Emilia Jussila

Optimizing the Supply Chain of a Sustainable Fashion Brand

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Abstract

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Abstract

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Supply chains are complex webs of processes, that make up the whole lifecycle of a product from design to the end user. Supply chains consist of processes and operators both inside the company as well as outside of it. It is often this aspect of complexity that makes supply chains so challenging to manage in terms of operational efficiency and sustainability. The objective of this thesis was to do a deep dive into one case example of a small, sustainable fashion brand's supply chain and its challenges and to find solutions to these challenges by prioritizing sustainable practices and efficient management.

This thesis was a case study that investigated one company's processes thoroughly and aimed to design a new and improved operation model by using observation, industry literature and other studies. The end product of the thesis is a comprehensive analysis of the company's current processes as well as an action plan for a new process and the results it could bring to the company compared to the old model.

Keywords:	Supply chain management, supply chain optimization, sustainable supply chain

The originality of this thesis has been checked using Turnitin Originality Check service.

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1 Introduction

The global fashion industry is undergoing a transformative shift towards sustainability, and new, agile fashion brands are playing a pivotal role in shaping this transition. As consumers increasingly prioritize eco-conscious choices, the imperative for fashion businesses to align with sustainable practices is not only an ethical obligation but a strategic necessity. At the heart of this paradigm shift lies the supply chain – a complex web of processes that demands optimization for both environmental and operational efficiency.

With an in-depth exploration of a case example as well as existing literature, this thesis seeks to explore and provide insights into the challenges faced by small, sustainable fashion companies in managing their supply chains. In a time where responsible consumerism is gaining momentum, this study aims to investigate how businesses seek a balance between circular design, ethical material sourcing, local production and operational efficiency. By diving into the world of supply chain management and different strategies implemented by businesses in the industry, this research aspires to offer a comprehensive framework for effectively and sustainably optimizing the supply chain in the context of small fashion businesses.

The significance of this study lies not only in its potential to contribute to the academic discourse on sustainable supply chain management but also in its practical implications for the fashion industry. As the conversation surrounding sustainability evolves from a trend to an industry standard, the findings of this study aim to inform and guide small fashion brands, enabling them to thrive in an industry where responsible and efficient supply chain practices are becoming more important by the day.

1.1 The Research Problem

This thesis is a case study with the objective of analyzing, simplifying and optimizing a brand's current supply chain process, for the upcoming collections to be as sustainable and operationally streamlined as possible. Having already identified some significant issues and places of improvement in the current process, this thesis aims to examine the entirety of the process together with the brand, step by step, and seek ways to optimize them with the help of market research, literature and data.

1.2 The Research Questions and Methods of the Thesis

This thesis is based on finding answers to two main questions. These questions are, as follows:

- How can the supply chain of a sustainable fashion brand be optimized by using diverse and responsible principles?

- How does the new, optimized process compare to the previous one?

The research method of this thesis is a qualitative study that is conducted as a case study, focusing on analyzing and developing a particular process of one company, where the results can also be applied to other companies on a larger scale. The choice to carry out this thesis as a case study was very intuitive since the study is focused on doing a deeper analysis of a singular process and developing it further while also learning from it. The methods used for this study include a literature review, where different professional literature, reports and studies on the topic are analysed and applied to this study, as well as observation, disclosure of information from the case example company and documentation. Using these methods, the study will aim to find answers to the research questions by first identifying the issues of the current process, followed by researching sustainability and different optimization strategies to achieve a sustainable supply chain, and finally presenting a proposition for a new process model, its benefits and possible ideas for further development. The method of

analysis used in this thesis is content analysis, which is focused on drawing conclusions, finding differentiating and connecting factors, building the overall picture from details and finding interesting aspects from the content that is analysed.

1.3 The Theoretical Framework of the Thesis

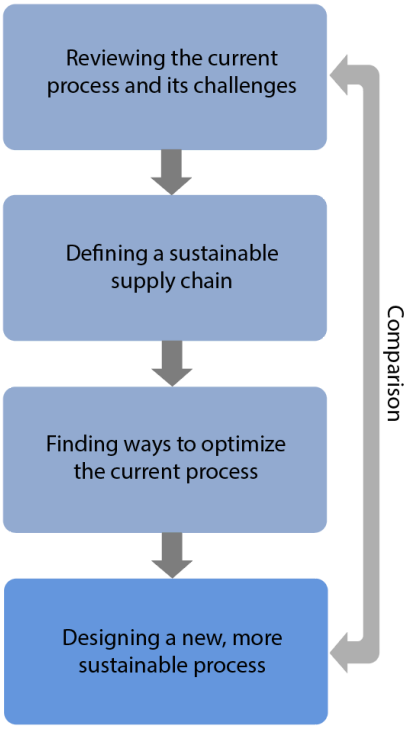

Figure 1. The process description of the thesis

This thesis is focused on examining one brand's current supply chain process as a whole, from sourcing the materials, producing the end product and delivering it to be stored and sold to consumers. This thesis will also be examining the brand's design process and its effects on the supply chain since the two are very closely intertwined in the case of this study. Due to the timeframe of carrying out the study, this thesis will exclude any marketing or sales operations (including cost calculations) relating to the supply chain. The importance of them will be acknowledged and understood, but they will not be studied further. As a result of the thesis, there will be a comprehensive guideline for fashion brands

with challenges and complexities in their current operations to optimize their supply chain processes to be more sustainable, manageable and streamlined. The significance and relevance of this study are based on the urgent pursuit of sustainability within the fashion industry, where the responsibility of making sustainable choices lies not only in the hands of the consumers but in the decision-making of the companies.

Even though the subject of sustainability has been, and continues to be, widely studied in the fashion industry, it is only recently that the bigger masses have begun to understand the different factors and complexities that are in play. For instance, in recent years a lot of brands have been rightfully accused of greenwashing, referring to a brand's misleading claims for sustainability in their products or processes without transparency or sufficient information about the actual impacts these actions have (Rauturier, 2022), which has resulted in a stronger awareness and wariness amongst consumers shopping for sustainable clothes. This awareness and need for more information have led to the examination of the supply chain, which in turn has shed light on the impacts of the cultivation of raw materials, processing them with chemicals and dyes, the amount of water and energy that is being used in the production process, the emissions that come from long haul deliveries, the ethical labour issues and so on. The industry is evolving rapidly and so is the knowledge of the challenges we face, and therefore the importance of active, ongoing research cannot be underestimated.

Perhaps the leading ideology, and one that has been studied a lot, in the field of sustainability and consumerism, is the circular economy model. It is considered to be an alternative to the traditional linear model, where a product is designed, made, sold and eventually disposed of. The circular economy aims to keep materials and products in use for as long as possible while designing out waste and regenerating the systems around it. The idea of a circular economy cannot be traced back to a single origin but has instead refined from different schools of thought originating from academics including, but not limited to, Walter Stahel, Geneviève Reday-Mulvey, Janine Benyus, Paul Hawken, Amory Lovins, L. Hunter Lovins, Kenneth Boulding and Gunter Pauli. (RTS, 2021.) Some of the

optimization strategies and ideas brought up in this thesis are based on the different concepts within the circular economy model, and the studies and literature behind it.

The literature review of this thesis is largely based on the book *Effective Strategic Sourcing* by Patrick Barr, published in 2022, as well as the book *Sustainable Fashion: New Approaches* by Kirsi Niinimäki (ed.) published in 2013. In addition to the aforementioned works, this thesis includes references to other notable sources, such as current articles, websites and reports.

1.4 Glossary of Terms

- Supply chain: A process consisting of multiple steps and phases, undertaken by a company with its suppliers to create a product. A supply chain includes everything from sourcing the raw materials to manufacturing a product and selling it to the end-user (Logistiikan Maailma, 2017b).

- Supply chain management or SCM: Managing the different steps, operators, costs and data related to supply chains (Logistiikan Maailma, 2017b).

- Optimization: The process of improving something to its best possible state.

- Sourcing: Finding and obtaining a certain element, e.g. materials.

- Deadstock: Leftover fabric that isn’t being used for its original purpose for some reason (Wolfe, 2022).

- Circular economy: A model where a product’s lifecycle is extended by different methods such as reuse, repair and recycle, to avoid the traditional linear consumption model where a product becomes waste at the end of its lifecycle (RTS, 2021).

- Lead time: The time a certain action or process takes from start to finish (Logistiikan Maailma, 2019a).

- Elapsed time: The actual time used for a certain action of process (Logistiikan Maailma, 2019a).

- Logistics: The flow of materials, information, payments and services in the supply chain (Logistiikan Maailma, 2017a).

