



IMPACTS OF PRODUCT DESIGN CHANGES ON SUPPLIERS:
A CASE STUDY OF THE FASHION INDUSTRY

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ABSTRACT

This thesis focuses on product design change in the fast fashion market and its impact on supplier companies. Theorizing from the relationship between product design and suppliers within an overarching framework of the supply chain and product design literatures, the research develops what impact product design changes have on supplier companies and how those changes connect to the performance of supplier companies. The multiple case study draws on interview data with 20 participants from a famous high-street fashion retailer and eight of its suppliers. This research validates that product design changes in the fast fashion market have physical and non-physical impacts across supplier company departments, and shows that these impacts connect significantly to the performance of supplier companies. This research contributes to the supply chain and product design literatures by providing an understanding of how product design changes create chain-like-effects, both internally and externally to supplier companies. This can catalyse supplier company strategy, which mitigates product design change to avoid this chain-like-effect. Practically, this thesis offers guidance for retailers and suppliers in creating solutions for the problems that they encounter during the product design change process by revealing the cause and effect relationship of product design changes and supplier companies. The results are currently limited to the fashion industry, and they are yet to be generalised to other buyer-driven commodity chains. Future research should focus on best practices for management to deal with the impact of product design change and in consideration in other industries.

Key Words: Product Design, Fast Fashion, Supply Chain, Supplier Performance, Buyer - Supplier Relations

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PRESENTATION STATEMENT

Research within this thesis was presented at two international, peer-reviewed conferences and one school conference arranged by University of Leicester:

- Nihan Ozkan / Impacts Of Rapid Incremental Innovation Of Products' Design On Supply Chain Strategy And Performance. Paper presented at The Doctoral Seminar, the integrated part of the 21st International Product Development Management Conference in Limerick, Ireland on 14th June 2014.

Abstract: Product design is becoming more important day by day because today, customers are demanding greater product variety and are switching more quickly to products with state-of-the-art technology.

Greater product variety and shorter product life cycles makes a significant increase in the number of new products and derivative products that need to be designed. This situation makes product design a regular and routine yet critical action for companies. It means for an organization, delays, problems, and confusion in product design shift from being annoyance to being life threatening. This makes product design within a supply chain a vital area to research.

This research aims to explore how rapid and continuous changes of products' design affect supply chain performance and strategy. Its specific objectives are (1) to identify and explore the effects of redesigning a product on supply chain performance regarding cost, quality, and transportation metrics; (2) to find out how these changes in supply chain performance impact companies' supply chain strategy.

- Nihan Ozkan / Impacts of Continuous Changes of Products' Design on Supply Chain Strategy and Performance. Paper presented at the 2nd School of Management PhD Conference. 6th May 2015.

Abstract: This research particularly focuses on product redesigning process and aims to fill the gap about product design effects on supply chain in the literature. This paper outlines doctoral research that will empirically explore how

product design changes impact supply chain performance, and how these changes in supply chain performance affect supply chain strategy.

- Nihan Ozkan; Michael, Saren; William Green / Innovation Sans Frontieres': A Study Of The Impact Of Fast-Fashion Product Design Across International Supply Networks. In: Proceedings of the 23rd Innovation and Product Development Management Conference: Crossing Borders and Boundaries: The Changing Role of Innovation/Entrepreneurship. Glasgow: European Institute for Advanced Studies in Management 2016 (EIASM Conference Proceedings Series)

Abstract: This paper explores how changes in a product's design are affected by the fast changing trends observed in the fashion industry and the impact this has on the supply network's performance across international and cultural borders. This has direct implications for the global supply network but is an understudied area. In today's globalised fast-fashion culture, the fashion industry and consumers all demand continuously updated designs from retailers and manufacturers. This study examines the relationship between retailers and suppliers and considers the strategies suppliers across international borders follow to manage these pressures. The main conclusions from previous studies of product design and supply networks are reviewed prior to an explanation of our in-depth case study methodology. We identify and analyse the challenges these circumstances pose for an international sample of suppliers from semi-structured interviews with them and their primary customer, a major UK retailer. The results reveal that how the supply network operates in the fashion industry and how individual suppliers and the supply network as a whole are affected by design changes. Finally we discuss the theoretical and managerial implications and suggest that future research could extend the study to other industries.

Table of Contents

ABSTRACT.....	i
Chapter 1: INTRODUCTION.....	1
1.1. The Study.....	1
1.2. Background of Product Design Changes.....	5
1.3. Research Questions.....	8
1.4. Outline of the Thesis.....	10
Chapter 2: LITERATURE REVIEW.....	12
2.1. Introduction.....	12
2.2. The NPD Process and Product Design	13
2.3. Product Design Effects on Supply Chain.....	17
2.3.1. Performance.....	18
2.3.2. Responsiveness	21
2.3.3. Buyer - Supplier Relationships.....	22
2.4. Tensions between Supply Chain Parties.....	24
2.5. The Fashion Industry Context.....	28
2.5.1. The Nature of Fashion Markets.....	29
2.5.2. Supply Chains in the Fashion Industry	32
2.5.3. Product Design in Fashion Industry.....	34
2.6. Product Design Changes.....	35
2.6.1. Product Design Changes in Fashion Industry.....	37
2.7. Summary.....	39
2.8. Conceptual Framework.....	42
2.9. Research Questions.....	47
Chapter 3: RESEARCH METHODOLOGY.....	49
3.1. Introduction.....	49
3.2. Methodology	49
3.3. Sampling.....	52
3.3.1. Why The Women's Fashion Industry Were Chosen?.....	55

3.3.2. Why Turkey?.....	57
3.4. Validity and rigour.....	59
3.4.1. Validity.....	59
3.4.2. Reliability	61
3.4.3. Ethical issues	61
3.5. Limitations of the Research.....	62
3.5.1. Selection of suppliers and interviewees	62
3.5.2. Poor Practice	64
 Chapter 4: DATA COLLECTION AND METHOD.....	65
4.1. Introduction.....	65
4.2. Case Description	65
4.3. Data Sources and Collection	67
4.4. Summary.....	71
 Chapter 5: THE CASE DESCRIPTIONS.....	72
5.1. Introduction.....	72
5.2. StarsFashion.....	73
5.2.1. Organisational Structure.....	73
5.2.2. 'Creating Range' Process.....	75
5.2.3. Supplier Relations.....	79
5.2.4. Design Change Requests from Suppliers.....	82
5.3. Supplier Company 1.....	86
5.3.1. Design Change Process.....	88
5.3.2. Design Change Impacts on Supplier Company 1.....	90
5.3.3. Strategies Against Design Change Requests.....	94
5.4. Supplier Company 2.....	96
5.4.1. Design Change Process.....	97
5.4.2. Design Change Impacts on Supplier Company 2.....	99
5.4.3. Strategies Against Design Change Requests.....	101
5.5. Supplier Company 3.....	102
5.5.1. Design Change Process.....	103
5.5.2. Design Change Impacts on Supplier Company 3.....	104
5.5.3. Strategies Against Design Change Requests.....	105

5.6. Supplier Company 4.....	107
5.6.1. Design Change Process.....	107
5.6.2. Design Change Impacts on Supplier Company 4.....	111
5.6.3. Strategies Against Design Change Requests.....	114
5.7. Supplier Company 5.....	116
5.7.1. Design Change Process.....	118
5.7.2. Design Change Impacts on Supplier Company 5.....	119
5.7.3. Strategies Against Design Change Requests.....	122
5.8. Supplier Company 6.....	123
5.8.1. Design Change Process.....	125
5.8.2. Design Change Impacts on Supplier Company 6.....	127
5.8.3. Strategies Against Design Change Requests.....	129
5.9. Supplier Company 7.....	132
5.9.1. Design Change Process.....	132
5.9.2. Design Change Impacts on Supplier Company 7.....	133
5.9.3. Strategies Against Design Change Requests.....	135
5.10. Supplier Company 8.....	136
5.10.1. Design Change Process.....	137
5.10.2. Design Change Impacts on Supplier Company 8.....	137
5.10.3. Strategies Against Design Change Requests.....	138
 Chapter 6: DATA ANALYSIS.....	 139
6.1. Introduction.....	139
6.2. The Data	139
6.3. Data Coding	143
6.4. Data Analysis	150
6.4.1. Classification of the Data	150
6.4.2 Pattern matching.....	153
6.4.3. Explanation Building.....	155
 Chapter 7: FINDINGS.....	 158
7.1. Impacts of Product Design Changes.....	158
7.1.1. Impact on Product Life-Cycles.....	158
7.1.2. Labour Force.....	159

7.1.3. Impact on Buyer-Seller Relationships.....	161
7.1.4. Impact on Preferred and Standard Suppliers.....	163
7.2. Strategies suppliers follow in case of design change.	166
7.2.1. Strategies to prevent product design changes	166
7.2.2. Strategies to minimise the impact of product design changes on cost	168
7.2.3. Strategies to minimise the impact of product design changes on lead-time.....	170
7.2.4. Strategies to minimise the impact of product design changes on quality.....	173
Chapter 8: DISCUSSION.....	174
8.1. Positive Impacts.....	174
8.2. Negative Impacts	176
8.2.1. Internal Impacts.....	176
8.2.1.1. Design department challenges.....	176
8.2.1.2. Purchasing department challenges.....	177
8.2.1.3. Production department challenges.....	178
8.2.1.4. Delivery challenges.....	179
8.2.2. External impacts	180
8.2.2.1. Power Challenges.....	180
8.2.2.2. Challenges of Being Responsive.....	181
8.2.2.3. Environmental Challenges.....	182
8.2.2.4. Ethical and Employment Challenges.....	183
Chapter 9: IMPLICATIONS.....	185
9.1. Theoretical Implications.....	185
9.1.1. Understanding how design changes impact on suppliers.....	185
9.1.2. Further research on tensions across supplier companies.....	187
9.2. Knowledge Implications.....	189
9.3. Managerial Implications	191
9.3.1. Education for designers and managers surrounding implications for design changes.....	191

9.3.2. Stronger relations between retailers and suppliers.....	192
9.3.3. Stress testing using cause and effect diagram.....	193
9.3.4. Supply chain decisions.....	194
Chapter 10: CONCLUSIONS.....	196
10.1. Introduction.....	196
10.2. Research Question 1 - What impact do product design changes have on supplier companies working in the fast fashion industry?.....	197
10.2. Research Question 2 - How do product design changes in the fast fashion industry connect to the performance of supplier companies?.....	201
10.3. Future Research.....	204
REFERENCES.....	227

INDEX OF TABLES

Table 1: Case organisations and interviews included in analysis	70
Table 2: Product design impacts suppliers have experienced.....	140
Table 3: Results of the tension types.....	165

INDEX OF FIGURES

Figure 1: Clothing Development Process.....	35
Figure 2: Conceptual Research Framework.....	42
Figure 3: StarsFashion's Organisational Structure.....	75
Figure 4: Product types in a women's wear range.....	77
Figure 5: Interactions between organisations and departments.....	141
Figure 6: Production flow.....	142
Figure 7: Conceptual Framework.....	154
Figure 8: Pattern developed by this research.....	154
Figure 9: Illustration of where tensions lie within the production life cycle.....	158

INDEX OF APPENDICES

Appendix 1: Ethical Approval Form.....	206
Appendix 2: Invitation for Supplier Companies to Participate	208
Appendix 3: Participant Information Sheet.....	209
Appendix 4: Participant Consent Statement.....	211
Appendix 5: Interview Guide and Interview Questions.....	212
Appendix 6: Example Transcript.....	214
Appendix 7: Example of Case Study Notes.....	224
Appendix 8: Example of Online Company Reports.....	225
Appendix 9: Example of Official Online Documents.....	226

1. INTRODUCTION

1.1. The Study

This thesis is concerned with product design changes and their effect on supplier companies working in the fashion industry. Therefore, the purpose of this thesis is to investigate what impacts take place on suppliers during product design changes and to reveal how those impacts are related with supplier performance. Product design is a subject which has attracted increasing attention from scholars (Schoonhoven et al., 1990; Gupta and Wilemon, 1990; Smith and Reinertsen, 1998; Van Echtelt et al., 2008;) for a number of decades, as it is seen as a key activity by many companies for keeping a strong position in today's competitive market. Researchers such as Lin and Zhou (2011) and Menguc et al. (2013) demonstrated that product design is both a value adding activity and a method for product differentiation. Through such differentiation in their products' design, companies can stay competitive in difficult market conditions. They can even control the market and become a leading firm by using distinctive product designs.

The increased differentiation in products creates some problems in supply chains by making it hard to estimate the demand for each item and the amount of the key materials necessary to meet customers' expectations (Timucin, 2000). While manufacturers deal with inaccurate demand forecasts, they also have to keep operational costs low, and lead times reliable and short (Skipworth and Harrison 2006). The increased product differentiation also makes product life cycles shorter, which requires a higher responsiveness level for manufacturers to maintain their relationship with the customers. The fashion industry was selected as the focus for this study because these challenges can clearly be observed within this type of fast-moving, design-centric industry, which frequently uses product design to stay up to date and to retain customer loyalty. In particular, *fast fashion* provides an excellent opportunity to observe the challenges of product design changes, since it has the fastest response to the fashion trends and design changes within the fashion industry.

At the end of the 1980s, retailers started to focus on increased punctuality, variety and fashionability, and added mid-season purchasing to the

regular two-season calendars to increase the sales (Crewe and Davenport, 1992; Tokatli et al., 2011). Since then, mid-season purchasing has turned into purchasing throughout the year, which is called 'fast fashion' (Reinach, 2005; Tokatli, 2008; Tokatli et al., 2011). In the fast fashion industry, trends are continuously changing and hence new products have to be designed in each season to meet the expectations of customers who closely follow these trends. Therefore, the product design process in the fast fashion industry is an iterative and complex process (Cachon and Swinney, 2011), in which the product needs to be defined and designed in accordance with the current trends. During this process, product size, shape, colours, pattern, materials (such as thread and fabric, etc.), need to be decided under budget and time constraints.

The product design process, including efficient supplier integration, is an important determinant for a successful new product (Affonso et al., 2013). The supplier part of the product design process is crucial to launching a new product, since suppliers have a huge effect on the production quality, time, and cost. The supply chain includes all activities from having access to raw materials to processing them into the final products and to delivering the final products to the retailers (Chen and Paulraj, 2004), and therefore has a huge impact on the new product development (NPD) process. However, managing the supply *network*, which includes all types of relationships with each unit of the supply chain (especially with suppliers such as raw material suppliers, production suppliers and delivery suppliers), has become more difficult because of the increased amount of sourcing activities at the global level. Raw material suppliers are suppliers who procure threads and fabric with the specific features and patterns that retailers need. Production suppliers supply manufacturing services such as cutting, stitching and assembling. Delivery suppliers supply carrier services including transportation of the order, invoicing and customs documentation. For each product type, retailers might work with different suppliers and this makes supply network management complicated.

In the past years of the fashion industry, only a small number of companies held purchasing power on hand, which created tailored market conditions such as standardized and long production times (Cachon & Swinney, 2011). However, quickly changing trends and constantly varying customer

demands created new market conditions, including greater market differentiation, short production times, and reduced time to market (Tokatli & Kizilgün, 2010). In this new market, the priority is to catch new trends is the most important activity while maintaining a competitive price and quality of products.

To stay competitive in these market conditions, fashion companies have started to source and manufacture their products overseas (Magretta, 1998). In this way, global level sourcing has started to become a top priority for fashion companies. Because trends change throughout each season, the fashion companies have found themselves in more competitive market conditions such as high volatility, low predictability, short product life cycle, and tremendous product variety (Carugati et al., 2008). The fashion companies have increased their product variety and shortened the life cycle of each product line to survive in the competitive market conditions (Lee, 2002).

The increase in product variety can increase the amount of sales, however it might also have economic disadvantages such as production costs (Hayes and Wheelwright, 1984), material costs and labour costs (Abbeglen and Stalk, 1985). Since domestic sourcing and production is costlier than sourcing and production in less developed countries, domestic sourcing and production can result in excessive production costs, material costs and labour costs. This increase in costs has canalized fashion companies to offshore manufacturing and sourcing to make a reduction in costs (Rosen, 2002).

In a less developed country, low-wage workers and a low value of currency result in reduced production and material costs, which attracts out sourcing and offshore manufacturing. However, there are many suppliers in the global supply networks. Retailers might have difficulty in choosing the cheapest and high quality suppliers among too many suppliers. The selected suppliers can be distanced from each other, which causes a more complex supply network. This might be problematic to manage for retailers. Additionally, all of the global suppliers are available to all customers, which are the fashion companies in this case. Therefore, having a competitive advantage is never guaranteed (Chesbrough, 2003; Kessler et al., 2000).

Another challenge for the fashion industry is trying to achieve more responsive suppliers all the time, which is becoming more difficult since

suppliers have certain limits about meeting their customers' expectations. For this reason, managing these complex relationships in global supply networks, whilst still achieving competitive price and quality and meeting customers' needs and wants at the same time, is both a top priority and a challenge for the fashion industry.

When the connection points above between product design, fashion industry, supply chain, and supply network have been linked, it can be concluded that, in these market conditions, 'product design' in the fashion industry is highly dependent on suppliers. This means any change in the product design leads to alteration in lead-times for each supplier, which results in extra costs and confusion in the supply plan. These problems including changes in lead-time and supply plan, extra cost, and reduced production time might affect the supplier performance. Therefore, it can also be inferred that any change in the product design can have an impact on suppliers. However, there is a clear gap in the literature about this relationship between product design changes and suppliers. This thesis will attempt to explore this area, and examines how these frequent changes in product design affect suppliers and what are the consequences of these changes on suppliers.

Previous literature (Mazzola et al., 2015; Inman et al., 2013; Chiu and Okudan, 2011; Cousins et al., 2011; Van Echtelt et al., 2008) has deeply analysed the relationship between the new product development (NPD) process and the supply chain elements for different industries. Mazzola et al. (2015) analysed the relationship between supply chain activities and the capacity of the firm to develop new products in the biopharmaceutical industry. Chiu and Okudan (2011) investigated the simultaneous optimization of both product design and supply chain design during the early design stages in the bicycle industry. Van Echtelt et al. (2008) explored how to manage supplier involvement in the new product development process for print and document management products. However, there is a shortage of research solely focused on the product design changes and its impacts on suppliers. This thesis attempts to fill this gap by addressing the lack of research in the literature regarding how any change made in the product design might affect supplier companies.

In this thesis, the academic literature describing the relationship between product design and the supply chain is reviewed to understand what challenges suppliers might face during the design change process in the fast fashion industry. Focusing on the impacts on different supplier relationships, the potential benefits, problems and tensions will be explored from the suppliers' side. In the previous research (e.g., Massow and Canbolat, 2014; Inman et al., 2013; Sheikhalishahi and Torabi, 2014) the problems of the suppliers are determined to improve the supplier performance. These studies, that put the retailers in the centre of the research, might miss the other problems and tensions that suppliers experience. In this thesis, I aim to reveal those problems and tensions being experienced throughout the supplier company during product design change process by developing second perspective. To achieve the research objectives, case studies, including a famous fast fashion retailer and its eight suppliers, will be used and interviews with the employees working in these supplier companies will be conducted. After using the results of the interviews to explain the tensions, problems and potential benefits the suppliers have, strategies that suppliers follow to avoid these problems and reduce tension will be explained. How the results relate to the literature and why the results are acceptable will then be explained.

1.2. Background of Product Design Changes

There are many challenges when using product design to help firms stay competitive, such as changing market circumstances, constant changes of demand forecast, integration of the entire process, and ability of responsiveness (Sharifi et al., 2013). For example, quick changes in the design of the products lead to products staying in the market for a short time. Accordingly, this shorter duration of the products causes shorter product life cycles (Willems, 1999), which lead to companies trying to offer the newest possible trend to the customers in a short span of time (Christopher et al., 2004; Choi, 2014; Choi and Hui, 2014). Therefore, this situation has increased the required degree of responsiveness, combined with a certain level of efficiency, while simultaneously putting pressure on costs. All these effects have changed the market conditions and provide the industry with special features such as

requirements of shortened lead-times, unpredictable demand forecast, increased responsiveness level and faster inventory turnovers (Barnes & Lea-Greenwood, 2006).

Product design comes with the new product development process. According to Sharifi et al. (2006), common product development strategy in the fashion industry begins initially with discovering 'what are the latest trends in the world?' After answering this question, the design of the product comes about by finding internal and external resources that are available (e.g. the Supply Chain). During this process, companies sometimes may invest in new sources, or search for new external sources to meet those demands.

As a result of quickly changing fashion trends, the new product development process, including searching future trends and managing the supply network for each trend, is repeated more often in shorter time periods. Repeated activities are not limited to these main steps in the fashion industry. During the new product development process, buyers generally make several changes in the products' design to re-design and redefine the product features (Lin, Zhou, 2011), even after the product is ordered. Requests may include changes to the product pattern, colour, or fabric. These time-consuming and costly product design change requests, repetitively made to suppliers, may pose a risk not only for the buyer company but also for the suppliers. Decisions made in the product design process have a significant impact on the quality, cycle time, and cost of the resulting product. As the development process continues, it becomes increasingly difficult and costly to make design changes.

Researchers (Khan et al., 2012; Chiu and Okudan, 2011; Graves and Willems, 2005; Nepal et al., 2012; Agard and Bassetto, 2012) have investigated the effects of product design on supply chain and several studies were conducted about its relationship with suppliers (Sabri and Shaikh, 2010). Through these studies, we can explore the narrative of product design and the supply chain, and understand the relationship between product design and suppliers.

