

Pavan Karunaratne

# **COOPETITION IN SUSTAINABLE APPAREL MANUFACTURING**

An interview study

Master of Science Thesis  
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# ABSTRACT

Pavan Karunaratne: Coopetition in Sustainable Manufacturing

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Examiners: Professor Leena Aarikka-Stenroos, Doctoral Researcher Linnea Harala

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The apparel industry is one of the biggest environmentally polluting industries globally. In recent years, there has been a shift from the end consumers towards sustainable fashion products due to the concern of the environmental impact of their purchases. Due to this, fashion brands have been trying to offer sustainable products to this growing customer segment. Fashion brands have been requesting apparel manufacturers and the other ecosystem partners involved in the apparel manufacturing process to develop sustainable products. Therefore, the apparel industry has been trying to move into sustainable manufacturing methods due to the pressure from external stakeholders and also due to the growing demand for sustainable products. This has posed several challenges to conventional apparel manufacturers who have developed their business models based on fast fashion. Hence, the objective of this study is to understand the current sustainable goals of the apparel manufacturing industry and also examine the challenges faced by apparel manufacturers when achieving them. Furthermore, whether there are existing coopetition elements in the apparel manufacturing ecosystem.

To achieve these research objectives, a case study of a global apparel manufacturer from South Asia was conducted. A series of qualitative interviews was conducted to gather data from the main actors in the organization. The interview data was transcribed and analyzed using the thematic data analysis method to get a broader understanding of the industry.

The key findings present the need for a systematic change in the apparel industry in order to make a substantial shift toward sustainability. Particularly in the current 'buyer-driven' business model, where price sensitivity is the central factor in selecting apparel manufacturers, collaborating among vertical actors poses significant challenges, while horizontal actor collaboration remains rare. Coopetition is a novel concept in the highly competitive apparel manufacturing industry. However, it offers promise as a means to achieve shared sustainable goals among ecosystem partners. Although, it is essential to emphasize that such initiatives need to be spearheaded by fashion brands, given their influential role in the apparel supply chains. In addition, equal commitment from the ecosystem partners needs to be ensured in order to mitigate misunderstandings. In conclusion, this study presents the importance of collaboration between ecosystem partners in the apparel manufacturing industry when achieving sustainable goals.

Keywords: sustainability, apparel manufacturing, ecosystems, coopetition, collaboration

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

## **PREFACE**

The research was conducted as part of the Master of science degree program in Industrial Engineering and Management program. It was written under the Center for Innovation and Technology Research (CITER) in the Faculty of Management and Business, Tampere University.

First and foremost, I would like to thank Professor Leena Aarikka-Stenroos for her continuous support and guidance in assisting to finalize the research topic and providing valuable feedback. Also, I would like to give special thanks to Doctoral Researcher Linnea Harala for her continuous support and valuable feedback in every step of the research process. This research would not have been possible without her flexibility and understanding.

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Tampere, 15 October 2023

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## LIST OF SYMBOLS AND ABBREVIATIONS

CSR	Corporate Social Responsibility
IP	Intellectual Property
MOQs	Minimum Order Quantities
RM	Raw Materials

# 1. INTRODUCTION

## 1.1 Background of the study

Apparel manufacturing is considered as the second most polluting industry, just behind the oil & gas industry (Nat Clim Chang, 2018). The industry accounts for more than 1 billion tons of greenhouse gas emissions annually, which affect severe climate change and global warming (Chen et al., 2021). To give some context, the apparel industry emits more greenhouse gases than the global aviation and maritime industries combined. Apart from this, synthetic fibers, which are used heavily in apparel products, cause environmental risks. Synthetic fibers account for around 70% of total global fiber production (Chen et al., 2021). Synthetic fibers are developed using petrochemicals, and they are non-biodegradable. Currently, the majority of apparel products manufactured using synthetic fabrics end up in landfills, which results in microplastic pollution (Nat Clim Chang, 2018). Furthermore, apart from the large water consumption involved in fabric dyeing, the release of fabric dyeing and finishing chemicals into water streams causes more water and environmental pollution (Muthu & Gardetti, 2016; Shirvanimoghaddam et al., 2020).

These numbers have only increased due to the acceleration of fast fashion. Fast fashion refers to relatively low-cost garments that are trendy and fashionable. The lifecycle of fast fashion products is far less compared to high-end durable apparel products (Saha et al., 2021). According to the American Apparel and Footwear Association, in 2018, 11.3 million tons of textile waste had ended up in landfills while only 2.5 million tons were recycled. There has been a growing concern among end consumers and authority bodies for apparel industry stakeholders to address these issues and reduce the impact on people and environment (Boström & Micheletti, 2016; Todeschini et al., 2017).

However, apparel manufacturing is a labor-intensive commodity goods manufacturing industry. Even though the majority of fashion brands are based in the United States and Europe Union, apparel manufacturing processes are outsourced to the developing countries where cost of labor is cheap (Gereffi, 1994). This has created complex supply chains within the apparel industry where transparency and traceability have become difficult. Furthermore, the apparel industry is a 'buyer-driven' industry where fashion brands select apparel manufacturers based on the low cost of manufacturing. This has created fierce competition among apparel manufacturers who are horizontal actors in the apparel manufacturing supply chain (Gereffi, G.; Appelbaum, 1994). The competitive nature



could discourage apparel manufacturers from taking sustainable initiatives, as this could further increase the cost of manufacturing.

There has been a growing demand for sustainable apparel products and initiatives among young consumers (Sobuj et al., 2021). Fashion brands have been trying to cater to this growing customer base, but there have been concerns from customers about 'greenwashing' in the apparel industry (Mckinsey & Company, 2019). The apparel industry has adapted the three pillars concept of sustainability, which are product, people, and planet at a macro level (MAS-Silueta, 2023). However, the collaboration between apparel manufacturing ecosystem partners is crucial to achieve system-level changes towards sustainability (Shen et al., 2017; Harala, 2021).

Coopetition refers to collaborating between competitors and also among other ecosystem partners when all partners involved can be mutually benefitted (Aarikka-Stenroos & Lehtimäki, 2014). According to past research, there have been attempts in several manufacturing industries to develop cooperative partnerships among vertical and horizontal actors in their ecosystems in order to address sustainable challenges (Harala et al., 2023). However, ecosystem partners need to align their goals and practices in order to achieve macro-level outcomes (Harala et al., 2023).

First, this research strives to identify challenges faced by apparel manufacturers when achieving sustainable goals. After that, the study explores the possibility of using coopetition to address the challenges faced by apparel manufacturers. Therefore, the research focuses on coopetition in the apparel industry. Past research that has been conducted on collaboration among apparel industry competitors is limited (Sobuj et al., 2021; Khairul Akter et al., 2022). Furthermore, the research on collaboration among competing horizontal actors in apparel manufacturing has been even more limited (Mohajeri et al., 2016). This thesis aims to address these research gaps by developing theoretical knowledge on existing coopetition elements in the apparel manufacturing industry.

## **1.2 Research objectives**

There has been an increase in demand for sustainable fashion products. Due to this, traditional apparel manufacturers have been moving into sustainable manufacturing methods. However, the apparel industry has to overcome numerous challenges to implement sustainable manufacturing. Coopetition is a concept where competitors work collaboratively to achieve mutual benefits. The aim of this research is to understand the challenges faced by apparel manufacturers when moving into sustainable

manufacturing. Also, the study aims to explore how cooperation can be used to achieve common sustainable goals set up by apparel manufacturers and their ecosystem partners.

The study is conducted by interviewing apparel industry professionals of the largest apparel conglomerate in South Asia, which predominantly cater to European and American markets. The study aims to answer the following research questions by combining the theoretical data and empirical data collected from interviews.

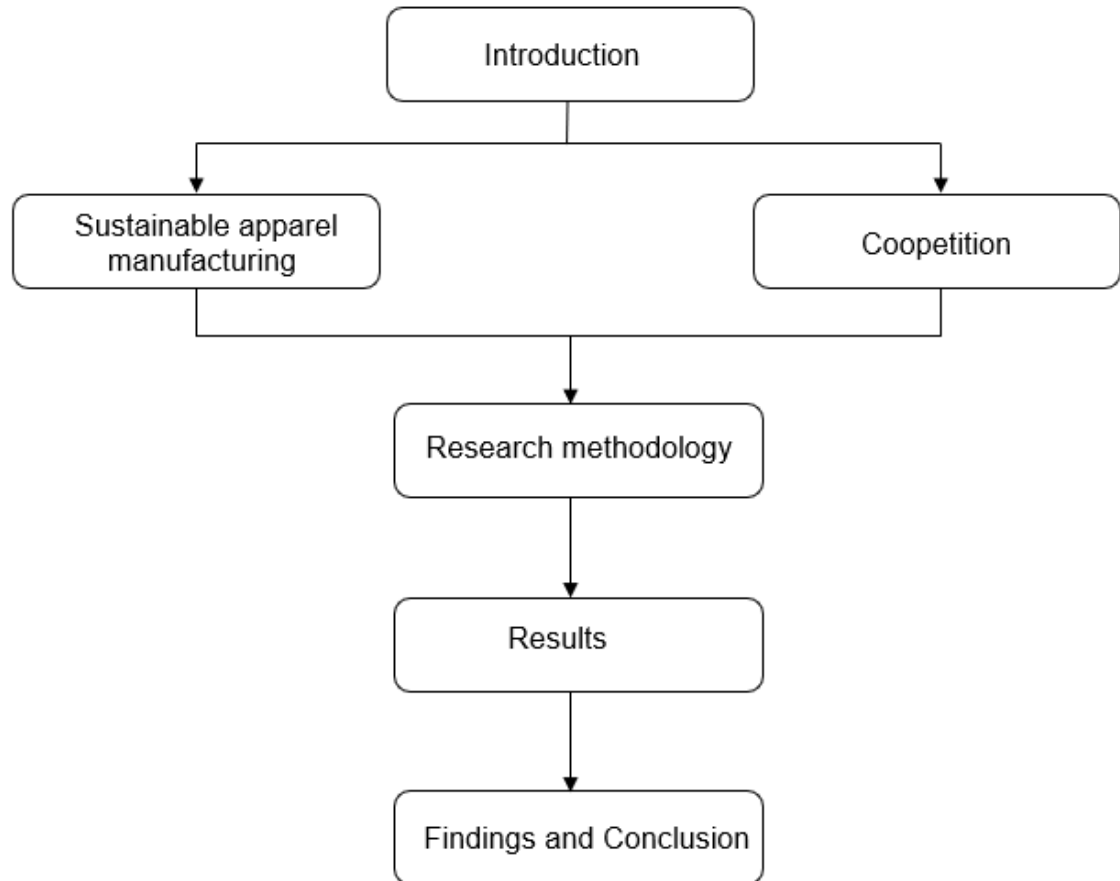
**RQ1:** What are the challenges faced by apparel manufacturers when implementing sustainable goals?