2 Case: Florence

The case study of this thesis was conducted together with a small fashion brand that focuses on sustainably produced products called Florence. Florence was founded in 2020 and offers women's premium loungewear pieces made from colorful deadstock materials such as cotton, linen and silk. In the heart of the brand is the idea of combining Brazilian and Finnish cultures through quality craftmanship, community and beautiful aesthetics. The products aim to reflect the Brazilian way of life that is associated with sunshine, movement and joy while also highlighting the Nordic aspects of quality and design. The products are mainly sold via the brand's online store and occasional pop-ups. The brand's core value is to create unique, comfortable and stylish clothes for everyday life in the most sustainable way possible. (Florence, 2024.)

2.1 Overview of the Current Supply Chain

Before going into defining a sustainable supply chain and exploring different optimization strategies, the current process and its challenges and areas of development need to be fully understood. In order to do so, the process has been simplified and divided into smaller steps, as seen in Figure 2, to assess each of them and their place in the supply chain. The information reviewed in this chapter has been disclosed by the contact person within the company and has permission to be used in this thesis.

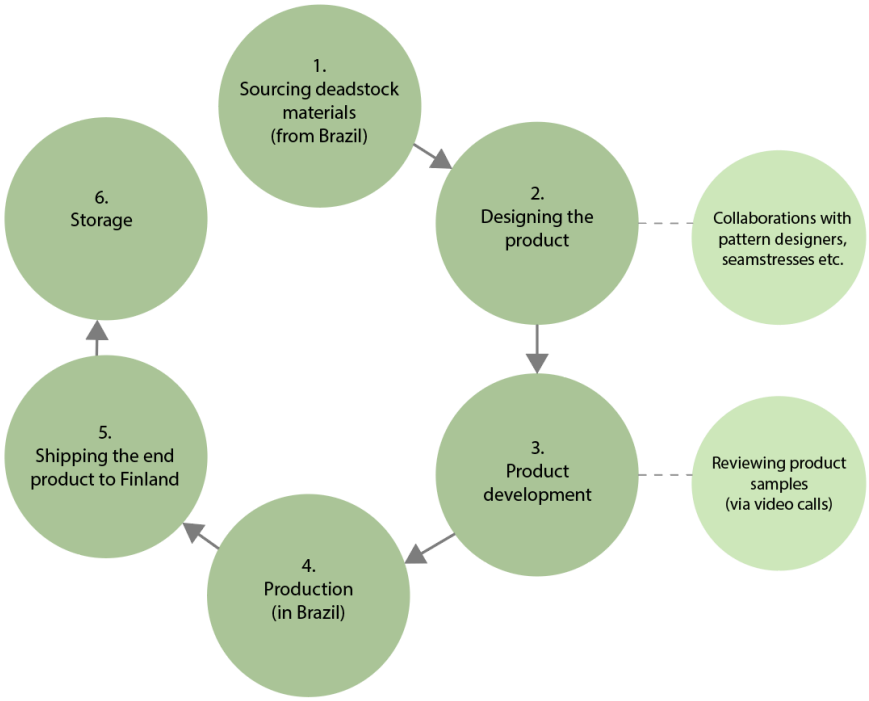

Figure 2. Overview of the current supply chain

As opposed to what might be seen as the traditional beginning of producing a new collection, the supply chain pictured above does not start from designing the product. In this case, the first step is to source the materials, which only consist of deadstock fabrics. Deadstock fabric, also known as overstock or surplus fabric, is defined as any type of leftover textile fabric that cannot be used for its original purpose for some reason (Wolfe, 2022). Even though nowadays the market for deadstock fabrics is growing, it has not always been so, and in the case example of this study, the deadstock materials in question were sourced all the way from Brazil from a local supplier. Working with Brazilian suppliers has been an important part of the brand's identity since that is where the brand's roots and identity come from. Finding the material supplier was a time-consuming and challenging job, however, since it was done by the brand itself, without an agent, for example, and therefore initially required traveling to Brazil and doing supplier research while there. Having found a supplier, selecting the fabrics then took place either via video calls, photos and emails or in some cases during the brand's visits to Brazil.

After the materials for the collection were sourced, it was time to start designing the products themselves. Since at this point the materials for the collection had already been chosen, the design process needed to heavily lean on them when creating the products: what kinds of structures, silhouettes, colorways and product types can be designed and in what quantities. So far the designs have followed a seasonless approach and have been launched mainly according to the manufacturing schedule, meaning once products were finished and shipped to Finland, they were launched on the website without a specific launch schedule. During the design process there has also been a strong emphasis on collaborations with, for example, different artists, pattern designers and seamstresses, to bring even more uniqueness and intrigue into the pieces.

Having decided on the final products for the collection, there is still product development ahead. This typically happens in the form of samples, which are the first manufactured versions of the designs and can still be modified before the actual production begins. Since the production also takes place in Brazil, oftentimes the samples are reviewed remotely with photos and videos. At this point, all the details, such as structures, trims and accessories are modified to perfection in order to get the best results once the actual production begins.

Once the final samples have been reviewed and accepted, the production can begin. The brand's products are manufactured by small ateliers formed by local seamstresses who became unemployed due to the Covid-19 pandemic. Creating jobs for the local people, and especially empowering women to become entrepreneurs and start their own ateliers is also one of the core values of the brand in terms of social sustainability. The seamstresses were met and introduced to the brand, and they were brought into the process of creating the products with their expertise and craftmanship. The timeframe for the production depends on the quantities produced (which, in turn, depend on the amount of deadstock materials that have been sourced), as well as the possibly complex structures of each garment. Once the production was finished, the garments were shipped from Brazil to Finland to be stored, sold and shipped to customers.

2.2 Challenges and Areas of Development in the Supply Chain

In order to bring about change in any process, one must take into account five different components: a clear vision of the desired end result, the right set of skills and competencies on the team working on the change, sufficient resources, a clear purpose for the change and a detailed action plan (Barr, 2022, p. 15). With this in mind, it is important to first discover and identify the challenges in the supply chain.

Referring back to Figure 2 and looking at the beginning stages of the current supply chain, the first challenge that has been identified by the brand is sourcing the materials first and then designing the product. Doing things in this particular order is different from the usual way fashion brands operate, and can create a risk in terms of effective material usage: if materials are sourced first and products are designed second, the required amount of materials cannot be calculated beforehand. This can in turn result in deadstock fabric or, on the contrary, not having enough fabric to manufacture a certain amount of products.

Moving ahead in the supply chain in Figure 2 and looking at the product development and manufacturing processes, the most significant challenge is the long distance. Since the product development process (in terms of samples) takes place in Brazil, the options are to ship the samples to Finland, which can take a long time and is not sustainable in terms of emissions related to long-haul deliveries (Ellen MacArthur Foundation, 2023), or the samples can be approved by emails, photos and video calls, through which the brand is not able to get the true touch and feel experience of the sample. A similar issue arises when the actual production begins since it can be difficult to make visits to the manufacturing facilities and oversee the production process due to the long distance. The distance also becomes an issue when discussing flexibility in the production process. Since there can be changes in the demand volumes, it is crucial for the company to react as quickly as possible, which can prove difficult when working with long-distance suppliers.

The last step of this part of the supply chain is shipping the end products to Finland from Brazil. The products are shipped as air freight, since the risks involving sea freight, including moisture damage, are too big. Shipping products from outside of the European Union also requires customs clearance. All of this is once again a time-consuming process, with considerably more emissions and risk factors compared to products being shipped from local factories.

3 A Sustainable Supply Chain

Sustainability is a widely used hypernym commonly used by the media and consumers when referring to anything relating to environmental, ethical and green values. In the context of businesses, however, other terms can be used when referring to their approach to responsible trade practices. Such terms, in addition to sustainability, can be ESG (environmental, social and governance); responsible business; and CSR (corporate social responsibility). (Barr, 2022, p. 121.) Furthermore, sustainability and sustainable development are divided into three main pillars, as defined by the Brundtland Report released by the WCED (World Commission on Environment and Development) in 1987. Those pillars are, to this day, economic, social and environmental development. (GEP, 2023.) This chapter of the thesis examines the concept and importance of sustainability in the context of a supply chain in the fashion industry.