According to Khan et al. (2012), companies have begun to recognize the influence that product design has on defining the supply chain and its performance. The supply chain, being a decisive mechanism, has decision steps such as selecting manufacturable products, right materials, and right

transportation type. This realisation of the relationship between product design and supply chain has led product designers to consider supply chain management issues during the early phases of product development. To do this, retailers encourage product designers to involve the suppliers earlier and more intensely in the product development process, in order to coordinate and improve the suppliers' capabilities and resources. McGinnis and Vallopra (1998) and Ragatz et al. (1997) revealed that early supplier involvement may improve product quality and decrease the product development cost, whilst Clark (1989) and Clark and Fujimoto (1991) found that supplier integration to the product development process may increase the speed of production. In addition, Van Echtelt et al. (2008) demonstrated that supplier involvement in the product design process can help companies differentiate their products and thereby maintain their competitiveness level and access suppliers' new technologies. In the light of these studies, suppliers have started to be seen as one of the crucial factors having a great impact on the product design.

Besides these positive impacts of product design over the fashion companies such as enabling product differentiation, encouraging early supplier involvement and increasing competitiveness level, the product design changes made during the product development process may have negative effects over suppliers. Lin and Zhou (2011) discussed the negative effects of product design changes and noted that frequently changing product design requirements might cause suppliers to have unstable production plans, delivery delays and supply uncertainty. Product design changes may delay the production processes, which result in delivery delays. Also, in case of any design change requests, suppliers may experience supply uncertainty because of shortage of materials, especially key components. These negative effects become worse for suppliers that experience communication problems and have low-level design capability since communication between R&D and production departments has to be clear and strong to increase the speed of production.

Lin and Zhou (2011), Van Echtelt et al. (2008) and Khan et al. (2012) presented some superficial effects of product design changes on the suppliers from the perspective of retailers'. This thesis investigates the product design change process from the suppliers' point of view. As distinct from these investigations, this thesis explores which departments of the supplier

companies are the most impacted by product design change requests and clarifies the tension points and potential benefits during the product design change process in the supplier company. This thesis also reveals how beneficial - or not – this double-sided relationship is for both sides, not just the retailers' perspective. This thesis also seeks out the detailed reasons for deteriorating communication between the supplier and the buyer during product design changes.

1.3. Research Questions

As initially stated, the overall research question of this thesis is to answer: “***What impact do product design changes have on supplier companies working in the fast fashion industry?***” Previous research (Lin and Zhou, 2011; Khan et al., 2008) investigated product design changes might affect supplier companies causing delivery problems, supply uncertainty, repetition of processes, unstable production plans, lack of communication between departments, and lack of ability to meet the customer expectations. As we see, these studies mention mostly physical effects of product design changes on supplier companies. However, this thesis will thoroughly investigate the impact of product design changes on supplier companies by focusing on not only physical but also non-physical effects in regard to relationship, motivation, different perceptions, lack of abilities and knowledge, and tension among employees and departments.

According to previous research (Gunasekaran and Kobu, 2007; Khan et al., 2008; Lin and Zhou, 2011), product design changes have influence over the performance of supplier companies in regard to cost, quality, delivery, lead-time, and responsiveness, which brings us to the second research question of this thesis: “***How do these physical and non-physical impacts of product design changes connect to the performance of supplier companies?***” By asking the second research question, this thesis aims to find out the connection between the impact of product design changes in the fast fashion industry on supplier companies and the performance of supplier companies.

Furthermore, previous research (Melander and Lakemond, 2015; Cousins et al., 2011; Van Echtelt et al., 2008; Aune and Gressetvold, 2011) has

thoroughly investigated supplier involvement in the new product development process and revealed that this integration should start at the product design stage to get an improved NPD performance and financial performance. This means that suppliers play a key role in the product design stage by having a power of influence over supplier performance and responsiveness (Khan et al., 2012). This strong relationship between suppliers and product design means that any change in the product design might have impacts on the suppliers. These arguments have informed the research questions of this thesis.

As a consequence, the research questions below have been established to explore the impacts (tension points, problems and potential benefits) on supplier companies due to product design changes; to understand the reasons for these tensions; and to build a picture of what might be done to prevent these problems in the future.

1. What impact do product design changes have on supplier companies working in the fast fashion industry?
2. How do the product design changes in the fast fashion industry connect to the performance of supplier companies?

By asking these research questions, the researcher aims to focus on suppliers' problems, tensions and potential benefits caused by product design changes. In this way, the product design change process will be better understood. If what suppliers experience during product design changes is well known, factors decreasing the supplier performance can be treated more quickly and precisely. The researcher believes that the results of this thesis will have significant implications for retailers and suppliers. The results might improve the relationship between retailers and suppliers by revealing the tension points in the design change process. Knowing the tension points will help suppliers and retailers create solutions for the problems they encounter during the design change process. Overcoming the tensions will result in increased supplier performance.

To answer the research questions, data will be collected regarding the tensions, potential benefits, and problems experienced between employees,

departments and buyers during the process of product design change. Data containing detailed information about the product design change process and how departments and employees interact with each other during product design changes will lead to better understanding of the product design change process. The data will also be used to explore the underlying reasons for supplier performance reduction.

1.4. Outline of the Thesis

This thesis is organized as follows. In the literature review chapter, the studies of new product development and product design will be reviewed to lay a foundation for how the product design process performs. After understanding how the product design process works as a stage of new product development, previous studies investigating the product design effects on supply chain performance, responsiveness and the retailer-supplier relationships will be reviewed to reveal the connection between product design and suppliers/supplier performance in different industries. This will be followed by an overview of the fashion industry, covering the characteristics of fashion markets, fashion supply chains and product design process in the fashion industry. This will provide an understanding of the link between product design and suppliers in the fashion industry. Literature regarding product design changes in the fashion industry will then be reviewed to gain an insight about the type of changes that can occur in the design of fashions. After building an extensive knowledge about the product design stage in the new product development process and its relation with suppliers in the fashion industry, a conceptual framework will be developed to address the research questions.

This thesis uses a case study method. The reasons for using this method are given in the methodology chapter, along with examples from the literature of studies using a similar research method. The sampling criteria such as the reasons for choosing the women's fashion industry and Turkey will be explained in the methodology chapter. This chapter will also discuss how the thesis will remain rigorous, and address the ethical precautions taken to protect the privacy and security of the interviewees and data. The possible challenges will

also be discussed; as well how to overcome those problems will also be explained.

In the data collection chapter, the methodological steps followed to answer the research questions will be explained. Detailed information about the focal retailer company, and the type and sources of the data that will be presented in the thesis, will take place in the data collection chapter.

In the case studies chapter, organisational structure, supplier relations and product design change requests of the focal retailer company will be described. Design change process in each supplier company, design change impacts experienced by each supplier company and each supplier company's strategies followed in response to design changes will also be identified in this chapter.

In the data analysis chapter, the methods for data collection, coding and classification will be explained. The reasons for using the specified analysing methods, which are pattern matching and explanation building in this thesis, will be mentioned in this chapter. How pattern matching and explanation building methods were conducted will also be explained.

In the findings chapter, the findings will be presented in relation to the objectives of the thesis. The impacts of product design changes on project life cycles, labour force, buyer-seller relationships and low level suppliers will be discussed in this chapter.

In the discussion chapter, the impacts of product design changes will be discussed in light of the findings of previous studies. The results of this thesis will be combined with the results of the previous studies in order to illustrate the positive and negative impacts of product design changes.

In the implications chapter, theoretical implications, knowledge implications, and managerial implications will be handled. This chapter will also explain how this research contributes to current theories, new perspectives, and approaches to the research subject, and explore practical uses of the research results.

Finally, key conclusions for both practitioners and scholars will be presented. The overall research will be summed up and the most significant points and areas of contribution of the thesis will be emphasised and explored.

2. LITERATURE REVIEW

2.1. Introduction

The literature review of this thesis is organised to summarise the findings from previous studies about this topic and identify the key gaps in the literature, in order to identify the appropriate research questions. Reviewing previously conducted studies about this topic will help the researcher avoid duplication. This literature review will also inform the audience about the conceptualization of the study, and the rationale for the methodology and methods employed in this research. Thanks to this literature review, the theoretical and methodological perspectives of previous studies will be understood and the results of these studies will be compared with the results of this research (Bryman and Bell, 2003).

This literature review aims to establish a framework that connects the key concepts of the thesis and will help understand the concepts, theories and arguments that take place in the thesis (Hart, 1998). Presenting and evaluating of the previous research enables the researcher to have a solid and sturdy base to begin further research. In order to do this, the previous studies that will create a strong base for this thesis will be located. Through the selected studies the audience will be able to understand the formulation of the research questions.

‘The NPD Process and Product Design’ section of the literature review will provide the audience with an understanding of how the NPD process works and where product design stands in this process. Some of the main studies carried out on these topics will be examined and the results will be evaluated to reveal the relationship between product design and the NPD process.

The ‘Product Design and Supply Chain’ section will explain how the product design stage is related to supply chain elements including performance, responsiveness, and retailer-supplier relations. The studies conducted in this topic will also be examined to understand that how the elements in the bilateral relation of product design and supply chain affect each other. This section will also analyse that how suppliers take place in this triangle and explain why they are important.

The 'Tensions Between Supply Chain Parties' section will explain how supply chains bring tension between the parties involved in the supply chain. Tension types experienced in the supply chain and which ways suppliers and retailers use to avoid these tensions will also be presented in this section. This section will also provide the audience with an understanding of how product design connects to the tensions between supply chain parties.

'The Fashion Industry Context' section will tell about the characteristics of the fast-fashion industry and show how supply chain works in the fashion industry during the NPD process involving a product design stage. While presenting and evaluating the previous studies, this part will also show how product design is perceived by the fashion sector. In this part, it will also be understood that how close the relationship between product design and suppliers is in the fashion industry.

The 'Product Design Changes' section will evaluate previous research to explain how product design changes might play a significant role in the supply chain in the fashion industry. This section will tell about the relationship between product design and suppliers. In this part, how product design changes occur will also be understood by reviewing the previous literature.

The 'Summary' section will summarise the rationale behind the thesis. The 'Conceptual Research Framework' based on the literature review of the relevant studies will then be developed to address the 'Research Questions': 'What impact do product design changes have on supplier companies working in the fast fashion industry?' and 'How do the product design changes in the fast fashion industry connect to the performance of supplier companies?'

2.2. The NPD Process and Product Design

Bandinelli et al. (2013) defined the new product development (NPD) process as a comprehensive process that involves several stages, such as design, modelling/prototyping, detailed engineering, material sourcing and production & distribution. Tran et al. (2011) proposed a more fashion industry-specific definition of NPD that includes five main stages: planning, concept

development, detailed design, testing, and production ramp-up. According to Tran et al.'s NPD definition in the fashion industry, the NPD process starts with the planning stage, during which fashion trends, design options and textile innovations are analysed. In the concept development stage, the design concepts and material development such as trims, colours and samples are evaluated together. The detailed product design stage is seen as the most critical stage in the NPD process since it includes many crucial processes such as product design varieties, price strategies, choosing materials, creating baseline sketch and measurements, and identifying key suppliers. The testing stage involves testing prototypes, generating visual photos, developing promotional materials, preparing for launch and refining quality control. Production ramp-up stage, which is the last stage of NPD, contains evaluation of production output and sending early promotional items and collections to the stores.

The above literature reveals how the product design stage, which is the most critical stage in the NPD process, is highly related to suppliers. Suppliers play a crucial role in offering varieties of a product with appropriate materials and at the right price.

The most significant handicap of the NPD process is that each of these stages has to be performed sequentially (Tyler et al., 2006). This has implications for product revisions, which increase the number of design changes and rearrangements to products, and accordingly lead to repeated work in production (Sen, 2008). The additional work in production that is related to late design changes causes extra costs and longer lead-times (Sen, 2008).

The NPD process is an important factor for a firm to stay competitive and profitable (Tyler et al., 2006). A successfully developed new product may contribute to a firm's sustainable competitiveness level and overall success in the fashion industry (Loch et al., 1996; Tyler et al., 2006). However, developing new products is not easy in today's market conditions consisting of competitive pressures, continuously changing consumer tastes, and increased level of technology; especially in the fast fashion industry (Menon et al., 2002). The seasonal demand for fashion products and volatile final products means the

NPD process occurs at least two times per year (Sen, 2008; Bandinelli et al., 2013) with requires a high level of innovation (Redfern and Davey, 2003). Another reason for the NPD process occurring several times a year in the fashion industry is because this process is heavily dependent on external factors such as fashion shows and textile exhibits (Tyler et al., 2006). The fashion shows and textile exhibits significantly affect the retailers' decisions about which items will be produced (d'Avolio et al., 2015). All these difficult conditions cause fast-fashion products' life cycles to be shorter, leading to producers continuously launching new products to the market (McNally et al., 2011).

The NPD process has its own challenges, such as making decisions about how and when to involve external factors such as suppliers, designers and different departments to the process. Previous research (e.g., Khan and Creazza, 2009; Pero et al., 2010) has shown the importance of incorporating suppliers into the NPD process to get the best outcome from this process regardless of the type of industry. Hagedoorn (2002) found that early integration of suppliers to the NPD process increases the performance of the process, which means having a high-quality product at lower cost in a short time. Additional studies find that supplier integration into the NPD process has significant advantages such as better NPD performance involving a higher-quality product and reduction of the NPD costs (Lawson et al., 2009; Petersen et al., 2003; Ragatz et al., 1997; Song and Di Benedetto, 2008; Wagner, 2012). However, having a continuous flow of information between retailer and supplier is an essential factor to ensure successful results from this incorporation (Sivadas and Dwyer, 2000).

Conversely, there are studies that have found that supplier integration into the NPD process is not necessary regardless of industry (Kessler et al., 2000; Littler et al., 1998). According to these studies, supplier integration into the NPD process does not have any effects on the performance of the NPD process. (Hong and Hartley, 2011). Eisenhardt and Tabrizi (1995) also found that supplier involvement in the NPD process has some advantages only in mature industry segments. These negative results can be explained as a result of the incompatibility between the capabilities of retailer company and the

technology of supplier firm, and too much time being spent on understanding suppliers' technical knowledge (Kessler et al., 2000).

Integration of designers into the NPD process is another challenging decision for the retailer company. Previous research has shown that involving designers at the different and relevant stages of the NPD process and using multi-functional teams including designers in the NPD process increase the performance of the NPD process (Sarin, 2009). However, at this point, tensions arising from involving too many people in one process might exist. Previous research has investigated the reasons of these tensions from the retailers' point of view and has shown that these tensions can arise because of different perspectives and goals of designers and managers, and cultural barriers related to language (Beverland, 2005; De Clercq et al., 2011; Micheli et al., 2012). To overcome these tensions, various management systems have been suggested (De Luca and Atuahene-Gima, 2007). This thesis aims to investigate particularly the tensions and problems taking place in the product design process, which is a sub-process of the NPD process.

In the previous literature, product design is perceived as both an outcome and a process (Talke et al., 2009). The outcome of the NPD process is usually defined as product design since the main decisions in the NPD process are mostly about product appearance (Eisenman, 2013). However, in this thesis, product design is considered as a process, since it consists of different decisions other than the appearance of the product, such as decisions about product usability and performance. Therefore, product design as a process not only includes the decisions about product appearance, but also plays an important role in the performance of the NPD process (Chiva and Alegre, 2007; Verganti, 2008). Research investigating the relationship between design and the NPD process has revealed that a successful product design can result in better NPD outcomes (Hertenstein et al., 2005; Utterback et al., 2006; Verganti, 2006; Ravasi and Stigiani, 2012). Although these studies demonstrate the importance of the product design process, product design is still considered as just a step in the NPD process (Goffin and Micheli, 2010). This thesis will address the question of whether product design is just a step in the NPD process or if it is an important factor affecting the suppliers.

2.3. Product Design Effects on Supply Chain

Previous literature defines the supply chain as managing the activities involving the flow of materials from suppliers to the end customers and controlling supply chain resources (Jones and Riley, 1985; Barney, 1991; Monczka and Morgan, 1997; Newbert, 2008). According to this definition, the supply chain is all about physical activities to make the total flow of materials possible.

The relationship between product design and supply chain has been investigated in previous research (Park et al., 2009; Hong et al., 2009; Roh et al., 2011). Through this relationship, we can make an inference about how product design and suppliers are related to each other. Forza et al. (2005) and Park et al. (2009) found that product design integration into the supply chain decisions is critical for the success for the NPD process and these decisions should be included to the process earlier. Since each product needs a different supply chain process such as deciding supply chain strategy, planning for the coming year of demand in different markets and operating incoming customer orders (Chopra and Peter, 2004), both product design and supply chain issues must be considered in the earlier stages of the product development process. According to Lee (2004), to overcome issues arising from different needs of each product, supplier companies have to be flexible enough to meet those different products' needs. Some researchers (Fisher, 1997; Vonderembse et al., 2006; Selldin and Olhager, 2007; Droge et al., 2012) acknowledged that those different needs of products define the retailers' supply chain strategy and performance. Supply chain strategy includes decisions about the location and capacity of production facilities (a.k.a. supplier companies), the products to be manufactured in supplier companies or stored at various locations, transportation type to be used (all transportation types have to be offered by suppliers to meet retailers' transportation needs) and the type of information systems to be applied for communication with suppliers (Chopra and Peter, 2004). As we see, all these decisions taking place in defining supply chain strategy are closely related to suppliers. All these decisions need to be made strategically to have high supply chain performance, which means maximising the capacity of the supply chain, including reduced costs, high product

availability and on-time delivery and all the necessary inventory to meet end-customer requirements (Hausman, 2004).

However, there is limited research into the impacts of product design on supply chain. When the previous studies investigating the relationship between product design and supply chain were reviewed, three key areas regarding the relationship between product design and supply chain emerged. According to these studies, product design has a power of affecting three main areas in the supply chain: performance of supply chain and suppliers, responsiveness and retailer relations of suppliers. These studies will be analysed in the next sections to understand how product design and supply chain are linked to each other and how they affect each other regarding performance, responsiveness level, and the retailer-supplier relationships. The following sections will also analyse how suppliers operate in these main areas of the supply chain and why product design and suppliers are related to each other.

2.3.1. Supply Chain and Supplier Performance

As mentioned in the previous sections, product design is the most crucial stage in the NPD process that involves several important decisions such as when and how to integrate supply chain decisions and suppliers. Since integrating supply chain decisions and suppliers into the NPD process, especially into the product design stage, increases the NPD performance (Hagedoorn, 2002; Petersen et al., 2003; Khan and Creazza, 2009; Wagner, 2012), NPD performance, and accordingly product design stage, may be highly connected to the performance of supply chain and suppliers. Therefore, in this section, supply chain performance and supplier performance will be discussed to better understand their relationship with the product design stage in the NPD process. This section will also show the connection between supply chain performance and supplier performance.

Supply chain performance refers to the ability of the supply chain's activities to meet end-customer requirements, including product availability, on-time delivery, quality standards and all the necessary inventory and capacity in the supply chain (Hausman, 2004).

Previous studies have already pointed out that product design impacts supply chain performance in different ways such as cost, quality, and lead-time. Christopher et al. (2012) defend the positive impact of product design on supply chain performance and for this reason, consider that product design extends beyond simply the appearance of a product. Other studies claim that product design is not an affective factor over supply chain performance without any other intermediary factors in the NPD process (Chiva and Alegre, 2009; Gemser and Leenders, 2001). According to these studies, product design might be seen as the most important stage in the NPD process because it is the focus point of some industries such as fashion and furniture. However, the product design stage alone does not greatly contribute to supply chain performance.

Supply chain performance is beyond merely the performance of the retailer company. It is also associated with the performance of the other parts of the supply chain such as supplier companies. Since the ability to meet customer requirements needs quick and trouble-free processing of basic materials, components, subassemblies and finished products, and distribution through various channels to the end customer, supplier companies gain more importance to catch the standards related to supply chain performance (Hausman, 2004).

To catch the performance standards to stay competitive in the market, companies need a continuous improvement in their supply chain. According to Parker (2000), companies need to measure their supply chain performance to: (a) determine their success level, (b) determine if their customers' needs are met, (c) reveal what they know and what they do not know, (d) determine the problematic areas and necessary improvements, (e) keep in mind that decisions always have to be made according to the facts, not to emotions, faith or intuition, and (f) identify if the planned improvements are performed in reality. Besides all these purposes to measure performance, retailer companies also measure their performance to compare it with the previous years' and with rivals' performance. To do this, global supply chain performance metrics are needed to understand whether retailer companies' supply chains perform well in the global arena. According to Stewart (1995), there are four important areas to understanding whether retailer companies outperform their rivals: 1) delivery

performance; (2) flexibility and responsiveness; (3) logistics costs; and (4) asset management. Since delivery performance, flexibility and responsiveness and cost of supply are the key performance metrics retailer companies expect from their suppliers to increase their supply chain performance, it is concluded that supplier performance might play a key role in increasing the entire supply chain performance (Medori and Steeple, 2000; Kumar Dey et al., 2015).

Supply chain performance metrics are not all about the physical measures such as delivery, quality, cost, product availability; they are also about relationships and other behavioral issues (Gunesakaran and Kobu, 2007). Therefore, catching the high performance standards in traditional organization lines such as procurement, manufacturing, distribution, marketing and sales, and research and development falls short of increasing supply chain performance (Hausman, 2004). To increase supply chain performance, retailer companies have to put in place more transparent communication and establish healthy relationships with people co-operating in supportive work, such as suppliers (Gunesakaran and Kobu, 2007).

