relevant information.

Current business model

Uses the TLBMC as the baseline and it is filled with the information from the interview script. Starting sequentially, from the economic layer categories until the social layer categories, the template is completed. Sticky notes of different colors represent: Titles in orange, Items in yellow, Ongoing action in green, and Points subject to Improvement in pink. Section 6.1 covers the current business model.

Vision

From the interview script, the vision is collected in sticky notes that will be used in the next step (Circular strategies ideation). The vision description is in section 6.2 and the visuals can be found under section 13.2 of the Appendix.

Circular strategies

In the ideation of the circular strategies, an informed brainstorming process takes place. It is informed because it considers the literature review of sustainable textile craft, the literature research on sustainable business models examples, and the vision

of the company to ideate potential ideas that will serve as the basis for the recommendations, next steps, and future business model.

First, following the instructions on how to use the Circular Strategies from the Circular Deck by Konietzko, Bocken, et al. (2020), the Circular Strategies were scrutinized, identifying the ones that TextileCompanyStudied already uses in their operations (Section 6.3), the ones that could potentially be applied to the company and the ones that do not apply because of the type of products that they manufacture. Then, using the applicable circular strategies to the company as a baseline, sticky notes are used, where different colors represent: the Vision in blue, the Idea Suggested in yellow, the Stakeholders Needed in green, and Points subject to Improvement (drawn from the current business model) in pink. Section 6.4.3 covers the Circular Strategies application and ideas suggested.

Future business model

Uses the TLBMC as the baseline and it is filled with the information from the vision and the current business model improvements considerations of section 6.4. Starting sequentially, from the economic layer categories until the social layer categories, the template is completed. Sticky notes in yellow represent the additions or changes to the business model. Section 6.6 covers the future business model.

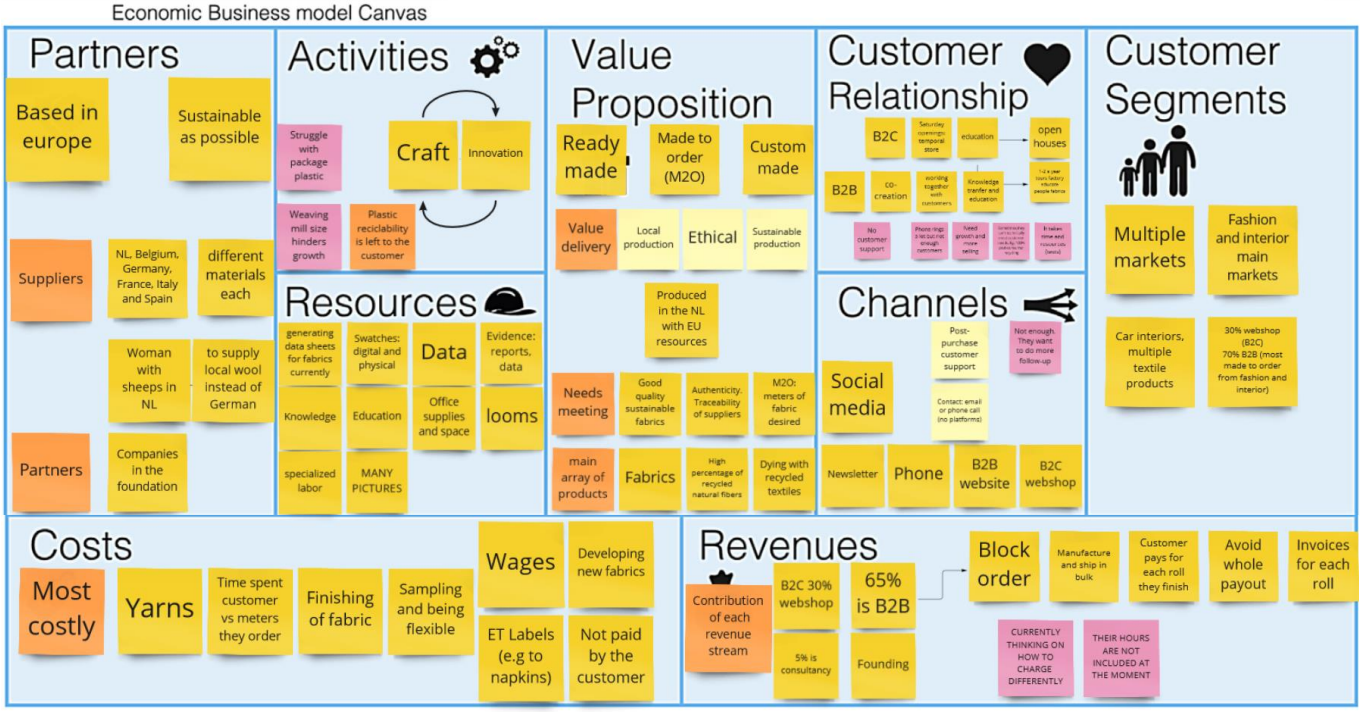
6. Analysis and Results

The results presented in sections 4.3 to 4.6 have not been validated by the company before the publication of this research because of time constraints. The company was contacted but unfortunately, it did not take place. However, it would have been carried out by having a meeting showing the results of the current business model TLBMC in Figure 14, the Circular Strategies in Figure 15, and the future business model TLBMC in Figure 18. Then, the potential improvements from section 6.4 would have been discussed and lastly, the priorities and next steps explained and discussed as well. After consulting the results and findings with the company, the section 9 Discussion would have covered the thoughts of the core members of the company on the ideas and priorities proposed and how they fit into the company's strategy.

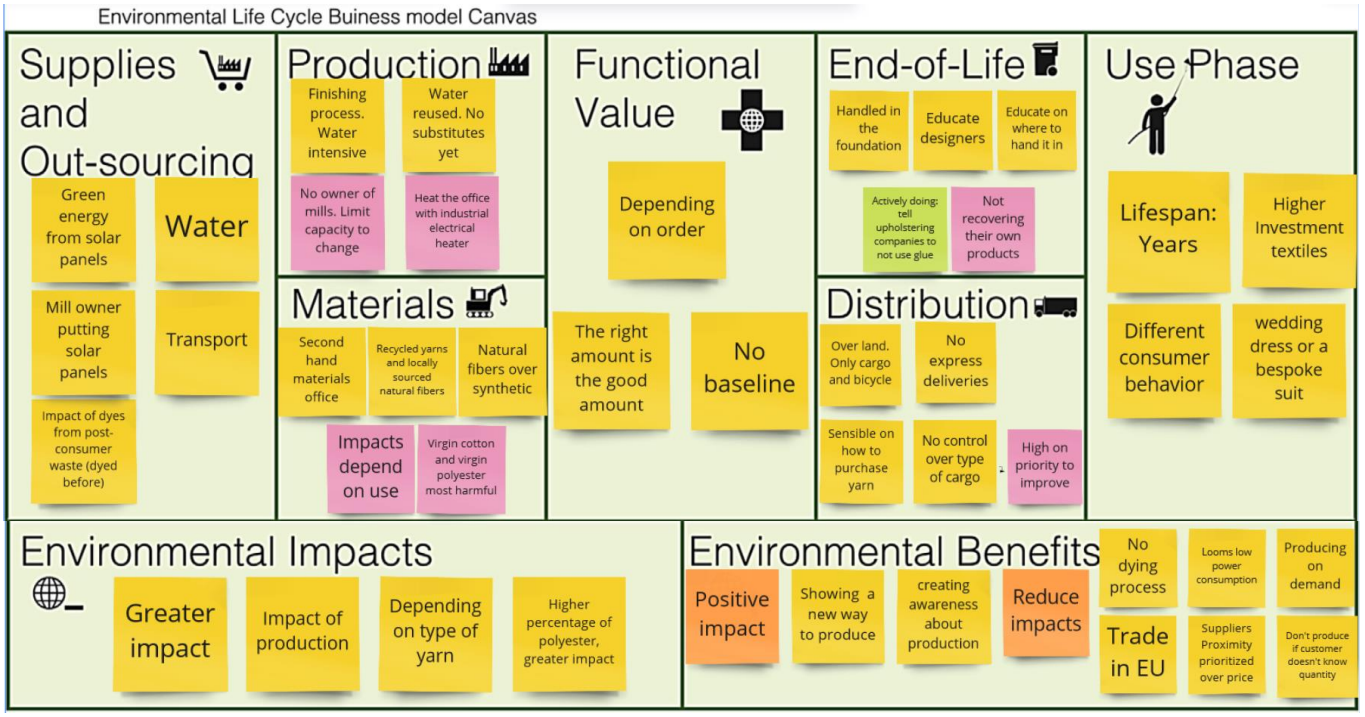
6.1 Current business model

The transcript of the interviews is used to fill the TLBMC tool and find out how the current business model works from an economic, environmental, and social perspective. The complete current business model can be found in Figure 14. Hereafter the sections of the most relevant points for improvement are explained, depicted in a pink sticky note on the canvas.

Economic Business model Canvas



Environmental Life Cycle Buiness model Canvas



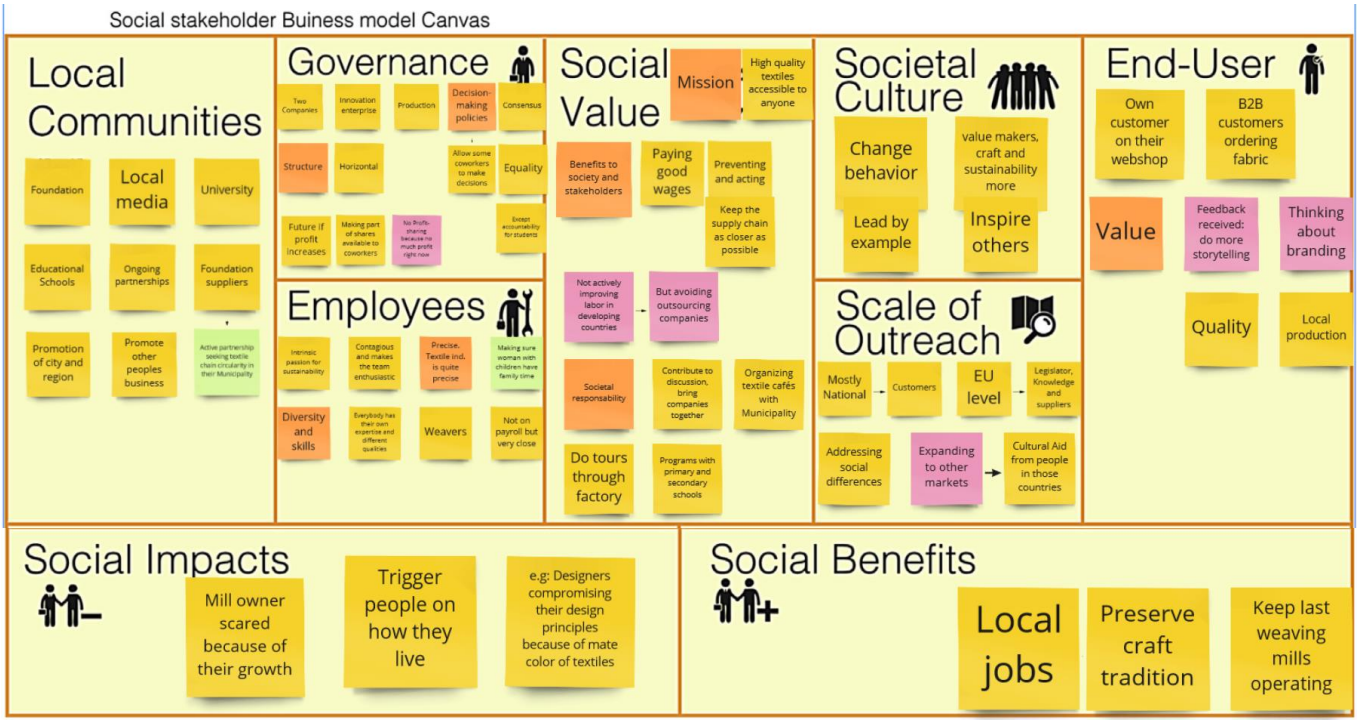


Figure 14: Current sustainable business model of the company

Legend: Orange: Titles, Yellow: Items, Green: Already doing, Pink: subject to Improvement

6.1.1. Economic layer

Activities. This section entails all that is needed to perform to execute the value proposition. Currently, TextileCompanyStudied is struggling with plastic packaging in their deliveries, as they do not find an alternative to it in adverse weather conditions. Nevertheless, they urge their customers to reuse it in their facilities, recycle it, or take it back if they become a regular user. Besides, the **weaving mill size hinders their growth**. They run their operations in the last weaving mill of Enschede, meaning that the size of the mills and the office space are limited and do not allow them to grow. Besides, the mill also has other clients besides TextileCompanyStudied hence the mill is not fully operating only for TextileCompanyStudied, reducing their working capacity and the demand they are able to meet.

Customer relationship. This section corresponds to the type of relationships the company wants to create or has established with its customer segments at any stage of the production, sales, distribution, or post-purchase process. TextileCompanyStudied does not have post-purchase customer support. However, they want to improve it. Nowadays, the only means of customer service are the phone and email that they use for the rest of the operations. They mentioned explicitly that the phone rings a lot but there are not enough customers to sustain their operations. **They need more growth and sales**. Besides, sometimes projects have an uncertain outcome or are just not

technically feasible. For example, if a customer wants 100% recycled post-consumer textile waste fabrics that is not feasible at the moment.

Revenues. This section involves all the different ways how the company is generating income from its customer segments (its revenue streams) as well as how customers are currently paying or would prefer to pay (pricing strategies) and what customers are valuing more and have more willingness to pay for. TextileCompanyStudied is not adding their hours when calculating the final price of their product. This is because the final price is already high compared to other options in the market. They are currently thinking of changing how they calculate the final price instead of summing up all the costs that are generated to produce a fabric plus a margin. Revenues are a serious concern in the company, as they are **not profitable yet and stable**. After eight years of life, they depend on founding to continue existing but these founds will finish at any time.

6.1.2. Environmental layer

Firstly, the company was asked if they conducted before any environmental assessment to quantify their impact, as an LCA for instance. They responded that they have only participated in a broader study for their yarn suppliers, but that they did not conduct any LCA of the life cycle of their products. They stated that in their case, they find it difficult to assess through an LCA what is their impact because they avoid much impact by not producing, as it is the case of not using dyes for example. Thus, the information collected for the environmental layer will be qualitative, as there is not any proper quantification of the environmental impacts of the company yet.

Functional value. The functional value is defined by a quantitative description of the product or service that is consumed during a given timeframe. In TextileCompanyStudied there is not a clear baseline to evaluate the impact of the product that the customer has. This is due to that products are made to order and the amounts are tailored to the customer's needs. Their philosophy is: "*The right amount is the good amount"*. Therefore, we could say that it is the amount of fabric a customer consumes during a particular timeframe.

Production. Production refers to the impacts associated with the actions performed to manufacture products and/or provide services. In the case of TextileCompanyStudied, this is translated into the limited freedom they have to change regarding mills and office, as they do not have the ownership of the property. The most relevant example is office heating, which is currently done using an industrial electrical heater. TextileCompanyStudied argues that a heat pump is too expensive for the remaining time they are going to stay there. Lastly, **they do not grow as much as they would desire.** As mentioned before, they run their operations in the last weaving mill of Enschede, meaning that the size of the mills and the office space are limited and do not allow them to grow. Besides, the mill also has other clients besides TextileCompanyStudied hence the mill is not fully operating only for

TextileCompanyStudied, reducing their working capacity and the demand they are able to meet.

Materials. This section refers to highlighting the most relevant materials used by a company and its environmental impact. In the case of textiles, the impacts of materials depend mainly on their use. Among all, virgin cotton and virgin polyester are the most harmful materials (Sustainable Apparel Coalition, 2022). TextileCompanyStudied is aware of the impacts different yarn compositions and sources have. They opt for recycled yarns and locally sourced natural fibers over international and synthetic fabrics when possible. Therefore, their biggest impact on materials is when yarns come from virgin cotton or virgin polyester.

End-of-life. The end-of-life category refers to the impacts associated with the products once the consumer decides to discard them. It is intended to support companies in expanding their responsibility beyond the lifetime of their products. Currently, TextileCompanyStudied is not recovering its own products once the consumer decides to discard them. They encourage and recommend discarding textile items in textile containers so that recycling companies can properly recycle them. However, the end-of-life of their products depends on their customer's choice, whether they decide to recycle or not.

Distribution. The distribution section refers to the types of transport, weights and distances traveled of the shipping involved to deliver the functional value. Nowadays, TextileCompanyStudied has no control over types of cargo. This is in part explained because they are not a big player. However, they ask shipping companies which fuels they use in their cargo transport and all their transportation modes are inland transport. Besides, they opt for bicycle transportation when the weight allows. Lastly, distribution is a high priority for the company to improve.