**RQ2:** What kind of cooperation currently exists with regard to sustainable apparel manufacturing ecosystems?

A semi-structured and open-ended questionnaire developed based on the research questions was used in the interviews to collect relevant information. This study would build the theoretical background on sustainable apparel manufacturing and cooperation first. After, the information gathered from the interviews will be analyzed in the research methodology section. Thereafter, results will be presented with regard to the case company. The study aims to understand the sustainable goals of the apparel industry, the challenges faced when achieving said goals, and whether cooperation can be used as a method to achieve sustainable apparel manufacturing goals.

### **1.3 Structure of the study**

This thesis included two main theoretical areas, which are sustainable manufacturing and cooperation. The two chapters are followed by a qualitative study that analyses the sustainable manufacturing goals and the challenges faced by a global apparel manufacturer based in South Asia. The below figure illustrates the structure of the study.



**Figure 1.** *The structure of the research.*

The first chapter will introduce the background of the study and the research objectives. It will be followed by two theoretical chapters, which will explain sustainable manufacturing and competition in chapter 2 and chapter 3, respectively. In chapter 2, apparel manufacturing and apparel manufacturing ecosystems will be introduced. Chapter 2 will conclude by explaining sustainable apparel manufacturing. Chapter 3 will begin with an introduction to competition and that will be followed by multi-actor competition and how multi-actor competition is used in different industries to achieve sustainable manufacturing goals. Chapter 3 will be concluded by exploring how multi-actor competition can be used for sustainable apparel manufacturing.

The theory chapters are followed by the research methodology of the research. Chapter 4 introduces and explains the case study research method. A case study was chosen to understand the practical challenges faced by apparel manufactures. A case company was selected based on relevance and access to data. The empirical data was mainly collected by conducting a series of qualitative interviews with selected professionals from the case company. Finally, chapter 4 concludes with the data analysis.

Chapter 5 includes the results of the case study. The results are presented in a manner to answer the main research questions. Firstly, the sustainable manufacturing goals and the challenges are explained. Secondly, existing competition aspects of the company's ecosystem and further improvements are presented.

In chapter 6, the findings and the conclusion are discussed. Firstly, the theoretical contribution of the study is presented. It is followed by the practical implications of the research. Finally, the limitations and the ideas for future research purposes are presented.

## 2. SUSTAINABLE APPAREL MANUFACTURING

This chapter starts with a brief introduction about apparel manufacturing. Firstly, fabric development is presented as fabrics are the biggest component of a garment. After that, how garments are manufactured using various methods is presented. In the second sub-chapter, apparel manufacturing ecosystems are introduced. In this, the ecosystem partners such as fashion brands, apparel manufacturers, raw material suppliers, buying offices, etc. are discussed. Also, their role and influence on other partners are discussed. Lastly, the chapter concludes by introducing sustainability in apparel manufacturing. For this, existing literature studies on sustainable apparel manufacturing are used.

### 2.1 Apparel manufacturing

#### Fashion segments

According to Doeringer & Crean (2006), apparel manufacturing could be divided into 6 broad categories. First, at the bottom of the pyramid, commodity products refer to low-value products with the shortest lifecycles such as intimate wear made of knit fabric and socks. Next, fashion-basic products refer to products such as athletic wear made out of knit fabric, formal shirts, and casual trousers. Third from the bottom, better fashion products refer to dresswear and suits that are affordable to the majority of customers (Doeringer & Crean, 2006). Forth from the bottom, bridge fashion products refer to fashion products that are ready made but only affordable to high-end customers. Fifth from the bottom, designer collection products refer to high end fashion products that are readymade and designed and developed by reputed designers. At the top, haute couture products refer to high end fashion products which are custom made by renowned designers specifically for famous personalities for special occasions (Abernathy, et al., 1999). The fashion pyramid is illustrated in figure 4.



**Figure 2.** *The fashion pyramid, adapted from Doeringer & Crean (2006).*

As product categories move up the pyramid, the market size gets smaller and far more specialized. Most importantly, the price sensitivity of the markets reduces when moving from commodity and basic fashion products to designer wear and haute culture products. Also, the quality of raw materials used has increased. According to Doeringer & Crean (2006), different fashion product segments have different production times and product release cycles. Especially basic commodity fashion products and basic fashion products are usually manufactured one year before the season they are planned to be released. These two product segments are usually released in 2 main seasons which are Spring/Summer and Fall/Winter (Mckinsey & Company, 2019).

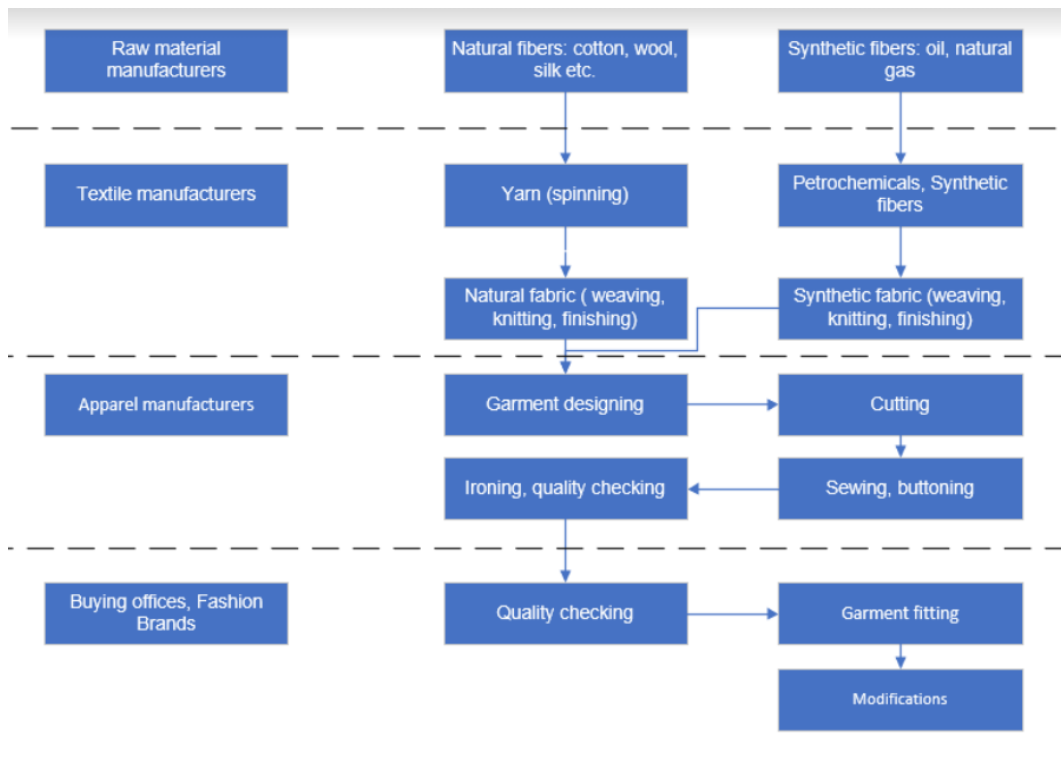
The production cycles of knit underwear and athletic wear which are included in fashion commodity and basic fashion categories are similar. Firstly, product design and development cycle takes about 3 -4 months. Secondly, sample making and sourcing fabric and other required components are done parallel, and 2-3 months are allocated for this step. Thirdly, the next 2-3 months are allocated for bulk production and quality checking. Finally, shipping orders and distributing them into retail stores take the rest of 2-3 months in the production cycle. Also, some basic commodity products like socks can have production cycles running for years without much change in the product design.

**Apparel manufacturing process**

Over the past few decades, there has been a notable shift in the apparel manufacturing industry, with production moving away from the United States and the European Union towards developing nations. This significant relocation can primarily be attributed to buyers' pursuit of cost advantages (Pinto & de Souza, 2013). According to Gereffi (1999), apparel manufacturing is a 'buyer-driven' linear chain.