3.1 Defining a Sustainable Supply Chain

A sustainable supply chain is a continuous process, where a company needs to ensure its values, especially environmental and social, are being upheld with integrity while increasing the company's economic and competitive advantage by lowering its carbon footprint (Barr, 2022, p. 121). Carbon footprint is a measurement tool, consisting of all the actions taken by a person or, for example, a business, in their everyday lives and the amount of greenhouse gas emissions released by said actions. Simply put, the larger the size of a carbon footprint, the more emissions are released. Carbon footprints can also be applied to a prod-

uct, counting the impact its lifecycle has on the environment. (Conservation International, 2023.) A commonly held misconception is that a majority of a company's carbon footprint comes from its logistics and manufacturing operations. In reality, however, most of the emissions generated by a company come from the materials being used in the manufacturing of a product. That is to say, most of a product's carbon footprint is built into its design. (Barr, 2022, p. 123.) With this in mind, it is important to examine the supply chain as a whole, not only focusing on singular parts in terms of sustainable practices.

For clarity, this thesis will be examining the sustainability of a supply chain from three key perspectives, as discussed above: the environmental, social and economic.

3.1.1 Environmental Sustainability

From the environmental perspective, the most sustainable practice would be adopting a circular supply chain model. A circular supply chain is based on the concept of circular economy, an approach developed against the 'take-make-waste' model, where a product's lifecycle is linear, and it eventually ends up as waste. In a circular economy, by contrast, a product's lifecycle is cyclical and regenerative by design, while aiming to separate the idea of business growth from the need to consume finite resources. The circular economy idea is based on three key principles: eliminating waste and pollution, recycling products and materials and regenerating the environment. (Ellen MacArthur Foundation, 2023.)

There are several steps in the supply chain where waste and pollution can be created. This starts already from the manufacturing of the raw materials. Materials, both natural and synthetic, require water, energy, chemicals and sometimes pesticides (for materials such as cotton) in order to be produced into fibres, yarn and fabrics. Therefore it is crucial to be extremely mindful of the material choices that are being made during the design process already. To adhere to the circular values discussed previously, it is also important to think of the materials' whole lifecycle. In order to be recycled at the highest value possible after

their use in their primary purpose comes to an end, mono-materials should be favoured. A mono-material is a material composed of only one single type of material, making it easier to recycle (Sustainable Design Cards, 2020d).

Once the manufacturing process of the product itself begins, the importance of energy and water efficiency needs to be considered once again. This could mean, for example, using renewable energy and minimizing water consumption or facilitating waste water cleaning. During the production process, different dyes and chemicals needed for finishing the products often also come into play. The handling and disposal of said dyes and chemicals need to be in line with environmental and circular values so that they can either be reused, repurposed or disposed of correctly, without affecting the environment. In an ideal production process, no waste is generated. However, in the fashion industry, leftover waste, such as excess cutting material, is often the reality. If this is the case, the production facility needs to have a waste management plan (that is respectful towards the environment) in place.

Even though it is estimated that logistics counts for as little as 2% of a company's carbon footprint (Barr, 2022, p. 123), it is still an impactful decision and should not be underestimated. Logistical traffic creates structural waste and pollution (Ellen MacArthur Foundation, 2023), and the longer the distances the more waste and pollution are generated, which is why local production is favourable for sustainable supply chains.

In addition to all of the factors presented so far that contribute to the sustainability of manufacturing a product, an extremely important aspect is the product's durability once it is purchased by a consumer, as well as how it can be disposed of once its lifecycle comes to an end. The product should be easy to maintain (in terms of washing, cleaning and repairing it) (Sustainable Design Cards, 2020c; Sustainable Design Cards, 2020e) and last for as long as possible in the use it was designed for, while also retaining its value style-wise (i.e. not designing products that rely heavily on current trends) (Sustainable Design Cards, 2020a). Once the product has reached the end of its lifecycle, it should be easy

to upcycle or recycle. This admittedly requires some knowledge on the consumer's part, but can be encouraged by proper disposal information, simple disassembly and using material compositions that are possible to be recycled.

3.1.2 Social Sustainability

Looking at the social aspect of a sustainable supply chain, the focus is on the workers, suppliers, consumers and communities surrounding the company. Ethical labour in the supply chain means fair wages, safety and proper rights for the workers. A case example of the neglect of safety regulations and the result of that would be the Rana Plaza disaster on the 24th of April in 2013, where over 1,100 people lost their lives in the collapse of a factory building. This tragic event brought a lot of media attention to the working conditions in Bangladesh (and other developing countries), where garments have been produced in questionable and oftentimes unsupervised conditions, the workers' rights have not been respected and they have not been paid a sufficient salary. (International Labour Organization, 2023.) Social sustainability aims to tackle issues like these by giving workers the option to unionize, paying a fair wage and providing safe working conditions by following safety regulations and doing safety audits in the workplace. Furthermore, companies that prioritize and respect human rights and foster positive relationships in the supply chain enable themselves to continue growing (United Nations Global Compact, 2015).

Hand in hand with ethical labour practices are transparency and traceability. It has become increasingly important for consumers to have access to information about where their products were made, how and by whom. Companies that do not disclose a sufficient answer to these questions can be seen as untrustworthy in the eyes of the consumer. At the Copenhagen Fashion Summit in 2018, the founder and creative director of Fashion Revolution, Orsola de Castro, noted that "Transparency is the first step towards a different culture in the fashion industry – one where brands become accountable and open, and consumers and citizens are ready to scrutinize and stay vigilant." During the summit, de

Castro also brought to light the fact that in the aftermath of the Rana Plaza disaster discussed in the previous chapter, there were brands who were not aware whether they were producing their products at Rana Plaza or not, leading us to the importance of traceability. (Klotz, 2018.) Traceability refers to being able to trace a product back to its origins, right down to the raw materials. This is especially important for the people within the company in terms of supply chain management, so that there are no blind spots in the process.

On a brighter note, social sustainability also brings to attention different ways to sustain and nurture important relationships through collaboration, empowerment, diversity and inclusion. This applies especially to brands' relationships with their suppliers since it is detrimental to the supply chain's functionality and efficiency, the brand's reputation and the end products to have a good working relationship. By maintaining a relationship with mutual respect, open discussions and mutually beneficial collaborations, the people within the supply chain will more likely feel motivated and excited, as well as have a good understanding of where improvements are needed and what opportunities they have to grow within the relationship. Positive relationships with suppliers foster focus, better working environments and better results. (Barr, 2022, p. 215.) It is important to actively evaluate and upkeep the social aspects of a supply chain and strive for improvement wherever possible.

3.1.3 Economic Sustainability

Finally, the economic sustainability covers practices that enable a company's economic growth without having negative effects on the other areas of sustainability (University of Mary Washington, 2017). There are many ways in which a company can go about implementing sustainable economic practices, and it is important to evaluate which ones are best suited for a specific case because there is no one size that fits all. A company could consider adding new concepts into its existing business model, depending on the products it offers, such as rental services, a resale platform or remanufacturing services. These concepts also help create new jobs and with them bring new expertise into the team.

Adding new concepts and services also enables the opportunity for longer and stronger customer relationships, since there's an increase in the customer journey touchpoints. Offering services that allow the company to interact with their own products again after they have been used by the consumer also provides valuable data on the products' durability and aging process, which in turn enables product development to take place. (Ellen MacArthur Foundation, 2023.)

Making sustainable decisions elsewhere in the supply chain can also have a positive economic impact on the company. For example, when there is a reduced need for virgin materials, the costs for material acquisitions are reduced as well (Ellen MacArthur Foundation, 2023). Optimizing the demand forecast is another important action to take when improving the environmental and economic practices of a company. An optimized demand forecast, based on facts, figures, expertise and good reflection skills on previous seasons, prevents possible overproduction, meaning too many materials or products are manufactured and end up as deadstock, or underproduction, meaning not enough materials or products are manufactured, and the company loses sales. When the manufacturing process happens as close to the brand as possible, the threat of disruptions in the supply chain is lesser, or at least tends to have a smaller impact on the supply chain as a whole. And finally, operating with transparency and traceability, following ethical practices and promoting diversity and inclusion, while important values as they are, also help create and upkeep meaningful, trusting and loyal customer relationships in a world where the consumer is growing more conscious every day.

3.2 The Vision and Purpose of a Sustainable Supply Chain

So far this thesis has established what kinds of challenges a company can face in its supply chain and defined what a sustainable supply chain looks like. The next step is to evaluate the purpose of optimizing an existing process within the case example company, as well as the vision for the new process. After the initial realization that there are issues within a process, the natural plan of action is

to find out how to do things differently and better. In this case, an improved process would benefit the brand and its suppliers, the customers and the environment.