6.1.3. Social layer

Governance. This section refers to decision-making policies and the organizational structure the company is adopting. In the case of the type of decision-making policies that TextileCompanyStudied has, **they would like to implement profit sharing but they are incapable of doing so nowadays**, as they do not have any profit to share yet.

Social Value. This section captures the company's mission and how they generate value and benefits for its stakeholders and society. TextileCompanyStudied is not actively improving labor in manufacturing textile companies of developing countries, but it is avoiding companies to go to third countries, in other words, outsourcing. Besides, it is creating and maintaining local jobs that otherwise will not exist in the region.

Scale of outreach. This section corresponds to the outreach of the organization (e.g. global, national, or local) and how they conform to the social and cultural differences that their stakeholders may have. TextileCompanyStudied operates at a European

level, with mainly national customers. They are currently investigating on expanding to other markets and to realize it, they have asked for aid from stakeholders already operating in those markets to adapt their products to the market's needs. Thus, there is awareness of social and cultural differences.

End-user. This section refers to the consumer of the value proposition and how if by doing so, its needs are met and its quality of life improved. The end-user of TextileCompanyStudied values the authenticity of the company and the quality of its products. However, they have mentioned to the company that they would highly appreciate if TextileCompanyStudied would do more storytelling. Thus, the company is already considering if they should go a step forward and become a brand, using branding strategies like making prints out of their logo in their textiles.

6.1.4. Horizontal and vertical coherence

In the previous sections 4.1.1, 4.1.2, and 4.1.3 the conflicting categories that mismatch the coherence of the business model have been highlighted in bold. In this section, horizontal and vertical coherence is analyzed.

Regarding horizontal coherence, they have participated or are actively participating in many ongoing initiatives, which gives horizontal coherence to both the environmental and social layers. In general, the issues found are overall weighted. For instance, although they don't have direct control over cargo, local sustainable yarns are preferred compared to cheaper sustainable yarns from other EU countries, which avoids transport. They do not do express deliveries and are sensible on the yarn orders they do, so that transport is also reduced. Hence, they keep a coherent strategy with its values and reduce environmental impacts.

Nevertheless, a horizontal incoherence in the economic layer is found. The fact that they depend on one weaving mill of limited production, hinders their growth and therefore their sales.

Besides, there is a clear vertical incoherence due to profitability. Not being profitable causes in turn that profit-sharing is not possible in the governance category of the social layer. Not having enough economic resources also impacts on the possibility of purchasing properties, hindering the freedom of choice of the founder and leading to less environmentally-friendly decisions, such as the heating of the office.

6.2 Vision of the company

A vision is a broad idea of the future. It depicts the ideal upcoming picture of the company and helps extracting the goals and the next steps to achieve it.

To ease the process of the ideation of the vision, the questionnaire touches upon four main categories: the vision itself, its goals, the impact of the goals, and the partners needed for the vision. The vision brainstorm can be found under section 9.5. Both the founder's ideas from the first interview and the core team's ideas from the second interview are shown and depicted with stickers of different colors. In the text, when

stating *all team members* both the founder and the other core team members are included.

6.2.1 Vision

Firstly, the founder brainstormed that she wishes to have a Stable and Happy company in the future, where they can serve as inspiration to their surroundings and other companies on how they do business, share how textiles are made, and their passion for their craft as well as how work can be fun. Besides, they want to be the reference partner for high-quality textiles and provide them to people that love them and need them.

The core team added that they see the business model changing, participating in innovative projects, and experimenting with new materials.

When asked how they would envision the company from now to 10 years, all the members see themselves growing. Owning facilities and having more machines. The team is also bigger, at least doubled. The founder highlighted that ideally, they would like to become the reference partner for custom orders and all the industrial production that is between laboratory-scale and mass production, caused by having a scalable weaving mill. At the same time, the core team supposes that in ten years the recycling industry would have grown and the work they do in their company will become mainstream. Therefore, to keep ahead of the competition they would like to become an R&D center to develop new products from recycled and new materials from local production.

6.2.2 Goals

From an economic perspective, the founder mentioned owning a factory and their own looms as well as an atelier for garments and patterns. She also mentioned that she wishes to be financially independent and grow independently without the need of investors or shareholders, so that no external parties have a saying or interfere in the business decision-making. The core team added that they would expect to invest in more machines and people.

From a social perspective, the founder mentioned that she would like to help other companies and creators and create jobs for people distant from the labor market. The core team members added to produce locally.

Regarding the environmental perspective, all the members agree on the idea of a Circular company. Thus, the method to come up with new circular strategies is not only appropriate but is also aligned with the company's vision. Besides, being carbon positive, making the office and transport cleaner, choosing refusing and reducing strategies rather than recycling, and an ultimate goal of 100% recycled post-consumer textiles fabrics with the same quality and properties as virgin materials was also mentioned by the founder. Lastly, one of the core team members mentioned that it will be interesting to conduct an LCA assessment of the company and its suppliers to measure the impact of their fabrics versus virgin materials.

6.2.3 Impacts of goals

The founder envisages that the biggest impact would come from inspiring others to follow their example. She would like to see that she is copied anywhere else around the world, following their local market strategy. She mentioned for instance, prioritizing happiness instead of money, changing to a job you are passionate about, making the environment better, or consuming less as other sources of inspiration. The core team members add that they would like to provide most fashion and interior industry sustainable textiles.

From a social perspective, the core members mentioned that the company will bring back the production of textiles to the Netherlands and Enschede, as well as the knowledge of weaving. Therefore, this will create new jobs and growth for the company while preserving the craft of weaving. Besides, the founder mentioned that one of her social goals would be to empower people to kick start their business idea, helping them to execute it by providing space, fabrics, or support. The core team members said that they are already pursuing this goal, as the founder is helping a coworker starting her own fashion brand and offering her space to work on Saturdays.

Regarding the environmental perspective, the core team mentioned that they would like to create more sustainable fabrics, have a zero waste factory, and close the loop with a circular company. However, all of the members mentioned that energy could be improved regarding how the company is being heated currently.

6.2.4 Partners in the vision

When asked who do they say with the company to reach their goals and materialize their vision, many stakeholders were mentioned.

The founder mentioned that patient and curious customers and people who go for quality over quantity as well as the thrift shops in the foundation to help them in their garment manufacturing, the municipalities social work places to provide the social employment and lastly, their customers that are specialized in circular design. For instance, together with interior designers contribute with knowledge and product on the textile part and combining both circular expertise, the final product is better together. The core team stated reliable suppliers and customers, and stakeholders that can make them improve locally. As an example they also gave the Foundation, to operate more locally and vertically integrated, having close proximity and relationship with partners and allowing them to rapidly develop and test new materials and products, improving the industry as a consequence.

Next, the core team highlighted that there are many small initiatives taking place, or that the company participated in the past and that it would be interesting to have a way to gather all the different initiatives together, so that the company can have a greater impact. Besides, they also brought up that producing and sourcing locally will produce a positive feedback by helping each other businesses, bringing back the industry that was disappearing, and generating prosperity for the city. Finally, they

also mentioned that it will be necessary to provide knowledge and education to primary and secondary schools, with the aim of inspiring people to change their consumption and production behavior by showing them how TextileCompanyStudied makes it possible.

6.3 Circular Strategies application

After the current business model of the company from the triple layer perspective is addressed, all the manufacturing steps of the company are examined. This information is harnessed to firstly identify which circular strategies is the company currently using and secondly to propose in section 6.4.3 further suggestions to improve circularity and the alignment with their goals, so that the future business model is built in section 6.6.

TextileCompanyStudied is applying many circular strategies in its production system at the moment. The strategies employed are described hereafter.

1. Design with low-impact inputs

This strategy concerns that products are composed of materials that require less energy, land, water, or resources in the production.

TextileCompanyStudied does not use any dyes. The colors in their fabrics come exclusively from recycled yarns. They also use post-consumer textile waste. It has been proven that recycling content has lower impacts than virgin materials (Sandin & Peters, 2018). A study conducted in the UK has found that the energy saved by a reuse/recycling operation infrastructure was approximately 90 kWh for every kilogram of polyester and for every kilogram of virgin cotton (Woolridge et al., 2006). TextileCompanyStudied also prefers local and natural yarns over virgin synthetic materials, being the latter more harmful (Sustainable Apparel Coalition, 2022).

2. Localize supply where appropriate

This strategy entails increasing the number of local suppliers. Having local suppliers decreases the impacts originated from the transport of supplies. *Dig Inn* has localized its supply chain allowing them to reduce transportation and boosting the local economy (Dig Inn, 2022). As explained before, TextileCompanyStudied is part of a locally-sourced textile loop. The foundation is composed of multiple partners that cover the whole supply chain, from textile collectors to fabric manufacturers. From the container to the finished product. In this chain, they are the last link being the partner for fabric manufacturing that closes the loop.

Lastly, they do not purchase any overseas yarns. They only produce their textiles with EU yarns, reducing the impacts associated with the transportation phase.

3. Design for standardization and compatibility

Standardization allows creating components, interfaces, or products that are also suited for other components, interfaces, or products (Bocken et al., 2016). During the whole production, the company uses the ISO standards for designing, testing, and checking textiles.

4. Design for physical durability

This strategy captures that products are designed to degrade slower and have a higher lifespan as a result (Bocken et al., 2016), (Mont, 2008). TextileCompanyStudied manufactures high-quality durable textiles that are long-lasting compared to other textiles on the market. This is also a relevant characteristic of sustainable craft products, as Väänänen et al. (2017) highlight how through the selection of materials sustainable crafts are long-lasting.

5. Encourage sufficiency

This strategy is related to encouraging responsible and moderate consumption of the products the company sells (Bocken & Short, 2016). In the case of TextileCompanyStudied, this can be translated into that they actively seek to educate their customers and the public to moderate the consumption of textiles in general and also of their products. As an example, they do not produce any meters if the customer does not know exactly how many meters they want or need so that no textile waste ends up landfilled as a result. Besides, they also sell in their webshop under the category *Beautiful Mistakes* a particular type of fabrics. These are fabrics that have irregularities or flaws that originated during the industrial production process. However, instead of throwing them away, they challenge their customers and offer these fabrics at a reduced price so that a second life can be given if the fabric could suit them, as the durability of the fabric and its overall qualities remain intact.

6. Design with recycled inputs

This strategy refers to designing products from recycled materials, components, or products (Singh & Ordoñez, 2016), (SPC, 2019). In the case of TextileCompanyStudied, they produce fabrics from recycled post-consumer waste textiles. In the course of its existence, the company has increased the recycled content of its fabrics without losing the performance of the fabrics they produce.

7. Build local waste-to-product loops

This strategy revolves around creating value from the waste generated locally in one facility and selling back that product to the facility (Krikke et al., 2004). TextileCompanyStudied applies this strategy by offering *Custom Made* projects to its clients, where they can bring their own waste and produce textiles for them out of it.

8. Produce and process with renewable energy

This strategy focuses on strengthening the capacity of the company to manufacture and running its operations with renewable energy, to avoid the higher environmental impacts produce by non-renewable energy sources (Shafiei & Salim, 2014). In TextileCompanyStudied, the electricity of the offices and mills comes from solar panels, and therefore from renewable resources.

9. Embed renewable energy production in the existing infrastructure

This strategy requires finding means to incorporate renewable energy in the infrastructure of the company, with the aim of running its operations with renewable energy (Shafiei & Salim, 2014). In our case, the owner of the mills used by TextileCompanyStudied to manufacture their textiles is currently deploying solar panels on the mill's roof. Thus, energy production is embedded in the existing infrastructure.

10. Build material database ecosystem

This strategy explores creating or encouraging a material database. A material database describes the characteristics of materials and the composition of products. Having an inventory of materials causes that components and/or products can be more easily reused and their materials recovered (Luscuere, 2016). TextileCompanyStudied is also applying this strategy, as they are currently creating a materials database of all the materials they use in their production.

11. Virtualize

This strategy examines reducing the need for physical products to deliver the same value virtualized (Manninen et al., 2018). TextileCompanyStudied virtualizes part of its process. For instance, they take high-resolution pictures of all the textiles that they sell via the online webshop, reducing the amount of samples they need to send to their customers.

6.4 Potential improvements

6.4.1 Context

Nowadays, the company struggles with making profit. In fact, they do not add the total costs originated from their own working hours because they already have a quite high price point compared with other textiles on the market. They also assume other costs, like not charging for the textile labels of their products and allocate it as part of their marketing budget, which might seem manageable but still it adds to the incurred costs. As a consequence, the company keeps depending on founding to continue existing.

The company's focus is centered around the physical product and conventional ways of making profit in an unconventional business model. Conventional ways of making

profit because they are monetizing their value proposition by a one-time up-front or pay per hour for consulting services, traditional ways to capitalize the value proposition (Aulet, 2013). Unconventional business model because the company is created with clear sustainability values, prioritizing the environmental and social part and originating a sustainable business model. However, the current means to capitalize on their work are not enough to keep the company afloat, as they depend on founding to keep existing after eight years of operations.

Lastly, textiles are in general products that do not hold much value added, as they serve as the raw material for other industries like fashion or upholstery that will add much value with a more elaborated product incorporating textiles. For instance, one of its clients *Dressed by haer* a local fashion designer, sells a dress made with one of their fabrics at a 229€ price point (Dressed by haer, 2022), while they sell the fabric for 19.20€/m (TextileCompanyStudied).

6.4.2 Generation of profit

Revenue is the money made by an organization and profit is the money left as a result of subtracting all expenses and costs generated (Boyte-White, 2021). The relationship between these concepts is explained in the next formula.

$$Profit = Revenue - Costs$$

To increase profit yields or maximize profit in an organization, two strategies could be applied. Following the formula, if costs are reduced more profit will be generated. Another option is to increase the revenues assuring that costs do not increase proportionally. Ideally, companies must combine both approaches, so that revenues are increased and costs minimized (Fred, 2017).

To be able to exist on its own, TextileCompanyStudied should reduce its incurred costs while increasing and diversifying its revenue streams. The latter can be done by adding more value to their products and services (Ramanujam & Tacke, 2016). This is where the circular strategies come into play, and together with the vision and goals of the company will help to uncover new avenues to foster circularity and further sustainable practices in the company while retaining a greater value to sustain its operations.

6.4.3 Suggestions drawn from the Circular Strategies

After identifying the circular strategies that TextileCompanyStudied is using in its operations in section 6.3, suggestions to improve circularity aligned with their goals are presented thereupon. Note that section 6.5 Priorities and next steps will elaborate on the fourth most promising strategies further proposed in this section. The application of the tool to ideate potential improvements can be found in Figure 15. It shows in detail the strategies, with the vision goals, points to improve uncovered in the current business model, solutions and partnerships proposed. The strategies suggested start from the top left and go from left to right, and top to bottom.