In a buyer-driven supply chain, buyers have substantial influence not only in the selection of suppliers but also in dictating various aspects of production, such as design, quality standards, and cost consideration (Gereffi, G.; Appelbaum, 1994). This approach contrasts with a more traditional 'producer-driven' supply chain, where manufacturers typically hold greater control over the production process. The 'buyer-driven' model emphasizes the importance of understanding and meeting the specific demands and preferences of consumers and retailers, ultimately driving the dynamics of the apparel manufacturing industry.

Due to this, current fashion brands do not have experience in apparel manufacturing, and they rely on large manufacturers who act as contractors. This is quite prevalent in the global fast fashion segment (Pinto & de Souza, 2013). Figure 3 illustrates the main partners involved in the apparel manufacturing process and their respective operations.



**Figure 3.** The apparel manufacturing process, Adapted from Richard P. Appelbaum & Gary Gereffi (2009).

According to Richard P. Appelbaum & Gary Gereffi (2009), apparel industry can be divided into 4 key segments. Firstly, raw material manufacturers produce natural fibers and synthetic fibers. Natural fibers are extracted from trees or animals and include cotton, silk, wool etc. Synthetic fibers are extracted from petroleum and include polyester, nylon, rayon, and acrylic (Shen et al., 2017). and mostly rayon. Also, raw material manufacturers develop fiber blends by mixing natural and synthetic fibers. Secondly, textile manufacturers use these fibers to develop yarns using spinning. After that, yarns can be used to develop fabrics using two main techniques depending on the required fabric properties (Karthik, 2017).

These techniques are called weaving and knitting. The main difference is two sets of yarn are used in the weaving technique whereas the technique is done using a single yarn. Next, apparel manufacturers process these fabric and other components based on the garment designs to develop garments. Typical processes of apparel manufacturers include fabric cutting, sewing, buttoning, and quality checking. Apparel manufacturers can carry out more advanced applications like material bonding, thermal moulding, heat transfer printing etc. when manufacturing more complex products (MAS, 2023). Large apparel manufacturers conduct quality checking of the finished garments according to the quality parameters shared by respective fashion brands as well.

Once the initial product samples are completed, buying offices and fashion brands receive them. The main role of buying offices is to ensure the sample meets the quality parameters requested by fashion brands. However, Nowadays, buying offices operated by fashion brands have expanded their scope far beyond their initial role in procurement. They now play an active and integral role in tasks ranging from product design and fabric selection to the sourcing of materials. Additionally, they closely oversee contracted sewing and various other aspects of production, which were traditionally the responsibility of apparel manufacturers (Doeringer & Crean, 2006).

The garment fitting is usually conducted by the designers and the product development team of the fashion brand as the final appearance of the garment on the wearer is an important factor as the end customers try apparel products prior to purchasing. While renowned fashion brands have in-house models dedicated to wearer trials, some brands hire freelance models that fit the ideal customer body type. Generally, achieving a satisfactory fit can take several iteration steps as fashion brands have different criteria to measure fit and also cater to different customer segments. Also, it is important to note that there are more.



## 2.2 Apparel manufacturing ecosystems

### Manufacturing methods in commodity goods manufacturing

According to Richard P. Appelbaum and Gary Gereffi (2009), there are two main types of manufacturing methods used in commodity goods manufacturing. They are 'producer-driven' and 'buyer-driven' respectively. Producer-driven manufacturing refers to the industries where manufacturers have a higher degree of control compared to the other partners in the manufacturing ecosystem. The characteristics of these industries include advanced technology usage and high capital investment requirements. Also according to Ertek & Griffin (2002), If the number of manufacturers is limited in an industry, there is a higher chance of the industry becoming a 'producer-driven' industry. Examples of producer-driven industries are aircraft manufacturing, automobile manufacturing, electronic and electrical appliances manufacturing etc. (Richard P. Appelbaum & Gary Gereffi, 2009). Figure 3. illustrates a flowchart of a 'producer-driven' industry supply chain.



**Figure 3.** 'Producer-driven' commodity goods manufacturing industry supply chains, adapted from (Gereffi, 1994).

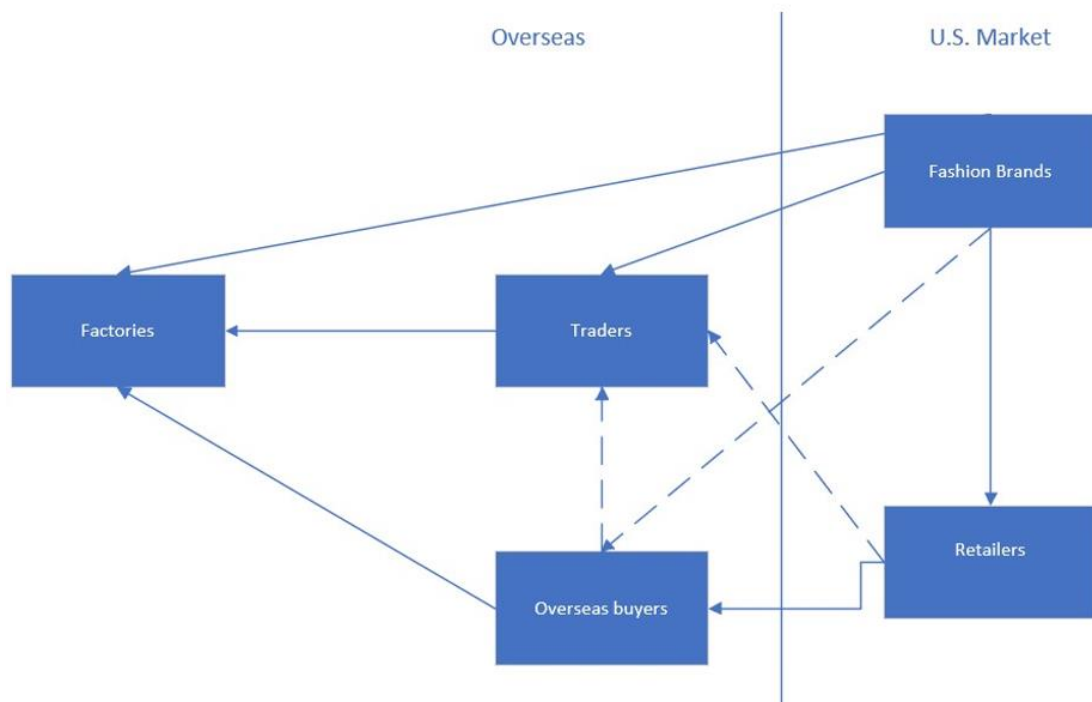
As the image shows in a 'producer-driven' industry, the manufacturer acts as the main focal point in the supply chain. In pursuit of operational efficiency and cost optimization, manufacturers often engage subsidiaries or external partners to manage lower-value or non-core functions. Nevertheless, it is imperative to note that in the context of critical manufacturing processes and proprietary technologies, the prevailing strategy dictates the retention of these operations in-house (Pinto & de Souza, 2013).

In 'producer-driven' industries, manufacturers have control over the buyers. Generally, in such industries, manufacturers possess advanced technology know-how and buyers are dependent on the manufacturer. Furthermore in producer-driven industries, products are complicated and difficult to manufacture by subcontractors (Gereffi, 1999b). Also producer-driven industries typically have linear transactions where the manufacturer is

specialized in a technology and decide which partners they want to interact with. (Gary Gereffi, 1994)

This approach reflects a conscious effort by manufacturers to maintain control over critical aspects of production and to optimize resource allocation. By strategically determining which partners to collaborate with, manufacturers can align their supply chain operations with their overarching business objectives, enhance production efficiency, and safeguard their proprietary technologies and intellectual property (Sammorra & Belussi, 2006).

The second method in commodity goods manufacturing refers to 'buyer-driven' industries. Figure 4 illustrates a diagram that shows the partners and communication directions in a 'buyer-driven' industry.



**Figure 5.** Buyer-driven commodity goods manufacturing industry supply chain, adapted from (Gereffi, 1994).

According to Gereffi and Korzeniewics(1994), two examples of the 'buyer-driven' commodity goods manufacturing industry are the fashion industry and athletic footwear industries in the United States. In 'buyer-driven' industries, fashion brands or companies that own multiple fashion brands could contact manufacturing factories directly. Also fashion brands could contact traders and overseas buyers to place their orders (Gereffi, 1999b). Compared to 'manufacturer-driven' industries, communication flow in 'buyer-driven' industries is nonlinear and more complex. Fashion brands act as the focal point

in the supply chain where they decide the companies, they want to partner with to get their products manufactured. The complex nature of the supply chain gives the fashion brands a competitive advantage as replicating the supply chain is far more difficult compared to 'producer-driven' supply chains.

According to Gereffi (1999), in buyer-driven industries, buyers are not involved in the manufacturing process. Most of the manufacturing processes are outsourced to licensed contractors in countries where the labor is cheap. The buyers sometimes assign local buying offices to overlook the manufacturers to ensure quality parameters and smooth delivery of shipments.

The characteristics of buyer-driven markets are high labor requirements, cost-based manufacturing, and changing manufacturing demography based on cost incentives. ((Richard P. Appelbaum & Gary Gereffi, 2009). Apparel manufacturing has evolved into a buyer-driven industry where manufacturing has moved to third-world countries in Asia over the years. This is evident as the major players in the apparel industry do not manufacture their products in-house. Fashion brands such as Nike, Victoria's Secret, GAP etc. focus on product designing and marketing while manufacturing has been outsourced to factories based in developing countries (Muthu & Gardetti, 2016).