Supplier performance refers to a retailer company's evaluation of how well a supplier company performs in critical tasks, such as product quality, delivery of the product, cost of the product, responsiveness and flexibility (Paparoidamis et al., 2017). Product design steps in here because design of a product can affect the suppliers' performance in regard to lead-time, product quality, responsiveness; and a fluctuation in supplier performance can impact retailers' overall supply chain performance (Kumar Dey et al., 2015). Therefore, retailers' communication with suppliers about the ordered products should be good and detailed enough to have improved supplier performance (Galt and Dale, 1991; Vonderembse and Tracey, 1999).

Product design and supplier performance have a strong relationship with each other since the price of the product, product quality and speed of delivery, which are the main performance criteria for supplier selection, depend on product design (Goffin et al., 1997). Therefore, any changes in product design may affect these main performance criteria for suppliers and harm trust between retailer and supplier. With reduced trust level, suppliers may experience increased levels of rework, low levels of customer satisfaction and

loss of customers (Gundlach & Cannon, 2010). Suppliers also use product design to gain new customers by differentiating their products (Bharadwaj & Matsuno, 2006; Ragman & Bowman, 1992).

In this study, the relationship between suppliers and product design will be investigated; this relationship will reveal what impact product design changes have on supplier companies and how these impacts of product design changes connect to the performance of supplier companies.

2.3.2. Responsiveness

Responsiveness of a supply chain is the last level firms aim to reach; it means the ability of immediately meeting the consumers' needs and wants. Companies can achieve cost reduction, efficient out-sourcing and production planning through responsive supply chains (Roh et al., 2014). Responsiveness is a necessary feature for both retailers and suppliers. As a result of shorter product life due to rapidly changing customer tastes, retailer companies have to be responsive enough to meet customers' expectations. These companies need a responsive supply chain to continuously launch trendy products. Therefore, suppliers also have to be responsive enough to meet the changing product design requirements coming from the retailers.

However, being responsive comes with its own challenges resulting from quick responses to fast-changing customer requirements (Lin and Zhou, 2011). Companies might have to manage the communication risk arising from working with the suppliers, since being responsive is highly relevant to the ability to work with suppliers. For example, Ellram and Stanley (2008) confirmed that the integration of suppliers to the NPD process increases supply chain responsiveness. Christopher et al. (2012) also investigated how product design and supply chain affect a firm's supply chain responsiveness. They aimed to explore the alignment between product design and the supply chain and identify how this alignment impacts on a firm's supply chain responsiveness. They utilized a single in-depth case study in a fashion retailer trying to create a competitive advantage by aligning product design with the supply chain. The results from the case study reveal that aligning product design with the supply

chain can positively reposition the company in a good way by increasing responsiveness level.

Since responsiveness of a supply chain is highly related to suppliers, retailer companies have to reduce the risk through healthy communication across functions and improve their ability to work together with the suppliers to stay responsive (Khan and Creazza, 2009).

Suppliers also have to be responsive enough to meet changing needs of retailer companies. Retailer companies often make a change in their products' designs and suppliers have to respond to these requirements quickly. To achieve this, supplier companies develop routine activities, such as regular communication and real-time inventory monitoring to meet their customers' needs and expectations (Paparoidamis et al., 2017). Therefore, product design also has impacts on supplier responsiveness and this study will explain the ways in which product design changes are relevant to supplier responsiveness.

2.3.3. Retailer - Supplier Relationship

Retailer-supplier relationship is crucial for managing materials and information flow across the supply chain (Handfield and Nichols, 1999). Since supply chains consist of supply networks including several types of suppliers, retailer companies should engage with all these supply chain parts to increase the entire supply chain performance. Retailer companies need to maintain good relationships with suppliers and other supply chain actors to create value for their customers (Dyer and Singh, 1998; Dyer, 2000).

In a global arena, maintaining good relationship gains more importance since relationship with domestic partners is relatively easy to maintain due to common culture and close geographical distance (Katsikeas, Skarmas, & Bello, 2009). Therefore, once a retailer company strongly bonded with a supplier that has superior supplier performance, it will make commitments to maintain that relationship (Bharaqwaj & Matsuno, 2006). For this reason, suppliers have to outperform their rivals, make an effort, time and investments to meet expectations, and exhibit honesty in their relationships to keep the retailer companies on hand (Katsikeas et al., 2009; Paparoidamis et al., 2017).

For suppliers, maintaining healthy relationships with retailer companies might increase the probability of repeated customer purchases and positive word-of-mouth, stable revenue and greater profitability (Paparoidamis et al., 2017).

The literature on supply chain management has many investigations into the relationship between suppliers and retailers in the retailers' NPD process. According to these studies, effective retailer-supplier relationships can increase the NPD performance by improving quality, delivery and price or cost (Weber et al., 1991; Akinc, 1993; Lau and Lau, 1994; Ingene and Parry, 1995). Companies can even shorten a product design cycle by 20 to 35 per cent by integrating the suppliers into the product design process (Sabri and Shaikh, 2010). Chiu and Okudan (2011) investigated when and how to incorporate supply chain decisions during product design by presenting a case study in the bicycle industry. They revealed that incorporating suppliers into the product design stages had positive effects on the NPD process. Menguc et al. (2013) analysed the impacts of supplier involvement on the design process and new product performance in Canadian high-tech companies with incremental and radical innovation capability. At the end of the analysis, they found that supplier involvement in design was beneficial to new product performance under both high incremental and radical innovation capability.

Conversely, Hartley et al. (1997) investigated retailer-supplier relationship impacts on retailers' NPD performance and lead time; and found that suppliers might have negative effects on the NPD performance because of supplier-related delays in production and delivery. However, studies show that when the coordination between retailer and supplier is effective, a good retailer-supplier relationship during product design stage positively affects the NPD process (Reyniers, 1992; Whang, 1995; Sox et al., 1997). Further, integrating suppliers into joint decisions and productive activities might build trust between retailers and suppliers, which is crucial for maintaining long-term relationships with suppliers (Morgan & Hunt, 1994; Kwon & Suh, 2004; Paparoidamis et al., 2017).

However, all these studies above examined the retailer-supplier relationship from the retailer side. They researched when to integrate suppliers into their NPD processes or asked if they should include the suppliers in their NPD processes. Not many studies investigated how product design and product design changes have impacts on the retailer-supplier relationship from the supplier side. In this study, how the effects of product design changes shape retailer-supplier relations in the supplier company will be analysed.

2.4. Tensions Between Supply Chain Parties

As mentioned above, global supply chains are far more complex because of long-distance relationships with suppliers. This complexity also brings tension between the parties involved in the supply chain, especially suppliers and retailers (Sun et al., 2012). For suppliers, having to understand a distant retailer's needs, while competing with the other suppliers in the market besides local suppliers, creates tension (Martin et al., 1998).

Institutional distance is another form of distance that creates tensions for suppliers and retailers. Institutional distance means differences in norms, regulations, and practices; and causes an increase in the amount of uncertainty for retailers and suppliers (Kostova, 1999). Different norms, regulations, and practices between two different countries may slow the processes in the supply activities. To avoid these tensions, suppliers often prefer to focus on specific customers to better understand them and serve them. However, digitization of information technology services, such as call centres and face-to-face phone calls, help suppliers to improve new solutions for fastening supply processes (Davenport, 2005). Since these solutions reduce the tensions resulting from slow processes between countries, retailer companies choose global suppliers with a mind at peace while taking advantage of cost, speed, and talent (Reddy 1997; Lewin et al., 2009).

Taking orders from global retailers offers suppliers growth opportunities (Kuo et al., 2012). Therefore, suppliers try to maintain healthy and effective relationships based on honesty and trust because successful retailer companies work with reliable and trustworthy suppliers and offer them growth

opportunities (Matook et al., 2009). Healthy relationships are important for retailers as well, since problematic relations affect the retailers' financial performance (Matook et al., 2009). To develop long-term relationships with low-risk suppliers, which cause less tension in the supply process, retailers need to carefully manage their suppliers taking account of supplier-related risks (Hartley and Choi, 1996). Jüttner et al. (2003, p. 200) define supplier-related risks as "any risks for the information, material and product flows from original supplier to the delivery of the final product for the end user". Supplier-related risks need to be under the control of retailers because they play a crucial role in retailers' short-term and long-term financial performance (Tang, 2006).

To identify supplier-related risks, retailers created several mechanisms and approaches such as supplier rating (Harland et al., 2003; Cousins et al., 2004). Retailers use supplier-rating mechanisms to assess suppliers according to their abilities, such as in terms of product quality, delivery time, and pricing (Matook et al., 2009). This mechanism helps retailers to identify low-risk suppliers and work with them. However, supplier-rating mechanisms ignore the risks that may arise from relationships since they assess suppliers using physical metrics (e.g., delivery, price, quality). To mitigate supplier-related risks relating to relationships, retailers have to work on achieving win-win relationships (Matook et al., 2009). This approach reduces tensions resulting from delivery risk, pricing risk, quality risk, and relationship risk that might occur during supply processes for suppliers and retailers. In this research, the researcher takes a supplier's point of view while defining the supply process. Therefore, in this research, the supply process refers to all stages in the production and delivery process that supplier companies perform to hand over the order to the retailer.

To reduce tensions relating to risks, retailers may prefer to use a knowledge sharing approach, integrating suppliers into the product development stage. During the product development stage, the relationship between retailer and supplier turns into a cooperation, which offers mutual benefits for both parties. This approach helps retailers and suppliers to understand the relationship (Krause et al., 1998) and improve the product quality and financial performance of the retailer (Carr and Kaynak, 2007). With

this approach, retailers might better understand suppliers' internal operations, such as which technology is implemented, how prices are calculated, and how the delivery schedule is handled (Choy et al., 2007). In this way, retailers might better estimate risks relating to suppliers to reduce tensions and to achieve better product development performance due to reduced risks and tensions. Knowledge sharing has to offer benefits to suppliers as well. Suppliers need to get the necessary support and investment they need (Handfield et al., 2000). Suppliers who do not have the support they expect may refuse to take part in future commitments, which could damage the long-term relationship (Matook et al., 2009). Consequently, knowledge sharing may help reduce tension, offering advantages for both parties and mutual understanding of the intentions and operations of the other side.

The uncertainties and paradoxes that occur in the process, such as risky decisions and the risks inherent in the supply process, may also cause tension. Smith and Lewis (2011, p.382) define paradoxes as "contradictory yet interrelated elements that exist simultaneously and persist over time". Paradoxes can occur due to different goals or expectations of suppliers and retailers (Corsaro et al., 2012). Integrating suppliers into the product development stage may be a disadvantage here, as suppliers and retailers might have different expectations from the product development stage. This situation may create tension between the parties. Retailers have to manage these paradoxes well, finding appropriate ways to handle these contradictions and reduce tensions (Birkinshaw, Crilly, Bouquet, & Lee, 2016; Gaim & Wåhlin, 2016).

Wang et al. (2014) define uncertainties as unexpected outcomes and/or problems that may affect the supply process adversely, such as delays in delivering the order to the retailer, and quality problems at the end of the production stage. Uncertainties may also include information delays, unavailability of information, communication issues (Cucchiella and Gastaldi, 2006; Sanchez-Rodrigues et al., 2010) and potential problems relating to the flow of goods and money (Ellegaard, 2008). Uncertainties arise because the people involved in the supply process do not know the process well enough to understand what is going on and cannot predict the probabilities (Wang et al.,

2014). Decision makers who do not know the process well can make wrong decisions because of uncertainties; this may result in an ineffective and inefficient supply process, which includes all production stages and delivery of the order to the retailer (Vorst and Beulens, 2002). An ineffective and inefficient supply process can create tension between suppliers and retailers, as neither side has been able to perform as well as they want. This dissatisfaction of both parties may harm the supplier-retailer relationship; may cause customer-loss for suppliers and poor organizational performance for retailers.

Retailers have to deal with all tension sources simultaneously to lower the amount of risks, uncertainties, and paradoxes in the supply process (Wang et al., 2014). Eliminating contradictions, uncertainties, and risks completely is not possible; however, retailers can improve their relationship with suppliers and make it possible to create good intentions toward each other. In this way, tension sources can be controlled and the supply process and/or product development process can be less problematic for suppliers and retailers.

Product design can also create tension in the supply process and between supply chain parties. Because of the quick changes in products' design, demand for each product cannot be predictable. If there is a decrease in the demand of a product because of changing trends, this can create tension for suppliers and retailers (Hallikas et al., 2004). Retailers may have tensions because they have to re-arrange suppliers to work with for each product. Each product design may need a different supply process and even different suppliers. This creates tension for the suppliers as well, as suppliers are always at risk of being replaced (Hallikas et al., 2004). On the other side, a successful product design can increase the demand of the product. Too much demand may also be risky for suppliers since adapting their facilities and operations may be impossible for suppliers (Hallikas et al., 2004). As a result, demand fluctuations and supply flexibility can increase tension for suppliers, either because they can be replaced at any time or because of increased responsibilities.

Product design is also an important factor for determining price, quality, and the lead-time of the product. Since price is fixed mostly in the beginning of the 'product order' stage, quality and time has to be managed carefully by

retailers (Hallikas et al., 2004). This means any change in the product design may result in rearrangement of price, quality, and lead-time, which can be problematic for both sides, because tension may arise due to different and incompatible expectations of suppliers and retailers (Kuo et al., 2012). Short product life cycles in the fashion industry, which means quickly changing product designs, can make it difficult for retailers to control the price, quality and lead-time of each product.

However, the above literature mostly focuses on the tensions of retailers, and approaches tensions of suppliers in a very general way. Tension sources such as uncertainties, risks, and paradoxes should also be viewed from the suppliers' side. This research fills this gap by focusing on the tensions of supplier companies during product design changes. Tensions resulting from product design changes will be examined in detail from the suppliers' point of view. This will help retailer companies to understand what suppliers are going through during any product design change, and strengthen their relationships with suppliers.

2.5. The Fashion Industry Context

For many consumers, fashion is a must-buy product for every season since it has many unique features such as timeliness and stylishness (Solomon and Rabolt, 2009). These features of fashion products have to keep up with each fashion trend that is frequently changing. To catch the latest trends in fashion and offer the newest trends to customers, fashion companies have to replenish their product lines with new styles monthly, weekly, or even daily (Payne, 2016). Since its main objective is meeting fast-changing consumer tastes by quickly producing the newest trend in fashion, the fashion industry is subject to product design changes more than any other industry. Fashion companies do not apply these continuously changing trends to their whole range, since they cannot deal with the issues arising from quickly changing trends at that case. For this reason, fashion companies produce classic and basic lines at a rate of around 80 per cent; and fast fashion (trendy) lines at 20 per cent (Intel, 2002a, b). Especially in the trendy lines, fashion companies

have frequent and quick NPD processes. Since the amount of NPD processes for fast fashion is much more than it is for the other lines, fashion companies have also started to move their operations to the global level to reduce cost of the NPD processes and remain competitive (Ganesan et al., 2009; MacCarthy and Jayarathne, 2009).

Today, fashion companies have a really strong relationship with their global partners. These fashion companies are highly dependent on their global suppliers when producing their products (Jacobs, 2006), using raw materials (thread and fabric), and subcontracting different production activities (e.g., milling, dyeing, weaving, finishing, cutting and sewing). This comes with new challenges, since managing a global supply chain involves controlling different aspects of the process. In this section, the nature of fashion markets, supply chains in the fashion industry, and product design in the fashion industry will be explored to understand how the nature of fashion markets creates its own terms regarding the formation of supply chains, and how fashion industry is highly subject to changes in product design.

2.5.1. The Nature of Fashion Markets

The nature of fashion markets is different from other industries' because of characteristics such as short life cycles of the products, high volatility of demand, low predictability of demand, and high impulse purchasing (Fernie and Sparks, 1998). These characteristics will now be explored to understand why the fashion industry is highly prone to product design changes and how the fashion supply chains differ from other industries.

Short life cycles: There are several reasons for the short life cycle of products in the fashion industry. First of all, fashion products are designed to catch trends and are highly dependent on seasons. Since trends change very quickly and seasonally, fashion products stay saleable for just a month or even weeks (Tokatli et al., 2008). This seasonal nature of fashion products and quickly changing trends leads to the fashion industry having products with short life cycles.

Secondly, the competition among fashion companies to offer the newest trend to customers results in the short life cycles of the products in the fashion industry (Christopher et al., 2004). Third, advanced communication and transportation technologies make it possible for customers to follow the latest trends and have the newest products (Kouvelis and Niederhoff, 2007). Thus, fashion retailers trying to catch global demand are obliged to introduce the latest trends and products to their customers. This means that short life cycles of fashion products force supply chains to be more responsive to the changes in fashion trends (Fisher, 1997). Furthermore, fashion retailers have to integrate the product design stage into the manufacturing process to speed up the production time, so that they can offer the latest products in the quickest way possible (Kouvelis and Niderhoff, 2007).

High volatility: Since changes in trends are dependent on popular events, movies, and celebrities, demand for these products can be unstable. Since the types of fashionable products are always changing in the fashion industry, the demand for highly fashionable products cannot be predictable (Christopher & Towill, 2001). To overcome this situation, producers developed agile operation systems to meet the volatile customer demand (Hiebelar et al., 1998) by increasing the information flow between retailers and suppliers (Harrison et al., 1999). Thanks to the agile supply chain, fashion companies are now able to react to volatile fluctuations in demand by improving the predictability of demand and accordingly arranging the amount of stock (Hewitt, 1999).

Low predictability: As volatile demand for fashion products makes forecasting hard, accurate forecasting is not possible for this industry. The short life cycle of fashion products is another reason for low predictability relating to fashion products. Because of short life cycles in the fashion industry, there is always a risk of inaccuracy and difficulties in predicting the popular products (Birtwistle et al., 2003). To overcome this characteristic of the fashion industry, practitioners developed quick response (QR) system, which aims to keep stating product specifications as far as possible in the production process to meet the customer demand for specific products (Birtwistle et al., 2003). By using the QR system, forecast accuracy can be improved as high as 95% (Mattila et al., 2002); and because of relatively predictable demand provided by

the QR strategy, the efficiency of the supply chain is improved (Aitken et al., 2003).

High impulse purchasing: When buying these fashion products, consumers don't make a rational decision beforehand (Christopher et al., 2004). In addition to its unplanned nature, impulse purchasing is a sudden and irresistible urge to buy (Muruganantham and Bhakat, 2013). It is an instant activity for a consumer since the latest trends immediately create a need for buying. Han et al. (1991) studied impulse buying, especially in the fashion industry, and defined the fashion-oriented impulse buying as an urge to buy the new fashion product. According to Han et al. (1991), new fashion trends and products stimulate fashion-oriented impulse buying. High impulse purchasing is one of the important characteristics of the fashion industry, since it has impacts on forecasting the likely success of new products (Muruganantham and Bhakat, 2013).

All these characteristics make the fashion marketplace highly competitive (Newman and Cullen, 2002). In these short life-cycle markets, fashion companies need to locate the latest trends immediately and turn these trends into products in the shortest time possible. For this purpose, fashion companies increase the number of seasons and continuously renew their product ranges to stay competitive in the market.

The implications of these characteristics on supply chain management create pressure and challenges. Whilst the traditional way to meet customer needs is forecasting, fashion retailers now face the low predictability of the fashion industry. The volatility of demand and the short cycle of products make the forecasting methods inaccurate at predicting sales. All these challenges cause an increase in costs and motivate the fashion companies to find new solutions to minimize their manufacturing costs. One of the ways to minimize the production cost for fashion companies is to source materials from overseas or to move production to offshore countries with low labour costs (Jones, 2002).

2.5.2. Supply chains in the Fashion Industry

Managing supply chains in a fashion industry is a complex process (Lowson et al., 1999; Christopher et al., 2004; Bruce et al., 2004) because most of the sourcing and supply chain decisions need to be taken in a global arena, which includes a number of parties (suppliers) from overseas (Jones, 2002). Supply chain managers in fashion companies have to control their global partners' moves and arrange them to reduce lead-times and increase responsiveness. As Christopher et al. (2004) mentioned, the success of a company in the fashion industry depends on its level of flexibility and responsiveness. Yet, reaching a certain responsiveness level requires more than managing the supply chain of the fashion company. It is also necessary to manage the connections among various companies within a supply network (Schnetzler et al., 2007).

Previous research (Wong, 1999; Dossenbach, 1999; Bowen, 2000; Harland, 1996; Lamming, 1996; Bidault and Cummings, 1994; Valsamakis and Groves, 1996) stresses the importance of relationships and the need to build a partnership with different supply chain parts. Fashion supply chains in particular need a closer cooperation between the participants responsible for the different processes, since fashion industry has more NPD processes than any other industries (Bandinelli et al., 2013). The high number of NPD processes mean frequently updated product development cycles, which requires a high degree of global outsourcing to reduce the excessive cost resulted from a repetitive NPD process (Tran et al., 2011). Collaboration between partners gains more importance when outsourcing becomes a factor, since outsourcing has more complexity in its nature.

However, there are many studies questioning this perspective. According to these views, powerful retailers control the fashion industry and these powerful fashion retailers have large numbers of small manufacturing companies with limited power (Werner and Stengg, 2001; Key Note, 1996; Towers, 2000). These studies reveal that the partnerships between the fashion companies and their suppliers are not double-sided, and not all parties in this relationship benefit from this partnership. Major fashion retailers have the power

to force the suppliers to decrease the prices (Bhamra et al., 1998). According to Jones (2000), this relationship is broken when fashion companies have the opportunity to achieve low purchase and manufacturing prices through globalisation.

Globalisation of sourcing and manufacturing has come with its own challenges, such as communication problems and low-level responsiveness. Many retailers in the fashion industry have started to apply the strategy of reducing the number of suppliers they work with to overcome the communication problems and increase the responsiveness level. When there are hundreds or thousands of suppliers in a supply network, it is not possible to be responsive enough because of communication problems.