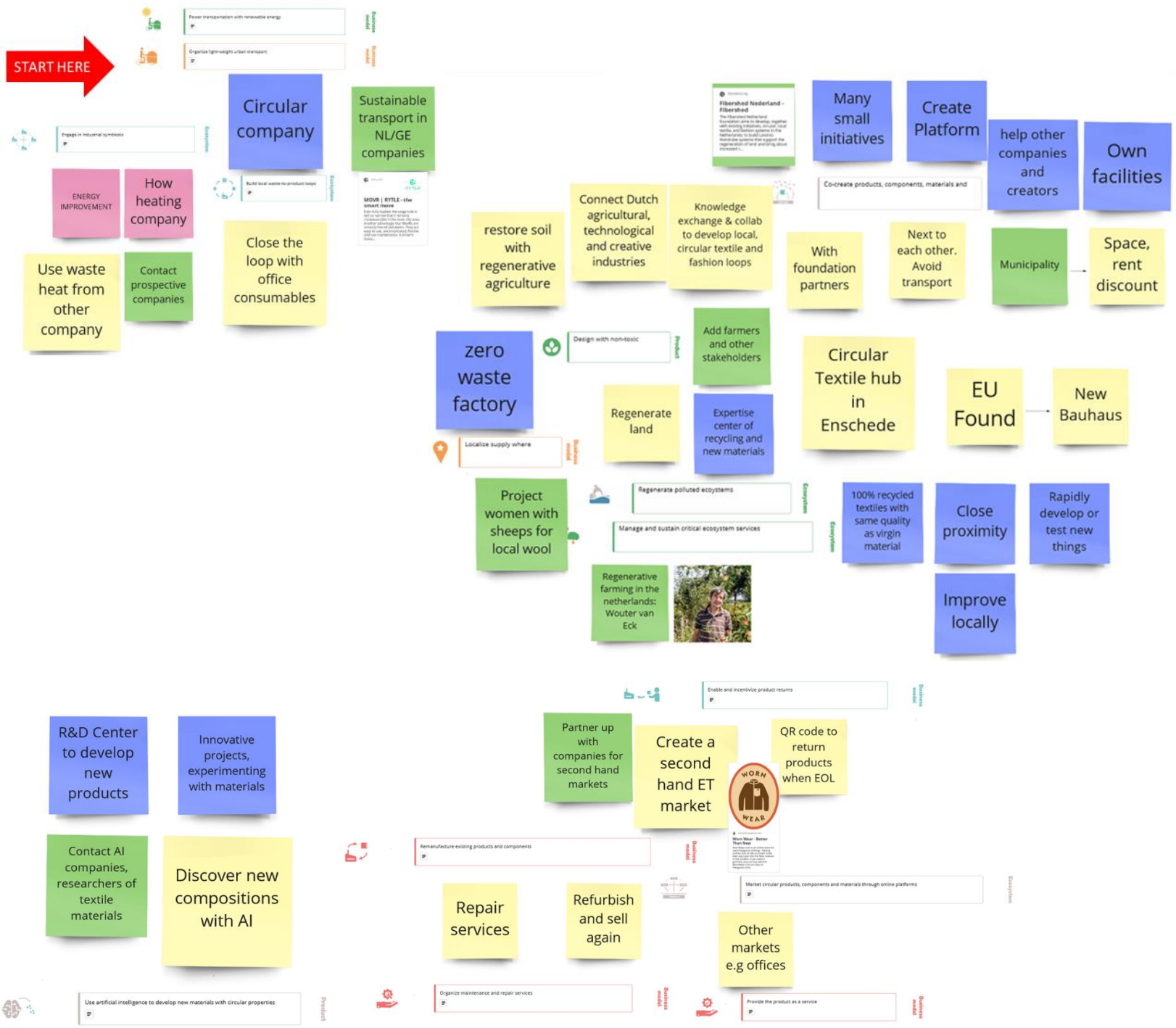


Figure 15: Circular strategies proposed for the company

Legend: Blue: Vision goals, Green: Partnerships, Yellow: Ideas suggested, Pink: subject to Improvement

Figure flow: Starting at top left. Left to right, top to bottom

1. Circular company

From the strategy *Build local waste-to-product loops* this idea serves as an inspiration for the current study. This strategy revolves around creating value from the waste generated locally in one facility and selling back that product to the facility (Krikke et al., 2004). It is currently used by TextileCompanyStudied through *Custom Made* projects to manufacture textiles from the waste of their clients, helping their clients to close the loop of their operations.

Regarding closing the loop of their own operations, TextileCompanyStudied tackles already the energy consumption from renewable sources and the office is furnished with second-hand furniture, but transport, heating, electronic and electrical equipment, and consumables of the office are still aspects to improve.

Several studies have demonstrated that the greatest impact derived from office activities is energy consumption. Gaidajis and Angelakoglou (2011) have found that in an office of similar characteristics to the one TextileCompanyStudied has, the energy consumed accounts for more than 80% of the impacts, of which more than 50% comes from heating. In that study, heating and cooling come from air-conditioning, whereas in the case of TextileCompanyStudied an industrial electrical heater is being used. These results are also aligned with the final energy consumption in the residential sector by use in the EU, considering offices energy consumption closer to a household than industrial energy demand, where 63.6% of the energy consumed comes from space heating (Eurostat, 2019). With these data in mind, office heating must be one of the priorities of TextileCompanyStudied to achieve the goal of a circular company as it potentially hinders significantly its achievement.

Regarding transport, depending on the type of transportation mode, weight, and distance, the impacts associated with cargo vary (OECD, 1997). A recent study commissioned by the European Environment Agency and studying the GHG emissions associated with passenger and freight transport from 2014 to 2018 in the EU, shows that air and road transport have the greatest emissions per ton kilometer and rail, waterborne and maritime freight account for the lowest (Fraunhofer ISI et al., 2020). TextileCompanyStudied transportation modes are only inland transportation. They also opt for bicycle transportation if weight and distance allow and do not offer express deliveries. However, they do not have much control over the type of transportation mode the shipping company uses. They only ask shipping companies the type of fuels they use to run their operations.

Based on the information above, the following ideas are suggested by the researchers of the current study:

- Heating energy improvement

  The strategy *Engage in Industrial Symbiosis* could potentially solve making the heating of the office more sustainable. This strategy covers the exchange or share of by-products among surrounding companies (Herczeg et al., 2018). Using waste heat from other nearby companies is an excellent alternative to conventional heating systems (Butturi et al., 2019). By doing so, the heat that otherwise would be considered a waste, a by-product without any economic value is now recovered and kept in TextileCompanyStudied operations, favoring the circular approach (Achterberg et al., 2016; MacArthur, 2013).

  One of the most successful examples to date of this practice is the Kalundborg Eco-industrial Park (Jacobsen, 2006). The Kalundborg Park saves annually 100GWh of energy, 87,000 of materials, and 635,000 tons of CO_2 (ENGIE Impact, 2022). As it happens in Kalundborg, by engaging in industrial symbiosis, the waste heat of one company could be employed as the heat source for TextileCompanyStudied reducing significantly the impacts associated with heating.

- Clean transport

  From the strategies *Power transportation with renewable energy* and *Organize light-weight urban transport* this idea is generated. *Power transportation with renewable energy* covers to run the transport needed with renewable energy. Picnic is an online supermarket that uses lightweight electric vehicles to deliver its products to its customers (Picnic, 2022). *Organize light-weight urban transport* corresponds to opt for lighter transportation modes. Lighter vehicles need less energy and materials to transport goods. RYTLE offers a lightweight vehicle solution with more than 200 kg load developed for urban transport (RYTLE, 2022).

  Looking for sustainable transport alternatives in Dutch or German companies (since TextileCompanyStudied operates close to the border) is key to shifting the transportation of goods to cleaner alternatives. Contacting RYTLE could be an option for deliveries to closer clients, since the maximum weight they deliver is 30kg (RYTLE, 2022). The challenge remains with the yarns coming from their EU suppliers. It is recommended to opt for rail freight as it holds the lowest environmental impact (Fraunhofer ISI et al., 2020) and join forces with their suppliers to find more sustainable transport companies that offer more sustainable international transportation services (Brown et al., 2019).

  The implementation of clean transport allows the use of fewer consumables (fuels needed in conventional motors) and increases the use of renewable energy, contributing to the circular economy (Konietzko, Bocken, et al., 2020; MacArthur, 2013).

- Close the loop of office consumables

  After tackling the heating energy improvement and transport, the next loops to close will be electronic and electrical equipment and office consumables. In Gaidajis and Angelakoglou (2011), these loops account for 12.6% of the total environmental impacts generated. Closing the loop of office consumables and generating compost with their organic waste could be an opportunity to use this waste as the supply of other companies that may use them as a source, paving the way to become a zero waste company, generating new value from waste and increasing circularity as a result (Achterberg et al., 2016; MacArthur, 2013).

2. Zero waste factory

From the strategies *Design with non-toxic materials, Manage and sustain critical ecosystem services, Regenerate polluted ecosystems,* and *Localize supply where appropriate* this idea is generated.

Design with non-toxic materials captures the avoidance of toxic substances or materials in any company operation or product, as they tend to bioaccumulate harming the environment and living organisms (Chojnacka, 2010). *Manage and sustain critical ecosystem services* refers to getting involved in projects related to sustaining and managing the ecosystems that affect the operations of the company. Häagen-Dazs engaged in a project to establish the largest pollinator in the US. The pollination of bees is a critical action the company depends on, as it is the starting point of many ice-cream ingredients (Nestlé USA, 2017). *Regenerate polluted ecosystems* investigates to engage in projects to regenerate the polluted ecosystems that are impacting the company. The Ocean Cleanup project cleans up floating ocean and rivers' plastic pollution to help regenerating the marine habitats (The Ocean Cleanup, 2022). *Localize supply where appropriate* entails increasing the number of local suppliers. Having local suppliers decreases the impacts originated from the transport of supplies. *Dig Inn* has localized its supply chain allowing them to reduce transportation and boosting the local economy (Dig Inn, 2022).

TextileCompanyStudied is nowadays opting for natural fibers instead of synthetic, however it still includes some percentages of synthetic fibers in its textiles. To make the textiles compostable and restore the soil, no hazardous chemicals must get into the soil. Therefore, it is advised to eliminate all synthetic textiles production in addition to engaging with regenerative farming and local sustainable farmers, as they help to supply the local yarns TextileCompanyStudied relies on. For instance, free-range sheep keep the land balance, offering weed control and fertilizing soils while providing the local wool TextileCompanyStudied would use in its operations. Circularity is increased as a result because the practices are focused on sustaining and managing natural ecosystems through the use of non-toxic, renewable, and local materials while closing the loop (Konietzko, Bocken, et al., 2020; MacArthur, 2013). This example will be further elaborated on in the next point.

3. Circular textile hub

This idea comes from the combination of the strategies *Co-create products, components, materials and information via online platforms; Localize supply where appropriate; Manage and sustain critical ecosystem services* and *Regenerate polluted ecosystems.*

Co-create products, components, materials and information via online platforms looks into creating online platforms to collaborate and realize circular materials, components, or products (Konietzko et al., 2019). *Localize supply where appropriate* entails increasing the number of local suppliers. Having local suppliers decreases the impacts originated from the transport of supplies. *Dig Inn* has localized its supply chain allowing them to reduce transportation and boosting the local economy (Dig Inn, 2022). *Manage and sustain critical ecosystem services* refers to getting involved in projects related to sustaining and managing the ecosystems that affect the operations of the company. Häagen-Dazs engaged in a project to establish the largest pollinator in the US. The pollination of bees is a critical action the company depends on, as it is the starting point of many ice-cream ingredients (Nestlé USA, 2017). *Regenerate polluted ecosystems* investigates to engage in projects to regenerate the polluted ecosystems that are impacting the company. The Ocean Cleanup project cleans up floating ocean and rivers' plastic pollution to help regenerating marine habitats (The Ocean Cleanup, 2022).

In the hub, they are the leading-edge research in textiles company. The Municipality acts as a facilitator, providing space for the stakeholders and renting discounts to enable the network growth. These types of incentives have been already proven to lead to circular hubs and foster circularity entrepreneurship in other Dutch cities like Rotterdam (BlueCity, 2022). The initiative could be also subsidized by EU founds like the New European Bauhaus, where a diversity of stakeholders would join, connecting people across different disciplines like arts, education, science, or architecture (EU-Commission Joint Research Centre, 2022).

Besides, the hub is designed to create a balanced healthy and resilient space, where soil is restored and sustainable farming and agricultural practices take place. These practices are inspired by the strategies *Manage and sustain critical ecosystem services* and *Regenerate polluted ecosystems* by restoring polluted ecosystems, but are also a key part of managing and sustaining critical ecosystems which TextileCompanyStudied depends on, allowing them to supervise and ensure local raw materials in their production; benefiting the community, environment and avoiding transport expenses.

Lastly, circularity is increased as a result because the practices are focused on sustaining and managing natural ecosystems through the use of non-toxic, renewable, and local materials while closing the loop (Konietzko, Bocken, et al., 2020; MacArthur, 2013).

All of the above is shaped by taking the following ideas into consideration:

- Create association with local textile-related companies and farmers

  To ensure local yarns, fair practices, and a positive impact on the environment, any company must go a step further. Collaboration is a capital part, where every stakeholder brings their expertise and greater outcomes are delivered (Brown et al., 2019). TextileCompanyStudied is already comfortable seeking help and collaborating with many partners. When they had the opportunity to buy a spinning machine, they decided to intensify their collaborations with spinning mills and set up programs instead. They opt for a vertical approach where the company is specialized rather than the horizontal approach where the company embeds all the processes. Quoting verbatim their words: "We are weaving experts and we shouldn't do it all, we should collaborate smart". Hence, creating an association or expanding the existing foundation to more stakeholders is recommended to keep adding value to their operations.

  Besides, the food and textile industry are intertwined. Sheep for instance produce raw materials for both industries, at the same time free-range sheep keep the land balance, offering weed control and fertilizing soils naturally (de Otálora et al., 2021). To continue expanding on and generating new opportunities for stakeholders outside of the current network of TextileCompanyStudied, with the objective of a Circular Textile Hub in mind, local farmers are needed to close the loop. Up until now, efforts have been made to ensure access to raw materials from multiple sustainable suppliers and more recently with a local farmer to replace German wool with Dutch wool. Thus, the strategy *Localize supply where appropriate* is further developed when creating the association.

- Create a collaborative platform

  From the strategy *Co-create products, components, materials and information via online platforms* this idea is generated. This strategy looks into creating online platforms to collaborate and realize circular materials, components, or products (Konietzko et al., 2019). Apart from community building and other activities to make the actors of the hub interact and collaborate in innovative projects, the fact of having a platform where all projects are visible and other people can reach out and join them, is an effective strategy to gather all initiatives in one place and have a greater impact together. In this way and linked with the previous point, new connections are established easier and the network expanded as a result. Lastly, this idea is directly tackling the goal's vision to have a platform where many small initiatives are collected.

4. **Subscription and leasing + maintenance**

Combining the strategies *Organize maintenance and repair services* and *Provide the product as a service* this idea is generated. *Organize maintenance and repair services* touches upon making products last longer by offering repair and maintenance services. It has been used by companies like Patagonia, to increase their products lifetime (Xiong & Chen, 2018). *Provide the product as a service* keeps the ownership of the product in the company and is the usage of the product and the results that are offered. The company MUD Jeans offers to pay for the performance of their jeans, leasing them for a monthly fee instead of owning them (MUD Jeans, 2022).

In this case, the idea for TextileCompanyStudied would be to look for different markets to offer the products as a service while offering maintenance of the products. For instance, upholstery and furniture are currently offered as a service for offices in the Netherlands, as it is the case for the company Ahrend (Mont et al., 2021).

In this manner, circularity is strengthened because repairing and maintenance strategies extend the lifetime of products, reducing the amount of products needed and keeping the highest economic value possible (Achterberg et al., 2016) and with leasing, fewer products are needed as well and it encourages that companies extend the lifetime of the products offered to their customers (Konietzko, Bocken, et al., 2020).

5. **Add maintenance and repair services**

The strategy *Organize maintenance and repair services* creates a new revenue stream. This strategy touches upon making products last longer by offering repair and maintenance services. It has been used by companies like Patagonia, to increase their products lifetime (Xiong & Chen, 2018).

The greatest advantage TextileCompanyStudied would have by offering maintenance and repair services of their fabrics is that value is added avoiding the production monetary costs, which represent the highest cost of the company. It adds another source of income to the company and from an environmental perspective, products extend their lifetime and fewer materials are needed. Besides, it strengthens the circularity of the business model as repairing and maintenance strategies extend the lifetime of products, reducing the amount of products needed and keeping the highest economic value possible (Achterberg et al., 2016).

6. **Application of AI**

From the strategy *Use artificial intelligence to develop new materials with circular properties* this idea is generated. This strategy entails using artificial intelligence to analyze datasets of material properties and structures and suggest novel

alternatives based on circular conditions (Ellen MacArthur Foundation, 2019a). The EU project Accelerated Metallurgy uses AI to speed up the ideation and testing of novel metal allows (Cordis, 2022).

To realize the vision of a leading-edge research center of textiles, most recent technology developments are commonplace. TextileCompanyStudied is used to go several steps further in innovation. Their focus is currently on testing products and different compositions, from laboratory experimentation to the field. However, to innovate in materials many companies are making use of artificial intelligence to develop new materials. This could also be an opportunity for TextileCompanyStudied to accelerate the development of novel compositions while reducing the time and effort derived from physical testing, only strategically testing the most promising compounds the AI machine suggests based on circular design requirements.

By applying this strategy, circularity is fostered because it makes use of data extracted through technology to help developing the circularity of the final product (Konietzko, Bocken, et al., 2020).

7. Create a second-hand market for their products

The strategies *Remanufacture existing products and components*, *Enable and incentivize product returns, Market circular products, components and materials through online platforms* and *Organize maintenance and repair services* originated the idea of creating a second-hand market with the product of the company.

Remanufacture existing products and components comprises the reuse of components in the manufacturing process coming from the collection of disposed products (Mont, 2008). *Enable and incentivize product returns* entails assuring the recovery of products sold by the company, so that the materials do not leave the loop (Wastling et al., 2018). *Market circular products, components and materials through online platforms* covers how online market platforms could be used to trade circular materials, components, or products (Konietzko et al., 2019). *Organize maintenance and repair services* touches upon making products last longer by offering repair and maintenance services. It has been used by companies like Patagonia, to increase their products lifetime (Xiong & Chen, 2018).

The idea is to recover their products once the customer wants to get rid of them. If necessary, these would be previously refurbished and reselled afterwards through an online platform. This practice has also the advantage of avoiding the production costs, as only repairing services might be needed. With this aim, a QR code included in the label of the product is recommended, to ease the process of returning it when it is not used anymore. In this way, the product is kept in the loop, holding its value after the customer decides to discard them, and improving as a result the overall circularity (Achterberg et al., 2016; MacArthur, 2013). An

example of this practice can be found in Teemill products (Ellen MacArthur Foundation).