After the Covid-19 pandemic, the focus on sustainability has accelerated noticeably, and companies' actions towards it need to be seen, not just spoken of. This creates a competitive advantage on the market for brands that are willing to work for more sustainable practices. This competitive advantage in turn is crucial for shareholders and investors, as well as for customers deciding where to shop. (Barr, 2022, p. 122.)

It has been estimated that roughly 70% of a company's carbon footprint lies within the supply chain (Barr, 2022, p. 122), therefore making it a good place to start the journey towards sustainable changes. There are many ways to shift the supply chain processes in a direction that is better for the environment, from the design of the products to choosing the materials, manufacturing the products and transporting them. Reducing and/or eliminating the pollution and waste generated by these processes is an important part of the vision and values of a sustainable brand, and helps lead the way towards a systematic change in the ways in which brands operate, therefore having a crucial purpose for the whole industry.

As mentioned previously, one of the core values of the case example brand is sustainability, so optimizing the brand's supply chain in sustainable ways is in line with the brand's identity. A change like this, when communicated properly, can have a significant positive impact on the social value of a brand, attracting new customers and showing the existing ones that the brand's actions are aligned with its values. Transparency and traceability help create trust and strengthen customer relationships. From a supplier's point of view, the sustainable values and actions of a brand are also important, since they can have a positive impact on the supplier's reputation as well: if their customer is a brand that's renowned for their sustainability, it sends a message that their suppliers are also sustainable and trustworthy.

Another benefit of optimizing the supply chain is the maximized efficiency and the resulting ease in supply chain management when all operations are as streamlined as possible. Having well-thought-out and functional processes saves time and helps with the short- and long-term planning of the company. This can often result in the company saving money as well since the risk of unexpected expenses is reduced.

When planning on making big changes in the supply chain process, the long-term approach is preferable compared to short-term fixes. It is important to leave room to scale in the future and to understand that not all changes can happen overnight, while still doing everything possible to make the supply chain better right now. The companies that end up waiting for laws and regulations to be set regarding sustainable practices before making any changes in their practices only end up losing their competitive advantage and having negative impacts on the environment, the communities and the relationships around them. (Barr, 2022, p. 124.)

4 Sustainable Optimization Strategies

With the brand's vision in mind, it is time to explore the best optimization strategies for a new and improved sustainable supply chain. This part of the thesis will divide the supply chain into smaller segments and find suitable solutions for each of them with the help of literature, market research, observation and the brand's own experience and expertise while keeping the bigger picture in mind during the process so that each solution can fit together seamlessly.

It has been estimated that only less than 10% of a typical company's elapsed time creates added value for the company. Therefore it is important to examine and evaluate the lead time of different processes to help optimize them. (Logistiikan Maailma, 2019a.) Some aspects of a process can be examined and optimized in a quantitative manner with numerical data. However, these kinds of results often show only a part of a more complex reality, and most of the time an optimal result cannot be calculated. Therefore different methods of analysis,

problem solving and forecasting need to be used in order to develop a company's processes. (Logistiikan Maailma, 2019b.) There are many different principles for supply chain management and development. The ones this thesis will specifically focus on include process simplification, lead time reduction, margin of error reduction, real-time communication, flexibility, reliability, and transparency. (Logistiikan Maailma, 2017f.)

4.1 Design Process

The whole existence of a supply chain begins with the idea of a product. With some estimates saying that up to 80% of a product's environmental impact is already predetermined during the design process, it's crucial to understand the impact of one's choices, down to even the most minuscule details (Première Vision, 2023). In addition to designing a new product, however, it is important to keep in mind and understand the product's complete lifecycle when approaching the design process with a sustainable mindset. The lifecycle of a product includes everything from its manufacturing to its eventual disposal and everything in between. In his work, Barr (2022, p. 29) talks about product lifecycles and emphasizes their importance, especially in the fashion industry where they tend to be extremely fast-paced. Niinimäki (2013, p. 17) reiterates this point in her work by encouraging designers to design lifecycles instead of products.

In *Sustainable Fashion: New Approaches*, Niinimäki (2013, p. 17) brings up two important principles to keep in mind during the design process. The first one consists of different guidelines for designing a lifecycle. These guidelines include reusing waste materials, upcycling products (or materials), the possible repairing and remodelling of products, recreating existing design concepts, reducing the use of resources and the creation of waste, using ecological materials and mono-materials, designing products that last longer, designing multifunctional products and designing products that delight consumers. As the name suggests, these are merely guidelines that leave a lot of room for creative interpretation, and it would most likely prove difficult to implement each and every one of them into one single product. They are, however, a good place to

start when designing sustainable products. A principle that goes hand in hand with these guidelines is the adherence to eco-design or design for the environment (DfE), both of which include lifecycle thinking, environmental consideration, effective recycling practices and avoiding the use of non-renewable materials and the creation of waste. A conscious designer should be aware of all of these principles, that is to say of all the options they have, and then decide which approaches are the best match for the product in question when taking into consideration other factors, such as budget, timeframe and suppliers.

The European Commission has also defined principles for ecological design. These principles overlap slightly with the different guidelines and principles discussed previously, including the use of low-impact materials that are non-toxic, recycled or produced sustainably and do not require many or any natural resources; efficient use of resources; designing products to be durable and of high quality; and designing products with the “reuse, recycle, renew” -principle, aiming for products to be reused, recycled or composted. (Niinimäki, 2013, p. 17.) Discussing these sustainable principles from different sources that aim to communicate the same few key concepts in different words may seem repetitive, but in actuality, it only highlights the importance of them, as well as strengthens their credibility and illustrates the simplicity of making impactful changes.

Even with all of the aforementioned guidelines and principles, the task of designing a product in the most sustainable and optimal way possible is by no means an easy one. With new trends popping up on social media at the speed of light, and the increased demand that follows, it may feel tempting to try to jump on every single one of them in order to stay relevant. The fashion calendar is often divided into two main seasons, autumn/winter and spring/summer, with the addition of pre-fall and resort collections. The emergence of fast fashion, however, has accelerated the production of new collections so much that there are new products on the market every week or even every day. This approach is highly flawed in terms of sustainability since these new and trendy pieces tend to have very short-lived lifecycles. It is instead better to limit the amount of

collections that are designed, developed and produced and when possible, keep them as seasonless as possible, so that they can be worn throughout the year regardless of the seasons or trends. This is of course easier said than done, especially in the northern hemisphere, where the weather conditions can be drastically different during different seasons.

In addition to the seasonless approach, there are many other values a designer should take into consideration in their work. In order for a garment to be used to its fullest potential and have a prolonged lifecycle, it should be easy to care for, be fit for its purpose, fit different types of bodies, be made of appropriate materials for the product type, offer value for the consumer's money, age well in terms of material and aesthetic, and reflect the market area with its aesthetic and price point. All of this may still not be enough to create a best-selling product, though. The competition in the fashion industry is fierce, with new brands emerging all the time, so designers must find ways to stand out. A designer should have original ideas and be brave enough to experiment with them, while also having an eye for proportions, silhouettes, textures, colors and patterns. In other words, a successful designer should aim to please everyone. (McKelvey & Munslow, 2012, p. 80, p. 82.)

One final aspect of a sustainably optimized design process is the emotional value attached to the products already when designing them. This is called embedded storytelling, which can include integrating brand stories of how a piece was made, where it was made and by whom, how it relates to the brand and where the idea for it came from. The story could also be something entirely made up, like those seen in editorials usually associated with bigger brands and luxury designer pieces. The point of creating such a story is to encourage the customer to in turn attach their own emotions, values, stories and memories to the product, which creates nostalgia and in the best-case scenario prolongs the lifespan of the product, compared to something one might purchase on an impulse just because it looks nice and the price is right. (Sustainable Design Cards, 2020b.)

In addition to optimizing the design elements of a product, it is also important to optimize the accuracy of production quantities, also known as forecasting the demand. This, if not done well, tends to result in lots of overstock that will need to be sold on sale, or on the other end of the spectrum, losing sales because there are not enough products to cover demand. Some brands have adopted a pre-order strategy, meaning consumers will order and pay for the products before they go into production, which allows the company to have a somewhat accurate representation of demand and also funds to cover production costs. A pre-order system can be difficult to establish if a brand is fairly new, however, since consumers typically like to have some guarantee of the quality and fit they are paying for. If a brand is more established and already has loyal customers who do not mind waiting a bit longer and paying before receiving their products, this strategy could be beneficial. Another way that does not require upfront payment from consumers is having a digital newsletter that consumers can sign up for via email to receive notifications about product launches. Examining the amount of newsletter sign-ups can then give a rough estimate of the amount of people interested in buying a company's products.