To overcome responsiveness problems arising from managing a global supply network, companies have found a number of strategies such as quick response (QR) and just in time (JIT) (Chandra and Kumar, 2000). While QR collects sales data to learn about consumer preferences and use this information in production decisions in a timely manner (Birtwistle et al., 2003), JIT makes the delivery of finished goods possible 'just in time' for them to be sold throughout the supply chain.

Although applying these strategies to global supply chains is helpful for fashion companies to reduce manufacturing costs and be more responsive to their consumer needs, sourcing globally may lead to decreasing employment levels in developed countries. Bhamra et al. (1998) stress that sourcing overseas may be a threat to industrialized countries, and suggest that focusing on domestic sourcing and keeping low level of stock is the best strategy for the future of developed countries.

Despite these problems arising from sourcing overseas, cost is still the most important factor for fashion companies (Lowson, 2001; Mattila et al., 2002). The fashion companies prefer to source their products from the Far East, Portugal and Turkey (Vinhas Da Silva et al., 2002) to take advantage of lower prices. However, Mattila et al. (2002) argue that manufacturing a product in a low labour-cost country is not always advantageous and has some hidden costs. When a product needs to be re-manufactured, this decision may not be

the best option. For example, the Far East countries are not practical for replenishment or re-manufacturing of the product since the lead-time will be longer than average, which increases costs such as transportation delays (Hines, 2001). Additionally, quality standards may be different and quality problems may occur (Lui and McGoldrick, 1996; Popp, 2000). Since fashion companies stay competitive by releasing new product lines quickly, these companies try to introduce new fashionable items within the shortest time possible. Therefore, the product development cycles are becoming shorter, and this makes buying and sourcing overseas a frequent occurrence, which increases the overall costs.

To overcome these problems, many fashion companies prefer working with the Far East countries for basic lines, which have a certain style that does not require any sudden changes. In this case, orders for the basic line products can be given well in advance without any risk of delivery delays. According to Financial Times (2005), the shipping time of a product ordered from China is 22 days, compared to five days from Turkey. For this reason, North African and Eastern European countries are preferred for fashion lines, and the domestic manufacturers are preferred for re-manufacturing or replenishment of the products (Birtwistle et al., 2003). Since distance is another important factor after cost, fashion companies are also conscious about the distance of suppliers when choosing their suppliers.

2.5.3. Product Design in Fashion Industry

As mentioned before, NPD is a major activity for a fashion company, since it is a way not only to meet consumer need and expectations, but also to gain some advantages such as high competitiveness level and product differentiation. Previous research (Bandinelli and Terzi, 2011; Bruce and Towers, 2004) revealed that NPD is a comprehensive process. This process includes the following consecutive stages: research, design, sampling, production, and delivery.

Figure 1: Clothing Development Process (Amarasiriwardena, 2013)



To start the NPD process, buyers working in the retailer companies undertake thorough research about the latest fashion trends by following the fashion weeks and fairs. In this way, they can forecast which trends and colours will be popular next season. After conducting research, designers, buyers and other relevant employees of the retailer companies make a brainstorm and decide what trends they are going to follow and which product designs they are going to produce for the next season (Sen, 2008). In the design process, there are many revisions and modifications, and the design and technical side of the product are discussed in detail. After conceptual designs are created, buyers working in the retailer companies contact suppliers to get the most affordable price for the best quality. In the sampling stage, suppliers prepare samples of the product and send them to the buyers. After taking the samples, buyers meet once again to decide if the samples meet the required standard. After approving the samples, the production stage begins, and this usually lasts 3-4 months (Bandinelli et al., 2013). After production, delivery is arranged to hand over the finished products to the buyer.

2.6. Product Design Changes

Change in the product design can take place at any stage in the suppliers' production process (Bandinelli et al., 2013). Especially in the fashion industry, product design changes such as change of colours and re-arrangements of the product specifications can be made even in the manufacturing stage of supplier companies. Therefore, we can classify product design changes as before-production design changes and after-production design changes. Before-production design changes can be made in the

conceptual design stage and sampling stage. After-production design changes happen almost immediately in the beginning of the production stage, due to several reasons such as market response and design mistakes.

Product design change is not a well-studied area and there is a big gap in the literature about this subject. Lin and Zhou (2011) conducted research into the impact of product design changes on the possible risks that might occur in supply chain in the Chinese special-purpose vehicle (SPV) industry. According to their study, possible risks in the supply chain include the risks affecting supply chain performance, such as risks related to quality, cost, delivery, lead-time, and responsiveness level. In the SPV industry, most of the changes are related to product design. They found that product design changes have negative effects on the risks that are likely to happen in the supply chain when companies have a lack of design capability and low level of communication between the R&D and production departments. They also found that the redesign process increases the possibility of risks in the supply chain such as supply uncertainty, because of shortage of materials -- especially key components.

Previous research has also investigated the reasons for design changes (Ledbetter, 1994; Chang, 2002; Andi and Minato, 2003). Wu et al. (2005) investigated the reasons for design change, and divided the reasons into two categories: external, such as political and economic factors; and internal, such as owner and designer factors. Nylen (1996) found that 51% of rework is derived from miscommunication in the design stage.

Cost of design change has also been studied in the literature. Barber et al. (2000) investigated quality failure costs in civil engineering projects and showed that 20% of the design change reasons lead to 80% of rework cost. Josephson et al. (2002) found that 26% of rework in construction projects is related to design, and the increase in the amount of reworks results in excessive cost.

In the manufacturing sector, design changes resulting from new customer requirements causes mistakes in the production process and supplier constraints (Keller et al., 2009). In the manufacturing sector, design changes

are less expensive when done in the earlier stages and more expensive when done in the production stage (Ehrlenspiel et al., 2007).

However, there is not enough research into the effects of product design changes in the fashion industry. This research aims to fill this gap. In this thesis, how these design changes affect the supplier company will be explored in the context of tensions, problems and potential benefits, and how these impacts of product design changes on supplier companies relate to supplier performance.

2.6.1. Product Design Changes in Fashion Industry

In the fashion industry, quality failure and non-conformance among product specifications are the main reasons for product design changes (Burati et al. 1992; Keller et al., 2009). In the fashion industry, quality is one of the most important factors that affect the competitiveness level of retailers (Cheng et al., 2013). Since quality is a collective performance of all production activities, it relies on the success of all production phases such as spinning, weaving, colouring, distribution and so on (Forza and Vinelli, 2000). However, product design changes due to quality failures mostly do not originate from the unsuccessful production stages of supplier companies. Most retailer companies source their materials from external suppliers and these poor quality materials result in poor quality products (Cheng et al., 2013). To prevent these kind of quality failures resulting in product design changes, many fashion retailers have increased their quality control mechanisms by preparing quality control contracts such as return contracts and revenue sharing contracts (Savaskan et al., 2004; Cachon and Lariviere, 2005).

Non-conformance of product specifications also results in product design changes, the execution of which requires extra effort and repetition of production processes (Love, 2002). Although design has to be reviewed in the design stage by applying quality procedures, changes in design can still exist during production. This supports the research result that the existing quality procedures do not allow for the tracking of errors in a broad and continuous way (Mohringer, 2007). According to Sen (2008), product design changes can be made even when the product is displayed in the store. To meet customer demand, retailers can make some changes in the product design. These

changes related to product design in the fashion industry can be made on several variables such as design concept, form of the product, quality checks and tests.

Concept Changes - In the concept changes, the starting point of the design can change because of market demands. For example, because of the increased demand in flared jeans, fashion companies can change the concept of skinny jeans to flared jeans. Since the concept is changed, then the design of the product has to be changed.

Fabric Changes – Fabrics are chosen according to trends and concepts. For example, if the trend (or concept) is floating dresses, then chiffon fabric has to be chosen to achieve that flying effect. Thus, changes in the concept might result in changes in the fabric type. Fabric type also affects the pattern and colour of the product, since some pattern and colour schemes are not suitable for all fabric.

Pattern Changes – In the pattern changes, patterns decided previously can be changed according to market demand, type of the fabric, and so on. For example, flower pattern might not seem trendy for the next season, and for this reason the pattern might be turned into a geometric pattern. Or the type of the fabric is not suitable for the flower pattern and it looks much better with geometric shapes.

Colour Changes – These changes might result from the type of the fabric and market demand. The fashion shows and fairs define the latest colour schemes. A change in the colour might happen because a specific pattern will match better with another trendy colour, or a colour may not be able to show its true tone on a specific fabric.

Checks and Tests – Some colours and fabric types are more enduring against quality checks and tests. If a product cannot pass these tests, the fabric type or the colour of the product might be changed because of these quality issues.

2.7. Summary

In the fashion clothing industry companies are obliged to update their product ranges with each new trend, which shortens each product's life cycle in the market (Willems, 1999). This feature of innovative activity across global borders has also dramatically affected the culture of fashion. Ready-to-wear trends in the 1990s that require minimal design have shifted to fast-fashion trends in the 2000s (Tokatli, Kizilgun et al., 2011).

This change in fashion products' design is likely to affect retailer-supplier relationships and potentially has a direct impact on suppliers. As fast-fashion trends require hectic schedules, shorter development cycles, rapid prototyping and batch processing, and a greater involvement of manufacturers in the preparation of collections, design change requirements are likely to impact on supplier performance, in terms of key performance indicators such as cost, quality, and lead-time. Other potential impacts on suppliers include supply uncertainty due to shortage of materials, especially key components; unstable production plans due to frequently changing customers' requirements; and delivery delays (Sharifi et al., 2013; Lin and Zhou, 2011; Perks et al., 2005; Baiman et al., 2001).

Product design determines the total cost of producing and delivering a product (Child, 1991). Thus, product design is increasingly recognized as a major factor in effective supply, since it has direct and indirect impacts on suppliers, and accordingly a performance reduction in one supplier affects supply network performance, which means the total performance of all kinds of parties taking place in the supply chain. Researchers have investigated how the timing of supply chain decisions affects performance in terms of its responsiveness. Many studies find that making supplier decisions at the product design stages makes a significant difference in performance (Graves and Willems, 2005; Chiu and Okudan, 2011; Khan et al., 2012; Nepal et al., 2012; Menguc et al., 2013). These impacts of product design on suppliers raise the importance of such decisions to a higher managerial level (Sharifi et al., 2013) and highlight the importance for managers to consider their supply strategy before product introduction and how this can affect product success and growth

potential (Agard and Bassetto, 2012). However, there is little research into the overall issue of how product design changes affect suppliers and how it is related to their performance.

Previous research has attempted to discover the reasons for product design changes and the costs resulting from a design change or rework. There are also studies that investigate the relationship between product design and the types of risks that might occur in the supply chain, such as supply uncertainty and shortage of materials. Although some effects of product design changes on supply chain are proposed in the literature review above, they are more general descriptions based on case studies in SPVs and construction projects.

The relationship between product design changes and supplier performance has not been investigated. It will be difficult for a fashion company to predict how product design changes create tension in the supplier company and to understand how these tensions might relate to supplier performance. This thesis will provide this information to managers and may influence the development of new methods or new approaches to reduce tension in the supplier companies and to help suppliers achieve their optimal performance.

The fashion industry is an interesting case from a design point of view, because apparel is subject to changes more than any other consumer good (Lipovetsky, 1987). Fast fashion products have a short shelf life, high volatility, low predictability, high impulse purchasing and strong value chain interdependence (Christopher et al., 2004; Jin, 2004). The fashion industry is also a typical case where both creative design (related to the image and aesthetics of a product) and technical design (related to the difficulty of working with three-dimensional fabric) are highly important (Moedas, 2006). The combined effect of these pressures clearly causes a great challenge for the retailer, who has to deal with logistics management of one of the most demanding industries with hundreds of colours and thousands of styles.

This means that retailers often have to make extra demands on their suppliers in order to meet these challenges. Because the retailer's requirements are so demanding and subject to change very quickly, supplier companies need

not only to concentrate on product design, but also to devote time to managing their own internal organizational and production issues and tensions and problems arising from the design requirements of retailers (Lowson et al., 1999; Christopher et al., 2004; Bruce et al., 2004). However, there are few empirical studies into the impact of product design change on suppliers' performance. This thesis investigates those design change demands and the pressures arising from those demands from the supplier point of view; and explores how the impacts arising from the requirements of change in the product design interact with supplier performance.

There are several reasons for the particular level of complexity in supply network in the fashion industry. Firstly, they typically have several different types of parties involved, such as retailers, suppliers, customers, agents, designers, and consultants (Jones, 2002). There has also been a dramatic shift from local sourcing to offshore sourcing and supply. Retailers and manufacturers have to manage an increasingly international network of suppliers. In addition, the offshore sourcing of products and materials results in significantly longer lead-times, which can offset the financial advantages of sourcing from low labour cost areas (Jones, 2002). The impact of offshore sourcing on lead times can be drastic, since it is not only distance per se that produces longer replenishment lead-times. There are often extra delays and variability caused by more complex internal production and management processes for all organizations involved, as well as the necessary import/export procedures (Christopher et al., 2004). For example, if retailers need a change in their product's design, they need to switch to using local suppliers and/or international suppliers close to the retailer to shorten the lead-time. However, if delays are caused by internal processes in the supplier company, that is not an area where the retailer can easily interfere. This thesis explores the reasons of those internal delays in international supplier companies when the retailer needs a product design change.

Traditional performance measures have been mostly financial – measuring cost and financial risks. However, these measures have the disadvantage of only looking at the issue from one side. They fail to look at intangible factors. This thesis focuses on all the impacts the supplier companies

experience, including physical and non-physical effects of product design changes. The nonphysical connections between product design change and supplier performance will provide insight into the impacts of design changes to help the retailer understand how suppliers will be affected. However, this thesis does not measure the performance of supplier companies. This thesis aims to reveal how the impacts of product design changes and supplier performance relate to each other.

2.8. Conceptual Framework

Drawing on the above literature, the conceptual framework has been developed to address the overall research question: “How do product design changes affect the supplier companies in the fast-fashion industry?”

The conceptual framework (see **Figure 2**) has been developed by the researcher’s synthesis of literature to better understand the connection between product design changes, the impacts of the product design changes on supplier company, and the supplier performance.

Figure 2: Conceptual Research Framework



This framework represents how product design changes affect the supplier companies and how the performance of the affected supplier company is influenced in the context of cost, quality, delivery, lead-time, and responsiveness.

The connection between product design changes and the impacts on supplier companies is informed by the research of Lin and Zhou (2011). Lin and

Zhou (2011) revealed that product design changes have several effects on supplier companies such as delivery delays, supply uncertainty due to the shortage of materials, repetition of processes, and unstable production plans. Their study also showed that product design changes create some problems in the supplier companies, such as lack of communication between departments and lack of design ability to meet the customer expectations. The reasons and results of these effects are elaborated below.

Delivery delay: In case of any change in product design, delivery time will be extended, since extra time is needed to make the required design changes. Any change in the product design results in changes in the production plans of the supplier companies, and either repetition (Lin and Zhou, 2011) or omission of some production stages (Sunjka and Jacob, 2013). Thus, in a design change process, urgent delivery dates must be settled or delivery delays will occur, especially for global suppliers. Since overseas shipping has a stable and fixed schedule, the supplier company has to book a new shipping date, which means longer both delivery times and excessive transportation costs due to urgent delivery (Lin and Zhou, 2011).

Shortage of Materials: Making changes to a product's design requires more raw materials (yarn/thread and fabric) and subsidiary materials (dye and other chemical components). Suppliers order or produce adequate amounts of raw and subsidiary materials and then work on/with them to create the intended product design. Therefore, any change in the product design causes suppliers to experience a shortage of materials (Lin and Zhou, 2011). Because of materials shortages, suppliers may not be able to deliver the products on time. Therefore, decisions about product design changes have to be made in the early stages of production in order to have a smooth production and delivery process without any interruptions due to shortage of materials (Egri and Vancza, 2007).

Repetition of processes: Any change in the product design might result in the repetition of the production processes, since the changed design needs several reworks (Lin and Zhou, 2011). For example, a change in the colour of the yarn might require a repetition of dyeing stage if the colour of the yarn is

able to be re-coloured. If the colour of the yarn is not suitable for re-colouring, then the greige¹ yarn has to be produced from scratch and then dyed with the intended colour, which means repetition of several stages, resulting in time loss and extra cost.

Unstable production plans: Any change in the product design results in changes in the production plans of the supplier companies (Lin and Zhou, 2011). Shortage of materials during product design change might cause interruptions in the production stages. The supplier might have to stop working to wait for the materials, and lose time to re-design the product. The unstable production plans cause the suppliers to miss other orders and lose potential revenue (Lin and Zhou, 2011).

Lack of communication: Product design changes can lead to several problems due to lack of communication between supplier and retailer. For example, suppliers may not be consulted about changes in the product design. This creates some problems if the requested changes are impossible for product in question. This lack of communication between buyer and retailer during a product design change might cause conflicts about the product design change process. Additionally, accurate information about the intended design of a product is necessary for an efficient design change process, since inconsistencies might have serious effects on the production process and the cost (Redman, 2008).

Design problems: When a retailer requires a product design change, supplier companies encounter several problems in attempting to satisfy the requirements. Supplier companies might sometimes not be able to make any change in the product design because of a lack of experience in redesigning products quickly (Lin and Zhou, 2011).

¹ **Greige yarn:** Yarn that is not bleached or dyed. (Source: Collins English Dictionary – Complete and Unabridged, 12th

The second connection between the impacts of product design changes on supplier companies and supplier performance is based on a review of the literature about supply chain performance (Gunasekaran and Kobu, 2007; Khan et al., 2008; Lin and Zhou, 2011). Khan et al. (2008) investigated the clothing industry to understand the relationship between product design and the possible risks in the supply chain, and found that product design is an important factor in defining the responsiveness level of the supplier companies. The authors also revealed that product design change, when sourcing overseas, is highly related to the quality and the delivery of the product. Lin and Zhou (2011) conducted a case study in the SPV industry about how product design changes trigger risks in the supply chain, and found that product design has an impact on the quality, cost, delivery, and lead-time of the product. As we have seen in the study of Gunasekaran and Kobu (2007), responsiveness level, lead-time, delivery, cost, and quality are the key performance indicators when measuring the performance. Therefore, we can conclude that product design and supplier performance are related to each other. The connection between product design and key performance measures (cost, quality, delivery, lead-time, responsiveness) is elaborated below.

Cost: Any change in the product design can yield high costs, especially in the case of overseas production and sourcing. For example, quality control processes can produce high costs because of the distance between the countries involved. Replacing defective products may cause high transportation costs (Lin and Zhou, 2011). Since any change in the product design will require repetition of the quality control process, any design change requirement can result in high quality control costs and transportation costs. Therefore, it is important to make clear decisions about the design of the product, since the product design stage has a crucial impact on the total cost of the product (Appelqvist et al, 2004).

Quality: Product design change requirements cause suppliers to change their production plans. In this case, suppliers start to re-produce the product with the intended design as quickly as possible. This urgent re-production might result in some quality failures, since the supplier has insufficient quality control while having a busy schedule (Lin and Zhou, 2011).

Delivery: An effective delivery process can influence supplier performance (Supply Chain Council, 2000). Since any product design change requirement will negatively affect the delivery process, the effectiveness of the delivery practice directly affects the supplier performance. As mentioned above, product design changes might be problematic because of the lack of communication between retailer and supplier (Lin and Zhou, 2011); this ineffective information sharing might significantly affect the delivery performance in a negative way (Zhou and Benton, 2007).

Lead-time: Any change in the product design extends the lead-time, and this is a serious problem when we consider the length of lead times in global supply chains (Khan et al., 2008). Long lead-times mean longer time-to-market and it eventually decreases the supplier performance (Khan et al., 2012). Since product design changes will result in repetition of production processes, quality control and delivery rounds, it will extend the lead-time. Extended lead-times mean that suppliers hand over the products to the retailer in longer times. This may result in retailers missing the launch dates and times, and hurt the competitiveness level of the retailer company.

Responsiveness: Product design and responsiveness are highly correlated with each other (Khan et al., 2009). In order to maintain competitiveness within the fashion industry, retailers have to align product design with the supply chain since this plays a crucial role in improving responsiveness. Therefore, responding the customers' requirements as fast as possible is the main objective for retailers and suppliers (Khan et al., 2012). Any change in the product design may decrease the responsiveness level of suppliers. And this decrease in the supplier responsiveness will eventually result in a reduction in the responsiveness level of the retailers (Khan et al., 2008).

When we consider both of these connections, Figure 2 indicates that design change requests coming from retailers may cause delivery delays, shortage of materials, repetition of processes, unstable production plans, lack of communication, and design issues in supplier companies. These problems create tension and problems, and may affect the supplier performance by

influencing responsiveness level, lead-time, delivery, cost, and the quality of the order.

Having a conceptual framework for the relationship between product design changes, supplier companies, and supplier performance, research question 1 focuses mainly on the impacts that suppliers have during the product design changes. Question 2 sets out to uncover how these tensions and problems are related to the supplier performance. The research questions, identified in section 1.3, are discussed below.

2.9. Research Questions

In light of these issues discussed in the previous sections, and the gaps in the literature on the role of product design in the supplier companies, this thesis reports on an empirical study based on a large UK fashion retailer and a sample of its more than 500 international suppliers. The aim is to investigate how product design change requirements coming from the retailer affect the supplier companies and how they are related to supplier performance. The focus is on the following two specific research questions:

RQ1 – What impact do product design changes have on supplier companies working in the fast fashion industry?