### 2.3 Sustainable apparel manufacturing

Many industries have adopted the United Nation's 17 goals of sustainable development. These sustainable goals cover 3 pillars of sustainability which address economic, societal, and environmental aspects (Purvis et al., 2019). In recent years, many apparel manufacturers also have implemented their sustainable goals by taking into 3 pillars of sustainability into account (Mckinsey & Company, 2019). The below table illustrates how United Nation's 17 sustainable goals are divided into 3 pillars of sustainability (Purvis et al., 2019)

**Table 1.** Sustainability pillars and United Nation's sustainable goals (Purvis et al., 2019)

Sustainability pillars	United Nation's 17 Goals of sustainable development
Economic (product)	<ul style="list-style-type: none"> <li>- Decent work and economic growth</li> <li>- Industry, innovation, and infrastructure</li> </ul>

	<ul style="list-style-type: none"> <li>- Reduced inequalities</li> </ul>
Social (people)	<ul style="list-style-type: none"> <li>- No poverty</li> <li>- Zero hunger</li> <li>- Good health and well-being</li> <li>- Quality education</li> <li>- Gender equality</li> <li>- Clean water and sanitation</li> <li>- Affordable and clean energy</li> <li>- Sustainable cities and communities</li> <li>- Peace, justice, and strong institutions</li> </ul>
Environmental (planet)	<ul style="list-style-type: none"> <li>- Responsible consumption and production</li> <li>- Climate action</li> <li>- Life below water</li> <li>- Life on land</li> </ul>

Out of these 17 goals, apparel manufacturers have identified 8 goals that are more relevant and possible to make an impact (Mckinsey & Company, 2019). The table below presents the 8 United Nation's sustainable goals which are more relevant to apparel manufacturing.

**Table 2.** *United Nation's sustainable goals that are relevant to the apparel manufacturing industry (MAS, 2023)*

<b>Sustainability pillars</b>	<b>United Nation's SDG relevant for apparel manufacturing</b>
Economic (product)	<ul style="list-style-type: none"> <li>- Industry, innovation, and infrastructure</li> </ul>
Social (people)	<ul style="list-style-type: none"> <li>- Good health and well-being</li> <li>- Gender equality</li> <li>- Clean water and sanitation</li> <li>- Affordable and clean energy</li> </ul>

Environmental (planet)	<ul style="list-style-type: none"> <li>- Responsible consumption and production</li> <li>- Climate action</li> </ul>
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Under the economic pillar, the main theme is building strong and safe infrastructure facilities, promoting industrialization based on sustainability and inclusivity, and encouraging innovation. Four goals are selected from social pillar as relevant for the apparel industry. Firstly, good health and well-being refers to promoting the well-being of people at all ages. Secondly, gender equality refers to women empowerment through employment and education. Also safeguarding girls from all forms of danger (United Nations, 2023). Thirdly, clean water and sanitation refers to everyone having access to clean water and sanitation facilities across the globe. Finally, affordable, and clean energy refers to ensuring energy to be accessible by all and also to be low-cost and low impact on the planet. Under the environmental pillar, the first UN goal is responsible consumption and production. According to the United Nations (2023), high-income nations have a 10 times more environmental footprint compared to low-income nations. Therefore, the responsibility of this goal mainly lies with developed countries that have higher power of affordability. Finally, climate action refers to taking urgent initiatives to mitigate the irreversible environmental change for the planet (Purvis et al., 2019).

### **Challenges in apparel manufacturing ecosystems**

According to a report published by Mckinsey in 2019, the demand for sustainable apparel products has been growing in main customer markets. However, one of the main challenges in apparel manufacturing is the industry does not have common sustainability standards (Todeschini et al., 2017). Due to this, driving progress in sustainability in the apparel manufacturing industry has become quite complex (Dissanayake & Sinha, 2015). According to an industry-wide survey conducted by Mckinsey, there are 4 key areas that require addressing with regard to improving sustainability in the apparel industry. They are 'embracing sustainable materials', 'driving transparency and traceability', 'turning supplier relationships into strategic partnerships,' and 'reinventing purchasing practices.'

Firstly, the current apparel products incorporating sustainable materials are limited according to the industry professionals. Increasing the percentage of apparel products with sustainable raw materials should be a priority as the demand is growing (Mckinsey & Company, 2019). Secondly, the lack of transparency and traceability are two major concerns raised by the industry professionals during the survey (Dissanayake & Sinha, 2015; Karthik, 2017). To improve transparency and traceability in the apparel industry would require substantial changes. Thirdly, in the context of suppliers, there is a growing

emphasis on social and environmental sustainability. Under social sustainability, apparel manufacturers have been focusing on the welfare of the workers, fair wages, women empowerment etc (Pinto & de Souza, 2013). Finally, the current apparel industry purchasing practices and strategies need to change with a focus on sustainable sourcing. The industry professionals anticipate this would result in a cost increase ranging from 1-5% (Mckinsey & Company, 2019). However, this could later turn into a competitive advantage with the demand for sustainable apparel products increasing according to the report.

## 3. COOPETITION

This chapter introduces the coopetition as a concept and proceeds to examine the primary drivers that motivate organizations to establish coopetition partnerships. Also, the concepts of dyadic coopetition and multi-actor coopetition are presented, and their main differences are explained in detail. Furthermore, literature examples on coopetition partnerships in 'buyer-driven' industries are presented. Finally, the chapter concludes by looking at the existing literature on using multi-actor coopetition in the apparel industry to achieve common sustainable goals.

### 3.1 Introduction to coopetition

Coopetition refers to the collaboration between competing companies, usually operating in the same industry or catering to the same customer groups. (Phillips & Ritala, 2019). This hybrid concept of competing and cooperating at the same time among business firms has been first introduced into research more than three decades ago. (Bouncken & Kraus, 2013; Harala et al., 2023). According to Bengtsson & Kock (1999), the advantages that companies can gain by coopetition can be divided into 3 main drivers, which are 'external,' 'relation-specific,' and 'internal' drivers. Depending on the industry in which the companies operate, the attractiveness of these drivers could vary (Harala, 2021).

The external drivers of coopetition are characteristics of the operating industry, high technological demand, and the existence of highly influential stakeholders (Bengtsson & Kock, 2000). Also, industry structure, and uncertainty of the future of the industry also can encourage organizations to partner up with the competitors to mitigate the risk (Phillips & Ritala, 2019). Furthermore, the merging of technologies could entice organizations to partner up with their competitors and form coopetition. By merging technologies, companies could develop products and services that are harder to replicate by other competitors and also strengthen their market share (Czernek & Czakon, 2016). This is quite relevant in advanced-tech industries where maintaining a technological edge is crucial to retain market share in the industry (Gnyawali & Park, 2011).

'Relation-specific' drivers that encourage competitors to collaborate include characteristics of the competitors involved and also the nature of the existing partnership (Bengtsson & Raza-Ullah, 2016). Typically, organizations would like to form coopetition partnerships with competitors that have valuable resources and technical capabilities.

Also, market-leading competitors in a particular industry face similar challenges such as finding capable and resourceful human capital, technology development, and speeding up R&D etc. By partnering up these companies can further strengthen their relationship and also address such issues (Gnyawali & Park, 2011). Finally, relationship-driven coopetition could allow partnering companies to set industry standards which is important in advanced technology-driven industries to retain market share.

### **Dyadic coopetition versus multi-actor coopetition**

According to Harala (2021) coopetition can exist in different levels depending on the number of companies involved. The basic form of coopetition is called dyadic coopetition, which takes place between two organizations. For example, an R&D company might collaborate with a larger cooperation to gain economy of scale whereas the latter party would benefit through R&D findings (Harala, 2021)

As the markets are becoming more competitive and product lifecycles are expected to be shorter, competing companies are forced to consider similar collaboration partnerships that can be mutually beneficial (Castañeda-Navarrete et al., 2021). According to Alves et al.,(2016) the companies could gain advantages such as accessing novel technology, improving their supply chain channels and most importantly allowing collaborated companies to remain competitive.

Bouncken and Kraus (2013) provide a collaboration between Toyota (Japan) and General Motors (United States) in the automotive industry as an early industrial example of dyadic coopetition. Even though both companies were competing to capture the same target customers, by partnering up they had gained mutually exclusive benefits. Toyota company had gained access to the United States market while General Motors company got the know-how of manufacturing small-sized automobiles which Toyota had mastered over the decades (Bouncken & Kraus, 2013).

Also, according to Czernek & Czakon (2016), coopetition can exist between partners in an ecosystem. However, when small and medium-sized organizations get into collaboration partnerships with large organizations, the smaller organizations can be overdependent on the bigger partner with more resources and financial capability. This could lead to a strain on the relationships as there is a lack of power balance (Osarenkhoe, 2010).



### 3.2 Coopetition for sustainable apparel manufacturing

Fast fashion has increased consumer buying rates of apparel products. Also, this has led to the manufacturing of apparel products with lower lifecycles to entice customers to make frequent purchases. On the one hand, this has led to the apparel manufacturing industry being cost-driven and also in return increased the amount of waste generated by the apparel industry (Dissanayake & Sinha, 2015). Nowadays, customers are more aware of the environmental impact of the apparel industry due to the access to information. Hence, the demands for apparel industry stakeholders to take action to mitigate their environmental impact have been on the rise (Rafi-ul-shan et al., 2020).