4.2 Materials

Possibly the most important, challenging and problematic phase of creating a new product is choosing the materials. It is also a complex phase to optimize since there is no one-size-fits-all solution. On the contrary, each material, no matter if it is synthetic or natural, comes with its own environmental burden, meaning it is, at this moment, impossible to find one best solution that would work for every kind of product and take into account all of the environmental aspects that come into play during a product's lifecycle. (Niinimäki, 2013, p. 19-20.)

As mentioned in the previous chapter, designing longevity into products is one sustainable strategy within product and lifecycle design. This strategy manifests into reality in the material choices and structures of a product. The two main attributes of a long-lasting material are high quality and repairability. High quality

in terms of material usually translates to longer fibres, which are proven to have better tensile strength, endure abrasion better, hold color better and be less prone to pilling (Première Vision, 2023). High quality and repairability can be attributed to many different kinds of materials, however, so they alone are not enough to determine the final selection.

When selecting materials for products, a designer has two options: either using virgin materials or opting for recycled or deadstock materials. Considering the amount of unused textiles and fabrics on the market and in the world in general, using virgin materials can sometimes get a bad reputation. Processing raw materials into fibres and further into fabrics requires water and energy, the exact amount depending on the material in question, and creates waste and pollution in the process. The cultivation of plant fibres also requires land, which could otherwise be used for food crops, and pesticides and other chemicals that can have massive negative impacts on the environment and the people working with the plants. It should also be noted, that certain plant fibres can only be cultivated in specific environments and climates, which will also naturally add a step to the logistics chain, when these fibres and materials are shipped to different destinations around the world. Although there are material innovations with new, more sustainable production methods coming up constantly and companies should be aware of them, another option would be to source recycled or deadstock materials. For recycled materials, there is still some processing to be done when the material gets reconfigured to a new format, meaning that energy, water and/or chemicals are still being used in the process. Unfortunately, the quality of the recycled material might not always be as good compared to virgin materials, and the options to recycle or upcycle the material further once the product reaches the end of its lifecycle may be limited.

For deadstock materials, no further processing is typically needed (unless the material will, for example, be dyed) since the material is ready to use, making it a better alternative for both virgin and recycled materials in terms of its impacts on the environment and resource preservation. Little to no natural resources will be used for this material, making it a low-impact choice. Instead of reconfiguring

a material or a product to a new format or producing a completely new material for a product, which requires a lot of resources and time, a suitable material might already be on the deadstock market (often for a reduced price point as well, compared to virgin materials). Of course, the existence of the concept of deadstock material highlights the issue of overproduction in the fashion industry, since deadstock is essentially someone else's leftover fabric or 'waste'. On the other hand, using this leftover resource is in line with the idea of reducing (the production of something new), reusing and recycling. It also goes hand in hand with the design principle of designing something unique and original, by finding hidden gems amongst different deadstock materials, making it a kind of treasure hunt for the designer.

A relatively new and still evolving innovation amongst materials is biodegradable materials. While they deserve a mention as one option to optimize material choices in the fashion industry, they should be considered cautiously. When a material is qualified as biodegradable, it means it will disintegrate at least 90% in the correct conditions (either soil or water) in six months. Unfortunately, there are a lot of incorrect claims of biodegradability on the market, and for many materials, the complete biodegrading process would take a much longer time in reality. There are also differences in biodegradability in different states of the same material; for example, natural fibres are biodegradable in their raw form, but not if processed with chemicals and dyes. It is also worth noting, that biodegradable garments that end up in landfills at the end of their lifecycle will not disintegrate, since they are surrounded by other waste, not soil or water. Some materials are also marketed as compostable, which is unfortunately not a perfect solution either, since the composting process produces methane as a side product. (Première Vision, 2023; Niinimäki, 2013, p. 16.)

4.3 Production

When optimizing the production process, there is one main aspect to keep in mind that ties together most of the other variables in terms of sustainability, and that is the location. When a supply chain is very fragmented and globalized,

managing risks becomes more difficult, whether those risks have to do with social issues, long distances, time, cultural and political differences, natural disasters et cetera (Niinimäki, 2013, p. 23). Therefore, the best approach to optimizing the production process in a supply chain is to localize it; a strategy that has been supported by many researchers as well as administrative bodies such as the European Commission.

The location of production is one of the most important strategic decisions for a company. This decision will have a significant role in how the supply chain moves forward and whether or not the process can run smoothly without disruptions. When selecting the location of production, one should take into consideration the locations of the company's other suppliers, the cost of the production as well as the possible logistical costs that the location might present, the social aspects (i.e. working conditions, culture, relationship management with production etc.), the service level, the revenue potential, the customers' needs and the quality of production. (Logistiikan Maailma, 2019b.)

As mentioned previously, the aim should be to localize production since it is both a sustainable option and has many other benefits for companies as well. When the production process is as close to the company as possible, it allows for a certain level of flexibility. This means it is easier to practice lean inventory management, which means that products are shipped just in time before they are needed, minimizing overproduction, waste and storage costs and on the other hand, making the possibility of extra orders to avoid products being out of stock easier. This is an especially good strategy for smaller brands who are looking for ways to optimize their finances and revenue as well. Flexibility in production also comes into play with customer service, since consumers expect short delivery times and reliability from brands (Logistiikan Maailma, 2019c).

Niinimäki (2013, p. 24) also discusses the importance of locality in her work, since it tends to lessen risks within the supply chain and also makes it easier to ensure that quality standards are being met. Barr (2022, p. 176) on the other hand mentions companies' increased drive to reduce risks and aim for simplicity

in their supply chains. The European Commission has also issued The New Industrial Strategy for Europe (10.3.2020) which is focused on industrial ecosystems and aims to relocate more manufacturing back to Europe (Barr, 2022, p. 127).

Apart from location, other ways to optimize production processes can include incorporating 3D modelling, which reduces the number of samples and prototypes needed and can also aid in reducing the waste that accumulates in the pattern-making and cutting process (Première Vision, 2023). If and when waste is created, it is also important that the production facilities have a plan to dispose of the waste in a responsible way, either using their own processes (closed-loop thinking) or by outsourcing it to a partner (open-loop thinking) (Niinimäki, 2013, p. 25). The production facilities should also have comprehensive knowledge about the energy and water usage of their processes, and aim to minimize them.

Another way to keep the production process as efficient and smooth as possible is clear communication and collaboration, starting from the design process and continuing throughout production. This basically means that the design team and production team develop the product together, aiming to find the best solutions for the company's specific needs. Doing this from the beginning means there are fewer disruptions, miscommunications and samples that need to be made during the production process itself. Having open communication and collaboration enables the company to save time, money and resources, and the production team to work efficiently and use their own strengths. It is also important that the communication and possible collaboration between the company's suppliers work. This could mean, for example, that materials are delivered to the factory on time and there is mutual trust and respect so that the process goes as planned.

4.4 Logistics

Optimizing the logistics of a sustainable fashion brand means managing the movement of materials, products, money and information up and down the supply chain while minimizing the environmental impact. There are various systems and technologies to help achieve this, which will be examined in this chapter. Once again, as mentioned with the production process as well, simplicity is key in order to keep the logistics of a supply chain as efficient and easy to manage as possible.

The term *green logistics* has been coined to represent economic, societal and environmental sustainability in logistics, and aims to minimize the environmental impact of logistic chains (Logistiikan Maailma, 2020). It has been estimated that as much as 90-95% of sold garments in all Western countries are imported, meaning that the logistic chains attributed to those garments can be extremely long (Niinimäki, 2013, p. 14). Localizing production processes helps shorten these chains, as discussed in the previous chapter, but there are other ways to optimize logistics as well.

According to some statistics, online retail has been steadily growing by about 10% per year, and is estimated to keep growing. This puts a lot of pressure on transportation, reverse logistics, packing materials and inventory management. For transportation, the optimal solution would be to minimize methods that create a high amount of emissions, such as air freight, and opt instead for rail- or sea freight. For short-distance deliveries that are made by car, the use of electric vehicles or vehicles powered by alternative fuels should be used. To minimize the number of deliveries, and thereby minimize emissions, efficient route planning and bulk deliveries are great strategies. For this, it is common to collaborate with a third-party logistics provider. Unfortunately, this strategy is only functional for deliveries between the suppliers and the company since orders from consumers typically come sporadically and can therefore be hard to optimize in terms of deliveries. The same methods of transportation also apply to reverse logistics, which is a term for when goods are transported back to the

company from their final destination for return, repair, remanufacturing or recycling, for instance. (Logistiikan Maailma, 2021; Logistiikan Maailma, 2017c.)