As mentioned in the previous sections, product design changes come with many challenges for the retailer and supplier. The main challenges for the suppliers are the delivery problems, design problems, communication problems, supply uncertainty, and unstable production plans as Lin and Zhou (2011) outlined. This research aims to build up this literature, and gives a detailed look at the supplier companies in the fashion industry. By asking this research question, this thesis aims to explore what is really going on in the supplier companies when the retailer makes a request for a design change.

RQ2 – How do product design changes in the fast fashion industry connect to the performance of supplier companies?

This research question aims to reveal how the impacts created by product design change requests correlate with the performance of the supplier. In other words, how product design changes have impacts on the responsiveness level, lead-time, delivery, cost, and the quality metrics, which constitute the supplier's performance (Gunasekaran and Kobu, 2007).

This thesis also aims to investigate the nature and quality of the relationships between retailers and suppliers in the fashion industry under the conditions of the product design change process. According to the previous studies, early and intense involvement of suppliers in product development is a way for companies to coordinate, improve, and reconfigure their critical capabilities and resources (Sabri and Shaikh, 2010; Khan and Creazza, 2009; Menguc, et al., 2013; F.E.A. Van Echtelt et al., 2008). In the related literature, this relationship is also described as beneficial to all parties involved (Wong, 1999; Dossenbach, 1999; Bowen, 2000; Harland, 1996; Lamming, 1996; Bidault and Cummings, 1994; Valsamakis and Groves, 1996). In this thesis, the opinions of suppliers about this double-sided relationship will show us how beneficial - or not - these are for both sides, not just the retailers' perspective.

3. RESEARCH METHODOLOGY

3.1. Introduction

This thesis aims to reveal the impacts of product design changes on supplier companies, and explore how these impacts on supplier companies connect to the supplier performance. In order to meet the research aims and answer the research questions, an in-depth case study methodology was selected. According to Yin (1984, p.13), the case study method is “an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.” In the following sections, the philosophy of in-depth case study will be explored to explain why the case study method was chosen for this research.

In this chapter, the issues associated with implementing the case study method (Yin, 2009) with validity and rigour are evaluated in relation to the effects of design changes to the suppliers.

3.2. Methodology

This research sought to establish how product design change requirements have had an impact on the suppliers in the fast fashion industry. In particular, how the retailer’s requirement to frequently and rapidly change a product’s design affects the supplier companies and accordingly their performance. According to Yin (2009), case study methodology is considered as an appropriate research methodology when a study asks ‘how’ or ‘why’ questions about the events over which researcher has little or no control. Taking a case study approach, the research questions will be answered and how frequent changes in product design affect the supplier company will be explored.

Case study methodology is perceived as a very powerful tool for exploratory research areas (Eisenhardt, 1989; Glaser and Strauss, 1967), since case studies frequently bring unexpected and unusual issues to light

(Hodkinson and Hodkinson, 2001). Eisenhardt (1989, pp. 548-549) says that case studies are: "Particularly well suited to new research areas or research areas for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building from normal science research." In this thesis, the research area I aim to investigate is almost new, since there is no known previous research about the impacts of product design changes on supplier companies in the fashion industry. Thus, the case study method will be suitable for this thesis to build a new theory from a very limited research area.

Case study methodology is appropriate to address real-world issues (Maon et al., 2009; Wu and Choi, 2005; Carter and Jennings, 2002; Ellram, 1996; New and Payne, 1995) because it provides a place for the experiences of individuals or organisations (Hodkinson and Hodkinson, 2001). Case study methodology is also better suited than other methodologies for providing in-depth assessment and rich event descriptions (McDonald, 1985; Closs et al., 2008). In this thesis, rich event descriptions and an in-depth assessment of the events are necessary to clearly understand what kind of impacts suppliers experience in their natural work environment. Since any impact of product design changes is counted as an event in this thesis, product design change experiences of employees from different levels and departments produce a detailed description of the events. Furthermore, different levels and departments of interviewees provide a deep assessment of the event, since each department and level has its own assessment of the impacts of product design changes.

Furthermore, the data richness that a case study provides can lead to new thinking and new ideas; and better conceptual and theoretical grounds can be established thanks to the richness of the data (Hodkinson and Hodkinson, 2001). For example, Khan et al. (2004) investigated the impact of product design on possible risks (troubles) in supply chain in the fashion industry. They chose to conduct a case study since it is appropriate for generating depth of information about an exploratory research area. The authors argued that a case study methodology was suitable for exploratory research areas, which need new thinking and new ideas about the subject. Lin and Zhou (2011) also preferred the case study method to explore the impact of product design changes on possible risks in the supply chain in the SPV industry, since they

considered it the best method to gain different perspectives and in-depth information about their contemporary research.

The case study methodology additionally has a strong tradition within management and supply chain analysis and was favoured in earlier studies heralding more compelling evidence and more robust outcomes (Herriot and Firestone, 1983). Since supply chains are very complex systems and consist of more than one activity and function, case studies are more suitable for this study to understand these complex inter-relationships, thanks to the nature of case studies looking in-depth at the correlated factors influencing each other (Hodkinson and Hodkinson, 2001). Additionally, 'tensions that suppliers experience due to product design changes' can be considered as a new research subject. Case studies are highly appropriate for new research areas and this method is also successful at generating an incremental theory (Eisenhardt, 1989).

However, using case studies might have some limitations, such as generalisation problems, too much data, and too much time required for data collection (Hodkinson and Hodkinson, 2001). Too much data can be unwieldy, challenging to analyse, and lack coherence when presented. Case studies can also be time-consuming. Since case studies produce high amount of documentation and a great deal of data, it can take long time to manage and organise all the data and documentation in a systematic way (Yin, 2009). Especially when the case studies are of an ethnographic or longitudinal nature (Yin, 2009). The results of a case study may not be generalizable if the study is conducted on a single example or a small number of cases, rather than a significantly representative sample (Bell, 2005). Despite its limitations, case study research has substantial interpretative advantages for standardising and generalising findings beyond the boundaries of the empirical research (Larsson and Lubatkin, 2001).

This research involves one fashion retailer and eight of its suppliers. This may look like a single case; however, it contains multiple supplier cases. Hence, each case contains one of the supplier companies working for a single fashion retailer. Thereby, the purpose of this thesis is to investigate how each supplier company is affected by the product design change requirements coming from a single fashion retailer. The research questions posed are

exploratory in nature, open-ended, and attempt to identify and analyse product design changes and determine how and why those changes lead to tensions in the supplier company. Therefore, utilizing a case study methodology was essential to describing and understanding the problems and behaviours of the selected supplier companies. (See Appendix 4 for interview questions and Section 4.2. for development of case description)

3.3. Sampling

This thesis aims to explore the impacts of product design changes on supplier companies and how these impacts connect to the supplier performance. For the purposes of this thesis, the unit of analyses is the retailer and a sample of suppliers of the retailer. This may look like a single case but within it there are multiple case organisations – the large retailer and a sample of suppliers. Each supplier company is the case and multiple case study including eight cases is conducted in this research.

To meet the research objectives, one of the largest UK high street fashion retailers was approached to enable an in-depth case study (Yin, 2009) through a sample of its 500-plus international suppliers who are based across more than a dozen countries. The retailer that was approached agreed to participate in the research anonymously (due to the focus on potential tensions and conflict) and as such a pseudonym is used for all references to the organisation within this thesis.

The industry of the retailer company was pre-specified as a result of secondary research about which industries are more prone to product design changes. A single industry was consciously selected to increase the internal validity of the results and to avoid industry influence. The reasons why the women's fashion industry is selected can be found in the next section (see 3.3.1. Why The Women's Fashion Industry Was Chosen).

After identifying the women's fashion industry as the research site, the researcher was introduced to an employee of StarsFashion. Initial interviews yielded information about the location of suppliers. According to the interviews, a fashion retailer company prefers suppliers from close countries or local areas

in any product design change situation. As a result of this information, suppliers located in the UK or Turkey were preferred. Whilst the fashion retailer is located in the UK, all suppliers analysed for this thesis were located in London and cities across Turkey. More information about why Turkey was selected can be found in the following section (see 3.3.2. Why Turkey?). The initial interviews also revealed that product design changes could be best observed in the raw materials, since design changes are required mostly in the beginning stage of production. Therefore it was important to choose the raw material suppliers to clearly understand the impacts of product design changes on supplier companies.

The purposive sampling method was applied to create the sample of supplier companies and interviewees. Purposive sampling was applied to this research since the number of people that can contribute to the research is limited (Curtis et al., 2000). Not every employee could provide rich descriptions and deep assessment about the impacts of product design changes. Also since the organisational structure of each supplier company is different from each other the key people can take place in different departments and with different titles. For this reason, companies and interviewees are selected through purposive sampling. Purposive sampling method is used by previous research investigating similar topics. For example, Khan et al. (2008) applied the purposive sampling method to their study when they investigated the impacts of product design on possible risks in supply chain. Lin and Zhou (2011) also used to same method to identify their sample when they explore the impacts of product design changes on risks in supply chain. Likewise, this research also used purposive sampling while investigating the impact of product design changes on supplier companies and how those impacts connect to the supplier performance.

Samples of the suppliers and interviewees were selected throughout the duration of the research (Miles and Huberman, 1994). This helped the researcher reach the key individuals related to product design changes. The contact information of other suppliers meeting the previously determined criteria was asked during the interviews with the supplier companies. According to these criteria, suppliers have to be working for the same retailer company, on

the raw materials, located in the UK or Turkey. It was important to select suppliers working for the same fashion retailer since the aim is to explore the impacts of any design change request coming from the retailer company on the suppliers. The fashion retailer and its eight British and Turkish raw material suppliers constituted the research sample of this case. This allowed the researcher to gather an in-depth and more compelling picture of the overall impacts of product design changes across the supplier companies (Herriott & Firestone, 1983). Multiple suppliers were included in the sample to strengthen conclusions through replication logic (Eisenhardt, 1989), analogous to multiple experiments (Hersen and Barlow, 1976). This multiple case study approach also strengthens the external validity of the analyses (Yin, 2009).

While sampling the interviewees, the key people in the supplier companies were identified from one interview to another (Miles and Huberman, 1994). When the researcher met with an interviewee in one of the supplier companies the key people who are relevant to product design changes were identified. In this approach, an interview can reveal the key people who are relevant to product design changes and then the researcher would ask those people if they would like to participate in this research. Or the researcher can directly ask the interviewee about the people that are the most relevant to the research area; and then the key people are asked if they would like to make an interview. As it is understood, this approach helped the researcher reach the main people who encounter the impacts of product design changes the most. The key people, who are the most relevant to the product design changes, provide rich descriptions and deep assessments about the impacts of product design changes (Miles and Huberman, 1994). Interviews with the key people also produce believable explanations and descriptions about the research topic. Convincing explanations about the research topic increase the validity of the data (Curtis et al., 2000).

Official online documents and online company reports were sampled according to their relevance for this study. The data extracted from these sources had already been categorised or coded for the retailer's own use. Therefore, the researcher directly used these existing categories for the data, which, by definition, were already aligned to their purpose and use by the

organisation. During the sampling stage of online company reports, data regarding sales and profits of StarsFashion for the last ten years were analysed. These included the financial highlights for the ten-year history of StarsFashion, which enabled the researcher to examine the general financial situation of the retailer company. Data regarding the annual assessment of risk and uncertainties of StarsFashion were also chosen because these include product design and selection risks, which enabled the researcher to identify the possible product design problems that StarsFashion foresees. This data also helped understand why product design is so important for retailers.

In addition, reports covering StarsFashion's historical information, ethical practices towards suppliers, and their approach to their products, customers, and suppliers were selected for analysis. Reports covering historical information about StarsFashion were used to present StarsFashion, the retailer company. The data regarding ethical practices towards suppliers was used to understand their approach to suppliers. This data helped the researcher to understand the relationship between the retailer company and its eight suppliers.

3.3.1. Why The Women's Fashion Industry Was Chosen

A pilot study was undertaken on women's fashion products manufactured by one of the largest retailers (by sales) in the UK's fashion industry: a public limited, multinational company, StarsFashion. StarsFashion offers stylish, quality, yet affordable collections of clothes for women, men, and children, alongside home products. In this thesis, Turkish and British international suppliers that supply the raw materials for the women's wear products of StarsFashion were chosen. The reasons why StarsFashion and its women's fashion suppliers were chosen for this research are listed below:

1) According to official online documents, StarsFashion has operations in China, Hong Kong, Sri Lanka, India and the UK engaged in the design, sourcing, buying, merchandising and quality control of its products. They work with over 500 suppliers around the world. The high volume of its international operations made StarsFashion appropriate for this investigation. It allows the researcher to investigate as many suppliers as possible to understand how

product design change requirements affect the relationship and operations with international suppliers.

2) StarsFashion's strong relationship with its suppliers is highly emphasized in the official online documents. This strong bond between them and their suppliers provides the researcher a deep understanding of how the company manages the relationship with their suppliers, both in a normal process and in a design change requirement situation.

3) A meeting with the buyer in women's wear department in StarsFashion, who is well known by my supervisor, was arranged for the pilot study. Through the buyer, the merchandiser in the same department was seen separately for an interview. These two interviews carried out with a buyer and a merchandiser yielded data that design change requirements mostly happen in the women's wear department. The buyer in StarsFashion mentions how fast-moving women's wear is by saying:

"On men's wear, it is a bit safer because men fashion doesn't move on as quickly as women's. Women's fashion is a lot quicker. So trends happen quicker. ...from the point of view of the product and the design, women's wear is different because you have to be hitting the trends right at the right times. Menswear we find, from a product developing point of view, is easier because they buy a t-shirt."

This means that, while the women's wear buyer would buy one hoodie, the buyer in the men's wear could probably buy a red one, a grey one, and a plum one and they would all work. This is called product blocking. Product blocking works well for men's wear works, but is less appropriate for women's wear. The men's wear range primarily focuses on jeans and bottoms; by contrast, women's wear incorporates dresses, skirts, trousers, and so on. There is a greater range of products involved in women's wear. Since it is more trend-oriented than other departments, it is more prone to changes. Therefore, by observing women's wear - an area prone to design changes - this investigation can better observe that process. The interviews also revealed StarsFashion's findings regarding how men buy. Men buy because they like the fit and shape, and they will come back and repeatedly buy similar products. According to

StarsFashion, men's wear and women's wear are very different. So it means while the women's wear buyer would buy one hoodie, the buyer in the men's wear could probably buy a red one, a grey one, and a plum one and they would all work, which is called product blocking.

4) The pilot study also reveals data that design change requirements are mostly made toward Turkey or the UK because of their close locations. Since design change requirements have lengthening impact on the production time, most retailers prefer to make design change requirements to a country which is geographically close, in order to catch up with the normal production time. For a United Kingdom based company, Turkey or the UK is the most appropriate country if they require any design change. For this reason, in the main study there are eight Turkish and British suppliers that produce raw materials for StarsFashion.

5) In this research, the raw material suppliers are chosen to see how the design change process affects the smallest unit of the supply chain. According to the pilot study interviews, it is understood that the design change process affects the company's supply chain. However, it is not that easy to execute this process. The retailer must go deep into the supply chain and re-organise all parties involved in this process from the starting point.

6) 20 participants who are working in the Turkish and British supplier companies were interviewed. All the participants working in the same supplier company were chosen from different levels and departments in the organisation. This will help understand how the design change process affects different levels and departments in a supplier company.

3.3.2. Why Turkey?

Seven of the supplier companies taking part in this research are located in Turkey and one in London. Providing information about the Turkish suppliers working in the fashion industry can provide a better understanding of why they were chosen for this thesis.

Turkey is one of three countries, following China and Italy, which exports the largest amount of raw materials and manufacturing to large foreign fashion

companies (the United Nations Comtrade data, 2006). Turkey is an irreplaceable developing country in terms of resource and production for the famous fast-fashion brands around the world such as Mango, Zara, H & M, TopShop, and Marks and Spencer (Tokatli et al., 2010).

Therefore, Turkey is one of the countries where the change in the fashion industry can best be observed as the change of the minimalist fashion trends (ready-to-wear) of the 90's moved to the more embellished trends (fast-fashion) of the 2000's. This change in fashion products' design resulted in disruptions to the manufacturing process of the Turkish supplier companies (Tokatli et al., 2010). Since minimalist fashion trends required long lead-times, accurately forecasted demands, and accurately planned production, Turkish suppliers experienced a problematic transition to the requirements of fast-fashion trends that included shorter development cycles, short lead-times, and uncertain demand forecast. Fast-fashion retailers started to require that manufacturers produce the fashion week trends as quickly as possible and send the finished products to the stores with incredible speed.

Despite these challenges, Turkish suppliers have managed to overcome these difficulties and keep their place in the fast-fashion era (Tokatli et al., 2008). Previous research tells us that the reason of this quick adaptation of Turkish suppliers is the global buyers (Tokatli and Kızılgün, 2009). Since the global buyers made meeting their demands a matter of life or death for their Turkish suppliers, they have had to adapt themselves to these totally new conditions. Otherwise, Turkey would have to stay outside of the fashion market and the fast-fashion retailers would move to other countries.

Today, Turkey has relatively higher prices and more orders than other supplier countries due to the quality of their products and manufacturing. However, they still have no power in their contracts with the global buyers and no guarantee for the future (Tokatli et al., 2010).

3.4. Validity and rigour

In this thesis, the positivist tradition is used to establish rigour in the research method. The positivist tradition presents four criteria to assess the rigour of case studies: internal validity, construct validity, external validity, and reliability (Campbell, 1963; Eisenhardt, 1989; Yin, 2009).

3.4.1. Validity

Internal validity: To establish internal validity, the researcher has to demonstrate a strong causal relationship of certain conditions leading to other conditions to defend the conclusions of the research. In this thesis, three measures were used to enhance internal validity (Yin, 2009).

First, a research framework was developed, which shows the causal relationship between the variables and the outcomes. To create the research framework, previous research studies were reviewed and then the causal relationship between product design changes and its effects on supplier companies was formed. Forming a research framework helped the researcher to distinguish what is a typical or atypical impact of product design changes on supplier companies. The research framework also helped the researcher to determine if the findings are plausible by allowing comparison of the patterns.

Second, pattern matching was used to compare the patterns in the research results with the patterns in the previous research (Denzin and Lincoln, 1994; Eisenhardt, 1989). The pattern between the product design changes and its impacts on each supplier company were compared with each other to achieve internal validity. The coincidence of the patterns of each supplier company strengthened the internal validity for the results of the case study. Furthermore, the match-up between the pattern of each supplier company and the pattern of the conceptual framework provided more internally valid results.

Third, triangulation of the collected data was used to verify findings from each supplier company (Yin, 2009) and reach internal validity of the results. I triangulated different types of data sources such as semi-structured interviews, official online documents, and online company reports were triangulated. This

means that different data sets that complement each other were collected. The data collected from semi-structured interviews contains rich descriptions and detailed assessments of about the impacts of product design changes. Official online documents provide data regarding StarsFashion's approach to its suppliers, customers and products. The data collected through official online documents also includes historical documents about StarsFashion and StarsFashion's ethical practices (See Appendix 9). Online company reports provide data regarding sales and profit of StarsFashion for the last ten years, and the annual assessment of risk and uncertainties of StarsFashion (See Appendix 8). All the collected data helped the researcher verify the internal validity of the results of the case study.

Construct validity: Construct validity was established to reduce the subjectivity. Construct validity is achieved by asking open-ended questions to prevent the interviewees from being manipulated. At the end of the interviews, I had a rich qualitative feedback, which also contributes to the construct validity (Landeta 2006; Rowe and Wright, 2011). The rich qualitative feedback provides a wider perspective and helps the researcher to avoid assessing the cases from a single point of view. In order to enhance construct validity in the thesis, I show clear evidence by linking the research questions to the findings (Yin, 2009). Triangulation of the collected data also helps to ensure the construct validity. In this thesis, I use different data sources such as secondary research, interviews and official online documents to reduce subjectivity and adopt different angles (Denzin and Lincoln, 1994; Yin, 2009). Since data and information is supported by multiple sources in the data triangulation, the researcher obtains more comprehensive data, which includes different perspectives. This helps the researcher reduce subjectivity and gain alternative perspectives.

External validity: The external validity of this research is achieved by using replication logic, which contributes to analytical generalization (Eisenhardt, 1989). The researcher used replication logic by giving place to eight supplier companies. The impacts of product design changes were evaluated and analysed for each supplier company. In this way, the replication

of the similar results achieved from eight suppliers provided the external validity of the findings. Cross-case analysis involving eight cases were utilised to prepare a good foundation for analytical generalization (Yin, 2009; Rowley, 2002). The results of the cases are compared and evaluated in the light of the existing literature to verify the stability of the research (Landeta, 2006), which supports the external validity.

3.4.2. Reliability

The reliability of research refers to achieving the same results every time the case study is conducted (Hill and Fowles, 1975; Stuart et al., 2002). The researcher aims to demonstrate reliability by supporting transparency of the research. Documentation of each research step, production of a case study protocol, and clarification of how the case study was conducted helped the researcher to enhance transparency. To practice reliability, each step was documented by recording the interviews and progress. Replication is another measure for reliability (Leonard-Barton, 1990). A case study database including case study notes and documents was composed to facilitate replication of the results by future investigators (Yin, 2009).

3.4.3. Ethical issues

I have applied to the Ethics Research Committee of School of Business, University of Leicester for ethical approval with the ID number of no42-843e. At the end of ethical assessment, the research was found compliant with the University's Research Ethics Code of Practice, which addresses aspects such as process transparency, participation and anonymity, data security and the right to withdraw. Accordingly, precautions have been taken throughout to protect the anonymity of the companies and their employees, and to retain anonymised data with password protected files.