This strategy has been used by Patagonia in their Worn Wear initiative. Worn Wear is a platform to buy or sell second-hand Patagonia items. Once the customer does not use a garment anymore, the item is traded in a Patagonia store. Patagonia will take care of the garment and make it available for a lower price. The customer who trades the item gets credit to buy something new or preloved in a Patagonia store. Lastly, the customer interested in second-hand Patagonia items buys these on the platform at a reduced price (Worn Wear, 2022).

6.4.4 Further suggestions

In addition to the ideas derived from the circular strategies, some aspects of how they monetize their value proposition are suggested to change with the aim of reducing incurred costs and increasing the share of value they extract (Fred, 2017). These are faster to implement than the circular strategies, as it only addresses little corrections on what they are currently doing that can be implemented straightaway as they do not rely on any stakeholder and just their own decision-making.

8. Services

- Consulting services

Meetings with clients are both time and labor-intensive. Currently, when developing a *Custom Made* or *Made to order* product, these hours are not being monetized as part of the process flow. On many occasions, the client could opt to not continue the process or the project proposed is unfeasible, resulting in a great loss for the company. Therefore, it is recommended that these hours are also accounted as consultancy hours. In this way, the first meeting and the rest of the meetings would be charged as consulting services so that the incurred expenses are covered.

- Students and group excursions

Part of the societal labor of TextileCompanyStudied is to raise awareness and to explain students and other societal groups the impact of the current textile industry and how textiles are made in its factory. The excursions are both time and labor-intensive. Therefore, it could be considered to ask for a fee per person when these visits take place.

9. Reduce the risk and expenses

During its operations, TextileCompanyStudied takes on many risks and expenses. For instance, the expenditures incurred in the meetings with clients with an uncertain outcome as discussed in the *Consulting services* point. Consulting services, but many others are undertaken.

- Block order

The company prefers to manufacture in block. In this way, they can create many meters of textile at once that the customer anticipates using for a time period, usually a year. The order is then placed and the customer only pays per roll they consume during the year, allowing them to pay the rolls once they sell their products. However, TextileCompanyStudied is taking all expenses involved to start the manufacturing process before any prior revenue, putting a bigger pressure on their budget. Therefore, it is recommended to change this practice so that an upfront payment or a higher portion of the order is asked in the first invoice to start production.

- Charge the customers for the complete product

Nowadays TextileCompanyStudied is not charging their clients for the labels they add to their B2C products. They are including them as part of their marketing budget. However, customers expect a label and are happy to purchase from a company that is aligned with their values. This information was drawn from the interview, as customers expect more storytelling and branding from the company and TextileCompanyStudied is considering if they should opt for a greater branding strategy by adding logos or patterns to their own textiles. For this reason, it is encouraged to not take on the costs of any labels and include that as part of the final product, as it also adds value and helps in building the personal branding of their customers (Zarkada, 2012), adding value to them and creating an emotional connection (Thomas, 2007).

10. Boost Storytelling

The storytelling of the company is quite particular and strong. However, this is not exploited to the fullest even though in the interviews conducted it was stated that their customers expect more storytelling and branding from the company. It is proven that consumers use brands and products to add to their own storytelling (Woodside et al., 2008). Therefore, we encourage TextileCompanyStudied to show how they make it possible with all the actors needed in the process, the company pillars (craft, innovation, quality, and sustainability) combined with the memories of the past as having the last remaining weaving mills in the region to deliver a complete and authentic story with an emotional bond. This could be done in a movie advertisement with the rest of the companies for instance.

6.5 Priorities and next steps

In order to shift the current sustainable business model toward a more sustainable business model that is aligned with the vision of the company and the circular strategies, the next steps are recommended to implement. The recommendations are focused on increasing revenues and decreasing costs to increase the overall profit (Fred, 2017), as this is one of the main problems encountered in the business model

causing a vertical incoherence in the TLBMC (see section 6.1.4) while improving circularity (Konietzko, Bocken, et al., 2020).

The priorities go from short-term (less than a year) to long-term implementation (more than a year). The order of the priorities' rationale is explained in each priority, following an ascending number where the lowest the number, the higher the priority.

6.5.1 Boost Storytelling

Storytelling for TextileCompanyStudied helps in two ways. It targets clients who value sustainability, craftmanship, and local and ethical production. It helps building trust and customer relationship, finding new partners and prospective customers aligned with any of the values the company holds. This can be explained because their customers use TextileCompanyStudied and its products to add to their own storytelling (Woodside et al., 2008), building upon the authenticity and the emotional bond to give more value to their products and differentiating themselves from the competition. The clients of TextileCompanyStudied customers will get a unique product, which will increase their customer attraction and gain market share as a result (Bowonder et al., 2010).

In the interview, it was stated that they need to increase their sales and that they struggle to have clients, but once they gain them it is very rare that they do not retain them. This strategy will affect directly customer attraction and retention, as the final product and its particular value proposition are unique in the market. Emphasizing the value that they create not only for the environment and society, but also for their clients by having a unique business model is crucial to gaining new customers and increasing their sales and revenue as a result. For this reason and because it is a strategy that can be executed in less than six months, this is the first strategy the company should prioritize.

6.5.2 Offer repair and maintenance services

From an economic perspective, it adds another source of income to the company and from an environmental perspective, products extend their lifetime and fewer materials are needed. Besides, it strengthens the circularity of the business model as repairing and maintenance strategies extend the lifetime of products, reducing the amount of products needed and keeping the highest economic value possible (Achterberg et al., 2016).

TextileCompanyStudied owns at least one sewing machine to finish the products they sell in the webshop in their B2C products. For the sales volume that they have, they could use the same machine to offer repair and maintenance services. In the interview, it was stated that they would like to improve the post-purchase customer service. This is an excellent way to start doing so, building trust in the company (Bozic, 2017) and emotional attachment to the repaired products (van den Berge et al., 2021) while increasing the revenues. Organizing repair and maintenance services

will take longer to develop, as it is definitely not as fast as the previous strategy proposed. But TextileCompanyStudied already has the space and the tools to implement it in less than one year and it is crucial for the company to prioritize finding alternative ways to generate income to continue existing and not depending on founding. That is why this strategy is proposed to prioritize next.

Logistics would be the main part to undertake. The main communication channels of TextileCompanyStudied are the phone and email, being the phone the most used. In the interview, it was also stated that the phone rings quite a lot and they are many times overloaded. It is employed to get in contact with the company at any stage of the sales process, to run the production, and assist customers' complaints. To avoid the overload, it is advisable to separate both channels of sales and customer service to reduce the pressure on the main communication channels that TextileCompanyStudied has by adding a separate phone line and/or form on their website for instance. Lastly, the shipping of the damaged and repaired product is handled. This can also be done by the same companies that they use for shipping purposes in their operations.

6.5.3 Create a second-hand market from returned products

Together with the previous point, a market is established. The discarded products are sent back to the company and there are refurbished if necessary and sold again on the website of the company with a reduced price. The logistics start by scanning a QR code that generates a post label to send the item back to TextileCompanyStudied, mimicking the strategy used by Teemill. In this way, the product is kept in the loop, improving the overall circularity (Ellen MacArthur Foundation). An example of this practice can be found on DSM-Niaga products as well (Mont et al., 2021). Once the item arrives at TextileCompanyStudied, repair services are performed if necessary. Then the product is uploaded to the online second-hand webshop with a reduced price and the customer earns a voucher to spend on the next purchase on any of the webshops of the company.

The major benefit from an economic point of view is that the customer also becomes a supplier for the company adding an additional revenue stream while eliminating the costs coming from the production of the good, which are the greatest costs TextileCompanyStudied has as stated in the interview. In the worst-case scenario where the item cannot be repaired, refurbished, or repurposed (turning them into other products), the foundation partners will come into play and the recycling process will start. Figure 16 shows the resource loops of the company. From an environmental perspective, handling the end-of-life of their products results in zero waste from textile waste contributing to the goals of zero waste and circular company. In this way, the products manufactured are kept in the loop, holding their value after the customer decides to discard them and shifting the paradigm from a linear to a circular economy as a consequence (Achterberg et al., 2016; MacArthur, 2013).

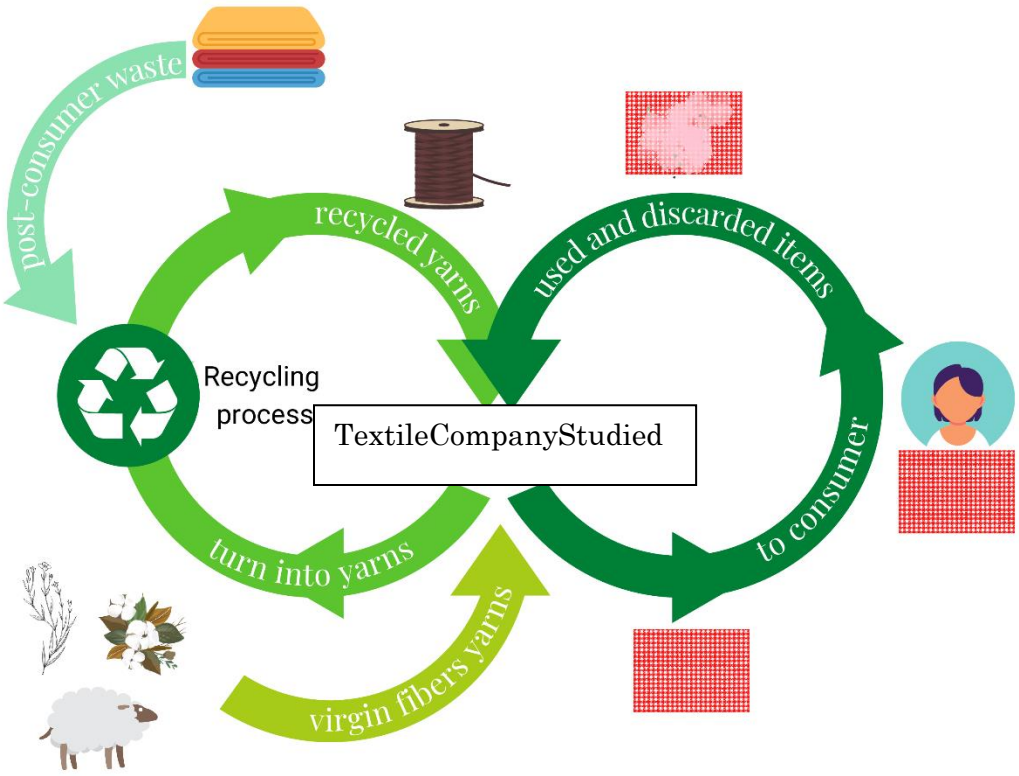


Figure 16: Current (left) and proposed (right) supply chain loops of TextileCompanyStudied

This strategy has been proposed after establishing the repair and maintenance services, because it will be embedded in the logistics to make the second-hand market a reality. TextileCompanyStudied will need to perform many other tasks to set up the whole recovery and selling system, although it is not a complex deployment and they should be able to establish it within a year, in the short-medium term. Starting by information explaining how the process works will be provided through the webpage of the company and in person to the regular and prospective customers. The new second-hand webshop page will be created (or a new section of the existing one) with the second-hand products available. QR codes will be printed on the labels and vouchers will be designed. The credit of the vouchers will also need to be decided taking into account the margins that TextileCompanyStudied considers appropriate and the cost of shipping. Lastly, as the textiles already manufactured do not have the QR code printed, it is recommended to spread the word among the former customers so that those fabrics can also be recovered in case customers decide to discard them.

6.5.4 Heating energy improvement

Engaging in industrial symbiosis is not a quick fix. It requires considerable time, effort, and investment to make it a reality but the results obtained are worth the effort. It can be classified as a long-term strategy, of more than one year. However, energy is a high priority on the agenda of TextileCompanyStudied. This is because it is a major environmental and economic burden for the company because of their

current energy system expenditures. This is why this strategy has been included in the priorities ultimately. By engaging in Industrial Symbiosis, the heat that otherwise would be considered a waste without any economic value is recovered and kept in TextileCompanyStudied operations, favoring the circular approach (Achterberg et al., 2016; MacArthur, 2013).

One of the most successful examples to date of Industrial Symbiosis is the Kalundborg Eco-industrial Park, where the exchange of a share of by-products among surrounding companies has been done since 1972 (Jacobsen, 2006). The Kalundborg Park saves annually 100GWh of energy, 87,000 of materials, and 635,000 tons of CO_2 (ENGIE Impact, 2022). Figure 17 depicts the exchanges of waste water, energy, and materials among the firms of the Kalundborg Park.

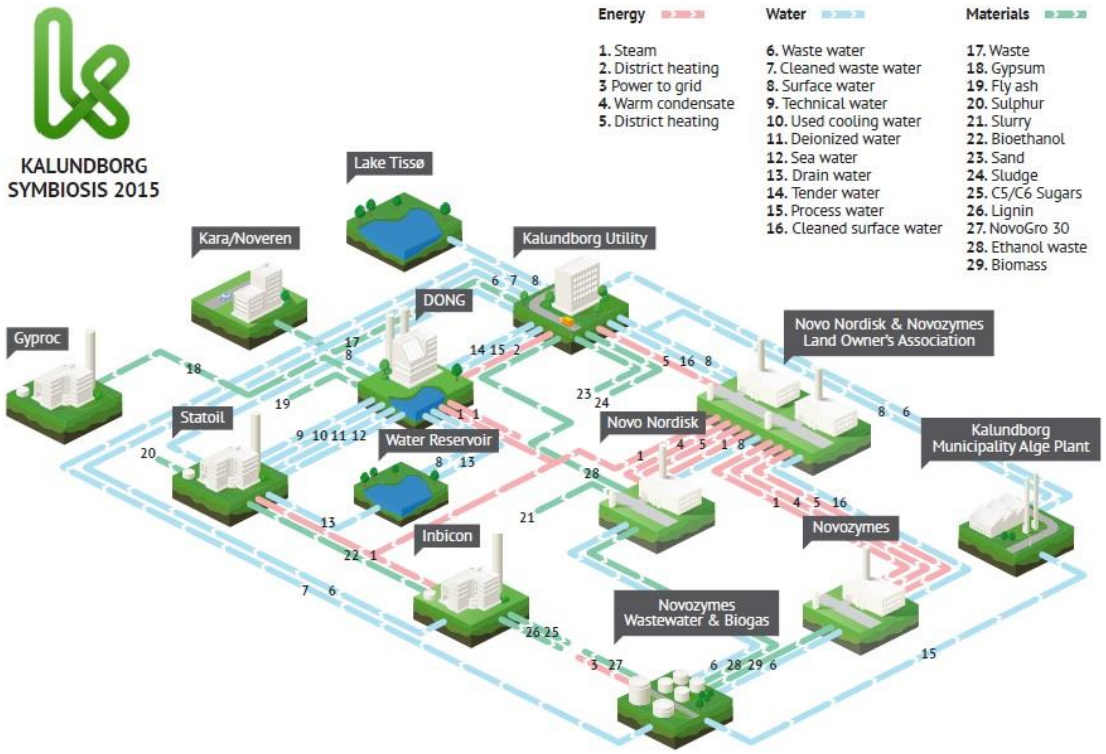


Figure 17: Industrial Symbiosis in Kalundborg. Detail of the network and resource exchanges

(Kalundborg Symbiosis, 2015)

The same logic could be applied in TextileCompanyStudied to pursue the objectives of circularity and zero waste further, closing the loop of waste heat in nearby companies, as it has been proven as an excellent alternative to conventional heating systems (Butturi et al., 2019; Herczeg et al., 2018). Collaboration is key in this strategy, finding suitable companies that have waste heat available. Once it is found, the

logistics to construct the network will start. As this requires a high investment, it is recommended to link this project to the development of the Circular Hub, taking into consideration in a bigger space with many other companies the waste flows and creating the appropriate network. Thus, finding a suitable partner with excess heat among the partners of the Circular Hub would be highly recommended.