Due to the growth of online shopping, there is also a natural emphasis on packing materials. When shopping in-store, a customer can easily decline any additional packaging, such as a plastic bag or even a receipt, but with online shopping, some form of packaging is always required. A lot of brands have started to opt for recyclable materials, such as paper or carton, which are better alternatives for plastic. The packaging should also be the right size, meaning no excess material is used. Any extra material, such as multiple layers of paper or plastic, should be avoided whenever possible, as long as removing them does not predispose the product to damage. It should be noted that the packaging material should also withstand possible reverse logistics if a customer decides to return their purchase. Ideally, the packaging should also instruct the customer on how to recycle it once it is no longer of service.

For an efficient logistics chain, the lean inventory management strategy discussed previously is also key. Other great tools for efficient inventory management are RFID and ERP. RFID or Radio Frequency Identification is a technology that allows for improved inventory accuracy in real time using a chip that is attached to a product. RFID helps with avoiding overstock and keeping the supply chain moving efficiently. It also holds more information compared to a traditional bar code, which allows for the whole lifecycle of a product to be examined, as well as recognizing products without actually seeing them. (Logistiikan Maailma, 2017d.) ERP or Enterprise Resource Planning on the other hand refers to a database that holds all the relevant information of the supply chain and other processes in real time. This database, as the name suggests, can be used to allocate and plan resources, and is an important tool for managing orders, materials, bookkeeping and inventory. (Logistiikan Maailma, 2017e.) Both RFID and ERP aim to keep a company’s processes running as efficiently as possible, so that any disruptions, surprises, waste and revenue loss are avoided.

4.5 Suppliers

Both Barr (2022) and Niinimäki (2013), in their respective works, talk about the importance of supplier relationships. Optimizing such relationships, or giving guidelines for optimizing them, unfortunately does not work in the same way as optimizing the other aspects discussed in this thesis previously. Human relationships are always subjective and often depend on variables that cannot be calculated, forecasted or optimized. Therefore, for the sake of this study, this thesis will be examining different factors that can help in selecting the right suppliers or that should be found in existing relationships with current suppliers in order to guarantee a sustainable and responsible work environment.

When a need for a new supplier has been identified, the first step for a company is to start doing market research. This could happen in the form of word-of-mouth information from other industry insiders, going to trade fairs or simply searching the internet. Market research is done so that knowledge of the market is current and accurate, but also to be aware of the amount of suppliers in the market. Once considerable options for suppliers are found, it is also good to be aware of their reputation, possible other customers and your importance and relevance to them as a potential customer. (Barr, 2022, p. 19, p. 23-24.) This can be seen as the basis upon which the relationship is then built. It is also worth noting that dependency on one single supplier for any specific material or action should be avoided. Diversifying suppliers lessens the risk of possible disruptions to the supply chain and also increases the company's negotiating power.

A relatively simple tool to use when judging the sustainability and responsibility of a supplier is to look at their certifications and the standards they follow. Some standards to look out for include SA 8000, a standard for social accountability; ISO 4001, an environmental management standard and EMAS, an Eco-Management and Audit Scheme (Niinimäki, 2013, p. 23). It is worth noting that these certificates and standards cost money and therefore are not always available for small companies even if they act according to them. On the other hand, one

should not rely on them exclusively to judge a supplier, and having a performance management plan and visiting suppliers regularly is recommended.

A performance management plan is a process applied to the most critical and strategic suppliers by a company. Despite its name, the performance management plan should not be seen as a surveillance tool, but rather a mutually beneficial process to ensure that the supplier understands the company's needs and is up to date on any improvements or developments that are needed, that they feel motivated and excited to work with the company and that they realize the benefit that this relationship has for them. A supplier's performance can be measured in the following areas: product quality, timeliness, cost, compliance with mutual agreements and ease of communication. When done regularly, the performance management plan should result in a better relationship with the supplier and their willingness to prioritize the buying organization going forward. (Barr, 2022, p. 209-211, p. 215.)

All suppliers, partners and operators in the supply chain should offer a safe and healthy work environment and a living wage to their employees. These are very basic human rights that are unfortunately, to this day, not fulfilled in many places. Therefore it is also the responsibility of companies to make sure their suppliers offer good working conditions to all their workers. Once again, this is considerably easier to execute when production and other processes of the supply chain are localized.

A good example of a company where social sustainability and traceability are optimized and continuously improved is the American outdoor clothes retailer Patagonia. In recent years Patagonia has become known for leading an industry example in environmental, social and economic sustainability and activism. On their website, they share their so-called *4-fold approach* to selecting their suppliers, where both new and existing suppliers must meet a specific set of criteria concerning environmental and social standards, quality and business. They also use a *Supplier Workplace Code of Conduct* that is based on the International Labor Organization's (ILO) core standards, which are applied to every

level of their supply chain from farm to factory. This code of conduct includes policies on topics such as health and safety, environment, wages, discrimination, law and code compliance, animal welfare and traceability, to name a few. (Patagonia, 2020.) Patagonia is also known for being a frontrunner in transparency, allowing consumers to see the information about where their products are made and by whom. This being said, they are also very transparent about the fact that there is still work to be done, and they should by no means be seen as a perfect company, but rather an inspiration and an example. A large amount of time and resources has gone into the work they have done and continue to do, and unfortunately, not every company has that possibility. They are, however, an exemplary company to show the whole industry how things can be done.

5 Comparing the Old and New Supply Chains

In this part of the thesis, various strategies for optimizing a supply chain have been successfully identified, and now it is time to put them into practice by assembling one, optimized model for the case example company. The company in question is a small fashion brand, which is important to keep in mind when selecting strategies. Once the new supply chain model has been presented, it will then be compared to the old supply chain model reviewed in Chapter 2.1.

In the old supply chain, the process started with sourcing the materials first and designing the products second. This tactic brought with it its own challenges, and therefore to make the process simpler and more efficient, the new supply chain will begin by designing the products. Since the brand in question is somewhat established already, there is data from previous collections regarding which products were successful and which ones could have been changed in some way. With this in mind, the first design strategy to be implemented is to recreate existing design concepts, meaning the new collection will include some now-sold-out bestsellers with some modifications. Having data from previous collections also helps with the demand forecast and estimating production quantities. Since the core value of the brand is to design comfortable, stylish and colorful clothes that bring joy, designing for delight is another strategy to be

implemented at the design stage. Designing for delight also allows for experimentation and boldness in design choices, which can be seen in the fit, colorways, silhouettes, prints and textures of the products. The collection design process in the new supply chain will stay in the seasonless approach, which helps minimize the amount of collections being produced, but a new principle that will be implemented is to build a strategy for the timings of new launches, based on the brand's own data as well as observations of general consumer behavior. Even though the brand is based in Finland, the seasonless approach is possible to execute since the selection consists of indoor clothing and loungewear, meaning the changing of the seasons and temperatures is not an issue.

After the design process is done, it is time to source the materials. In this part of the supply chain, the old and new processes differ only slightly since the most optimal choice for the brand in question remains to be the use of deadstock materials. The only difference is that going forward the materials will be sourced from Europe instead of Brazil, shortening the logistics chain and making the sourcing process easier. The main justification for using deadstock materials is to minimize the use of natural resources by opting for a low-impact, upcycled choice. When sourcing deadstock materials, one can never know what they are going to find, but some key characteristics to keep in mind are high quality and strong fabrics that enable a long lifecycle for the products as well as a certain level of uniqueness, with different colors, patterns and textures, that complement the design choices. Since there are limited quantities of the deadstock materials that are available, it is important that the designs have some flexibility in terms of material choices. This is due to the brand's strategy regarding sold-out products, in which a certain product can be brought back in a similar (or intentionally different, but still fitting) deadstock material due to high demand. This enables the brand to not lose sales and the customers to get something unique, while also creating a sense of urgency: if you miss out, you might not get this exact product anymore!

Possibly the biggest change compared to the old supply chain happens in production. As mentioned in Chapter 2.1, the products were previously manufactured in Brazil, which was challenging in terms of distance, longer delivery times, flexibility and emissions related to long-haul deliveries. Since the Covid-19 pandemic has subsided, many of the seamstresses manufacturing the brand's products have reclaimed their previous jobs, meaning a change in production strategy was inevitable in that sense as well. Therefore, in the new supply chain model the production process will be localized and moved to Finland. This is beneficial for the company, the suppliers and the customers alike. Having production in the same country as the company itself allows for easier real-time communication and collaboration as well as more frequent visits to the production facilities. It also allows for more flexibility, shorter logistics chains (and therefore also reduced costs for logistics) and better risk management. This also benefits the customers of the brand, since shorter delivery times and better reliability are guaranteed.