The interview with the first person working in the retailer company was provided by one of the supervisors. In this first interview, the interviewee gave the contact information of one of the key material suppliers. The phone contact with the person working in the supplier company was made and the meeting

date and time was decided. During the meeting, the researcher asked which employees at different levels and different departments in the supplier company could best contribute to the research. In this way, employees, who are the most related to the product design changes, from different departments and different levels, have been involved in this research. The communication details of the other supplier companies working for the same retailer were obtained from the interviewed persons. All contributions were made voluntarily and interviewees were informed through the invitation, confirmation and prior to the interview of their right to withdraw, while permission to record the interviews was also sought.

A copy of the ethical approval form is included in Appendices (see Appendix 1).

3.5. Limitations of the Research Methodology

In this section, potential limitations related to the research methodology and process will be described and critically assessed. Determining the limitations *ex ante* in this manner enables the researcher to understand in what way the results and analysis should be interpreted cautiously or with important caveats. Identifying the limitations may also be helpful for future researchers in designing and conducting future research in this area.

Limitations in the research process are focused on the selection of suppliers and interviewees, and data analysis (Landeta, 2006). The discussion highlights how these limitations relate to the research carried out and what measures were taken to mitigate any limitations.

3.5.1. Selection of suppliers and interviewees

One of the most recognised limitations of this thesis is the subjective selection of supplier companies and interviewees (McKinnon and Forster, 2000; Landeta, 2006) because the process of sample selection relied on purposive sampling.

In the selection of the suppliers, the first supplier company was contacted via the interviewees from the retailer company. And that interview with the employees working in the first supplier company yielded contact information for another supplier company working for the same retailer. When requesting contact information for additional suppliers, the researcher influenced the selection by indicating the necessary criteria for inclusion, such as working for the same retailer, their location, and supplying raw materials. This is how the sample of suppliers was selected during this research. This approach helped the researcher discover a key event or relationship about the impacts of product design changes and the researcher had a chance to look for that specific element in another supplier company (Miles and Huberman, 1994).

The interviewees were also identified from one interview to another in essence snowballing but with the criteria for participation in mind. This helped the researcher reach to the key individuals who are related to the product design changes. As a result of this, one general managers, five sales managers, four export-import managers, two employees from colouring department, two employees from fabric production department, one employee from printing department, one employee from thread department, and one employee from design department have been interviewed. The number of employees working in the same departments is uneven, which can be another challenge for generalising the results. However, having the interviewees from different departments may result in a wider perspective about the research topic.

Although these difficulties posed a challenge for the thesis, the results of interviews are consistent with each other. It means the collected data is consistent. In addition, the selected supplier companies have an advanced level of communication between departments. All departments are immediately informed about any change in the work plan. Therefore all departments and employees within a supplier company are aware of any problem or tension in case of any design change situation. In this way, the uneven distribution of the number of employees between the departments is no longer a weakness of the thesis. In addition, the interviews revealed that all supplier companies participating in this research work for other leading fashion retailers based in

the UK. This means that the findings can be generalised beyond one famous fashion retailer.

3.5.2. Poor Practice

Poor design of the case study questions can be another limitation during execution of this type of research (Gupta and Clarke, 1996). To overcome this issue, the researcher has looked at the case study design from other related research that investigates the impacts of product design changes on supply chain risk in special purpose vehicle industry (Lin and Zhou, 2011). The case study design of Lin and Zhou (2011) was modified according to the researcher's own research subject. Since Lin and Zhou (2011) worked in the SPV industry, the interview guide they used was adapted to the fashion industry. Accordingly, the interview questions were also adjusted to the research topic. Since this research focuses on the impacts of product design changes, the interview questions were arranged to generate in-depth data about the experiences of suppliers during product design changes, rather than focusing on possible risks that might occur in supply chain.

One other limitation observed is the difficulty of undertaking this research as an individual. If the researcher would have a chance to conduct this research with a research team, more extensive data would be documented. It is difficult to write down everything that is important while participating and observing at the same time (Mack et al., 2005). The researcher mostly relies on his/her memory to write down his/her observations as completely as possible. To mitigate this, the researcher sought advice from the research supervisors about what questions to ask, how to ask them, what to observe and what to record before meeting the interviewees.

Gaining benefit from the knowledge of experts (Seuring and Muller, 2007) and hearing different perspectives might be difficult when the researcher conducted this research alone. In a team-based research, researchers could review the field notes of each other and the case descriptions; so the data would be interpreted in a more objective way. While drawing out the issues of research interest from the data, the supervisors stepped in again and contributed to the findings with their knowledge.

4. DATA COLLECTION

4.1. Introduction

This chapter detailed information about the fast-fashion retailer that was the focal subject of the study. This is discussed in two main sections. General information about the retailer and the retailer's approach to their supply chain are included in 'Information about StarsFashion' section. In 'Data Collection' section, information about the data, data collection and associated collection methods are presented.

4.2. Information about StarsFashion

'StarsFashion' (pseudonym) is a public limited, multinational company and one of the largest retailers by sales in the UK's fashion industry. The first StarsFashion store opened with an exclusive collection of stylish clothes, shoes and accessories for women². At the end of the first year, there were 70 women's wear stores around the UK³. Two years after launching the womenswear collection, the menswear was presented to the market⁴. In the same year, the number of stores presenting menswear increased to 52⁵. A year on from launching the menswear collection, StarsFashion introduced the first home interiors range⁶. Two years after introducing the home interiors range, kids' wear was presented to the market⁷.

For about 40 years, StarsFashion has been operating in the UK⁸. Twelve years after it was established, the company expanded overseas and had 300 stores in 16 countries worldwide⁹. Today StarsFashion offers stylish, quality, yet

2,3,4,5,6,7,8,9 All information is taken from official company documents and online company reports. References are not included, since it will break anonymity.

affordable collections of clothes for women, men, children with more than 500 stores in the UK and Ireland and almost 200 stores in more than 40 countries overseas¹⁰. They also trade online in around 70 countries outside the UK¹¹. Total sales of StarsFashion was almost £4 billion in 2015 with over £2 billion in retail sales and over £1.5 billion in online sales¹².

StarsFashion employs more than 50,000 workers globally¹³. They use an in-house design team to create their ranges, and source their products from many countries around the world¹⁴. StarsFashion has operations in China, Hong Kong, Sri Lanka, India and the UK engaged in the design, sourcing, buying, merchandising and quality control of its products¹⁵. They work with over 500 suppliers around the world¹⁶. They work very closely with their suppliers to maintain the traceability and visibility of the entire supply chain across a number of product categories¹⁷. StarsFashion's strong relationship with its suppliers is highly emphasized in official online documents.

During 2013, StarsFashion formed global teams to review and improve the supply chain process to ensure that potential suppliers fully understand the requirements prior to contracting with StarsFashion¹⁸. These global teams also work closely with the suppliers' factories to train, support and develop an approach of continuous improvement¹⁹. The company reports about StarsFashion's supply chain performance indicate that, between the years of 2012 and 2013, the company showed a significant decrease in the number of countries where their products are manufactured and in the number of suppliers worked with²⁰. In the same time interval, the reports also showed that the

10,11,12,13,14,15,16,17,18,19,20,21 All information is taken from official company documents and online company reports. References are not included, since it will break anonymity.

number of suppliers disengaged increased²¹. These practices and results show that StarsFashion adopts a strategy of 'less is more' and considers the suppliers as their partners and collaborators.

The structural characteristics of StarsFashion make it a suitable case to explore how re-designing products impacts supply chain performance and what tensions suppliers have in their company during product design changes.

4.3. Data Sources and Collection

A multiple case study was conducted to achieve the research objectives. Although this research looks at a single retailer (StarsFashion), each of eight suppliers of StarsFashion is treated as an individual case study. Thus, eight cases are analysed in this thesis. The primary method for data collection was semi-structured interviews (Cooper and Schindler, 2008). This is a fundamental method of obtaining valuable information within case study research, alongside official online documents and online company reports, which complemented interviews where available (Yin, 2009). Thus, semi-structured interviews, official online documents and online company reports were used to collect the necessary data. Data were gathered during one year of interviews across one retailer company and eight of its suppliers, conducted between January 2015 and January 2016.

In this thesis, analysis is reported from 20 interviews across the nine organisations: the retailer and its eight different suppliers. Each interview took place in the interviewee's own working area. Since the supplier companies were spread throughout different cities of Turkey, the researcher had to travel to the different regions of Turkey to visit supplier companies and conduct interviews. Interviews incorporated people with different relationships to the supply chain, such as buyers, designers, merchandisers, technologists, and suppliers. People from different roles within the companies were involved in multiple interviews to obtain viewpoints from people in both retail and product development. This gave me the opportunity to observe the same issues from different angles.

Table 1 describes the case study organisation, the interviewee's roles and the number of the interviews conducted within each organisation. In many cases additional interviews were sought but in a time-pressured working environment volunteers were not always forthcoming.

The interviews lasted between 45 and 90 minutes. All interviews were conducted in the field at the place of the interviewees' work according to the interviewee's schedule and availability, as suggested by Feagin et al. (1991). All interviews were recorded to maintain accuracy, transcribed in the language of interviewee (Turkish or English) before being translated to English to facilitate analysis. The researcher conducted all of these activities. Where meaning may have been lost in the translation the analyses referred back to the original language. This provided the researcher with contextual information that was drawn on in the analysis.

The structure and interview questions were tailored to the specific interviewee, although the supplier interviews generally covered the same topics. The retailer interview was tailored differently to the supplier interviews. For example, the supplier network case organization interviews included probing around the implications for the manufacturer's side of the design change requirements. In the initial interviews, very general questions were formulated to understand the general characteristics of the phenomena. In the next steps, more precise research questions were formulated. The interviews were conducted in accordance with the guide and open-ended questions were used specifically to encourage a guided but deep narrative, with limited constraints placed on the participants and the information they provided.

The researcher made initial contact with each selected company via email to ascertain if the company was willing to participate in the study. Follow up emails and phone calls were made to set up face-to-face interviews. The specific number of face-to-face interviews varied by company (from 1 to 5 per company depending on employee availability).

Interviewees' job titles included buyers, merchandisers in the manufacturing company, sales managers, export managers, designers and

pressers (see **Table 1**). Interviewees were located in different departments. In order to establish if perceptions and experiences were consistent across different areas of expertise within supplier organisations, interviews were conducted across departments when the opportunity arose. For example, operational level managers participated from the departments of purchasing, production, and sales, and the departments of design, press, and colouring (See Table 1 for further information).

To ensure the data collected answered the research questions, all interviews followed a case study interview protocol to support the reliability of data, as proposed by Yin (2009). These protocols were revised as the case studies were conducted in accordance with the researcher's growing knowledge regarding phenomena under investigation. Follow up emails and/or phone calls by the researcher were also used to clarify any outstanding questions on the data gathered.

The interview guide was designed and utilized to gather rich descriptive information from the participants. The interview guide used in this research was based on the interview guide of Lin and Zhou (2011). Lin and Zhou (2011) conducted a case study to investigate the impacts of product design changes on risks in supply chain in the special purpose vehicle (SPV) industry. Since this thesis aims to explore the impacts of product design changes on the supplier companies in the fashion industry, the interview guide of Lin and Zhou (2011) was modified for use within a fashion industry context. Furthermore, the interview questions of Lin and Zhou (2011) focused primarily on physical risks such as production risk, planning risk, supply risk and delivery risk. However, this research focuses on what each supplier company experiences, including physical or non-physical impacts, during the product design change process. Non-physical impacts include tensions experienced during product design change process. In parallel with this difference between the research aims, the interview questions were modified according to the focus point of this thesis. The interview guide is displayed in Appendix 4.

Table 1: Table of case organisations (n=9) and interviews included in analysis (n=20)

Case organisation	Description of case organisation	Interview department	Interviewee title and frequency
'Starsfashion' Clothing Manufacturer	'Starsfashion' is one of the largest UK fashion retailers (see case information in method section)	<ul style="list-style-type: none"> Purchasing Merchandising 	1. Buyer (1) 2. Merchandiser (1)
Supplier Company 1	A strategic supplier of 'Starsfashion'. They have their own facilities to produce yarn and fabric.	<ul style="list-style-type: none"> Sales Digital Print Colouring Export-Import 	1. Sales managers (2) 2. Head of Digital Print (1) 3. Employee in Colouring (1) 4. Export-Import manager (1)
Supplier Company 2	A preferred supplier of 'Starsfashion'. They produce fabric.	<ul style="list-style-type: none"> Sales 	1. Owner/Sales Manager (1)
Supplier Company 3	A standard supplier of 'Starsfashion'. They produce yarn.	<ul style="list-style-type: none"> Sales 	1. Sales Manager (1)
Supplier Company 4	A standard supplier of 'Starsfashion'. They produce yarn.	<ul style="list-style-type: none"> Export-Import 	1. Export-Import Manager (1)
Supplier Company 5	A preferred supplier of 'StarsFashion'. They produce fabric.	<ul style="list-style-type: none"> Export-Import 	1. Export Manager (1)
Supplier Company 6	A strategic supplier of 'StarsFashion'. They have their own facilities to produce yarn and fabric.	<ul style="list-style-type: none"> Management Export-Import Colouring Design 	1. Owner / General Manager (1) 2. Export-Import Manager (1) 3. Head of Colouring Department (1) 4. Manager of Thread Department (1)
Supplier Company 7	A standard supplier of 'StarsFashion'. They produce yarn and fabric.	<ul style="list-style-type: none"> Production 	1. Head of Fabric Production Department (1) 2. Fabric Production Manager (1)
Supplier Company 8	A preferred supplier of 'Starsfashion'. They are a design company that create tailor-made designs for companies.	<ul style="list-style-type: none"> Management Sales Design 	1. General Manager (1) 2. Sales Manager (1) 3. Designer (1)

The collected data was analysed through case descriptions, data coding, categorising, pattern matching and explanation building. First, I focused on case descriptions by writing detailed descriptions, which are necessary to gain an insight into the phenomenon (Gersick, 1988; Miles and Huberman, 1994). Case descriptions helped the researcher get rid of unnecessary data and save the data that is relevant to the research questions. After composing case descriptions, data coding was applied to the collected data to organise and classify raw data into categories (Mackey and Gass, 2012). Categorisation of the data helped the researcher analyse and interpret the data and understand the phenomenon by replication of the data. Thanks to the categories, the researcher was able to explore whether or not the supplier companies follow a pattern. After creating categories revealing a pattern that supplier companies follow, the researcher used pattern-matching method to compare the emergent pattern with the pattern outlined in the conceptual framework. This method was helpful as a basis for explanation building, which allows the results of the thesis to be compared with the findings of the previous studies.

4.4. Summary

StarsFashion and a sample of its suppliers are the cases in this study. Different resources such as semi-structured interviews, official online documents and online company reports were used in this research. The retailer and its eight suppliers were investigated and 20 semi-structured interviews with different level of employees were conducted. All interviews were recorded, transcribed and then translated to English. Case study protocol and interview guide were used to gather reliable and descriptive data. To analyse the collected data, case descriptions, data coding, categorisation of the data, pattern matching and explanation building methods will be used.

5. THE CASE DESCRIPTIONS

5.1. Introduction

In this chapter of the research, the data collected from the nine cases investigated (retailer company and eight of its supplier companies) will be presented. 'Section 5.2.' introduces the case developed from StarsFashion, consisting of interviews conducted with an experienced buyer and a merchandiser working for a women's department. The interviews revealed their understanding of StarsFashion's organisational structure and how they worked with their suppliers. The subsequent sections 5.3-5.10 introduce the supplier cases.

In the case of the retailer company (section 5.2.), general information about StarsFashion will be given and its organizational structure will be defined. This will help better understand the working principles of the company and how the departments in the retailer company are calibrated. Then, the data about how the product ranges are created in the retailer company and which departments are involved in the creation process will be provided, in order to understand how product design takes place in these product range creation processes. In the third part, the data about the supplier relations of StarsFashion will be presented. These data will provide information about how StarsFashion works with its suppliers. In the last part, the data about how StarsFashion makes design change requests to its suppliers and how this requirement process works will be presented.

In the cases of the supplier companies (sections 5.3-5.10.), general information about each supplier company will be given. In this part, the researcher also mentions how many employees were interviewed in each company and gives information about the interviewees' departments and experiences. Second, the data about the design change process in each supplier company will be presented. This will help us understand what departments are affected by design changes, and the tension points during the design change process. Third, the data about the impacts of product design changes on each supplier company will be provided. In this way, the tensions the departments and employees experience due to the changes in product design will be clarified. In the last part, the data about the strategies that each

supplier company follows to avoid product design changes and to prevent their performance from reducing will be presented.

5.2. StarsFashion

5.2.1. Organisational Structure

The organisational structure in **Figure 3** was how the interviewee interpreted the organisational structure of StarsFashion. As shown in **Figure 3**, StarsFashion have buying teams, merchandising teams, design teams and technology teams for each department and each product type. They have buying teams in the women's wear and under the women's wear department they have buying teams for each product line. StarsFashion have 13 product lines in the women's wear category, including: coats & jackets, dresses, jeans, jumpsuits, knitwear, trousers, shirts & blouses, skirts, t-shirts, sportswear, sweatshirts & hoodies, beachwear, work wear. The buyers purchase products from suppliers from all around the world and develop the product into trends and then sell them through the stores and on the Internet. The buyer who was interviewed for this study explains the job by saying:

“Basically the buyer's role is to work with designers to get the trends right within develop the product, and work with technologists to make sure the fit is right for people so we know that our customers will return because the fit is right for them. So their sizing is right when they go in, they know that they can pick up a size 12 and it will fit them. And then we all sit down and discuss the range and pull it all together to create what we have seen in store.”

The bottom-line for a merchandiser is to help the company make profit. Merchandisers cover 3 areas: helping to buy the product by working with the buyer, getting the product into the business by making contacting with suppliers, and then helping to sell the product. The forefront of merchandisers' thinking is about right product, right price in the right place and at the right time. In order to make as much profit as they can, those are the four things they

need to get right. The merchandiser of the women's wear in StarsFashion explained what exactly they are doing by saying:

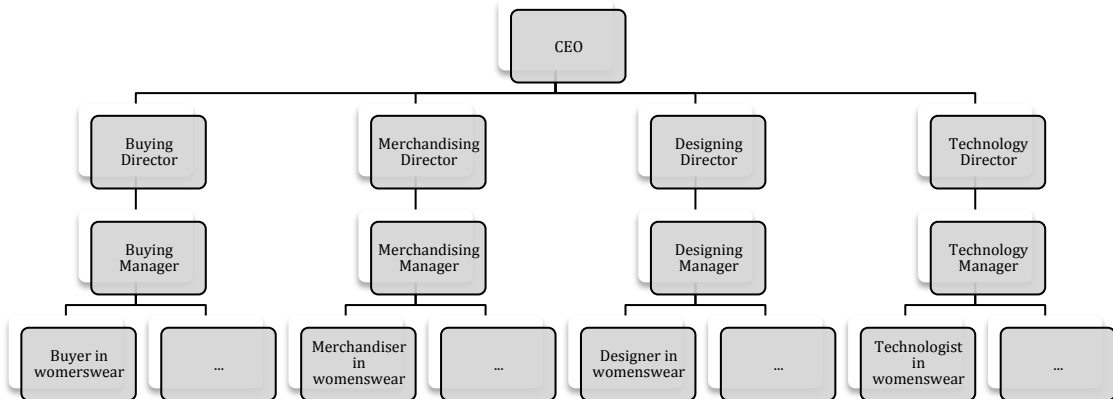
“So the position that we have to start from is where we ended up last year (financially). What was our finishing position in terms of sales, in terms of profit, etc.? I would then break that down into product types. I work on ladies' wear. So I would analyse my sales and would break it down into each individual parts of ladies' wear and also into sub groups, for example tailoring. I then would split that down to jackets, trousers, skirts, dresses to see where we made our money, what we could have done better, what we didn't do so well, would like to stop. I would then from there, build a picture financially of where I think we can take the following season.”

Broadly speaking, buyers develop products while merchandisers look at sales history to determine the bestsellers in every range. Designers bring in trends and design new products. Technologists ensure that the fit of the product is correct, so they know that their customers will return because the fit is right for them. All these parts work together to create a range in women's wear.

A lot of the time different departments also have to work together to create the range. The denim team could work with the blouse team to make sure that the blouse will sit nicely with a pair of jeans. This is called product surgery. In the product surgery process, all the product is racked up before it goes into store so that product teams can review it. The teams co-ordinate the different clothing items across different lines, and the items are racked up to make sure they match with each other. Through the process, the designers create stories in the beginning of each season.

StarsFashion may have as many as four stories for each season. All products are assessed to make sure that they fit into the story, and new products that are bought must also co-ordinate with the story. This ensures that the collection looks cohesive. By racking up all the products beforehand, the retailer can ensure that all the items tie into the overall story, and make sure the range will look good in store. The same process is also applied to create a range in men's wear, kids' wear, and home textile.

Figure 3: StarsFashion's Organisational Structure



5.2.2. 'Creating Range' Process

When creating a range, StarsFashion uses product teams including buyers, merchandisers, designers and technologists. Broadly, the buying side buys the garments, and the merchandisers handle the financial side of the product, while designers develop the products, and technologists ensure the products has the right fit and standard quality.

Here we may need a further explanation to clearly understand what exactly a merchandiser does in the fashion industry, since the merchandiser interviewed for this thesis stated that the role of merchandiser is always confused with the financing department. Merchandisers try to match the money to the product. By contrast, the finance department is solely concerned with money and making sure it stacks up. A merchandiser will build a structure of money for the specific department and consider how much that department needs to take on specific areas. They then break that down into product types, so part of it will go to tailoring, part of it will go to blouses, and so on. Within each product type, they will also prepare a structure of how many options they need to have, roughly what average selling price that needs to be and what they need to buy of different options.