According to Korzeniewicz (1994), the apparel industry falls into the commodity goods manufacturing sector. Also, apparel manufacturing had changed into a 'buyer-driven' industry from a 'producer-driven' industry due to the relocation of large-scale apparel manufacturing factories from the United States and European Union to developing countries (Gereffi, 1999). The main reason for the relocation has been identified as the cost advantages due to the availability of low-cost labor in those countries. The outsourcing of labor-intensive operations has created quite complex and large supply chains. Independent subcontractors have specialized in component manufacturing and garment finishing to provide services to fashion brands based in developed countries (Dissanayake & Sinha, 2015). Fast fashion has intensified the competition between horizontal actors such as apparel manufacturers to win orders from fashion brands. Also, the apparel industry is 'demand-driven' and can be quite volatile as consumer buying patterns can change rapidly (Rafi-ul-shan et al., 2020).

Due to the complex nature of the supply chains in the apparel industry, the lack of transparency and traceability have increased over the years (Rafi-UI-Shan et al., 2018). This also has resulted in the apparel manufacturing industry to be scrutinized by external stakeholders such as Government authorities, Non-Government organizations, and sustainability advocates (Khairul Akter et al., 2022).

Literature studies on coopetition in 'buyer-driven' industries are sparse. More research has been done on coopetition on 'manufacturer-driven' industries. Apparel manufacturing as a commodity goods manufacturing industry is predominantly controlled and driven by fashion brands (Gereffi, 1999b). Moreover, coopetition for sustainable manufacturing in fast fashion is a further distinctive topic. As the fast fashion industry is predominantly driven by cost benefits where fashion brands are always looking to move from their existing partners for more cost-effective new partners, coopetition among ecosystem partners becomes even more challenging (Gereffi, G. & Appelbaum, 1994).

Coopetition could deliver positive results for apparel manufacturing in the environmental sustainability aspect according to Luo (2017). Many studies in the field of fashion supply chain management primarily concentrate on vertical connections between buyers and suppliers, where buyers are trying to gain a competitive edge by addressing sustainability concerns. However, there is comparatively less emphasis on examining horizontal relationships or exploring how companies within a fiercely competitive industry can collaborate with their rivals while safeguarding brand reputation and ensuring a reliable supply chain (Shen et al., 2017).

According to Manzhynski & Figge (2020), coopetition could contribute to sustainability mostly on a societal level which addresses people. The apparel manufacturing industry has created many job opportunities for low-income families in developing countries over the years (Dissanayake & Sinha, 2015; Sobuj et al., 2021). However, there can be conflicting impacts between economic aspects and social or environmental aspects due to coopetition according to Hahn et al., (2010). Coopetition could produce positive results in the economic aspect but at the same time could yield negative results in the latter aspects or vice versa (Bengtsson & Raza-Ullah, 2016; Harala et al., 2023)

The first research question aims to understand the current sustainability goals of apparel manufacturers and explore the challenges they face in achieving these goals. The second research question has a dual focus. First, it seeks to understand the existing elements of coopetition among ecosystem partners in the apparel manufacturing industry. This involves examining relationships between both vertical and horizontal actors within the apparel economy system. Subsequently, the study attempts to investigate whether coopetition can be utilized to overcome the challenges faced by apparel manufacturers.

## 4. RESEARCH METHODOLOGY

Chapter 4 includes the research method used to understand the sustainable apparel manufacturing aspects and its challenges. The research method is followed by case selection which explains the basis of the case company selection. After that, how qualitative interviews are used for preliminary data gathering is explained. Finally, analyzing data to understand the cooperation elements in the case company's current business model is presented.

### 4.1 Research method

Case study research method was used in this study. Most research that has been conducted on sustainable apparel has focused on either end consumers or fashion brands (Dissanayake & Sinha, 2015). However, in order to understand the ground-level challenges of sustainable apparel manufacturing, it is important to study how apparel manufacturers operate and their business models (Pinto & de Souza, 2013). For the purpose of exploring the aspects of sustainable apparel manufacturing and its challenges, a qualitative case study method is used.

According to Aino and Törnroos (2005), the case study research method is ideal when the research objective is to understand the influencing factors of an environment from a practical point of view. Additionally, the case study method is suitable when researching unfamiliar and novel concepts with the aim of gaining a broader and more holistic viewpoint (Voss et al., 2002). As cooperation is a novel concept specifically in the apparel manufacturing industry where existing research is limited, conducting a qualitative case study was justified.

The case company consists of a group of companies that specialize in raw material manufacturing, apparel component manufacturing, and garment finishing. Companies should have a B2B model as the research focuses predominantly on the challenges faced by mass apparel manufacturers that cater to global markets. This research obtained ten interviews conducted with professionals who cover areas such as product development, manufacturing, marketing etc.

A series of semi-structured and qualitative interviews were conducted with the apparel manufacturing industry professionals as part of the research (Saunders & Bristow, 2023). The interviewees were selected based on the relevance of their areas of expertise to the research topics which are apparel manufacturing, sustainability, and cooperation.

According to Saunders & Bristow (2023), conducting semi-structured interviews is ideal when researching complex and unclear territories. Furthermore, using open-ended questions is recommended when the objective is to gain a broader understanding of the research topic as well (Saunders & Bristow, 2023).

## **4.2 Case selection**

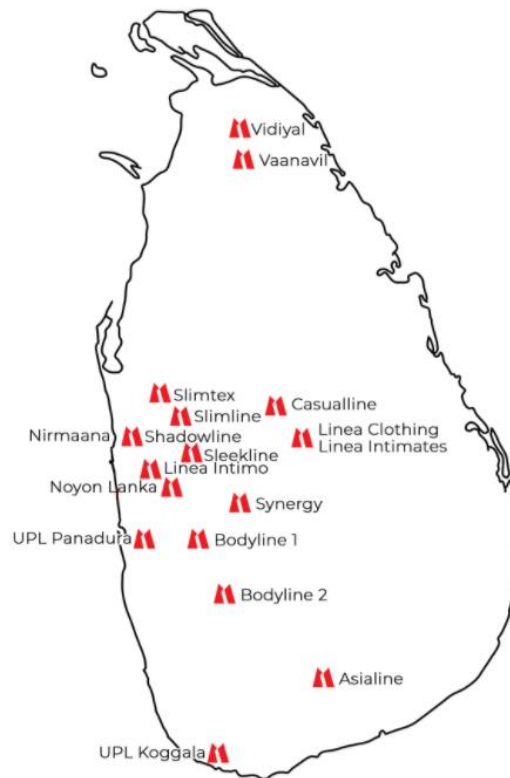
The objective of this study is to understand the challenges faced by apparel manufacturers when implementing sustainable manufacturing goals and whether coopetition could help to alleviate those challenges. When selecting an apparel manufacturer as a case company several requirements were considered. First, the case company needs to operate in a B2B market as the research is focused on mass-scale apparel manufacturing. Second, the case company's business customers should represent Europe and the United States. Third, the case company needs to have actual manufacturing facilities which would keep aside intermediaries such as buying offices. This was important as the challenges faced by an actual apparel manufacturer to an intermediary could be different. Therefore, understanding the challenges from an apparel manufacturer's point of view was important to achieve the research objectives. Secondary research was conducted to shortlist several companies that would fulfill the aforementioned criteria. The shortlisted companies were contacted to ask for permission as the research involved interviewing employees. After evaluating, fulfillment of criteria and the willingness to be part of the study, MAS Holdings was selected as the case company.

MAS is the largest apparel manufacturer in South Asia with the headquarters based in Sri Lanka (MAS, 2023). MAS has 52 apparel manufacturing and design facilities operating in 17 countries with a workforce of over 115,000. Founded in 1987, the organization operates in a B2B business model and mainly caters to globally renowned fashion brands in the United States and Europe (MAS, 2023). MAS provides design-to-delivery apparel solutions with the use of cutting-edge technology and specialized expertise. The company's global manufacturing and design facilities are shown in Figure 2.



**Figure 6.** Global Manufacturing and design facility locations of MAS Holdings. (MAS, 2023)

The comprehensive supply chain that spans from the start to the completion of apparel manufacturing in intimate, activewear, sleepwear and swimwear is a pivotal and cohesive element of MAS. Furthermore, MAS design, develop and manufacture innovative apparel for Wearabletech, Femtech and Healthtech markets as well. The MAS supply chain encompasses a range of manufacturing facilities, each possessing its own specialized skills (MAS, 2023). These facilities collaborate to craft exceptional products, paying scrupulous attention to every detail, from fabric selection and printing to a variety of embellishments such as elastic, lace, hook, and eye tape, along with various other accessories. Figure 7 shows the design and manufacturing locations of the MAS organization based in Sri Lanka.



**Figure 7.** Manufacturing and design facility locations of MAS Holdings in Sri Lanka (MAS, 2023)

Noyon Lanka specializes in the creation of various types of knitted lace. TRISCHEL operates as a fully integrated facility, managing both circular and warp-knit fabric production. The Stretchline Group is dedicated to designing and manufacturing narrow-performance fabrics, including elastics, for a diverse range of apparel needs. Textprint Lanka offers comprehensive fabric printing services, catering to both cotton and synthetic materials. Prym Intimates excels in crafting a diverse array of accessories and enhancements tailored for intimate apparel. Moreover, 'MAS FABRICS Matrix' serves as South Asia's largest and most advanced center for knit technology, focusing on the production of ground-breaking knitted components (MAS, 2023).