The main retail channel for the company is their online store, which puts an emphasis on the logistical optimization. At the time of this study, this is the area of the new supply chain where most development is still needed, which will be discussed in Chapter 5.2. Some of the previous optimization strategies (especially the localization of production) also have a positive impact on the logistics chain, for example in terms of faster restocks (when possible in terms of materials) of products that might sell out, better reliability and reduced risk of disruptions. For packing materials used for online orders, easily recyclable materials will be used. There will also be an emphasis on the aesthetic of the packing materials, meaning the customer will most likely prefer to use them again for other purposes instead of disposing of them right away, resulting in longevity in the packaging materials' lifecycle as well.

Making changes as radical as the ones discussed in this chapter not only affects the company's own processes, but also its brand story and message to its customers and followers. In this case, a large part of the company's identity has

been tied to its Brazilian roots in terms of manufacturing, material sourcing, designs and storytelling. That means moving the production and material supplier to Europe will have a significant impact on how the brand's identity is communicated outwards, which leads to a certain type of rebranding. Even though the core values and parts of the aesthetic of the brand remain the same, a transformation such as this will inevitably change the company in one way or another. This could mean highlighting other parts of the brand's identity more, finding other ways to communicate the current identity or changing parts of the identity altogether.

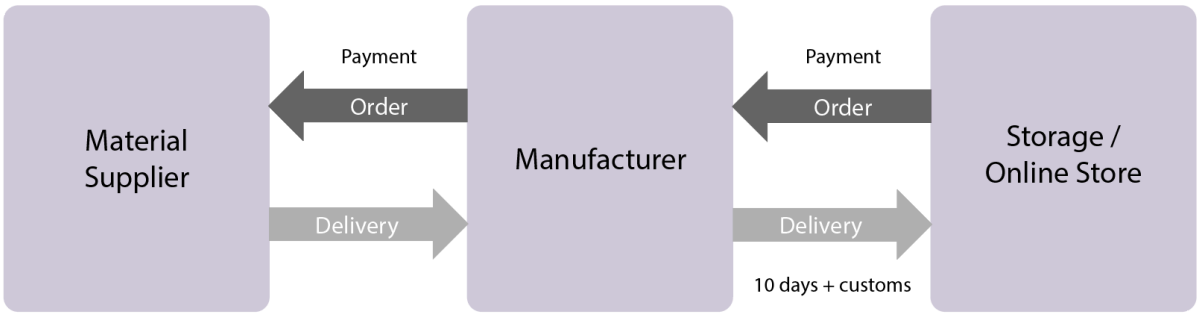

Figure 3. The old supply chain.

Pictured above in Figure 3. is the old supply chain model and the actions that happen between the suppliers and the brand. This is a very common model, where the brand makes an order of products in a certain amount to the manufacturer and the manufacturer in turn makes an order for the material supplier. After these orders have been processed, the material supplier makes a delivery to the manufacturer, who in turn makes a delivery to the brand. In this particular model, the exact prices are undisclosed but will be considered as the baseline to which the new model will be compared. The delivery time of the materials to the manufacturer is also undisclosed, but since the materials in question are deadstock, they are ready to be shipped and used. The delivery from Brazil to Finland, on the other hand, is estimated at around 10 days plus customs clearance.

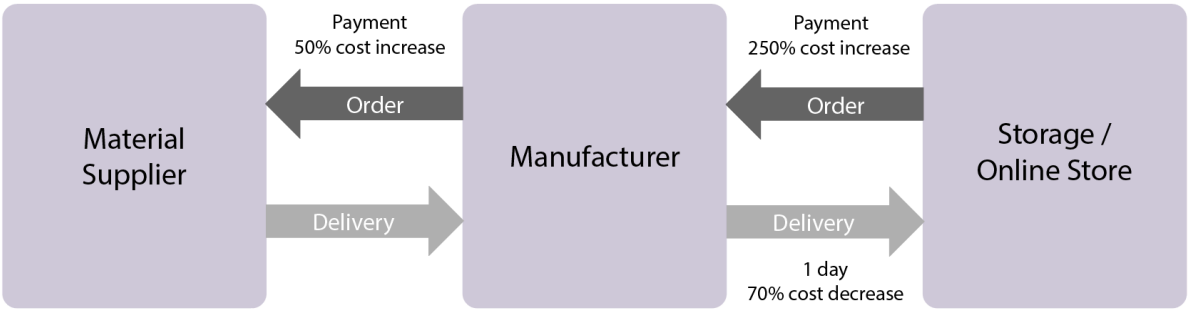

Figure 4. The new supply chain.

Figure 4. is the new supply chain model pictured in the same format as the old supply chain in Figure 3., with additional information about the effects of the changes that have been implemented. Starting with the brand's order to the manufacturer, there is a 250% increase in the price of manufacturing. This means that manufacturing products in Finland is 2,5 times more expensive compared to Brazil, which was to be expected but will in turn affect the pricing of the garments. Since the brand's positioning is in the premium category, its target group also consists of people who are willing to pay the premium price for garments. Still, pricing the new products and balancing the profit margin is arguably one of the more challenging decisions in the sales department following the increased manufacturing costs, a challenge that many brands have needed to tackle in recent years. Moving forward in the supply chain, the cost of deadstock materials has also increased by around 50%. Once again, the processing and delivery times of the material supplier are undisclosed, since there are no significant changes in them compared to the previous model. Surprisingly, the manufacturing time is also more or less the same since the products themselves are still similar in terms of structures, material compositions and styles. The delivery process from manufacturer to the brand is noticeably different, however, with delivery time dropping to one day, customs clearance not being necessary anymore and logistics costs decreasing by 70%.

Comparing the results of this study to the literature review, the main works of which were *Effective Strategic Sourcing* by Patrick Barr (2022) and *Sustainable Fashion: New Approaches* by Kirsi Niinimäki (ed.) (2013), most of the ideologies, claims and strategies presented in these works have been proven effective and functional. Even though Barr (2022) and Niinimäki (2013) wrote their respective works almost ten years apart, the common themes and ideas in them remain the same, highlighting even more the fact that it is not the question of *what should be done*, but *how it should be done* that companies need the answers to. It is worth mentioning, however, that neither of these works discusses the effects these changes might have on the brand image and how to handle the necessity of rebranding a company after implementing these changes. This is a notion brands and companies should be aware of and consider before starting the journey of optimizing their supply chain. Since optimization is typically a positive thing, if done with the aim of sustainability, a rebranding that reflects that aim should by no means be seen as an obstacle, but only as another component that should be considered early on. Another aspect that came up in the literature review was Barr's mention of sustainable supply chains not requiring increased costs (Barr, 2022, p. 149). However, as can be seen from the results of this study, there have been considerable and inevitable cost increases in some areas of the supply chain. It can be argued that in the long run, such increases will pay themselves back, so to speak, but it does not change the fact that companies should be prepared for increased costs when making large, operational shifts towards sustainability.

5.1 Positive and Negative Aspects of the Old and New Supply Chains

In this chapter are two tables listing the positive and possible negative aspects of the old and new supply chain models, as well as further explanations for the tables' contents. The aim of this chapter is to easily compare the two processes and to justify the changes that have been made.

Sustainability	Brand	Business
+ Employing local people + Low impact materials from local supplier	+ Brazilian heritage	+ Affordable production costs + Common language and culture
- Emissions from air freight - More difficult to arrange visits and manage supplier relationships - Risk of over- or underproduction is bigger	- Emissions from long distance deliveries contradict sustainable values of the brand - Difficult to react quickly to customer needs	- Long delivery times - Customs - Increased logistics costs - Risks relating to long distance deliveries - Lack of strategy - More difficult to manage the supply chain

Table 1. Positive and negative aspects of the old supply chain

The areas that will be assessed in this part are divided into three categories: overall sustainability, brand image and business. In the table above the positives and negatives of the old model are presented, some of which have already been discussed before. In terms of social sustainability, the old supply chain was successful in employing local people, creating a community and collaborating with other professionals in the industry who had lost their jobs due to the Covid-19 pandemic. Another positive aspect of the old model was using locally

sourced deadstock materials, which was continued onto the new process, only with new suppliers. The downsides of the old process in terms of sustainability were the emissions resulting from air freight deliveries, the difficulty of managing supplier relationships and the risk of over- or underproduction, since the just-in-time inventory management style is more challenging to implement.