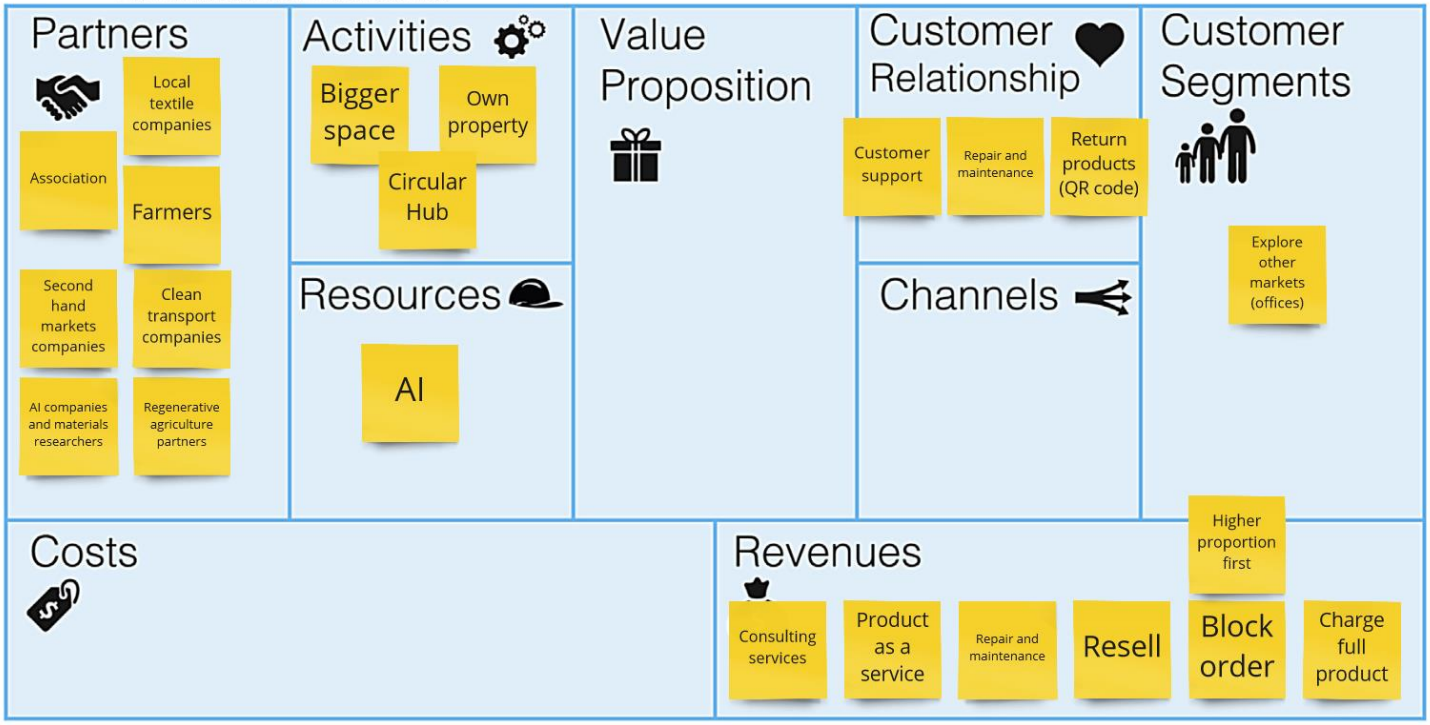
One example of application of this strategy in the textile industry that proves the environmental benefits that the Circular Hub would obtain from Industrial Symbiosis is the case of the RESYNTEX project described under the archetype *Create value from 'waste'* in the Literature research section. By engaging in industrial symbiosis, the greenhouse (GHG) emissions are approximately halved compared to the emissions in the conventional scenario (Magaud, 2019). Figure 13 shows the corresponding GHG emissions.

6.6 Future business model proposal

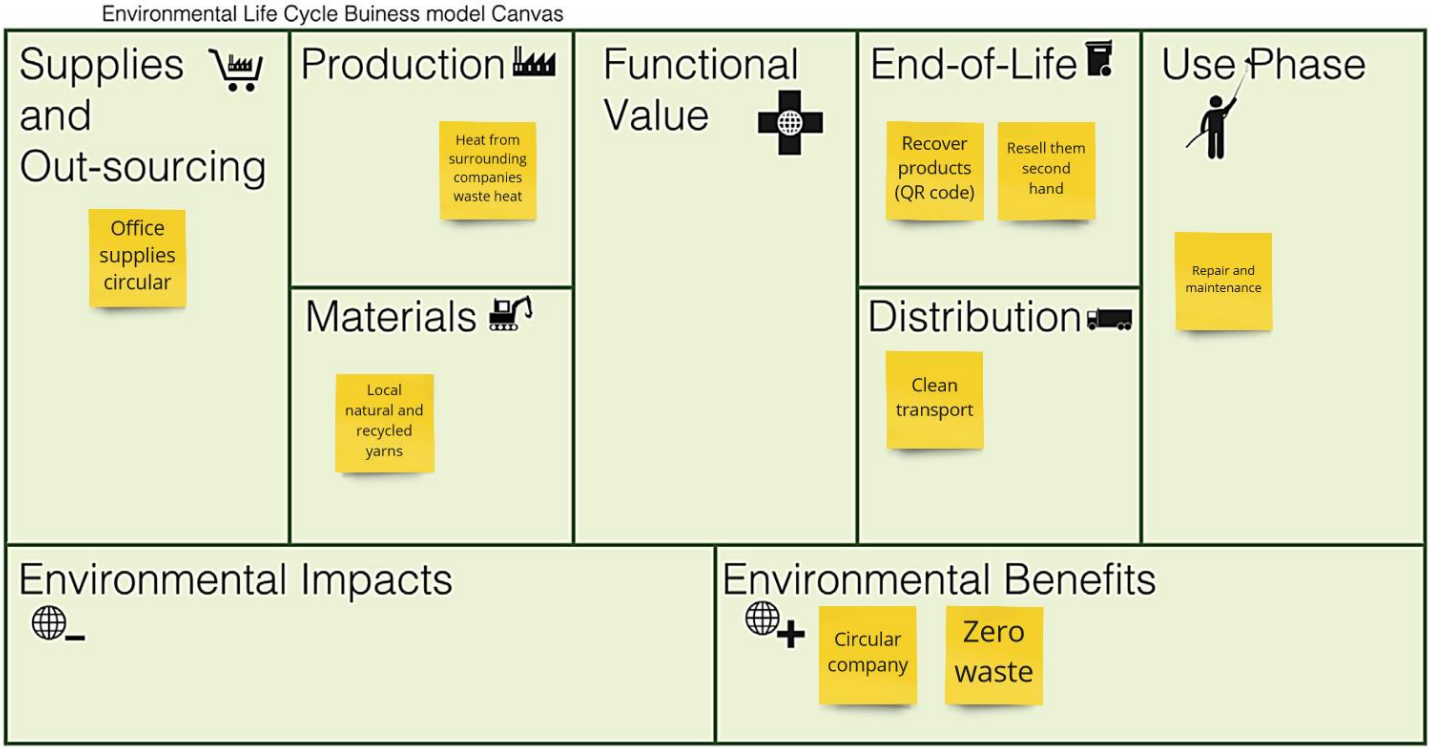
Together with the vision and the current business model improvements considerations of section 6.4, the proposed future business model is built using the TLBMC. Figure 18 shows the future business model. Note that only the changes and additions to the business model are included for the sake of clarity.

As can be seen in Figure 18, the information displayed in the future business model is qualitative. This is because the data obtained in the research and its nature were mainly qualitative as well as the goals and the solutions proposed from the Circular Strategies in Figure 15. The Circular Strategies serve as the starting point to complete the current business model so that new strategies can be implemented and in the long run the future business model will incorporate all the suggestions included in sections 6.4.3 and 6.4.4. It is recommended however that for further research more quantification takes place. For instance, measuring the environmental impacts including the heating impact would shed more light on the magnitudes the company is dealing with to find suitable lower impact alternatives and ultimately reaching their zero emissions goal (Das et al., 2022).

Economic Business model Canvas



Environmental Life Cycle Buiness model Canvas



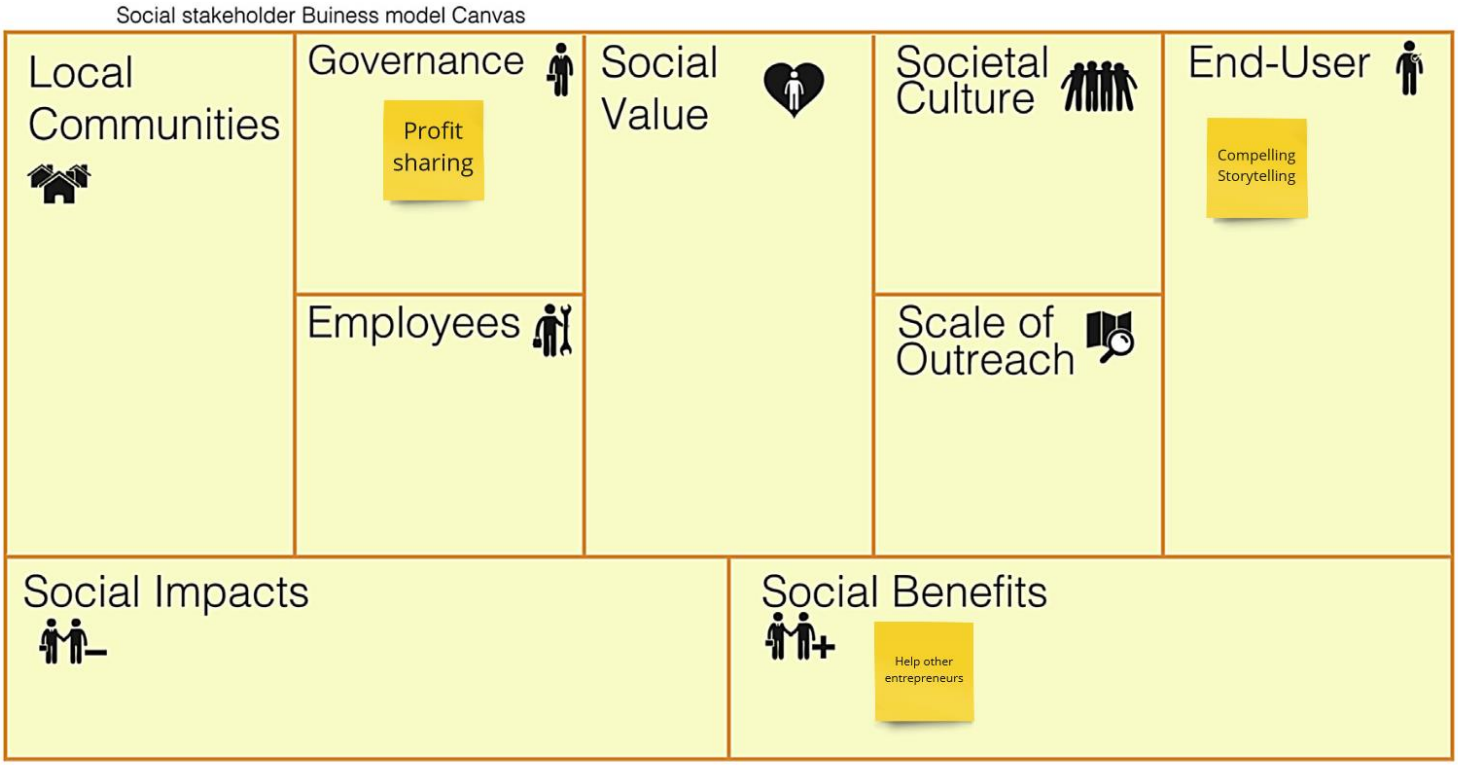


Figure 18: Future sustainable business model

The main additions to the business model are described hereafter.

6.6.1 Economic layer

Partners. This section comprises the key partnerships that are needed to reduce risk and optimize operations. The new partnerships needed toward the vision of the company are local textile companies and farmers, regenerative agriculture researchers and practitioners to realize the Circular Hub long-term project; online second-hand platform creators' companies to make the creation of a second-hand market possible; clean transport companies to shift toward clean shipping; and AI companies and materials researchers to apply AI in the R&D of the company. The Municipality and EU have not been included because they were already included in the current business model, although they are necessary to realize the Circular Hub project.

Activities. This section comprises all that is needed to perform to execute the value proposition. Regarding activities, the future business model is characterized by the ownership of property, a bigger space, and the activities that are carried out in the Circular Hub (for instance R&D of new textiles compositions, wool supply from local sheep, etc.).

Resources. This section corresponds to anything that is needed to create value for the customers. The main resource that is added to the business model is nonmaterial resources, from the knowledge of artificial intelligence applied to textiles.

Customer relationship. This section describes the type of relationships the company wants to create or has established with its customer segments at any stage of the production, sales, distribution, or post-purchase process. The main addition to the customer relationship is having a customer support service. The inclusion of repair and maintenance services and the QR code to return products are also included.

Customer segments. This section corresponds to the customers that the company is targeting. The customer segment added and suggested to explore is offices, offering their range of products as a service.

Revenues. This section involves all different ways how the company is generating income from its customer segments (its revenue streams) as well as how customers are currently paying or would prefer to pay (pricing strategies) and what customers are valuing more and have more willingness to pay for. To increase profitability in the future, some revenue streams have been suggested to monetize part of the value that the company is generating for its customers. These are: Consulting services, offering the product as a service, repair and maintenance services, resell refurbish products, block orders with a higher proportion in the first invoice, and charging customers for the full product (the label too).

6.6.2 Environmental layer

Supplies and out-sourcing. This section refers to the environmental impacts of the rest of the activities or materials that are not core to delivering the functional value but are necessary to deliver it. They can be embedded as part of the company's action or outsourced to third parties. In the future business model, office supplies are closed in the loop, leading to a decrease in the impacts originated by them.

Production. This section refers to the impacts associated with the actions performed to manufacture products and/or provide services. The most relevant addition of the future business model would be to heat the office using waste heat from surrounding companies, solving one of the main issues the company is struggling wishes to improve.

Materials. This section refers to highlighting the most relevant materials used by a company and its environmental impacts. Materials will be mainly local natural and recycled yarns.

End-of-life. This section refers to the impacts associated with the products once the consumer decides to discard them. It is intended to support companies in expanding their responsibility beyond the lifetime of their products. In the future, the end-of-life is managed to a certain extent. The company recovers its own products using a QR code and can refurbish them, allowing the products to keep in the loop. Afterward, they can resell them as second-hand.

Use Phase. This section focuses on the customer's environmental impact during usage of the product or service as part of the company's functional value. It considers the

energy requirements and material intake during use as well as maintenance and repair of products if appropriate. In the future business model, repair and maintenance services increase the lifetime of products and therefore decreases the overall impact of the product during its use phase.

Distribution. This section refers to the types of transport, weights and distances traveled of the shipping involved to deliver the functional value. Cargo transport will be performed by clean inland transportation.

Environmental Benefits. This section refers to the ecological positive impact or ecological impact reduction a company has. With all the future actions in mind, the outcome is a circular company where material loops are closed and land is regenerated and any waste is being generated. Besides, clean transport is incorporated reducing substantially the impacts associated with the transportation of goods.

6.6.3 Social layer

Governance. This section refers to decision-making policies and the organizational structure the company is adopting. In the future business model, profit is being shared with organization members, as the company has become profitable.

End-user. This section refers to the consumer of the value proposition and how if by doing so, its needs are met and its quality of life improved. In the future business model, TextileCompanyStudied is doing compelling storytelling aligned with their values and work, making stakeholders prone to collaboration.

Social Benefits. This section refers to the social positive impact a company has. In the future business model, having a diverse network and a Circular Hub allows helping other entrepreneurs to realize their ideas and receive support, creating positive social value.

7. Conclusions

7.1 Sustainable crafts and sustainable textile crafts

This subsection answers the subquestion *SQ1: What are sustainable crafts and sustainable textile crafts?* Studies related to sustainability, craft, and innovation due to the resurgence of craft are quite novel areas of research. At the moment, scholars have not reached an agreement on the traits and definition of sustainable craft, but they agree on the clear connection that exists between them (Blackburn, 2009; Fletcher, 2013; Yair, 2010). The most recent description is brought by Väänänen et al. (2017) and Väänänen and Pöllänen (2020) and takes into account the description of the physical and non-physical influence on the crafted goods that affect the decisions made by the artisan related to sustainability. They define sustainable crafts as a configuration of three intertwined elements: *product, practice,* and *immaterial* craft. Craft as a *product* is defined by the techniques employed, its design, and materials

chosen. *Practice* refers to skill, ideology, and knowledge. Ideology in this context attends to responsibility and fair practices. And *immaterial* craft is composed of the values and the attitude of the artisan toward its creations, being the result of *practice* and *product*. According to the authors, *Immaterial* craft influences the process of craftmanship and ultimately the impact of the craft product on an environmental, social, economic and cultural level.

Studies examining sustainable textile crafts are also quite limited, although it has been showcased that they lead to strengthening and connecting local communities and generating local prosperity while helping reducing the carbon footprint associated with the goods that otherwise would have been produced industrially (Ferraro et al., 2011). Some characteristics of the business models that sustainable craft textiles community-centered manufacture, access to international markets by fair-trade labeling, ensuring a minimum fare resulting in a fair and stable income for employees and respect for the environment by reducing the environmental impact of dyes and waste from the textiles manufactured (Dissanayake et al., 2017).