### **Sustainability at MAS**

The organization has 3 main focus areas where they want to make a positive impact in terms of sustainability. They are 'products changed for good,' 'lives changed for good' and 'our planet changed for good.' These terms are developed in line with the famous 3 pillars of sustainability introduced in literature pillars which are 'product,' 'people,' and 'planet' (Purvis et al., 2019). Furthermore, the organizational sustainability strategy is developed by taking into consideration of United Nation's sustainable development goals (MAS, 2023). Table 3 presents the current sustainability goals and initiatives taken

by MAS as an organization. These goals are divided into 3 main focus areas which cover product, people, and planet.

**Table 3. Focused areas of sustainability of MAS (MAS, 2023)**

<b>Areas of focus</b>	<b>Projects and initiatives</b>
Products changed for good	<p><b>Sustainability</b></p> <ul style="list-style-type: none"> <li>- Generate 50% of revenue from sustainable products by 2025.</li> <li>- Reutilizing pre-consumer waste materials</li> <li>- Recycling PET bottles to develop yarn and fabric</li> </ul>
Lives changed for good	<p><b>Women empowerment</b></p> <ul style="list-style-type: none"> <li>- 30% women in management by 2025 Inclusivity</li> <li>- Employing 400 persons with disabilities</li> </ul>
Our planet changed for good	<p><b>Reduce fossil fuel consumption</b></p> <ul style="list-style-type: none"> <li>- Solar panel installation</li> </ul> <p><b>Reduce hazardous chemicals</b></p> <ul style="list-style-type: none"> <li>- Zero discharge of hazardous chemicals into the environment by 2025</li> </ul> <p><b>Increasing biodiversity</b></p> <ul style="list-style-type: none"> <li>- Restoring 25,000 acres by 2025</li> <li>- Mangrove restoration</li> <li>- Aerial reforestation</li> </ul>

### 4.3 Data gathering

Online interviews were conducted as part of the research to gather information and expert opinions based on a questionnaire. The questionnaire included 10 questions covering 2 main research questions which are presented before. The questionnaire was shared with the interviewees prior to the interviews for them to get familiarized with the questions. Most of the questions were open-ended and the interviewees were allowed to share their ideas freely. Open-ended questions are recommended to be used when

the objective is to gain a deeper perspective on topics where opinions could be varied (Saunders & Bristow, 2023). At the beginning of every interview, permission was requested to record the online meeting. The researcher explained the concept of cooperation when inquired by the interviewees in an unbiased manner. Question structure and the list of questions are included in Appendix B.

The interviewees were selected from focus areas such as product development and R&D, manufacturing, and sustainability. Furthermore, an external raw material supplier was interviewed to understand the perspective of external stakeholders. Details of the interviewees are listed in Table 1.

**Table 4.** Details of the interviewees.

INTERVIEWEE	DATE	FOCUS AREA OF THE INTERVIEWEE	MANAGERIAL LEVEL	DURATION
I1	12.01.2023	Head of product development and R&D	Senior Manager	67 min
I2	02.02.2023	Sustainability consultant, Ph.D.	Senior Manager	57 min
I3	07.03.2023	Consumer & product innovation lead, central innovation	Mid Senior Manager	55 min
I4	17.04.2023	Raw material supplier, external	Country Manager	42 min
I5	24.05.2023	Supply chain specialist	Senior Manager	58 min
I6	9.06.2023	Head of product innovation and sustainability, Intellectual property	Senior Manager	65 min

The interviewees were selected carefully considering their involvement and focus areas within the apparel manufacturing industry. To understand the opinion on sustainable apparel manufacturing and cooperation initiatives, interviewees who were involved in sustainable projects were selected. The interviewees were accessed through past interactions of the researcher. Initial interviewees also suggested potential interviewees whose input would be relevant and valuable for gaining a broader understanding.

#### 4.4 Data analysis

The data was collected mainly by interviewing apparel industry professionals who were involved in sustainable initiatives. All the online meetings were recorded and transcribed.



Also, notes were taken during the interviews to capture the key points raised by the interviewees (Saunders & Bristow, 2023)

The thematic analysis method was used to analyze data gathered from the interviewees. Following the approach suggested by Saunders and Bristow (2023), firstly familiarizing with data was done before conducting the analysis. An excel file was developed using the extracts from the transcripts to summarize the findings shared by the interviewees. The excel file included 9 questions in rows and the key points of the answers shared by the respective interviewees in columns. These key points were carefully studied to understand patterns from the answers. Later, these patterns were used to develop common themes (Saunders & Bristow, 2023) The identified themes included sustainable trends, organizational sustainable themes, key sustainable pillars of the organizations, current sustainability challenges, conflicts among ecosystem partners including competitors.

The first main research question was to identify the challenges faced by the manufacturers when achieving sustainable goals. This was answered by using the data extracted from interviews. The interviewees had a good understanding of challenges as they were directly involved in sustainable initiatives within the apparel industry.

The second research question was to identify cooperation within apparel manufacturing ecosystem partners, and this was also answered using interview answers. The interviewees shared instances that seemed to align with the theme of cooperation. Also, they were asked to explain the challenges and limitations restricting cooperation among ecosystem partners.

In this research, the researcher employed thematic analysis as the chosen method for data analysis. This approach hinges on the researcher's subjective judgments, yet it's worth noting that the data classification decisions were made based on a data-driven manner. Even though the case company has manufacturing facilities in multiple countries, the majority of the interviewees were based in Sri Lanka except one, which may have had an unforeseen influence. Furthermore, although the interviewees were asked to share their opinions freely, it is possible some issues were exaggerated or were not shared by the interviewees.

## 5. RESULTS

### 5.1 Sustainable apparel manufacturing

The first research question attempts to understand the challenges faced by apparel manufacturers when implementing sustainable goals. First, this section presents the current market trends with regard to sustainable apparel manufacturing as identified by the interviewees. After that, the organizational sustainable goals of the apparel manufacturers and the benefits are presented. Finally, the section introduces the current challenges faced by apparel manufacturers.

#### Market trends

The current market trends and topics include fashion products with sustainable aspects, Product reusability, and low impact packaging methods (I1; I2; I4; I5; I6). Gen Z customers are more conscious about the environmental impact of their purchases and fashion brands are trying to retain these customers by developing products with sustainable aspects. Older generations like baby boomers and Gen X do not seem to care that much about sustainability (I3; I6). However, the younger generation customer segment is growing, and they are more updated about concepts such as 'greenwashing.' Therefore, typical fast fashion brands are finding it challenging to cater to this growing customer segment (I2; I3; I4). These trends are closely monitored by fashion brands and communicated to apparel manufacturers and other partners in the ecosystem.

*"There's a Consumer shift from Baby boomers and Gen X to Gen Z. Gen Z is different to previous generations. They not only want to feel good in their clothes but also wanting to know that they are making ethical purchases." (I3)*

On the manufacturing front, maximizing handprint has been discussed frequently apart from minimizing carbon footprint. Maximizing handprint refers to sourcing low-energy consumed raw materials (I4). This involves adjusting the manufacturing processes of the raw material manufacturers. On the other hand, raw materials that can be processed using low energy during the apparel manufacturing process help to minimize carbon footprint. Furthermore, manufacturers are looking at the possibility of reduction of chemicals used in pre-processing and post-processing stages (I1; I2).

*"Under environmental sustainability, low water consumption, reducing the use of chemicals are topics which are being discussed."*

## **Sustainable manufacturing goals**

The current sustainable goals of the organization can be divided into three main focused segments as: product, people, and planet (I3; I4; I5). They are developed in alignment with United Nation's sustainable development goals. Developing sustainable product categories is one of the most important goals of apparel manufacturers as of now.

According to the sustainability consultant, they carry out various projects in rural areas where they have manufacturing plants. The projects mainly focus on people and planet segments (I2). The aim is to support the community and people as the majority of the workforce for apparel manufacturing plants are from nearby areas. Social projects aim to uplift the living conditions of the community whereas environmental projects aim to safeguard and improve the biodiversity of the area.

*“At the organizational level, we are carrying out corporate social responsibility (CSR) projects. One of the main initiatives is carrying out reforestation projects in areas where deforestation has taken place. These projects are carried out with the involvement of government bodies in respective areas.”*

## **Benefits of achieving sustainable goals**

Increasing the brand image is the main benefit of achieving sustainable goals from the manufacturers' point of view (I1; I3; I5). This is mainly due to fashion brands that work with apparel manufacturers are interested in sustainable product segments and also sustainable initiatives. This allows the fashion brands to cater to customers who are conscious about sustainability (I2; I4).

*“In the past, fashion brands considered sustainability as a good to have but nowadays it is a main topic and brands expect us to have a sustainability product segment to present when they visit us” (I1; I3)*

As the competition among apparel manufacturers are fierce, positioning as an innovative product developer and manufacturer in front of fashion brands could be helpful to avoid getting into price competition. Large fashion brands develop their designs in house and provide the design to the apparel manufacturers and ask for manufacturing cost. Generally, fashion brands inquire about manufacturing cost from several apparel manufacturers and select the cheapest option.