For brand image, the old supply chain was one of its main building blocks, considering the brand's heritage is tied to Brazilian culture. This means that any changes made in the process would inevitably alter this part of the brand's image as well, requiring some level of rebranding. Then again, the old supply chain model with its downsides in terms of sustainability can be seen as contradicting to another core value of the brand, which is sustainability. It is also important to note, that having such a global supply chain as a small brand can make it difficult to answer to customer needs efficiently as they arise, which can in turn have a bad impact on customer relationships.

Lastly, in terms of business practices, the benefits of the old supply chain were lower production costs and a common language and culture, which made working with suppliers easier. The negative sides of the old process include longer delivery times that also include the customs procedures since products are shipped from outside of the EU. The longer delivery distance also led to increased costs in the logistics chain and bigger risks for the products. The old supply chain was also lacking some strategy and was overall more difficult to manage, which are major factors as to why changing the process was necessary in the first place.

Sustainability	Brand	Business
+ Reduced emissions in the logistics chain + Lower risk of overstock + Easier to manage social sustainability + Low-impact materials from a European supplier	+ A new, sustainable process + Rebranding + Easier to answer to customer needs	+ Reduced logistics cost + A more manageable, simplified and strategic process + Increased efficiency + Increased flexibility with suppliers + Reduced risks relating to complex, global supply chains + Shorter delivery times
	- Change of brand identity	- Increased manufacturing cost - Increased material cost - Language barrier

Table 2. Positive and negative aspects of the new supply chain.

Having examined the positives and negatives of the old supply chain, it is time to take a look at the same aspects of the new supply chain, as summarized above in Table 2. Since this study was conducted from the point of view of sustainability, the main goal was to minimize the negative effects and emphasize the positive progress. At this point, with the changes that have been made, the emissions of the logistics chain have successfully been reduced, the risk of overstock is lower, the low-impact materials for the products are sourced from Europe and social sustainability and supplier relationships are easier to manage.

As mentioned previously, the changes that have been implemented to the supply chain process also affect the brand's identity, but doing a rebranding can also be a positive thing. When a brand has been established for a while, it can

be beneficial to take a look at the brand's story, image and message, and improve them to better fit the market, the customers and the current time. After all, brands should evolve together with the people and the world around them. A rebranding goes well together with introducing a new, more sustainable process, and both of those things together help to better answer customer needs.

In terms of business practices, the new supply chain inevitably raises costs in manufacturing and materials, which was to be expected, since Europe and the Nordics tend to be more expensive locations to manufacture products and source materials from. This will consequently lead to some increases in the product prices. The costs in the logistics chain are reduced, however, since the distances are significantly shorter. The new process will also increase efficiency and flexibility with product deliveries and restocks, shorten delivery times massively and reduce the risks involved in complex, global supply chains, resulting in a more strategic, simplified and manageable process overall.

Comparing the two tables presented in this chapter, Table 1. and Table 2., it is clear that the strategic changes made in the new supply chain process are beneficial and justifiable, and have resulted in the desired outcome, which was to optimize the brand's supply chain using diverse sustainable strategies.

5.2 Further Development Ideas

Optimizing a process as complex and significant as a supply chain does not happen overnight. Sometimes to optimize means to compromise, meaning that certain elements need to be prioritized first and other elements can be focused on further down the line. This is typically due to a company's resources at any given time, but it does not need to be seen as a negative thing. It is actually quite smart for a business to implement new strategies gradually, so that their effects and functionality can then be monitored for a certain period of time before other new strategies are brought in. Sustainability and optimization should be seen as a marathon, not a sprint, since it is often the long-term approach that brings the best results compared to a haphazard change that tends to add

cost and not result in the most optimal sustainable solutions. (Barr, 2022, p. 149.)

In this study, the case example company is a small brand, meaning that some logistical integrations are, at the time of conducting this study, too time-consuming, expensive or require special expertise. This includes technologies like RFID and ERP, that require a significant amount of resources and programming in order to be integrated. The same goes for having a third party logistics partner that is focused on green logistics, preferably using electric vehicles and/or alternative fuels and has the core value of sustainability. The market for different logistics partners is quite vast and requires more thorough market research than what the timeframe of this study allows for, as well as resources on the company's side.

Another task regarding the new supply chain that will be left out of this study but would be highly beneficial and necessary for the company is making a risk analysis of the new process. This is a crucial step in any business strategy, and helps the company to identify, prepare for and avoid possible disruptions to the supply chain. Although this study has identified different risk factors in the old supply chain model of the brand and has made strategic changes that alleviate those risks considerably, it is still worth looking into possible new risks that might arise with the changes that have been made.

6 Conclusion

In this chapter, this study will be concluded with final assessments of its results, further development ideas and level of success. This chapter also examines the answers that were found to the research questions presented in chapter 1.2.

Supply chains in the fashion industry are complex webs of processes, suppliers, subcontractors and logistics, that hold the majority of a company's environmental impact within them. It is therefore crucial in today's world, impacted by climate change, humanitarian issues and growing consumer consciousness, to examine the choices that are being made by companies in every step of their

supply chains and aim to optimize them to be more sustainable. This is something many companies put off because they do not know where to start, yet they are still afraid of the consequences of not being sustainable enough. (Barr, 2022, p. 122, p. 132.) This was the driving force behind conducting this case study: to have a comprehensive guideline made up of different strategies for optimizing supply chains within the fashion industry to make them more sustainable, efficient and manageable.

The primary research question for this thesis was: How can the supply chain of a sustainable fashion brand be optimized by using diverse and responsible principles? The sub-question for this thesis was: How does the new, optimized process compare to the previous one? The thesis answered both of these questions by creating a new supply chain model for the case example company and by proving its benefits for the company, its stakeholders and the environment. In this sense, the study was successful and achieved its end goals. It is worth noting, however, that sustainability and CSR practices should be seen as a continuous commitment that is actively evaluated and developed (Niinimäki, 2013, p. 24).

As discussed in Chapter 5, the results of this study show that the original supply chain of the case example brand was successfully optimized using different strategies, and that the new supply chain shows significant improvements for the brand. There are also different strategies mentioned in this study that can be implemented in the future that can help improve the process even further. A downside to implementing the optimization strategies discussed in this study is the rise of manufacturing costs, which was to be expected, considering manufacturing is known to be more expensive in northern Europe. On the other hand, logistics costs were reduced significantly by localizing production and sourcing the materials from Europe.

The study was conducted over a period of time by getting familiarized with the company's current supply chain and identifying its challenges, and researching literature, articles, reports and studies on the subject of sustainable supply

chains. Having identified different optimization strategies from the research materials, it was then time to narrow them down to find the best possible solutions for the case example company. From the selected solutions, a new supply chain model was then built and compared to the old model to emphasize the importance of the changes and justify the choices. As an end result, there is a guideline for different optimization strategies for fashion brands wanting to develop their supply chains now and in the future. Having guidelines for sustainable strategies helps companies, both big and small, take the first steps in evaluating their current situation and mapping out possibilities to start changing it. If every company did this, a larger paradigm shift would happen in the whole industry. Before getting to that point, however, there are misconceptions to be corrected on a societal level, such as sustainability always being the more expensive option, or logistics being the biggest cause of emissions in the supply chain. These supply chain myths could also be a topic for another study in the future. Another topic for further research based on this thesis could be on how to communicate a sustainable supply chain through marketing, especially since there is a lot of greenwashing in the industry.

Conducting this study on the optimization of sustainable supply chains in the fashion industry is a full-circle moment that concludes my personal journey as a student, and has opened up a new understanding of the industry as a whole, while shedding light on the realization that there is still a lot to learn. The complexity of the processes that are required in order to get a garment from an idea to a consumer’s closet remains as fascinating as it was at the beginning of this study, only less daunting to work with. There are still numerous studies to be conducted regarding this subject, none of which will be useless since the more we understand the industry we work in, the better tools we will have to change it for the better. As someone who is only beginning their journey in this rapidly changing industry, I believe I will witness changes in the supply chain processes that I couldn’t have ever imagined during this study, which is an exciting thought, and one I will pay close attention to going forward.

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Appendix

First Production Samples of The New Supply Chain

This appendix includes pictures and information of the first production samples manufactured for the case example brand by a Finnish factory using deadstock materials sourced from France.

All of the samples pictured below are part of a new, upcoming collection (which will include more products than presented here). The products include a light-weight coat, a sleeveless dress, a pair of pants, shorts and a matching set including a long-sleeved shirt and shorts. The material for all of the products is a cotton poplin that comes in various colors and prints. The buttons used in two of the products (the lightweight coat and long-sleeved top) are also deadstock.