7.2 Sustainable business models and strategies that companies that manufacture sustainable textiles use

This subsection answers the subquestion *SQ2: Which sustainable business models and strategies use companies that manufacture textiles in the most sustainable way possible?* Sustainable textile companies make use of different strategies to embed sustainability in their business model. Using the categorization of Bocken et al. (2014) by the Sustainable Business Model Archetypes, eight archetypes are distinguished and several examples are given:

1. **Maximize material and energy efficiency.** Examples in the textile industry are Continental clothing with their apparel collection EarthPositive which is 100% organic and with a reduction of 90% CO_2 emissions (Continental Clothing Co., 2022) and the use of mono-materials by Continuum a company that developed a 3D printed bikini collection from Nylon 12 (Continuum).

2. **Create value from 'waste'.** Examples in the textile industry are Teemill, a company specialized in the circular production of t-shirts (Ellen MacArthur Foundation). Regarding Industrial Symbiosis, the European project RESYNTEX employs innovative technology that creates chemical by-products from textile waste, serving as raw materials for the chemical industry.

3. **Substitute with renewables and natural processes.** Examples in the textile industry are H&M, running 90% of its operations with renewable energy in 2020 (H&M Group, 2020). Patagonia uses 100% renewable energy in its offices, stores, and distribution centers across the US (Patagonia Inc., 2022). Regarding bioinspired materials, the company Sprintex Engineering has developed a

sustainable alternative to silk by artificially synthesizing spider silk naturally. (The Biomimicry Institute, 2022).

4. **Deliver functionality rather than ownership.** Examples in the textile industry are the leasing strategy of the company MUD Jeans (MUD Jeans, 2022). Examples of the renting model are the rent of special occasion wear like Circle Closet (Circle Closet, 2022). Regarding lifetime extension of products, the company Nudie Jeans offers free repair services in their stores and free DIY repairing kits (Nudie Jeans Co., 2022).

5. **Adopt a stewardship role.** An example in the textile industry is the Better Cotton Initiative. Through a membership, stakeholders come together to ensure cotton harvesting best environmental and social practices (Better Cotton, 2022).

6. **Encourage sufficiency.** Examples in the textile industry are product durability and longevity, second-hand goods, and the slow fashion movement (Bocken et al., 2014). In the second-hand and slow fashion movement, online second-hand platforms like ThredUp or Vinted are enabling consumer-to-consumer sales (ThredUp Inc., 2022).

7. **Re-purpose the business for society/environment.** Examples in the textile industry in Europe are the company The North Circular producing premium knitwear employing mainly local skilled aging women and the lingerie company Who Made Your Pants? that employs refugee women. (Bocken et al., 2014; Pal, 2017).

8. **Develop scale-up solutions.** An example in the textile industry in Europe is the Open Garments initiative. In this project, the user customizes, orders and sells clothing items and a manufacturing network of microenterprises manufactures the goods. The online platform Open Garments provides the service to connect them (Open Garments, 2019).

7.3 Current business model of the company

This subsection answers the subquestion *SQ3: What is the current business model of the textile company studied?* The current business model of TextileCompanyStudied is depicted in Figure 14 under section 6.1. The conflicting parts that mismatch the coherence of the business model have been highlighted in bold through the different layers and are explained in section 6.1.4 Horizontal and vertical coherence.

Economic layer

Regarding *activities*, they struggle with plastic packaging in their deliveries when adverse weather conditions occur. Besides, the **weaving mill size hinders their growth**. They run their operations in the last weaving mill of Enschede, meaning that

the size of the mills and the office space are limited and do not allow them to grow. The mill is also not fully operating only for TextileCompanyStudied, reducing their working capacity and the demand they are able to meet. Regarding *customer relationship*, they do not have post-purchase customer support and wants to improve it. They mentioned explicitly that the phone rings a lot but there are not enough customers to sustain their operations. **They need more growth and sales**. Lastly, TextileCompanyStudied is not adding their hours when calculating the final price of their product. This is because the final price is already high compared to other options in the market. *Revenues* are a serious concern in the company, as they are **not profitable yet and stable**. They still depend on founding to continue existing.

Environmental layer

There is not a clear *functional value*. This is because meters are tailored to the customer's needs. The *functional value* is in this case the amount of fabric a customer consumes during a particular timeframe. The impacts associated with *production* are translated into the limited freedom they have to change regarding mills and office, because they do not hold the ownership of the property. For instance, office heating is done with an industrial electrical furnace. Lastly, **they do not grow as much as they would desire.** As mentioned before, the size of the mills and the office space are limited and do not allow them to grow. Regarding impacts of *materials*, TextileCompanyStudied is aware of the impacts of different yarns compositions and sources. Their biggest impact on materials is when yarns come from virgin cotton or virgin polyester. The *end-of-life* is not directly handled. They encourage and recommend recycling textiles to their customers and the public. However, they are not recovering their own products directly once the consumer discards them. Regarding *distribution*, they do not have control over types of cargo. They opt for bicycle transportation when weight allows and only work with inland transport. Lastly, distribution is a high priority for the company to improve.

Social layer

In the case of *governance* and the type of decision-making policies that TextileCompanyStudied has, **they would like to implement profit sharing but they are incapable of doing so nowadays** because there is no profit to share yet. Regarding *social value*. TextileCompanyStudied is avoiding companies outsourcing their operations. They create and maintain local jobs that otherwise will not exist. The *scale of outreach* is at a European level, with mainly national customers. They are investigating on expanding to other markets and have asked for aid from stakeholders operating in those markets to adapt their products. The *end-user* of TextileCompanyStudied values the authenticity of the company and the quality of its products. They would highly appreciate if TextileCompanyStudied would do more storytelling.

7.4 Potential future business model of the company considering its vision

This subsection answers the subquestion *SQ4: What could the future business model of the textile company studied look like taking into account its sustainability goals?*

The future business model of TextileCompanyStudied is depicted in Figure 18 in section 6.6. Taking into account its vision and the circular strategies, the following additions to the current sustainable model are:

Economic layer

The new *partnerships* needed toward the vision of the company are local textile companies and farmers, regenerative agriculture researchers and practitioners to realize the Circular Hub long-term project; online second-hand platform creators' companies; clean transport companies; and AI companies and materials researchers. The *activities* are characterized by the ownership of the property, a bigger space, and the activities that are carried out in the Circular Hub. The main *resource* added is the knowledge of artificial intelligence applied to textiles. The *customer relationship* incorporates a customer support service, the inclusion of repair and maintenance service, and the QR code to recover products. The *customer segment* added and suggested to explore is offices, offering their range of products as a service. The *revenue* streams suggested to monetize the value that the company is generating for its customers is done by: Consulting services, offering the product as a service, repair and maintenance services, reselling refurbished products, block orders with a higher proportion in the first invoice, and charging customers for the full product.

Environmental layer

The *supplies and out-sourcing* category has the office supplies closed in the loop. The most relevant addition in the *production* would be to heat the office using waste heat from surrounding companies. *Materials* will be mainly local natural and recycled yarns. The *end-of-life* is managed to a certain extent. TextileCompanyStudied recovers their own products and can refurbish them, allowing the products to be kept in the loop and to be sold as second-hand. The overall impact of the product during its *use phase* decreases because repair and maintenance services increase its lifetime. The *distribution* will be performed by clean inland transportation. With all the future actions in mind, the *environmental benefits* are a circular company where material loops are closed, land is regenerated, and any waste is being generated.

Social layer

Regarding *governance*, profit is being shared with organization members, as the company becomes profitable. In the future business model, TextileCompanyStudied is doing compelling storytelling aligned with their values and work, making stakeholders and the *end-user* prone to collaboration. With all the future actions in mind, the *social benefits* of having a diverse network and a Circular Hub allows

TextileCompanyStudied to help other entrepreneurs realize their ideas and receive support.

7.4.1 Circular strategies implemented in the business model

This subsection answers the subquestion *SQ4.1: Which circular strategies can be implemented in the business model?* Considering its vision and the points for improvement of the current sustainable business model, the following circular strategies are suggested:

- *Build local waste-to-product loops.* For closing the loop of their operations with office supplies.
- *Engage in Industrial Symbiosis.* Could potentially solve making the heating of the office more sustainable.
- *Power transportation with renewable energy* and *Organize light-weight urban transport*. Looking for cleaner transportation alternatives to shift the current transportation of goods.
- *Design with non-toxic materials.* Only use natural materials and avoid synthetic materials.
- *Manage and sustain critical ecosystem services* and *Regenerate polluted ecosystems.* Make textiles compostable and restore the soil through regenerative farming.
- *Localize supply where appropriate.* Engaging with local sustainable farmers to ensure access to local natural yarns and regenerative farming practices.
- *Co-create products, components, materials and information via online platforms.* Looks into having a platform where all projects are visible and other stakeholders can reach out and join, fostering collaboration.
- *Organize maintenance and repair services.* Adds a revenue stream and avoids production costs.
- *Provide the product as a service*. Look for different markets to offer textile products as a service.
- *Use artificial intelligence to develop new materials with circular properties*. Accelerate the development of novel textile compositions by only experimenting with the most promising compounds the AI machine suggests according to circular design requirements.
- *Remanufacture existing products and components.* Once the customer does not use an item anymore, the item is recovered and refurbished or remanufactured by the company.
- *Enable and incentivize product returns.* Recover the company's products once the customer wants to discard them.
- *Market circular products, components and materials through online platforms.* Offer second-hand products of the recovered items sent back by the customer and make them available in the webshop for a lower price.

7.4.2 Potential improvements uncovered by the circular strategies

This subsection answers the subquestion *SQ4.2: Which potential improvements are uncovered by the different strategies?* The improvements are focused on strengthening the gap in the economic layer while improving the overall circularity of the business model. The biggest struggle of the company is making profit.

1. Circular company. Regarding closing the loop of their own operations, TextileCompanyStudied tackles already the energy consumption from renewable sources and the office is furnished with second-hand furniture, but transport, heating, electronic and electrical equipment, and consumables of the office are still aspects to improve.

    - Heating energy improvement. The heat that otherwise would be considered waste is now recovered from a nearby company and kept in TextileCompanyStudied operations, favoring the circular approach.

    - Clean transport. Looking for sustainable transport alternatives in Dutch or German companies to shift the transportation of goods to cleaner alternatives. The challenge remains with the yarns coming from their EU suppliers. It is recommended to opt for rail freight as it holds the lowest environmental impact (Fraunhofer ISI et al., 2020) and join forces with their suppliers to find more sustainable international transportation services.

    - Close the loop of office consumables. After tackling the heating energy improvement and transport, the next loops to close will be electronic and electrical equipment and office consumables. Closing the loop of office consumables and generating compost with their organic waste is an opportunity for other companies to use it as a source, increasing circularity as a result.

2. Zero waste factory. To make the textiles compostable and restore the soil, no hazardous chemicals must get into the soil. Therefore, it is advised to eliminate all synthetic textiles production in addition to engaging with regenerative farming and local sustainable farmers, as they help to supply the local yarns TextileCompanyStudied relies on.

3. Circular textile hub. In the hub, they are the leading-edge research in textiles company. The hub is designed to create a balanced healthy and resilient space, where soil is restored and sustainable farming and agricultural practices next to textile manufacturing take place.

- Create association with local textile-related companies and farmers. To ensure local yarns, fair practices, and a positive impact on the environment, any company must go a step further. To continue expanding on and generating new

opportunities for stakeholders outside of the current network of TextileCompanyStudied, with the objective of a Circular Textile Hub in mind, local farmers are needed to close the loop.

- Create a collaborative platform. Platform where all projects are visible and other people can reach out and join them, aiming to have a greater impact together. In this way, new connections are established easier and the network expanded as a result.

4. Subscription and leasing + maintenance. Look for different markets to offer the products as a service while offering maintenance of the products. For instance, upholstery and furniture are currently offered as a service for offices in the Netherlands, as it is the case for the company Ahrend (Mont et al., 2021).

5. Add maintenance and repair services. Value is added avoiding the production monetary costs that represent the highest cost of the company. It adds another source of income and from an environmental perspective, products extend their lifetime and fewer materials are needed.

6. Application of AI. To innovate in materials many companies are making use of artificial intelligence to develop new materials. This is an opportunity for TextileCompanyStudied to accelerate the development of novel compositions, only strategically testing the most promising compounds the AI machine suggests based on circular design requirements.

7. Create a second-hand market for their products. The idea is to recover their products once the customer wants to get rid of them. If necessary, these would be previously refurbished and reselled afterwards through an online platform. This practice has also the advantage of avoiding the production costs, as only repairing services might be needed.

Further suggestions. Related only with how they monetize their value proposition more efficiently with the aim of reducing incurred costs and increasing the share of value they extract (Fred, 2017).

8. Services
    - Consulting services. Meetings with clients are both time and labor-intensive. It is recommended to charge for the meetings of *Custom Made* projects as consulting services so that incurred expenses are covered.

    - Students and group excursions. The excursions are both time and labor-intensive. Therefore, it could be considered to ask for a fee per person when these visits take place.

9. Reduce the risk and expenses.
    - Block order. It is recommended to ask for an upfront payment or a higher portion of the order in the first invoice to start production.

    - Charge the customers for the complete product. It is encouraged to not take on the costs of any labels and include that as part of the final product, as it also adds value and helps in building the personal branding of their customers (Zarkada, 2012).

10. Boost Storytelling. The storytelling is quite particular and strong. but not exploited to the fullest. It is encouraged to show how they make it possible with all the actors needed in the process. This could be done in a movie advertisement with the rest of the companies for instance.

7.4.3 Next steps and priorities toward circularity and sustainability

This subsection answers the subquestion *SQ4.3: Which next steps should be prioritized toward circularity and sustainability?* In order to shift the current sustainable business model toward a more sustainable business model that is aligned with the vision of the company and the circular strategies, the next steps have been recommended to implement. They are focused on increasing revenues and decreasing costs to increase the overall profit (Fred, 2017), as this is one of the main issues encountered in the business model of TextileCompanyStudied.

The priorities go from short-term (less than a year) to long-term implementation (more than a year). The order of the priorities' rationale is explained in detail in section 6.5, following an ascending number where the lowest the number, the higher the priority.

1. Boost storytelling. Helps building trust and customer relationship, and find new partners and prospective customers aligned with the values of the company.
2. Offer repair and maintenance services. Adds a revenue stream while improving circularity.
3. Create a second-hand market from returned products. Adds a revenue stream while improving circularity.
4. Heating improvement by engaging in Industrial Symbiosis. Waste heat from other company used as the heat source.

7.5 Findings from the company compared to the existing literature on sustainable craft textiles manufacture

This subsection answers the subquestion *SQ5: Which findings from the textile company studied can build upon or contrast with the existing knowledge on sustainable craft textiles manufacture?* The current business model of TextileCompanyStudied is a combination of multiple Sustainable Business Model Archetypes distinguished by Bocken et al. (2014), and maximizing as a result the benefits coming from the

combination of the different archetypes. The archetypes identified are: Maximize material and energy efficiency, Create value from 'waste', Substitute with renewables and natural processes, Adopt a stewardship role, Encourage sufficiency, and Repurpose for society/environment.

- Maximize material and energy efficiency. Manufacturing with local and low power consumption looms, and low impact materials like local and natural yarns. Avoidance of dying through the use of the dyes from recycled content. Create high-quality durable textiles.
- Create value from 'waste'. Use of recycled yarns from post-consumer waste.
- Substitute with renewables and natural processes. Powering their operations with renewable energy from solar panels. Natural materials are preferred over synthetic materials.
- Adopt a stewardship role. Part of the Foundation of circular textiles. Active role as an educator, promoter, and supporter of other companies in the region. Many ongoing initiatives regarding social and environmental activities.
- Encourage sufficiency. Through education, open days, and media they actively seek to educate on the textile industry and its impacts and shift the consumer behavior from overconsumption to buying less and better.
- Repurpose for society/environment. They collaborate extensively with many stakeholders (the Foundation, Suppliers, Clients, the Municipality, etc.). Most importantly, they provide local jobs and fair salaries to their employees. Although weavers are not on their payroll, they are very close to the company and they help to maintain their jobs. Some of them come from marginalized backgrounds.

Currently, the archetypes Deliver functionality rather than ownership and Develop scale up solutions are not incorporated in the business model of TextileCompanyStudied. This trend can also be noticed in other sustainable textile crafts, as they are monetized through the conventional one-time strategy instead of being offered as a service by leasing or renting. Besides, crafts are usually performed by artisans or a group of artisans in small-scale production, making harder to scale up their works, maximize the environmental and social benefits of their activities and drive overall systemic change.

The generation of income by artisans, profitability, and the analysis of the economic implications of craft activities are recurring topics in literature. In TextileCompanyStudied is also an issue of concern, as they still depend on founding to keep existing. By increasing their revenue streams and reducing costs, they should be able to increase profits, capturing more value in their sustainable business model (Fred, 2017).