## **Current challenges**

Apparel manufacturers are facing several challenges when achieving their sustainable goals. One of the biggest challenges is the price consciousness of fashion brands towards sustainable products. (I1; I2; I3; I4; I5). As sourcing and processing sustainable

materials are still more expensive than regular materials, the price of products with sustainable aspects is higher. Apart from the high price of raw materials, there are other cost components involved in sustainable apparel products such as product development costs, and sustainability certificate fees. Apparel manufacturers have to bear the cost of product development and also sustainability certificate fees currently (I2; I3; I4).

*“High price of sustainable materials due to low volumes is a big concern. Raw material suppliers are not willing to invest to scale up production without confirmation from the buyers. Furthermore, assessing the latest technologies requires a steep learning curve for the current apparel industry professionals as well” (I1)*

Another challenge shared by the product development manager was the strict quality standards set by fashion brands for sustainable products (I1). According to him, fashion brands are using existing quality standards that are used to test current products to evaluate sustainable products as well. Even for the existing products, if the tolerances could be slightly increased with regard to color fastness, hand feel, fit etc, the wastage of finished goods could be reduced significantly. Currently, there are accredited third party laboratories conducting material and garment tests (I6). The quality standards of renowned fashion brands are quite high. For example, the wash cycle test of a famous lingerie brand would need the garment to retain its color, shape, and hand feel after 40 industrial wash cycles. In the apparel industry, achieving color refers to developing a garment that could retain its color while being exposed to daily use and washing. Colors can fade or diminish due to either chemical reactions or dye particle removal over a period of time. The color fading phenomenon is referred to as color fastness in the apparel manufacturing industry (I6).

However, according to the product innovation and sustainability lead, the brands also have color palettes for every new product. Color palette refers to the number of colors the product will be available for the end consumers if the fashion brand decides to launch the product onto the market. Most brands choose their color palettes based on factors such as target customer group, brand image, product launch season etc. For example, the color palette of a fashion brand could consist of 8 colors for products to be launched in Autumn season. A new sustainable product could achieve 6 colors but fail to achieve the next 2. Most of the time, brands inform the apparel manufacturer to develop the product to be available for all 8 colors (I1). This means the apparel manufacturer has to spend more time and money even though sometimes achieving all colors could not be possible for certain products due to the properties of the fabric and other incorporated materials.

Furthermore, as the most sustainable products are novel and require further trials, achieving the same quality standards could take years. Thus, further increasing development costs. As the apparel manufacturers have to bear the development costs on their own, this is a challenge.

According to the sustainability consultant, the inability to recycle complex fabric and composite blends is a challenge in terms of recyclability. Currently, complex material wastes are being discarded by burning them which is not environment friendly. The manufacturers have to discard the material wastage to ensure new product designs will not get stolen or replicated by other manufacturers as they have contractual obligations with the fashion brands.

According to the manager who represents the external supplier, changing trends in fast fashion price driven market focusing on just product sustainability are the key challenges faced by the suppliers in the apparel manufacturing ecosystem (I4).

*“The fashion brands want to cater to the new eco-friendly customers while maintaining the regular customers. From past experience, the fashion trends can be seasonal. This makes difficult to invest on product development because, in the next season, brands might not be interested.”*

## **5.2 Types of cooperation exist in the apparel manufacturing industry ecosystem.**

The second research question aims to understand whether there are existing cooperation elements in the apparel manufacturing industry currently. First, this section presents the ecosystem partners that are currently collaborating with apparel manufacturers in their sustainable initiatives. Secondly, the possibility of direct competitors working together is explored and presented. Thirdly, the challenges faced by apparel manufacturers when working with ecosystem partners are presented. Finally, the section concludes by exploring the challenges that could potentially restrict the competing apparel manufacturers collaborating.

### **Ecosystem partners**

This section presents the ecosystem partners that apparel manufacturers have been collaborating with for their sustainable projects. The majority of the interviewees said that they are collaborating with raw material suppliers to develop sustainable materials and components (I1; I3; I4). The main motivation has been fashion brands requesting products with sustainable elements. Therefore, apparel manufacturers are trying to incorporate sustainable raw materials or components for the existing products. Also, according

to the head of product development and sustainability, materials that can be applied with low energy consumption are also being developed by raw material manufacturers (I6).

*“Most of our raw material suppliers currently have sustainable product segments. Furthermore, all the partners at the backend of the supply chain have sustainable projects in their pipelines due to the growing demand.”*

According to the sustainability consultant, their team has partnered up with local material recycling organizations to recycle apparel waste (I2). Material recycling organizations have the technical know-how and processing capability of apparel waste. However, the sustainability consultant reiterated that the processing capacity of the local partners is limited, and more advanced and capable recycling partners are based in Europe. Also, reforestation projects are carried out by partnering up with relevant government bodies as such initiatives require government approval and conducting initial feasibility studies (I2; I3).

*“We have partnered up with the government forestry department for a reforestation project. The department recommended suitable seeds and plants to be used in the project based on the selected area. Also, we partnered up with the Sri Lankan Air Force to drop seed bombs from the air. This method was faster when covering a large area of land.”*

However, interviewees did not mention collaborating with fashion brands or buying offices during their interviews. When specifically inquired about collaborating with customers, the senior product development manager shared that fashion brands are not willing to share product and process development costs and the risks involved when developing sustainable products are discouraging (I1).

*“The brands want to see the finished product concept after incorporating sustainable materials. However, this requires a lot of time and resource allocation. An innovative sustainable product development can sometimes take years. But there is no guarantee from brands whether a concept would get commercialized. Therefore, we as manufacturers have to bear all the product development costs with a lot of uncertainty. As a product development manager, I have to justify the investment of the projects to internal top management as well. If brands would have shared at least a part of the development cost, it would encourage manufacturers”.*

### **Challenges when working with ecosystem partners**

There are several challenges apparel manufacturers are currently facing when collaborating with ecosystem partners. Firstly, large raw material manufacturers typically have high minimum order quantities (MOQs). However, apparel product development does not require large quantities of raw materials (RM) as only a few samples are made at the

beginning for concept validation and quality testing. However, manufacturing a small batch of RM is sometimes not feasible for RM manufacturers. For example, machines used in fabric manufacturing can be quite large and running such machines involves fixed costs. Therefore, RM suppliers have set high MOQs for their products in order to cover these fixed costs. Purchasing a large batch of RM at the beginning of product development is quite risky as there is a high chance of the concept not getting picked by fashion brands. In such a situation, the apparel manufacturer has to bear the cost of RM and possibly discard the batch as well (I1; I3). Furthermore, according to the country manager of external RM suppliers, changing their suppliers can be quite costly and time consuming (I4).

*“The success rate of apparel product development concepts is around 1-2% from my experience. The success rate refers to product concepts getting picked by a brand which leads to bulk orders. However, first, the concepts that get picked by fashion brands are tested in their outlets in small batches. Only if a concept sells well during the initial testing period, the brand will place a large order.”*

Secondly, intellectual property (IP) restrictions can limit or delay when working with ecosystem partners. Most of the ecosystem partners in apparel industry have been keen to secure their proprietary rights due to the competitive nature of the industry. Therefore, RM manufacturers and apparel manufacturers try to make sure that their product and process innovations are secured under their organizations by applying for patents, trademarks, copyright etc. There has been instances where brands have filed patents under their organizations by using ideas and product concepts shared by apparel manufacturers and raw material manufacturers. Due to this, most ecosystem partners try to secure novel product, design, and process concepts before presenting them to fashion brands and buying offices. This is applicable to sustainable products and processes as well. However, filing patents and securing IP rights include documentation and working with patent filing law firms. After filling out a patent application, the requesters need to wait several months for the patent office to assess and determine the novelty of the request. During this time period, it is advised not to share about the innovation even within the organization (I6). Due to this, the release of innovative sustainable product concepts gets delayed. However, raw material manufacturers and apparel manufacturers are reluctant to share their novel ideas before securing their IP rights due to the buying power of fashion brands possesses in the industry (I1; I3; I6).

*“We once developed an innovative product by collaborating with a raw material manufacturer. The raw material was not visible from outside as it was inserted inside the product. When we presented the product concept to a renowned fashion brand, the*

*representatives requested a raw material sample along with a finished product sample. Later, we found out from the raw material supplier that the fashion brand representatives had reached out to them directly and wanted to purchase raw materials and conduct product development trials with another apparel manufacturer. Because of such experiences, we have to be extra careful when working with fashion brands.”*

According to the head of product development and sustainability manager who overlooks intellectual property (IP) rights of one strategic business unit (SBUs), apparel manufacturers cannot be involved in legal cases with fashion brands as it would be detrimental to the business partnerships. As the apparel industry is a ‘buyer-driven’ industry, apparel manufacturers do not possess any control over fashion brands. Fashion brands' loyalty towards apparel manufacturers is also less due to the many options available to them (I3; I6). Therefore, apparel manufacturers are leaning towards safeguarding their product and process innovations before proceeding into vertical collaboration with fashion brands.

*“We are advised not to share innovative product or process concepts directly with fashion brands before checking the novelty with the legal teams. If the concept has the potential to file a patent, we try to safeguard our IP rights as early as possible. In the past, on several occasions, fashion brands had attempted to file patent applications using our product concepts without informing us.”*

### **Competitors working together**

Competing apparel manufacturers working together in product or process development is quite rare in the apparel industry according to the interviewees (I1; I2; I3; I4; I6). The consumer and product innovation lead even mentioned that there is no incentive to collaborate with competitors (I3).