First, product team members come together and talk about what buyers and designers think is going to be on trend and what the buyer needs to buy

with the budget available to them. Buyers take these specifications and go to visit the suppliers to find out what they have on offer and what StarsFashion can get for what prices.

Decisions about what will be trends in each season usually do not come from a merchandiser. Usually that will come from the buying and the design teams. A merchandiser explains this situation by saying:

“I would say in the time I have been working in the retail, I have probably made a few decisions about product and said ‘I think this (trend) is going to be really big. They (the design team) were astonished at my comment but they were interested in comment.”

Upcoming trend decisions emerge from the design and buying departments, who determine what trends will be big in each season. This information allows the merchandiser to move the money from one product line to another.

StarsFashion has its own big design teams for each range. They mostly create their designs internally and source products (raw materials such as threads, yarns, fabrics) and services (weaving, dyeing, knitting, sewing, delivery) from the UK and mostly overseas. However, they sometime prefer using designer teams outside of the company. The buyer working in women’s wear of StarsFashion says:

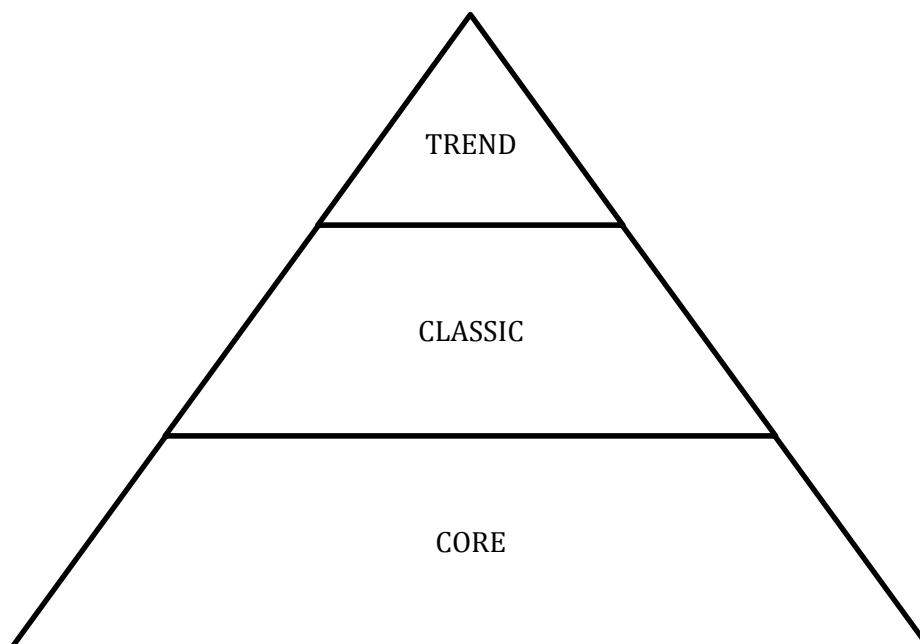
“We kind of take inspiration from lots of different places to create the range and work with the designers to make sure it is right for trend. When the bestsellers maybe were last season, we are replicating on moving forward if there is a bestseller, we always try to move on forward as well as covering of what the new trends are, as well.”

To create a range, three product parts will be involved in the creation process: Core products, Classic products and Trend products (see **Figure 3**). The core is probably the biggest area, classic is middle, and trend is the smallest part. The core covers the basic products that appeal to all customers. The core is kept as the largest part since they need to make sure the core

customer keeps coming back to them. Customers who like the fit and the quality of a basic product will usually come back and re-buy the product without even trying it on.

StarsFashion also need to be in line with the rest of the high street to make sure they remain on trend. The trend product range is the smallest part, since trends continuously change. Retailers therefore have to continuously catch the trends and create a new range for each trend. Classic customers fall in the middle. To remain competitive, the retailer also needs to offer classic pieces. The classic section involves tailored products, which have to be timeless but also trendy.

Figure 4: Product types in a women's wear range



StarsFashion has really strong relationships with their suppliers, and the company is able to use this relationship while developing products. They have product developers at the head office who only work for suppliers and act as go-betweens. The buyer says:

“These product developers have really good connections with suppliers so they can speak the language of these suppliers which also helps. And they have got good kind of background of working and developing product and they feed through to the buyers.”

The normal operation process of StarsFashion is shown in **Figure 3**. The buyer, the designer, the merchandiser and the technologist working for women’s wear come together and create a range. When the designer has designed a product and the buyer approves it, they send it to the right supplier. The supplier then works on it and sends the samples to the buyer. After the samples are checked by the buyer, the designer, the merchandiser and the technologist of the product, they go into a selection. This is a meeting where all managers decide whether the product will be in or out of the range. If the product is selected, then they book it from the supplier. The supplier then gives the lead-time to them, which is a deadline for when the product has to be ready so that it will arrive at the right time in store. This process repeats for every single product in store. The buyer says:

“Our teams and suppliers look at a critical path to make sure the product is on track and we get it into the store in the right time. Because you wouldn’t want a big woolly jumper to come in in high summer, you would need it in the right time, so you would need in October when air starts to get cold.”

If they need to change the current range that is going into production the product team sits down, has meetings about the product and discuss the best way to go about making changes. It may be that StarsFashion loses money in terms of cost, since usually items that are made in UK are more expensive than products from China or Bangladesh. However, if they need something in quicker, then they will place it in the UK and either pay a little bit more money for it and put the selling price up, or make slightly less margin on it which reduces the profit but could increase the sales.

5.2.3. Supplier Relations

In their normal operation process, StarsFashion uses lots of suppliers in different countries depending on several factors. For example, Portugal is a good place to get blouses quickly, whereas Vietnam and China are the preferred countries to source tailoring.

StarsFashion have to make all the arrangements to make sure all the products come in the right time to create a story in the store. For example, if a blouse is intended to match with a suit, it creates a story in the store. These items may come from different suppliers from different countries. In this case, StarsFashion would get the blouse quicker and hold it in the warehouse, and then they would send it out once the tailoring is ready so that it creates the story in store.

StarsFashion also finds that certain countries are more expensive, so producing in somewhere like Italy would be much more expensive than producing in China. They find big differences regarding production between countries. Places like Cambodia and Bangladesh, where those factories set a high minimum order quantity, could set conditions such as only accepting high quantity production. There are also places like Turkey, UK and China where their quantity demand is a lot less. While suppliers in Cambodia and Bangladesh might set a condition of ordering ten thousand units, countries like Turkey, the UK and China require a thousand units.

Starsfashion decides the production location depending on product type and price. Products requiring lots of embellishments, or using silk or cashmere, will come to a higher price. Products ordered at a lower quantity are usually more expensive than if the retailer orders tens of thousands of units, because when suppliers produce in bulk they can charge less per product. So the cost price would be lower the more you buy.

The merchandiser working in StarsFashion analyses the sales at the end of this year and tries to build a picture of what they need to do this time next year. The buyer then speaks with the long distance suppliers in Bangladesh and China that have a longer lead time, and let them know what StarsFashion is looking for and what kind of things StarsFashion requires from them. At the same time, they will also contact the short distance suppliers

based in the UK, Turkey, and sometimes Morocco. Typically, summer products are requested in February so products will come through into StarsFashion around June time.

The short lead-time products are usually jersey products, but there is some woven as well. The middle lead-time products can be anything between the short and long lead-time, while the long lead-time products are usually woven and knitwear. Winter clothing usually has the longest lead-time. In order to get good prices, StarsFashion orders most of the production for winter collections from China and Bangladesh. Coats are usually ordered from China or Bangladesh; knitwear is mainly supplied from China. The lead-time for knitwear from China from point of order is between 16 and 24 weeks, which is nearly half a year. Summer products typically involve more jersey fabric, and that is produced a lot closer to home. An order can be placed in Leicester and delivered within 6 weeks, Turkey is 8 weeks, and East Europe is 6 to 8 weeks.

The buyer works with the suppliers directly on the product side. The merchandiser also speaks to them very regularly about the critical path and how it is working for the suppliers' point of view. In this way they can make sure every product that StarsFashion buys comes in at the time that StarsFashion is expecting it to. For example, at the beginning of summer StarsFashion wants all the vests, short sleeve tops, and shorts to be in stores in time for summer. If they delay by 3-4 weeks, StarsFashion could miss summer, which lowers the sales and again lowers the profit.

Suppliers play a key role in preparing the products at the right time by staying loyal to the lead-time. Lead-time is how long the supplier needs to make and ship that product. Once StarsFashion has learnt the lead-time, they then can make the right decisions at the right time.

Fashion retail is all about getting the trends right at the moment. To make such decisions correctly, retailers need to make them as late in path as they can, and therefore they need to know the lead-time of each product type that they are buying from the supplier. There is also an element of trust with the suppliers. On the one hand, the suppliers can trust that the retailer is going to place an order with them, so they can leave a capacity open in their factories. This means they can make it in time once they have got the orders. The merchandiser from women's wear explains this situation by saying,

“If you can give the suppliers lead time you generally do and if they are definitely running late, and you definitely need the product, we usually will get them to afraid to proportion of the stock. So if it is something that suppliers have done we will get them to pay for it. And if it is something what we have changed that is probably a delay in the critical path, then we will pay for it.”

Another solution for missing lead-times and for making up lost time is to get the products by airplane. This way, StarsFashion can get the products in 7 to 10 days. However, the downside of that is the extra cost, which means either the supplier loses out or StarsFashion loses out. If StarsFashion loses out, this comes off the bottom line profit. If the supplier loses out generally their prices will be slightly higher next time the retailer goes to place an order with them. Margins for suppliers are a lot tighter than StarsFashion's, and they therefore need to try to make that money back. For this reason, these situations can cause a lot of tension in various points, such as damages to the relationships with the suppliers and some troubles inside StarsFashion.

According to the merchandiser from StarsFashion, launch dates have the most tension. StarsFashion launches its autumn product on 21st of July, so in order to launch that garments need to arrive in the warehouse by the 7th of July. Therefore shipping from across different areas of the world need to be on time. This gets us back to the importance of suppliers, which make sure that shipping is on time. The merchandiser explains this tension by saying:

“A lot of retailers around country will also be launching at the same time or using similar suppliers, similar supply bases. So as you get closer to those dates it becomes really tense. We are making sure to chase suppliers on weekly, if not daily bases, as we get close to the shipment time. We are also making sure that we get honest answers from them. So that is the shipment side of making your launch is quite stressful.”

These lead-time arrangements may also cause problems inside StarsFashion since a lot of meetings with the buying side and within the

product team take place close to the launch dates. According to the merchandiser:

“They tend to be very tense. They are generally quite good and quite productive. But when you are presenting to buying managers, merchandise managers and directors that does become stressful because again the critical path is quite tight. You need to place orders by certain time and if the management teams are not happy with either the figure or product scheme, sometimes you have to start again. So those meetings are quite stressful.”

5.2.4. Design Change Requests from Suppliers

This kind of hectic schedule requires strong relationship with suppliers to get work done. Since sometimes StarsFashion has difficulties when creating a range, they need to work in collaboration with their suppliers. Design change requirement is a major problem when creating a range. It affects lead-time, cost, and the relationship with the suppliers.

If StarsFashion requests a design change such as a change in colour, they have to follow certain rules written into the contract. Since StarsFashion normally buy products in bulk, they would buy (for example) about 8000 yards. If they wish to make colour changes, they have to inform the supplier before the yarn has already been dyed. The supplier can probably accommodate the change if they haven't started to dye the yarn. If they have already started to dye it, StarsFashion must either go with the original colour, or stop production and lose money on it.

Even though StarsFashion protects their strong relationship with their suppliers, in any design change situation they take a risk of hurting this bond. The buyer from StarsFashion says:

“If we actually bought it and it has gone through production, it has got a label on it, we still have to take it. However, a lot of the time, ideally we just cancel it but we lose money and the supplier's faith in us.”

This statement does not correlate with the philosophy of respecting the contract and keeping the supplier on side. This shows that in a design change situation the retailer prefers creating the range with the right colours and patterns, and puts the supplier relationship in second place. This decision is understandable, since there are a lot of stress points when choosing the right product designs inside the retailer company. While the buyer would normally prefer not to cancel an order, they also have to answer to their manager. In this scenario, the buyer can choose to push the supplier to change the design, thus putting the supplier relationship at risk. The buyer in StarsFashion mentions,

“That (require a change in the product design) has just happened. I try not to do it because you need to keep the suppliers on side and be friends and make sure you are in a partnership. However, I think that (pushing suppliers for a design change) does often happen. It can leave kind of bad attitude and also often the supplier then adds on tiny amounts to your next purchases of the money. They also may have lost money by cancelling of the previous line; we do find that that happens sometimes.”

Design change not only creates a tense relationship with the suppliers, it also causes a stressful environment inside the retailer company. For example, in the selection, every little detail is looked at and considered by the managers, from the button to the button thread on the product and so on. The whole team developing the products and creating the range shows their range to the managers. It is a very tense atmosphere; the pressure is high. The buyer makes a point of the stress by saying

“... and they (the managers) could rip it (the range) apart, they could say that things are not quite right about it, or they could love it, they could say it is the best season they have ever seen. But that’s a very tense time because you have worked very hard to create the range and you are sitting in a room with everybody and sometimes you can have a bad selection meeting. A lot of the time it also feels quite tense within the team because everybody is very busy. Because you plan for the selection meeting but you are still working all

the way up to it, to get product in for the meeting and then you are still working the current season.”

In the case of a tiny design change that managers decide in the selection meeting such as to add buttons or take something off, product teams might have to go all the way back and repeat all the stages from the start. However, suppliers usually build that into the critical path. Things that are easier than others like changing the button or taking a button off or slight changes are quite easy to accommodate as long as there aren't too many. Suppliers usually build some flexibility into the critical path, so that if things move out by a day here or a day there that can be accommodated. This is called 'bunt'.

However, sometimes the supplier will accept too many orders for the time period. In this case, even simple changes can make them late on one product, which then throws out all the other products they have got coming into that line. It may also be the case that when they put an item into production, it is harder to make than they initially thought, so production will take longer. In addition, there might be delays in fabrics, trims, labels, etc. - all of those things have an impact on StarsFashion.

Beside this stressful atmosphere, design change has some serious consequences for the retailer company. The interviews with StarsFashion revealed a true event that has recently happened in the company: Teams in the design department stated that an upcoming trend is little crop tops and everybody is wearing those. The product teams developed lots of crop tops based on that trend. However, they realised that they had developed too many and that customers probably wouldn't buy it because it is very 'young' to wear those little crop tops. The buyer therefore had to stop the orders and lose money on them. This means that it is not only the designers who are responsible for making sure that the designs are right. Changing designs or orders based on the trends sometimes doesn't work. Sometimes it is better not to follow the trends rather than going for.

Serious things occur when design changes are made. The buyer states what the outcomes of design change can be:

“The biggest drastic thing is when you have stopped something or you have had to let it go into the store and it doesn’t sell, so you lose money. We never want to lose money, we should be making money, and that can be hard on the team, it can be hard on bottom line, so it is quite drastic when things that happened then we have to air in (the product), or if things don’t really work as well as we wanted it to.”

After any design change, the retailer has to look at changing the pricing, then ordering new labels and swing tickets, all of which means additional delays. Then the retailer has to bring in the product by plane rather than shipping, which costs a lot more. This is also detrimental to the margin. The retailer company makes less margin for the product and they may as well give it away. So changes in design can impact on margin and sales. This situation definitely affects the mood of the department. People lose confidence if things change. They have to go back to something they have already worked on, and it can cause friction and decrease confidence. When things like this happen, where some element of the design, colour, or print is wrong, or a product hasn’t worked, that is really bad for the employees. These wrong decisions in retail put a great pressure on employees. The buyer mentions this situation by saying,

“The pressure is on to get things right. If you get things wrong you are picked up on it, it is remembered. You don’t want to be remembered for bad things.”

Men’s wear is a lot simpler because men’s wear is less trend driven than women’s wear. Employees working in the men’s wear department generally make fewer changes because the product is simpler as well. It is easier to predict the trends, make decisions and not to change them at all, which makes a big difference in the complexity of the work.

To avoid design change requests, the women’s wear departments follow the trends very closely so as not to make bad decisions about the design of their products. The buying teams are constantly looking on websites,

especially WGSN²², which is a fashion trend forecasting service helping leading brands plan and trade their ranges and predicting what new colours and shapes are coming through. Buyers also often go shopping to New York, Los Angeles, Tokyo, and all around the world to research different products and then design their own versions of them. They also need to look at the different brands to know what's the newest thing certain brands have got in and they need to constantly review what bloggers are wearing to get inspiration. Buyers will even consider which new films are coming out. For example, when 50 Shades of Grey came out, t-shirts with "Hello, Mr. Grey" or "Grey is the best shade!" would have been good to get in so customers who had seen the movie would buy into it. To make the right decisions about design, buyers need to be totally on top of trends and know when certain trends are coming and why they want to buy things at certain times. Regarding making right decisions the buyer says,

"We have a limited amount of time. We have to make decisions really quickly. So you just pray that you make the right decision. A lot of the time, you have to go with what you have got and it has to be quick. When we have to make snappy decisions we have to do it."

The initial interviews carried out with the employees of StarsFashion yielded data indicating that design decisions can influence many levels of operation in the company including processes in the supply chain and relationships with suppliers.

5.3. Supplier Company 1

Supplier Company 1 is a textile company and a strategic supplier of StarsFashion. They produce fabric and have dyeing, printing, digital printing, knitting, and weaving departments in their facility. All production departments

²² WGSN is a flagship trend forecasting service, which has global experts tracking near- and long-term trends across 14 fashion categories. More information can be found on this link: <https://www.wgsn.com/en/products/fashion/>

are internal to the company. They also have four sub-companies, with both designers and sellers in each of the sub-companies. One of the sub-companies is located in London, and was founded specifically to make sales just in England. This company receives the design requirements from customers in England. They create designs there and after taking customers' approval, they send the approved design to Turkey to be produced. Their team in England creates the designs that English buyers desire and Supplier Company 1 produces it in Turkey. However, England is not their only market; they have a global customer base, which means they sell all over the world. However, England is their most important market, since their customer base includes many UK-based brands like Topshop, River Island, Bravissimo, Next, Marks and Spencer, and Asos. That is why they have one of their sub-companies in England.

When the buyer from StarsFashion gives a fabric/yarn order to Supplier Company 1, this order starts and ends in the marketing department in Supplier Company 1. The marketing department takes the order and collects the information about the order. They ask questions such as "What does the customer want?", "How many?", "What colour?", "Which quality?", "What price?". The marketing manager then passes all the info to the appropriate departments, and makes contact with the production department to get the fabric with the desired quality. At the same time, they talk to the design department to get the print done. Everything then goes to the colouring department to finish the design. The marketing manager shares all the product updates with the customer, sends them samples, and gets feedback which they discuss with the relevant department. If it is conventional print, it goes to conventional print department. If it is a digital print, it comes to digital print department. After printing is done, the finishing stage begins to give the product its final shape. The marketing manager then arranges carrier and delivers the order to the customer.

Five interviews were conducted in this company, which included two interviewees from the sales department for England, one interviewee from the colouring department, one interviewee from digital print department and one interviewee from import and export department. Interviewees from the sales department work on marketing and pricing the orders, arranging logistics of

loading, and managing the sub-company in England. The interviewee from the colouring department provides insight into how the design department views the customer, StarsFashion; the interviewee has worked in this department for 15 years. Another interviewee is the manager of the digital print department who is responsible for turning the colours to the numerical values and entering those numerical values to the appropriate machines to create a print on the fabric. The last interviewee is the export-import manager, who deals with customs issues after the marketing department sells the products, and makes logistics arrangements for those exported orders.

5.3.1. Design Change Process

In case of any design change request that may come from their customers, Supplier Company 1 never puts the orders into production until the customers complete their 'purchase order form'. In this way, they protect themselves under warranty in the event of the customer requesting further changes. This form includes all the conditions and enforcements for unexpected situations and requests from both the supplier and buyer. The form also mentions the specific dates that the final design change requirements can be made, which is usually before the production stage. However, most of the time customers disregard the conditions and articles laid out in the purchase order form; and Supplier Company 1 overlooks the situation so as to maintain their relationship with the customer.

Any design change requests before the specified date in the purchase order form are mostly okay for Supplier Company 1 since they try to satisfy their customers. However, after the production stage, the customer has to buy that fabric with or without any design change because the supplier is preparing, knitting and weaving that fabric just for them. The sales manager explains the situation saying,

"We make that fabric ready for printing and dyeing. After that, we wait the customer's approval for the colour or pattern before we work on it. They have all the rights to make change in the design of the product in this stage, no matter of how many. They can even say 'I am not buying this fabric right now; I

am going to buy it for the next month'. But they cannot say 'I do not buy this fabric' at all. We then, according to the purchase order form, have a right to sue them and get all our money back. But this time, our relationship gets worse. So both sides do their share and try to find a mutual way."

This quote suggests that the relationship is more important than the contractual obligation, which, presumably, means that the customer uses this to argue for changes later than the contract obliges. This may create several problems such as changes in production plans, tight schedule and tensions inside Supplier Company 1.