It has also been found that TextileCompanyStudied benefits from the collaboration with other stakeholders and from expanding its network. In the existing literature, artisans benefit from networking with other makers and stakeholders to co-innovate and co-create (Kuhn & Galloway, 2015; Romero & Molina, 2011) and so it is the case

for TextileCompanyStudied. In fact, to pursue their vision ambitions and realize their goals they will need to continue exchanging information and collaborating with diverse groups. This is a fundamental consequence that is originated when organizations seek to pursue more sustainable practices and it has been recognized on many occasions in literature (Konietzko, Baldassarre, et al., 2020; Konietzko, Bocken, et al., 2020). In this way, local ecosystems are created, together with local prosperity. This is another commonality that TextileCompanyStudied has with the existing literature on sustainable textile crafts. Through the Foundation, they build upon the legacy of craft in the region of Enschede by preserving the skills and knowledge of weaving, closing the loop of textiles, and generating local benefits.

7.6 Sustainable business models and circular strategies potentially applicable to sustainable craft textiles manufacturers in European countries

This subsection answers the main research question *M-RQ: Which sustainable business models and circular strategies could be applied to companies that are specialized in the manufacture of sustainable craft textiles in European countries?* Considering the findings from the case study and the literature research, the next sustainable business models and circular strategies could be potentially applied to other sustainable craft manufacturing companies in Europe.

The archetype *Maximize material and energy efficiency* and the circular strategy *Localize supply where appropriate* can be applied through the selection of low impact materials like local and natural yarns and manufacturing with local and low power consumption looms, and avoiding the dying process or at least using dyes without hazardous chemicals. Besides, by creating high-quality durable textiles it is encouraged that the lifetime of the textiles is extended and fewer products are needed to meet the same consumer needs.

The archetype *Create value from 'waste'* and the circular strategies *Remanufacture existing products and components* and *Build local waste-to-product loops* can be applied through the use of discarded or recycled content, as the example of Sri Lanka's handloom industry (Dissanayake et al., 2017) or the case of TextileCompanyStudied respectively.

The archetype *Substitute with renewables and natural processes* and the circular strategies *Design with non-toxic materials, Use artificial intelligence to develop new materials with circular properties, Power transportation with renewable energy* and *Organize light-weight urban transport* can be applied by powering the company's operations with renewable energy, like H&M and Patagonia already practice and by preferring natural materials over synthetic materials like the natural spyder silk that substitutes silk from silk worms (H&M Group, 2020; Patagonia Inc., 2022; The Biomimicry Institute, 2022).

The archetype *Adopt a stewardship role* can be applied by being part of foundations, cooperatives, or programs that works at the grass-roots stage by applying more sustainable and ethical methods. In the textile industry, the Better Cotton Initiative stands out as a stewardship program (Better Cotton, 2022).

The archetype *Encourage sufficiency* can be applied through education, to actively seek to educate on the textile industry and its impacts and shift the consumer behavior from overconsumption to buying less and better, as the case study in TextileCompanyStudied and the study on sustainable textile perceptions in Finland indicate that could be an efficient method (Vartiainen & Kaipainen, 2012). The circular strategy *Market circular products, components and materials through online platforms* like Etsy, offers the opportunity to artisans to offer their products globally, increasing their level of life. However, environmental impacts due to the transport of crafted goods are increased.

The archetype *Repurpose for society/environment* can be applied by providing local jobs and fair salaries to marginalized communities. The cases in literature focusing on the societal aspect are The North Circular In the UK the company employing local skilled workers which are mainly aging women and the lingerie company Who Made Your Pants? employing refugee women (Pal, 2017; Reddy, 2014). In the case of TextileCompanyStudied, they help to sustain the weavers' jobs, coming some of them from marginalized backgrounds.

Lastly, this research has uncovered that sustainable craft textiles could benefit enormously from a PSS model since their core value is durability, high quality, and authenticity, corresponding to the *Deliver functionality rather than ownership* archetype and *Provide the product as a service* and *Organize maintenance and repair services* circular strategies, being perfectly suited for a sharing economy and reducing the amount of goods manufactured. Another sustainable business model, where the consumer has an active role in the manufacturing process by being also the supplier of discarded items once it decides to return them, is the *Creating value from 'waste'* archetype and *Enable and incentivize product returns* circular strategy. Next, the consumer actively designing sustainable products through co-creation in crowdsourcing and Open Innovation platforms, which corresponds to *Develop scale up solutions* archetype and *Co-create products, components, materials and information via online platforms* circular strategy.

8. Findings

The case study conducted reveals the following outcomes. Firstly, the current business model of TextileCompanyStudied is a combination of multiple Sustainable Business Model Archetypes distinguished by Bocken et al. (2014), maximizing as a result the benefits coming from the combination of all of them. These models are: Maximize material and energy efficiency, Create value from 'waste', Substitute with renewables

and natural processes, Adopt a stewardship role, Encourage sufficiency, and Repurpose for society/environment.

TextileCompanyStudied is devoted to sustainability and fair practices. A few problems related to environmental impacts that are also shared among other manufacturers related to transport, packaging, and end-of-life of their products were identified. However, they are aware of these points and want to solve them. One could say that conducting this study proves that point.

The major problem encountered is financial capital. It creates conflicts between the different components of the business model and is illustrated by a vertical incoherence in the TLBMC. This generates a stability threat and a company's dependency on founding to continue with their operations. This situation is generated by several causes.

The company incurs in manufacturing losses. They are not adding the total costs originated from their own working hours because they already have a quite high price point compared with the competition. The weaving mill size hinders their growth. They operate in the last remaining weaving mill of Enschede, meaning that the size of the mills and the office space are limited and do not allow them to grow. Besides, the mill operates for other clients besides TextileCompanyStudied hence the mill is not fully operating only for them, reducing their working capacity and the demand they are able to meet. In addition, they do not own the weaving mill. This hinders the freedom of choice of the founder to scale up and upgrade the current infrastructure to meet the demand of their customer. It also leads to potentially less environmental decisions, such as the choice of office heating for instance. They also take on many risks and expenses and do not make efficient use of storytelling, which is key to building trust and customer relationships and finding new partners and prospective customers aligned with any of the values of the company, potentially increasing their revenues.

These constraints do not allow them to scale up and reach a significant critical mass to surpass the break-even point and generate profit on their own. The *Develop scale up solutions* archetype touches upon this problem, where their social and environmental impact is also limited due to their size (Bocken et al., 2014).

At the same time, as TextileCompanyStudied incorporates *Encourage sufficiency* strategies through education to the public in consuming less but of better quality, is hindering their own growth based on increasing sales of their products to increase the yield of their profit, the standard economic approach in a linear economy. Even though they manufacture in an innovative and sustainable way toward circularity, the way they capture value from their customers is based in a traditional way, aligned with a linear economy. Another limiting aspect is not selling in international markets. The reemergence of craft has been possible by the inclusion of innovative technologies and techniques in the crafting process and the access to international markets thanks to IT technology and the internet (Martínez Torán, 2021). TextileCompanyStudied builds

upon the craft legacy of weaving in their region and incorporates innovation through the use of recycled yarns from post-consumer waste and a webshop. However, their strong commitment to local markets because of their sustainability strategy centered on local production, may prevent them from expanding to international markets that involve overseas shipping of their manufactured goods, reducing its opportunities to solely the European market and inhibiting major growth.

To address their economic challenges, recommendations have been given to generate profit through the reduction of costs and increase of revenues while shifting the way they capture value to a more circular economy approach that is in line with the rest of their sustainable goals and manufacturing practices. The detail of these recommendations and next steps are covered in sections 4.4 and 4.5 respectively.

As a result of applying these recommendations, the company will end up embedding the eight Business Model Archetypes that are described by Bocken et al. (2014) in its future sustainable business model, maximizing the benefit of all of them in their advantage.

9. Discussion

From the case study, the application of the eight archetypes of Bocken et al. (2014) reveals that sustainable craft textile companies might be able to also embed the existing sustainable business models in their operations and benefit from them. However, the fact that businesses develop sustainable and circular practices in their business model in a linear economy context interferes with their sustainable and circular ambition. Companies might be used to adopting traditional ways of monetizing their value proposition, like using one-time payments or consumable-based models in the case of physical goods (Aulet, 2013). These means might get short and get even obsolete in a circular economy paradigm. For instance, in the one-time model, the good is sold at once directly to the consumer, not necessarily offering any repairing or maintenance services or incentive to recover the product once it reaches its end-of-life or the consumer decides to discard them. The responsibility of discarding the product lies solely in the consumer and the value of the product decreases over a short period of time (Achterberg et al., 2016). Consumables if not designed to get returned and refilled, are also aligned with the concept of embracing consumption to increase sales, generating more waste as a result.

However, in awareness of the above, the circular economy model generates new revenue stream opportunities and gives the consumer an active role in the design and manufacture of new sustainable textile crafts. For instance, by offering PSS – corresponding to *Deliver functionality rather than ownership* archetype and *Provide the product as a service* circular strategy – sustainable craft goods can benefit enormously since their core value is durability, high-quality and authenticity, being perfectly suited for a sharing economy and reducing the amount of goods manufactured. The consumer has an active role in the manufacturing process by being

also the supplier of discarded items once it decides to return them –corresponding to the *Creating value from 'waste'* archetype and *Enable and incentivize product returns* circular strategy– and actively designing by co-creating products in crowdsourcing and through Open Innovation platforms – corresponding to *Develop scale up solutions* archetype and *Co-create products, components, materials and information via online platforms* circular strategy.

Craft is also characterized by small levels of production. This small scale entails that artisans struggle to make sufficient profit with the limited units that they can craft while competing in price with the mass-production industry. This is also noticeable in the case of TextileCompanyStudied and shared with other European cases like the Scottish case in the region of Fife where they need to supplement their activities with other sources of income, the fact also other companies in the sector are quite unstable like it is the case of The North Circular that it does not operate anymore, and the uncertain economic benefits that the sustainable handloom industry in Sri Lanka has (Dissanayake et al., 2017; Ferraro et al., 2011). Innovation plays an important role here. It has allowed the reemergence of craft through technology applied to the craft process and techniques, and also generates the opportunity to expand to international markets through IT technology and the internet (Martínez Torán, 2021).

It has also been observed that it is easier for sustainable-founded companies to lose economic value. They prioritize well-being and good practices over economic benefits and cannot compete in price with the industrialized standard product that destroys environmental and social value. In other words, sustainable-based ventures diversify the value that they capture through additional means compared to the solely monetary value that conventional companies focus on capturing. These means, translated into social and environmental contributions, are pivotal in their development and help sustain their operations. In the long term, they assure a more resilient and robust supply chain. These characteristics are observed in the case study of TextileCompanyStudied and in other sustainable-based enterprises like Patagonia.

In the end, sustainable-based companies are chosen by customers because of the quality, values, and benefits that they generate for their stakeholders and their environment. This is also witnessed in TextileCompanyStudied. However, making their products and services economically accessible to the least-favored groups is challenging. That is why second-hand shops represent a great opportunity to democratize access to good quality textiles for a reduced price. The example of Patagonia with its own second-hand shop Worn Wear is a good example of the above (Worn Wear, 2022).

Whether or not sustainable craft can pave the path toward sustainable development is a question that goes beyond the scope of this research. However, it has been observed through the case study and the literature research performed that scalability is a pivotal part in order to allow the shift of the whole industry. In the current linear economy paradigm, the tradeoffs between scalability and access to international

markets are intrinsically related to generating more income opportunities, increasing profitability and the level of life of the artisans and employees from sustainable craft textiles manufacturing companies as a result. However, it clashes with reducing environmental impacts and developing local markets networks, which are the norm in a circular economy paradigm and are aligned with sustainability and sustainable development.

10. Relevance to the literature

This research addresses a unique textile manufacturing case in the Netherlands that embeds sustainability, innovation, and craft as part of their manufacturing process. It exemplifies the traits and troubles that textile companies that are rooted in sustainable practices and craft possess and experience. It confirms the economic barriers that sustainable craft activities experience and that have been already documented in other studies in Europe, as it is the case of The North Circular company and the Scottish artisans.

The research contributes to the existing literature on sustainable business modeling and circular techniques implementation of craft-related ventures by shedding some light on potentially viable solutions and circular principles. The research has found in particular, three promising potential sustainable business models for craft in European companies: offering craft as a service (*Deliver functionality rather than ownership* archetype and *Provide the product as a service* circular strategy), recovering the discarded items once the consumer throws them away (*Creating value from 'waste'* archetype and *Enable and incentivize product returns* circular strategy), and co-creating products in crowdsourcing and through Open Innovation platforms (corresponding to *Develop scale up solutions* archetype and *Co-create products, components, materials and information via online platforms* circular strategy).

Lastly, it also confirms that collaboration is pivotal to achieving circularity and sustainability as other previous studies were indicating and the tradeoffs encountered between economic feasibility, environmental impacts, and future generations' prosperity to pave the path toward sustainable development.

11. Limitations and recommendations

Several limitations are encountered in the completion of the present study. First and foremost, literature on sustainable craft and sustainable craft textiles is quite limited. It is still in early stages of development and there is no consensus among academics on what sustainable craft means and is characterized by. The scarce literature on the topic also affects the studies related to sustainable business models and circular strategies applied to craft ventures. To illustrate examples of sustainable business models, initiatives from the overall textile industry were selected, which may not necessarily involve craft in their development. This is because few cases that exemplify sustainable craft textiles business models are documented yet.

It could also be found as a quite relevant limitation the fact that the results presented in sections 6.3 to 6.6 have not been validated by the company before the publication of this research because of time constraints. The company was contacted but unfortunately, it did not take place. Therefore, it is encouraged to contrast the findings and results of this study with TextileCompanyStudied to affirm the insights obtained from this research. For further research, testing if the addition of the three most promising sustainable business models uncovered in this research supports TextileCompanyStudied to become stable, profitable, and economically independent while pursuing its sustainability goals and vision. This is done by analyzing the effects of applying the recommendations and next steps in the company provided in this thesis.

Another limitation is that there is no quantification of the benefits that TextileCompanyStudied generates. The data acquired and the information displayed in both TLBMC are mostly qualitative. To give the recommendations and next steps to the company, quantitative data from other studies had to be employed because of the lack of quantitative data that TextileCompanyStudied handles in terms of their impact. However, the fact that they are involved in many social and environmental initiatives and its size, provides some insight into the scale and scope of their impact. Thus, it would be a great addition to build upon this study for further research to quantify the impact of the company, as it might shed light on the specific technicalities of the case and uncover surprising results.

Besides, the quantification in economic, social, and environmental terms of sustainable business models and the circular strategies that prove that they create sustainability benefits in other companies of the textile industry are usually undocumented. Examples from the clothing industry are mostly used to illustrate the potential of such measures, because more data is available regarding impacts in this particular area of textiles. Although more research is needed to clarify if the same impact can be achieved in sustainable textiles in general and if in a similar magnitude.

Another limitation is that the results obtained from the study are based solely on one case and literature research. Therefore, it is recommended to conduct further research on sustainable business models and circular strategies in textile craft-based ventures in the European context in order to confirm and contrast the findings obtained in this study.

Lastly, whether or not sustainable craft textiles and sustainable craft can overall pave the path toward sustainable development is a question that goes beyond the scope of this research. Nevertheless, further research in this regard is recommended to analyze which barriers and enablers are influencing sustainable craft manufacturing in the current socio-economic context and if they could represent indeed a practical case toward sustainable development.

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13. Appendices

13.1. Interview script

Economic layer

Customer segments: Customers that you are targeting

Who are your clients? For whom do you create value?

Who are your most important customers?

Value proposition: which value is the customer gaining with your product

What is the value you are delivering to your customer?

Which problem or problems are you helping your customer to solve?

Which customer needs do you meet?

What array of products and/or services do you offer to each Customer Segment?

Customer relationship: Describes the type of relationships you want to create with your customer segments

What type of relationship does each of your Customer Segments expect you to establish and maintain with them? (e.g. Personal assistance, Self-Service, Automated services, Co-creation, etc.)

Which ones have you established?

How are they integrated with the rest of your business model?

How costly are they?

Channels: how you deliver your value proposition to your customers

Through which Channels do your Customer Segments want to be reached?

How are you reaching them now?

Which ones work best?

Which ones are most cost-efficient?

Do you provide post-purchase customer support? If so, how?

Activities: what you need to do to execute your value proposition (e.g. production, problem solving, etc.)

How do you integrate craft into your value proposition?

What Activities do your Value Proposition demand?

Customer Relationships?

Distribution Channels?

Resources: What you need to create value for your customers (e.g. physical, intellectual (patents, data), human, financial)

What Resources do your Value Proposition demand?

Customer Relationships?

Distribution Channels?

Partners: buyer-supplier relationships that are needed to reduce risk and optimize operations

Who are your suppliers?