According to the consumer and product innovation lead manager, fashion brands that they work with do not encourage cocreation or collaboration between apparel manufacturers. Especially in the fast fashion industry, brands have a higher degree of control where they can restrict the operating freedom of apparel manufacturers with whom they work (I3). Furthermore, as an apparel manufacturer, MAS wants to first reach out to their biggest customer brands when they develop an innovation rather than sharing with other apparel manufacturers. Because it is quite possible to several apparel manufacturers to work on the same concept as they source raw materials from same suppliers. If a competitor has already presented a similar concept to a fashion brand, the novelty factor is already gone (I6). Then the fashion brand would focus more on the price rather than the innovation. Also, according to product development and R&D manager, local and



regional buying offices that represent fashion brands create price competition among apparel manufacturers to get the lowest price (I1).

*“Fashion brand representatives visit MAS and other apparel manufacturers quite regularly to find out about new product innovations. If MAS do not present enough innovative product concepts, this could discourage brands from visiting in the future. Therefore, we are always working on new product concepts and trying to present them as soon as possible to brands with the highest potential.”*

However, according to the sustainability consultant, even though they do not currently work with competitors currently but open to possible collaboration for local corporate social responsibility (CSR) projects (I2). The product development and R&D manager mentioned that competitors may come together on rare occasions when there is a threat to a shared IP space (I1). The country manager representing the raw material supplier mentioned that competing fashion brands could collaborate together if they want and manufacturers would like to follow the brands. Furthermore, he stated that fashion brands had partnered up to boycott a large raw material supplier over an ethical issue in the past (I5).

## 6. DISCUSSION AND CONCLUSIONS

The apparel manufacturing industry has been attempting to make sustainable changes amidst growing demands from the concerned customers and external stakeholders. There are 3 main segments that apparel manufacturers are focusing on which are product, people, and planet in terms of sustainability. While a lot of work has been done on the people segment, bringing change in product and planet segments requires a systematic change in the fashion industry according to industry professionals. This involves collaboration between all the ecosystem partners in the apparel industry. Most importantly, apparel manufacturers expect fashion brands to get more involved in the product segment.

However, the apparel manufacturing industry has evolved into a 'buyer-driven' industry where manufacturing is outsourced to developing countries with the aim of utilizing low-cost labor. Fashion brands changing apparel manufacturers purely based on cost has created fierce competition among apparel manufacturers. Furthermore, fashion brands have been benefitting by creating price competition among apparel manufacturers as well. Therefore, collaboration among horizontal actors in the apparel manufacturing systems are rare according to the research findings.

Fashion brands and apparel manufacturers have identified that there is a growing market for sustainable products. Therefore, they have been trying to capture this customer segment while maintaining the existing customer segments. However, the new customer segment is far more informed and aware about 'greenwashing' in the apparel industry. Therefore, these customers expect more transparency and traceability from the apparel manufacturing industry including fashion brands.

Also apparel manufacturers are skeptical about the real motives of fast fashion brands in terms of achieving sustainable goals. This is mainly due to several reasons. Firstly, fashion brands have been too price sensitive on sustainable products which have higher manufacturing costs currently. Secondly, fashion brands do not want to share the development costs of sustainable product development. Thirdly, buying offices that represent fashion brands does not encourage apparel manufacturers to work together. Furthermore, fashion brands demanding strict quality control for sustainable products is also a discouraging sign. The majority of apparel manufacturing industry professionals are of the opinion that fashion brands are willing to trick customers without trying to make a real impact on sustainability.

Apart from this, manufacturers are concerned about securing their IP rights from competitors and fashion brands for new innovation rather than collaboration due to the competitive nature of the apparel industry. The high price of sustainable raw materials is also a concerning factor for the manufacturers.

Coopetition is still a novel concept for apparel manufacturers. Collaboration between horizontal actors which are competing manufacturers is non-existent currently. Collaboration between horizontal actors is also limited due to the 'buyer-driven' nature of the market where fashion brands are mainly attracted to the lowest cost.

## **6.1 Theoretical contribution**

This research study focuses on sustainability in the apparel manufacturing industry. Past research is mainly conducted on the sustainable expectations of the end consumers and sustainable goals of fashion brands. However, studies conducted on the sustainable goals of apparel manufacturers are limited. Therefore, this study is conducted to understand the current sustainable goals of apparel manufacturers. Also, this study contributes to understanding the challenges faced by apparel manufacturers when achieving their sustainable goals.

Furthermore, this research explores whether there are existing coopetition elements in apparel manufacturing. This qualitative research makes a valuable addition to the body of knowledge concerning sustainable apparel manufacturing and the interconnected relationships among partners within the fashion industry ecosystem. This study aims to contribute to apparel manufacturing, sustainability, and coopetition literature by presenting empirical findings of sustainability in the apparel manufacturing industry, from the point of view of apparel manufacturers.

## **6.2 Practical contribution**

The research helps to understand the current sustainable goals of apparel manufacturers, especially catering to fast fashion brands. Also, the findings provide valuable in-depth insights into the challenges faced by apparel manufacturers when achieving their sustainable goals. These findings could be especially valuable not only for the fashion brands but also for the other ecosystem partners in the apparel industry who are trying to move in the direction of sustainability. Furthermore, fashion industry decision-makers and policymakers could study the findings to identify shared areas of interest for potential collaboration with manufacturers.

The findings of this study highlight the need for a systematic change in the apparel ecosystem in order to make a significant shift toward sustainability. Also, according to the research findings, collaboration between horizontal ecosystem partners is non-existent due to the fierce competitive nature of the industry. Additionally, the 'buyer-driven' business model where the control power is concentrated with fashion brands discourages horizontal collaborations as well. Furthermore, collaboration between vertical ecosystem partners is also deemed to be challenging due to negative past experiences and additional emphasis on safeguarding IP rights. This is again mainly due to the imbalance of power dynamics of the apparel industry supply chain.

However, the study findings emphasize that in order to make a substantial shift toward sustainability, collaboration and risk-sharing should take place between ecosystem partners in the apparel industry. The first step could be vertical actor collaboration where fashion brands initiate collaboration with apparel manufacturers on the areas highlighted in chapter 4.5 in the results.

### **6.3 Limitations and Future Research Prospects**

This research has certain limitations which are presented in this section. Firstly, the main source of data gathering is conducted using qualitative interviews research method. The interviewees were selected based on their focused areas and recommendations from industry professionals. However, the study's credibility could be influenced by the deliberate selection of interviewees, who were chosen either because they were presumed to play a significant role in apparel manufacturing or were recommended by a previous interviewee within the industry.

The thematic analysis method was used to analyze data gathered from the interviewees. However, as the researcher conducted the qualitative interviews and also transcribed them, there is a possibility of the researcher influencing the outcomes of the study (Saunders & Bristow, 2023).

The research specifically focused on understanding the challenges encountered by apparel manufacturers. Therefore, the interviewed professionals were from the apparel manufacturing industry who primarily operate at the back end of the apparel manufacturing supply chain. However, the research findings highlight the significant influence of fashion brands and buying offices on apparel manufacturers. Therefore, as a future research possibility, this study can be extended to collect feedback from fashion brands and buying offices. This would help to get a broader understanding of the challenges

presented in the findings. Also, it would allow us to compare the sustainable goals of multiple ecosystem partners and check whether they are aligned.

Furthermore, research focused on sustainability from the perspectives of apparel manufacturers is limited. As this research was a single case study, further research would contribute to understanding common challenges faced by apparel manufacturers. Additionally, coopetition is still a novel concept in the apparel manufacturing industry. Therefore, conducting further research would also help industry professionals become more familiar with the concept of coopetition.

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## APPENDIX A: SECONDARY SOURCES

### Web sources:

MAS Holdings, 2023, MAS Holdings Web page: <https://www.masholdings.com/>

MAS Fabric Park, 2023, MAS Fabric Park web page : <https://www.masfabricpark.com/>

Sri Lanka Business, 2023, Available: <https://www.srilankabusiness.com/edb/success-stories/mas-holdings.html#:~:text=Today%20MAS%20is%20one%20of,employment%20to%20over%2060%2C000%20people>

# APPENDIX B: INTERVIEW STRUCTURES AND QUESTIONS

## Interview Questions

### **Introduction**

- 1) What is your role in the company?
- 2) Can I please record the interview to extract data to be used in the research?

### **Theme - Sustainable manufacturing**

RQ1. What are the challenges faced by apparel manufacturers when implementing sustainable manufacturing goals?

- 3) What kind of major trends can be observed with regard to sustainable manufacturing in the apparel industry?
- 4) What are the current sustainable goals/ themes of your organization/ department?
- 5) What are the benefits of achieving sustainable manufacturing goals according to you? (Ex. Financial, societal, environmental)
- 6) What are the challenges faced by apparel manufacturers when achieving sustainable goals?

### **Theme - Coopetition**

RQ 2. What kind of coopetition currently exists with regard to sustainable apparel manufacturing ecosystems.

- 7) Who are the ecosystem partners involved when achieving sustainable goals?
- 8) Do competitors usually work together in the textile industry?
- 9) What are the challenges faced when working with ecosystem partners/ competitors from your experiences?
- 10) Have the competitors partnered up to solve the challenges in sustainable manufacturing? Do you have anything else to add?