Who are your Partners?

Which Activities do your partners perform?

Which Resources do you acquire from your partners?

Costs: Costs involved in delivering the value proposition

What are the most significant costs intrinsic to your business model?

Which Activities are most costly?

Which Resources are most costly?

Revenues: how you are generating income from your customer segments

How many Revenue Streams do you have? In which ways are you capturing value?

What is the contribution of each Revenue Stream to your total revenue? (percentage, most important)

What do your customers value more and are more willing to pay for?

How do you calculate the final price? What are your customers currently paying?

How are your customers currently paying? Sales, subscription, renting (e.g. ***fixed pricing*** *(volume dependent, list price),* ***dynamic pricing*** *(negotiation))*

Is there any preferred way they would like to pay?

Environmental layer

Outweigh environmental impacts and benefits

Previous question: **Have you ever performed any Environmental Assessment like a Life Cycle Assessment in your company?**

Functional value: main outcomes of a product or service consumed by its customers in a given timeframe

(to fill depending on the consumption impact)

Materials

Which are the materials you mainly use for your activities?

Which materials have the biggest environmental impacts?

Production

Which activities have the biggest environmental impacts?

Supplies and out-sourcing

Which production and material activities that are not core to the business do you have? (e.g. energy, water)

Distribution: impacts of the distribution channels

Which transportation modes (type of shipping) do you use?

How much distance is traveled?

What are the weights of what is shipped?

What is the packaging used for transport? How do you operate with it? (e.g. return it)

Use Phase: the impacts that arise from the usage of the product by the customer

What is the usage phase of the customer since they acquire your product until the end of life of the product?

End-of-life: impacts that arise from the end of consumption of the functional value. It usually entails incineration or disposal of the product (other options are disassembly, repurposing, remanufacturing, and recycling)

How do you deal with the end of life of your product currently?

Environmental Impacts: company's ecological costs

Which phase has the greatest environmental impact?

Where do the hotspots reside?

Environmental Benefits: company's ecological value generation (reducing impacts or creating positive)

How does your company have reduced its impacts?

creates positive environmental impacts?

Social layer

Social Value

What is your company's mission?

How do you create benefits for your stakeholders and society? Note: stakeholders being shareholders, employees, customers, community, suppliers, governmental bodies, etc.

Employees

Which aspects would you consider most relevant for employees to have for the success of your current business model?

How diverse are your employees? Which skills do they have?

Do you have any programs for employees improvement? e.g. professional development, training,

additional support programs, etc.

Governance: decision-making and structure of the organization

How is your organization governed? (e.g. not-for profit, cooperative, publicly traded for-profit, privately owned for-profit) BB

What kind of internal structure do you have? (e.g. organizational hierarchy, functional v. unit specialization) Give examples

What kind of decision-making policies do you have? (e.g., transparency, consultation, non-financial criteria, profit sharing) Give examples

Local communities: societal relationships with local communities and suppliers

Do you interact with local communities?

If so, which are they and how do you interact?

How would you define your relationship with your suppliers? Do you have any ongoing initiatives with your suppliers?

Societal culture: potential impact of an organization on society

(to fill after the interview)

Scale of outreach: breadth and depth of the relationships an organization builds with its stakeholders

What is the outreach of the company? (Local, national, global)

Do you address social differences? Do you take locally cultural and ethical actions across different cultures and if applicable, countries?

Have you developed or are developing long-term relationships with your stakeholders? If so, which kind of relationships are these?

End-user: the person who consumes the value proposition

Who is your end-user? (e.g. textbook publishers-> customer: instructors but end-user students)

Which values or value do you give to your end-user?

Social impacts: company's societal costs

Which negative social impacts do you have on your stakeholders? Any particular aspect to improve or numbers?

Social Benefits: company's societal value generation

Which positive social impacts do you have on your stakeholders? Any initiative or numbers?

Vision

What is your vision for your company? What do you strive for in your company?

What are the main goals of your company in the future?

Do you have any particular goal from an economic, environmental, or social perspective?

With that goal, how does look success for your business?

What is your impact on society and the environment?

Who do you see with you? Who are your customers, suppliers, and partners?

Vision (team)

What is your vision of the company? What do you strive for in the company?

What are the main goals of the company in the future?

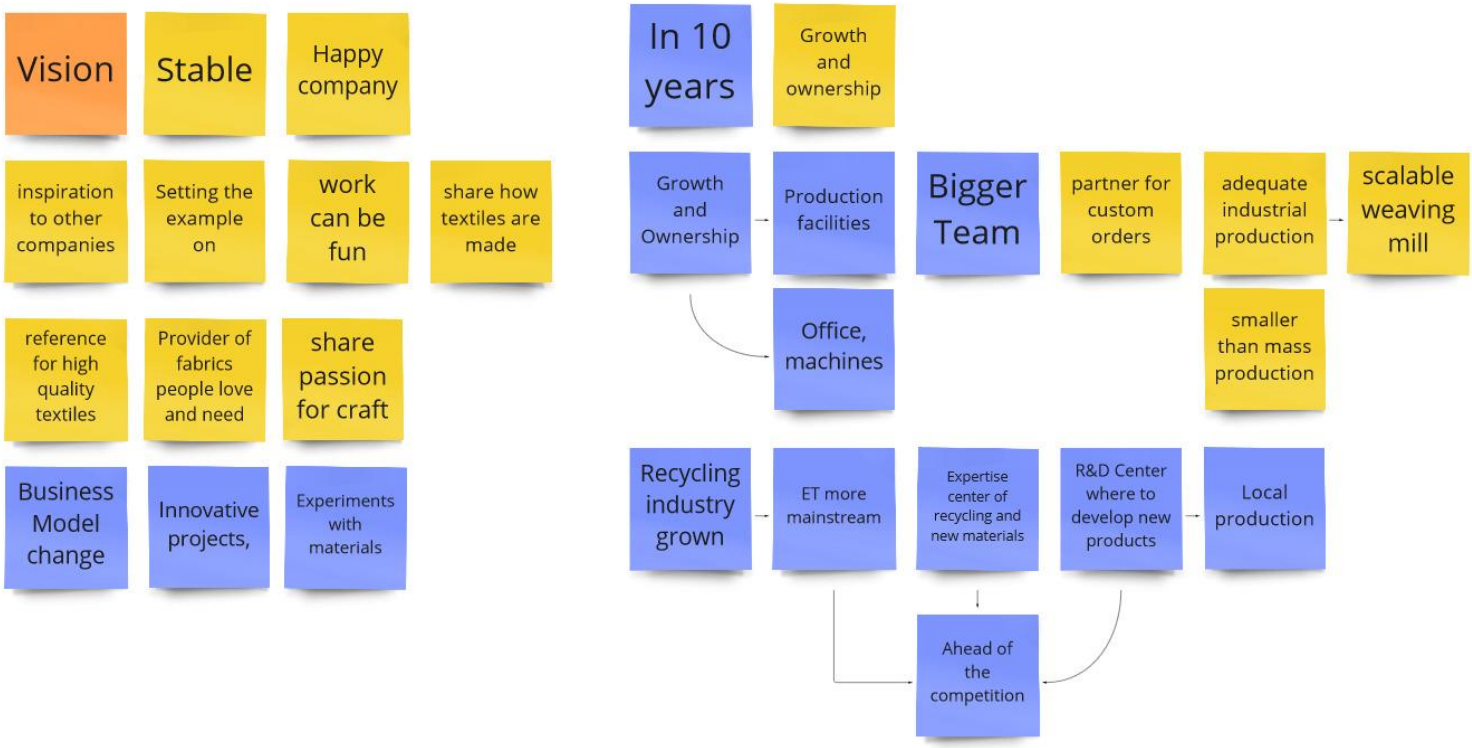
Do you have any particular goal from an economic, environmental, or social perspective?

With that goal, how does look success for your business?

What is your impact on society and the environment?

Who do you see with you? Who are your customers, suppliers, and partners?

13.2. Vision


Vision
Stable
Happy company
inspiration to other companies
Setting the example on
work can be fun
share how textiles are made
reference for high quality textiles
Provider of fabrics people love and need
share passion for craft
Business Model change
Innovative projects,
Experiments with materials
In 10 years
Growth and ownership
Growth and Ownership
Production facilities
Bigger Team
partner for custom orders
adequate industrial production
scalable weaving mill
Office, machines
smaller than mass production
Recycling industry grown
ET more mainstream
Expertise center of recycling and new materials
R&D Center where to develop new products
Local production
Ahead of the competition

Goals

Economic

Own factory

Invest in machines and people

Own looms there or in other place

Atelier for garments and patterns

Independent finance and growth

No investors or shareholders

No external parties interfering business

Social

help other companies and creators

People distant to labor market

Produce local

Environment

100% recycled post-consumer textiles same quality as virgin

Being circular

Preventing and reusing is always better than recycling

PART OF CIRCULAR ECOSYSTEM

Circular

LCA assessment of company and suppliers

Carbon positive

Office, transport

impact when using their fabrics instead of virgin materials


Impact of goals
Biggest impact
Being copied anywhere **Local market**
Provide most fashion and interior industry
inspiration for other people
change to job you are passionate about
happiness instead of money
consume less
make the environment better
Social
Bring back
Production of textiles to NL and Enschede
Jobs and growing
Empowering people kickstart their business idea
Space, idea, fabrics, etc.
Already implementing it (low scale)
Knowledge of weaving
Preserving craft of weaving
Environment
Create more sust fabrics
zero waste factory
Close the loop Circularity
ENERGY IMPROVEMENT
How heating company

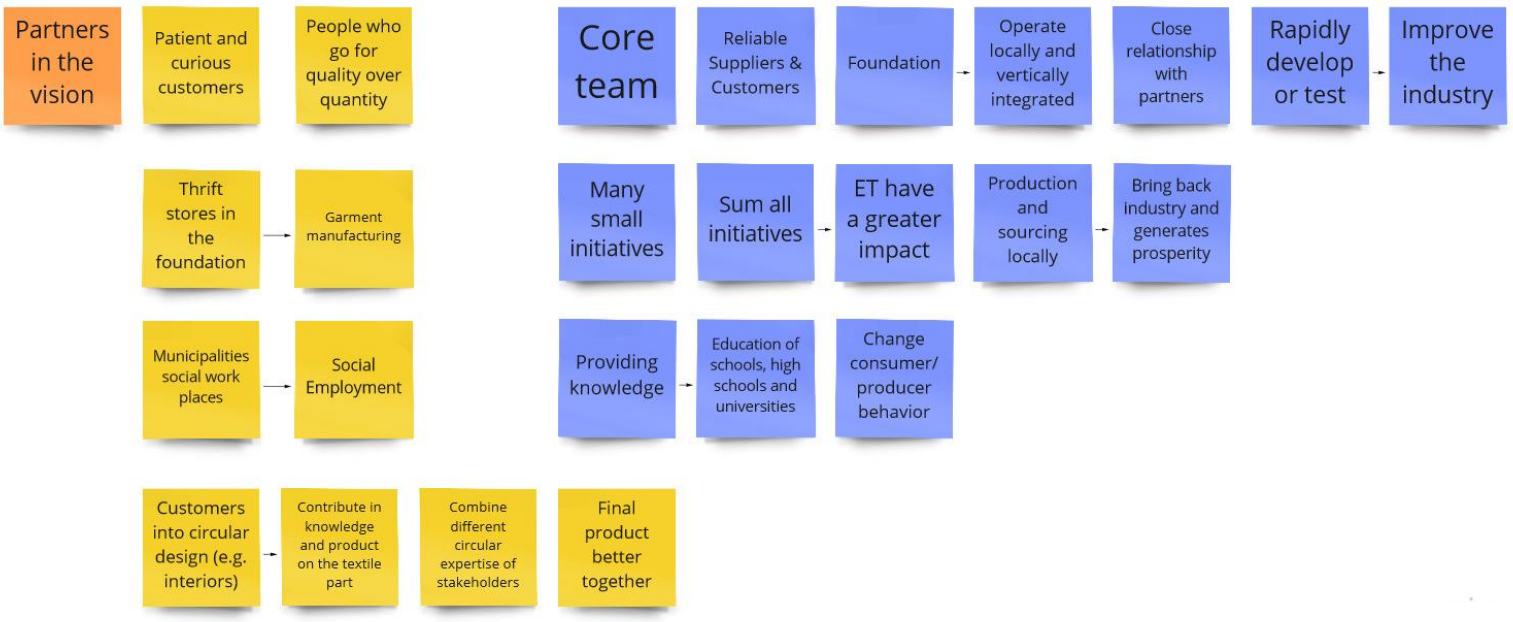


Figure 19: Vision of the company

Legend: Orange: Titles, Blue: Core team vision, Yellow: Founder vision, Green: Already doing, Pink: subject to Improvement

13.3. Brochure

Regionaal Textielsorteercentrum Twente

TWENTE MILIEU
Schoon, gezond en fris

STAP 1 » INZAMELING

Twente Milieu haalt het textiel uit de textielcontainers op. U helpt ons door uw textiel in een gesloten zak in de container te gooien. Zo blijft het textiel schoon en droog.

Meer weten over deze stap?
Scan de QR-code met uw smartphone
of ga naar www.twentemilieu.nl/textiel

↑ Verzamel textiel in een gesloten zak. Zo blijft het schoon en droog. Door schoenen aan elkaar vast te binden blijven ze altijd bij elkaar tijdens de sortering.

STAP 2 » SORTEREN

Het textiel wordt in het Regionaal Textielsorteercentrum met de hand gesorteerd. Hierbij wordt het in 3 groepen verdeeld:

1. Herdraagbaar textiel
Geschikt voor tweede-hands verkoop.

2. Recyclebaar textiel
Geschikt voor recycling.

3. Afval
Ongeschikt voor tweede-hands verkoop of recycling

↑ Herdraagbare kleding gaat naar een kringloopwinkel. Van recyclebare kleding worden vezels gemaakt.

STAP 3 » VERKOOP IN KRINGLOOPWINKELS

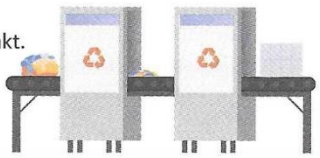
Textiel dat geschikt is voor tweedehands verkoop wordt verkocht in de regionale kringloopwinkels van Het Goed en De Beurs. Zo krijgt het een tweede leven.

Meer weten over Het Goed?
Scan de QR-code
of ga naar www.hetgoed.nl

Meer weten over De Beurs?
Scan de QR-code of ga naar
www.kringloopbedrijfdebeurs.nl

STAP 4 » MECHANISCHE RECYCLING

Textiel dat niet geschikt is voor tweedehands verkoop wordt gerecycled. Van sommige textielsoorten, zoals jeans en wol, worden bij Frankenhuis in Haaksbergen vezels gemaakt. Zo ontstaat er grondstof voor nieuwe garen of vilt voor isolatiemateriaal. Dit proces heet mechanische recycling.



Meer weten over mechanische recycling?
Scan de QR-code met uw smartphone
of ga naar www.frankenhuisbv.nl

STAP 5 » CHEMISCHE RECYCLING

Door een chemische bewerking kan katoen gerecycled worden in de proeffabriek van Saxcel. Hierbij ontstaat een sterke en kleurvaste vezel. Deze vezel kan als nieuw katoen worden ingezet.

Meer weten over SaxCell?
Scan de QR-code met uw smartphone
of ga naar www.saxcell.nl

STAP 6 » NIEUW TEXTIEL

Van gerecycled vezels wordt nieuw garen gesponnen. [redacted] gebruikt dit garen om nieuwe textielproducten te breien en weven, voor onder andere meubelstoffen of kleding.

[redacted]

↑ Nieuw textiel is niet altijd helemaal nieuw. Zo kan je nieuwe stoel of t-shirt gemaakt zijn van gerecycled materiaal.

STAP 7 » TERUG BIJ HET BEGIN

Kleding of ander textiel dat versleten is of niet meer wordt gebruikt, wordt weggegooid. Bijvoorbeeld in de textielcontainers van Twente Milieu.

Meer weten over [redacted]?
Scan de QR-code met uw smartphone of ga naar www.texplus.nl

↑ De circulaire route van textiel zorgt ervoor dat er jaarlijks miljoenen kilo's niet worden weggegooid. Stel je eens voor hoe goed dat is voor het milieu!

Wat mag er ✓wel en ✗ niet in de textielcontainer?

WEL	NIET
✓ Schoenen (per paar samengebonden)	✗ Met verf/olie vervuild of nat textiel
✓ (Kapotte en versleten) kleding	✗ Vloerbedekking
✓ Riemen en tassen	✗ Kussens en dekbedden
✓ Handdoeken, theedoeken en washandjes	✗ Lappen kleiner dan 25x25cm

Het volledige overzicht
Kijk voor een volledig overzicht op www.twentemilieu.nl/textiel of scan de QR-code.