As a supplier working for the fashion industry, Supplier Company 1 follows trends very closely and accepts that trends change very quickly. Supplier Company 1 sees this characteristic of trends in the fashion industry as the reason why suppliers make products with short-term life cycles. The interviews provided a real example of an event describing how quickly the customers can change and request a re-design of the product. The interviewee tells the story:

"So yes, there are lots of changes in our work. We are not like home textile. They are producing long-term products. We are not like that. For example, one of my customers told me that he wants a specific flower pattern on the fabric since flowery things are very trendy at that time. After a day, he called me again and said, "I realised the sales of flower patterns are about to decrease. Right now, geometric patterns are in. Can we change the flowery pattern to the geometrical one?" So these things happen a lot in our business."

Supplier Company 1 claims that their customers know what they really want. Despite this statement, pattern changes still happen later than the purchase order form would suggest. However, pattern changes are not requested as frequently as colour change requests.

The interviewee from the colouring department mentions that they continually face colour change requests. They have frequently had the experience of making colour changes because their customer's customer

wants a colour change. They do the re-work no matter how many times they have to. However, sometimes they confront unexpected dilemmas. The colourist suggests that they do not understand the customer preferences and requests:

“Sometimes, they don’t like the colour we like the most. Sometimes we are thinking that we are going to be criticised for the defective colour job, but they like that colour so much. I think they don’t understand the technical side of all these colouring work.”

The Sales Manager reinforces the colourist’s opinion, adding:

“They are not picky; they don’t know textile. They want impossible things from us. They think that every design is appropriate for every fabric. We cannot teach this to them. Sometimes we go to England and show them the samples to prove that. We cannot persuade them though. It takes so much time of course. I think they are not well educated about textile. They just know it from the books and in theory but not in practically. They need different perspectives. We have workers, any resource, and any substructure here as long as you want me to do an achievable work.”

5.3.2. Design Change Impacts on Supplier Company 1

Design change requirements cause increases in lead-time. Supplier Company 1 calculates how much time a design change request takes and adapts itself accordingly. According to their measurements, from creating the design from scratch to production of the order takes 3-4 weeks. In this 3-4 week period, Supplier Company 1 is able to make lots of design changes. Most of the time, the customers know they cause the supplier a lot of work, so they are being flexible about the lead-times.

Design change requirements cause defects in production since textile is very hard to produce. For example, in order to fix the colour on the fabric with steam, steam has to be at exactly 170°. Steam is hard to stabilise; if it decreases to 168°, it changes the colour of the fabric. Another example occurs

in the washing stage of the fabric. For example, the hardness of water can differ from day to day; the amount of salt in the water could be higher than usual; or a worker might be distracted and put a little bit more soap in the system to wash the fabric. All of these factors can be the reason for changes in the colour of the fabric. For example, in the tentering²³ stage, fabric has to move under the same heat and speed. Staying in the heat for only a second longer can change the colour. Textiles are very delicate. For this reason, it is easy to make mistakes when changes are made late, because it impacts all of these stages and processes. The manufacturer is trying to produce the standardised fabric required by the market, to the same high quality standards every day. This is very different to other industries, for example the automotive sector, where you can produce the same car everyday within more controlled processes, with fewer constraints and factors likely to impact the outcomes. Textile on the other hand is very delicate and prone to mistakes. Design change requests mean repeating all the production stages and that increases the risk of defects in the production stages. If defects in the order arise from the production by Supplier Company 1, they apply a discount for their customers for the purchase or take the order back from customer. This is the worst possible outcome of design change for the supplier. Once Supplier Company 1 exports the order; it is time-consuming and expensive for them to import it back. Before they can import it back, they must first inform the customs officers. However, customs sometimes want evidence from Supplier Company 1. In this situation, the supplier informs the customer and asks them to send a report about the situation. Sometimes the supplier has to persuade the customs department of the reality of the situation. This requires evidence such as paperwork and documentation, which takes up a lot of time. After submitting the documents to the customs officials and explaining that this is an economically important product, the supplier then pays some tax and fees for the order. Other official organisations such as the tax office and import union must also be informed. Eventually the supplier is able to the product back. They either try to utilise the product in the company or make some revisions on

²³ **Tentering** is used to straighten the fabric and dry it. The fabric is stretched taut while steaming or drying and held in place with clips or pins, called tenterhooks. (Source: <http://www.textilelinks.com/author/rb/blterms.html>)

the same product and export it back. For these reasons, the supplier usually tries to avoid the situation of having to take stock back, and instead try to solve the issue by talking or by giving discounts.

However, if the defection comes from a mistake made by the customer, both parties try to solve the situation by talking. If they cannot solve the problem by themselves, the matter goes to the courts. If the court finds that the supplier is in the right, the customer will take the order at a discounted price. However, this may damage the relationship between the supplier and their customers. In this situation, if their customer is very important for the supplier, the supplier may prefer to take the order back or produce the whole order again, so as not to lose their important customer.

All these possible outcomes that can result from design change requests increase the amount of strategic decisions the Supplier Company 1 has to make, which puts the supplier company in risky situations and raises the possibility of making mistakes. The production department's workers also make strategic decisions about their parts as well. The colourist explains how they decide to send their work to customers and the sorts of risky decisions they take:

“We use our own approval as a base for customer satisfaction. Because I know this colouring job, I know what is good and what is bad about this. If I like a work I’m on it, I send it to the customer. Even they have some stupid critics about it. If I didn’t like it, I do not send my work despite of the chance of taking customer’s approval. Because we are technical people, we generally turn out to be right.”

Design change requests also have impacts on transportation of the orders. The supplier company sometimes prefers to change the type of carrier they use. They can change from carrier to airway, which is more expensive and extra cost for the supplier.

Because of design changes in products, some production stages may have to be repeated. For example, Supplier Company 1 may sometimes have to repeat the finishing stage because of design changes. Some fabric is not affected by those operations but some fabrics are, such as crinkle fabrics.

Crinkle fabric flattens out with every operation. This reduces the quality of the fabric, which reduces the quality standard of the supplier.

Design change requests can cause some communication problems. Some customers are very picky. Sometimes Supplier Company 1 doesn't understand what they want because from the perspective of the supplier, the product they produce and the product the customer wants are the same. However, the customer sees a difference. The supplier sometimes doesn't understand the issue when it is discussed via e-mails, which is the preferred method of communication. Since some differences need a touch or being there in person to be understood, the supplier might have to go see the customer and understand what they really need. The colourist gives an example for this situation:

"Sometimes we don't understand their critiques and send the same design again by telling them we did the changes they want. Then, they accept. We face completely different reactions for the same work."

These kinds of critiques take up the supplier's time, and the supplier then has shorter time for production if the customer is very strict about lead-time. If the supplier has no chance to go and see the customer, they may prepare and send several samples to the customer until they understand what the customer wants. This increases their courier cost as well.

Design change requests bring an increased level of criticism from customers. Since design change requests were much rarer about 10 years ago, Supplier Company 1 had fewer customer criticisms in a design change situation. However now, they are "critical to death" according to the colourist. These complaints can be detrimental to the motivation of workers, especially if they have to work many times on the same order.

Sometimes designers working in Supplier Company 1 think that they did a very good job. After a design change request, it is very hard for the sales managers to tell them to do that job again. It can be frustrating for them and cause some tension between managers and workers. This can cause motivation loss and frustration among workers. As a result, human errors and

working hours increase. Workers feel the tension and get stressed due to a backlog of other orders. The colourist explains this frustration:

“They are just making critics without any knowledge. This can be frustrating. And of course it doesn’t help with motivation. We are criticised by educated but unqualified people.”

5.3.3. Strategies Against Design Change Requests

Supplier Company 1 has adopted a strategy of working on orders very quickly. In this way, their customers do not have time to request any changes in pattern or colour most of the time.

Another strategy Supplier Company 1 has against design change requests is to calculate the cost of misfortunes and included it in the price so they don’t have any extra cost. In a very short time, they make the pattern changes customers want in the computer, and then continue with the colour changes. After they give the supplier approval, the supplier passes through production and finally sends it via UPS. Most of the time, the supplier has already foreseen these possibilities and included most of the costs in the price.

Most of the time, the supplier has to make strategic decisions. Sometimes, design changes create delays and the supplier can expire the lead-time. In this kind of situation, customers might ask the supplier to send the product without any approval. The supplier approves if the design change is perfectly done and then send the order to the customer. With this strategy, both sides don’t lose any more time. However, the supplier takes a great responsibility of trust by giving strategic decisions about the fabric, colour, pattern, quality, and knitting. Sometimes the suppliers might have to trust their own quality control instead of international quality test centres. If the supplier passes over the lead-time and if the products pass their own tests, they don’t wait for the results of other test centres and immediately start to load the order to trucks and send it to the customer. All these strategies are risky for the supplier because if there is even a little defect in the product, the customer can reject the product, send it back, or ask for a discount or refund. The digital print manager explains the process of taking strategic decisions:

“We are like in a live match. We managers are the coaches. If one of our workers, equipment, customers’ idea changes we have to change the place of our players or we are trying to apply a new game system. (In any design change situation) We are changing our priorities, we are trying to persuade our customers, and we are trying to find another way to meet the requirements.”

If there is a change in the colour of the product, Supplier Company 1 uses the same mould to avoid any costs coming from re-producing a new mould. Another strategy to avoid costs is to send lots of samples to customers. In this way, they avoid sample traffic and prevent the laboratory from re-work.

The most important and helpful strategy is to know your customers very well. Supplier Company 1 managers look at countries and develop a certain profile for each country they work with. According to the sales managers of Supplier Company 1, each country sometimes has its own trends or each country adapts the same trends to their own cultures. For example, America generally uses big prints, France uses basics and England uses heavy trends. Managers have to know each country’s trend and react quickly to put them in production.

Adapting the facilities to new technologies is another strategy to decrease the amount of design change requests. Using digital print technology makes the process faster, which allows the supplier to be more responsive to design changes. Supplier Company 1 uses both conventional prints and digital prints because having the necessary equipment and education for digital print is more expensive. The manager of digital print department explains the importance of digital print:

“When there was no digital sector, there was the professional sector, which everything was made by hand. And it took so much time. You could spend 4-5 days to create a design before. But now, you can do it within the hours. Everything is so fast. You can be more responsive. Conventional

printing is so restricted. Colour scheme is limited. We are using digital print for about 4 years and it is freeing. No matter how many colours you have in your pattern. 30000? It is ok! “

However, there are downsides to adopting digital technology and becoming more responsive. When customers realise that the supplier can make changes quickly, they start to demand quicker results and come with more design change requests. The supplier can never be responsive enough against design changes. In conventional print, changing the colour is easier since conventional print comes with limited colour schemes. However, digital prints come with endless colour schemes. For example, if a customer asks: “Let’s make this green one tone bolder”, this can be done easily in conventional print. However, in digital print, there may be numerous bolder tones of that green. The digital print manager explains this situation:

“Since digital print is a new technology, customers have no idea about this yet. That’s why we have problems. We are trying to explain this situation to customers. We are trying to teach them the digital print. Also in digital print, there is no chance to change only one colour and keep the rest the same. You have to play with the all colours in the print to keep the integrity. So one change causes another change and another one...”

5.4. Supplier Company 2

Supplier Company 2 is a preferred supplier of StarsFashion. They produce fabric for StarsFashion. However, they also have their own design teams and they sometimes present their own range to StarsFashion. For example, the marketing manager might bring some designs and offer to make samples for StarsFashion based on those designs, or offer to make amendments to the designs specifically for StarsFashion. Their work is bilateral.

The interviewee from Supplier Company 2 is the owner of the company and head of the marketing department of this business, which investigates new

trends, what the customers want, what the price will be, and the possibility of attracting new customers. The main work of the interviewee is marketing and selling their products. The interviewee is also the employee who communicates directly with StarsFashion and resolves any problems with them.

The usual operation in Supplier Company 2 starts in the marketing department. The marketing manager takes the order from customers and asks the production department to make a sample. After the sample is ready, the marketing manager sends that sample to StarsFashion. The product team in StarsFashion looks at the colour and the fit. If they find a problem about the colour, the fit, or the fabric, they send their feedback to the marketing manager in the supplier company. The supplier then works on a new sample. If this time the customer is happy with the product and has no further criticisms, the supplier takes the official order by getting the purchase form signed. The marketing manager then sends to the merchandiser all the information taken from customers, such as the conditions that are agreed upon, all features of the product, the agreed approval dates, if there is a missing detail of the product, the deadline for this work and the date of starting production. The merchandiser makes an allocation in the budget, taking the product lines into consideration. Then the production manager, who follows the production chain, makes all the arrangements in the colouring and printing departments so that production can start. Once the order is ready, delivery takes place through the logistics department. After delivering the order, the finance department receives the payment as the final stage of the order. This is how a customer order is processed inside the supplier company.

5.4.1. Design Change Process

Design changes happen frequently because Supplier Company 2 is located in Turkey. In Turkey, the speed of any production process is relatively quick. It takes only 10 days between the day England wants a sample from the supplier and the day the supplier sends the sample. Suppliers in Turkey are also very flexible about making a sample. The marketing manager explains the importance of Turkey's location:

“Since we give short-term production lead-time, England and the Europe see us a last chance. They take the Far East plan in the first place since they have longer lead-time than us. It is like around 2.5 – 3 months. Since they have a longer lead-time their prices are low. But it is trend; it is fashion. Everything is changing so quickly. Since Turkey’s location is advantageous, England thinks they can be more flexible. So they usually can say things like “The design of the product has just changed, let’s do a print on it and let’s do it right now.” These things sometimes are advantage for us but sometimes they are the ones that stress us out.”

Since trends may quickly come and go, and plans in the retailer company can suddenly change unexpectedly. They may have to change the design of the product on short notice and require a quick response from the suppliers. For this reason, the closeness of the supplier gains importance and provides a great advantage for the retailer company.

Supplier Company 2 receives many design change requests. Sometimes, the customer sees a new design story in television or in the fashion shows and as a result they want a design change from the supplier. In case of any design change situation, the customer informs the supplier. The supplier then immediately revises the product if they can. If it is not possible to make that kind of change, the supplier makes an explanation and tries to reach an agreement with the customer.

Colour is the most wanted design change Supplier Company 2 has always received. There is always traffic between the buyer and the supplier when deciding which colour is going to be used. Sometimes there can be some colour differences in the bulk fabric coming from the last production stage. In this situation, people who are responsible for production share this information with their supervisors. The supplier has to make some strategic decisions at this moment such as “What should we do with them?”, “Should we cut them or not?”, “Should we put the order to the production process again or not?”. In these situations, Supplier Company 2 either say dispatches the products with less than the regular amount or continues production if they believe that it is a commercially good product.

5.4.2. Design Change Impacts on Supplier Company 2

Design change requests affect Supplier Company 2 in terms of cost. For example, sometimes they are requested to change the fabric. To change the fabric type, they have to buy large amounts of yarn, which is an extra cost for the supplier. They sometimes may have to prepare a new mould for the new design, which is an extra cost as well.

The most important criteria here is for Supplier Company 2 to see and understand the customer's good faith. If they know the customer well, the supplier tries not to see these changes as a problem. However, the cost of making only one sample is about £400. Sometimes they may have to make 10 samples but the customer only chooses 2 or 3 of them. So the rest is an extra cost for the supplier.

Design change requests also affect the working conditions such as work hours and workload. The amount of work hours can increase and sometimes Supplier Company 2 may want the employees work for extra hours. All these are extra costs for the supplier company, which obliges the supplier to find new ways to meet the deficit. Increasing the price per product for the next purchase of the same customer is one of the ways to close the financial gap.

When ideas change at the last minute, that affects the production plans of Supplier Company 2. A tiny criticism coming from the customer may affect other orders that the supplier has got from other customers, which affects lead-time of all orders. All production plans have to change and be re-arranged according to the priority of customers in this situation. The marketing manager and owner of Supplier Company 2 explains how a design change has a knock-on effect:

"It affects everything. A tiny change in one person's mind can affect all production process. The customer maybe cancels the fabric and tends to choose another fabric. In this situation, if we have already given okay for the fabric, we want cost of the fabric we will not use because it has already been prepared. The retail cost then changes because another fabric will be used so the retail price also needs to be changed. If the retail price changes, all trims

we have used need to be changed. And all these changes cause a delay of the delivery time. We may have to use airline instead of shipping.”

Supplier Company 2 mentions that they sometimes meet some unreliable customers that want the supplier to make a sample and then take that sample and send it to the Far East Countries for production. When Supplier Company 2 hears something like that or understands what those customers are trying to do, it changes the kind of relationship they have with them.

The most immediate effect of design change requests is the tension between employees and departments and customers. The employees can question the decisions being made by the managers and might ask why the managers accepted that kind of last minute change. The supplier may have some tension with the delivery agency at the pre-reservation stage because they have to change the delivery time. In some cases, they may have to work with another shipping agent they don't know very well, which can be problematic.

Design change requests affect the lead-time of Supplier Company 2 in some situations. If the customer wants little physical changes in design such as moving a button or a pocket in the first 7-10 days of the order, this doesn't affect lead-time too much. In this stage, design changes can be made without any change in the lead-time, despite extra costs, because of repeated production stages. However, if the customer wants a big design change such as changing fabric or adding prints, which frequently happen, this certainly affects lead-time. Since the supplier uses the time for design instead of using that time for production, too many design changes ultimately affect lead-time.

Design change process ultimately includes people and hence it depends on human decisions. A different kind of decision can be made on very short notice. If Supplier Company 2 feels that the customer can keep their word they take the risk. However sometimes requests are impossible to fulfil. In any impossible situation, Supplier Company 2 prefers to explain the whole process to the customer, and wants them to act according to the conditions of the purchasing contract. If the product has come to the final stage and the production of this product has been cancelled due to trivial reasons, Supplier

Company 2 looks at all the correspondence between the firms and investigates what the mistake is. They find out who is in the wrong in this case and try to negotiate reciprocally on why this product has been cancelled. After that they decide who is right or wrong. If Supplier Company 2 feels the customer is really unhappy with the order and want an impossible design change, they immediately say “we are done” and “there is no need to dispatch this product.” This can be damaging for the customer-supplier relationship.

5.4.3. Strategies Against Design Change Requests

Supplier Company 2 tries to control the internal and external communication firmly to realise design changes early and implement the changes in the early stage of production. For this purpose, there is a report system inside the business allowing the managers to know what is going on in the production department. However, this report system is not available for external communication taking place between the supplier and customer.

Another strategy against design change requests is to use digital prints, especially while preparing samples. Using digital print minimises (i.e. sets to zero) the moulding cost. Supplier Company 2 prefers making samples by directly using digital print rather than moulding the sample, because moulding is an extra cost. Supplier Company 2 works each single colour for the price of €100-120. If for example a product has 6 colours, that means the cost of this product is €720. However, the design of the products can change at any time and a new mould has to be produced. Since Supplier Company 2 doesn't know how many times the product design will change, they don't want to use moulding, since this will result in extra costs. Instead of moulding, they use digital print when making samples. If they think that the print is going to change, they produce the sample product with digital print instead of moulding it.

Another precaution for design changes is to use the same fabric for both the sample fabric and the production (original) fabric. Most of the time, when retailers want a pattern sample, suppliers use a different (mostly, cheaper) fabric to show the pattern. However, in this method, suppliers use the same quality fabric in their samples to show a pattern. When Supplier Company 2 makes the sample from the same fabric they intend to use in production, and

under the same production conditions, and then when they receive a criticism about the fit, they do not need to wait for the fabric. They can immediately remake the sample and resend it to the customer. The marketing manager gives an example for this situation:

“For example, I had a fit comment today and immediately made a fit to that fabric and sent it to the customer. If I did not have that fabric, I would have lost 3-4 days and had to wait for the new fabric. Then the sample would be made. That means at least 5-day loss for me.”

Supplier Company 2 has another strategy to avoid unreliable customers. When the customer wants the supplier to make a sample the supplier first wants the cost of the sample. If the customer does not agree to this condition the supplier doesn't accept the job offer.

5.5. Supplier Company 3

Supplier Company 3 is a standard supplier of StarsFashion. They produce synthetic thread (polyester) and export it all over the world since 1986. They mainly work with the Far East countries such as China, Thailand, Indonesia, and Vietnam. However, they also export to Europe, Brazil, Mexico and America.

Supplier Company 3 imports polyester chips, which is a raw material. Polyester chips are small polyester crumbles consisting of polyurethane. Polyester raw threads are produced from polyester chips. There are two types of polyester threads: polyester raw thread, and polyester flat thread. Raw thread can stretch but flat thread cannot. Raw thread can be processed and turned into texture thread, which is more voluminous and has more creases. These texture threads can be used anywhere depending on its thickness and structure.

The customers have to weave the polyester and process it into different fabrics when they buy it from Supplier Company 3.

The interviewee from Supplier Company 3 is a trade manager who is responsible for buying, export, import, export incentives and import incentives.

He is an experienced buyer who has worked in the same company from the beginning.

5.5.1. Design Change Process

Design change requests start with the marketing department in Supplier Company 3. Customers that want to work with Supplier Company 3 send samples of the product they need to the marketing manager of Supplier Company 3. After the marketing department takes the sample, they send it to the laboratory to be analysed. The laboratory analyses the sample and informs the marketing manager about the sample and thread features. If Supplier Company 3 can produce those threads, they inform the customer and give them a price. If they cannot produce it, they offer alternative threads or refer the customer to some other supplier they know.

Customers have to give precise details of the thread they want, in order to avoid any design changes. The interviewee states:

“Since 150-200 types of threads can be produced from polyester chips, customers should know where to use it. Bad communication or slightly wrong explanation can result in dissatisfaction leading to design change requirements.”

The most requested change to the design of thread concerns the number of filaments. The number of filaments in a single thread can range from 24 to 288 according to the use. These filaments can change the softness and shape of the fabric. Supplier Company 3 uses ‘centring method’ to arrange the number of the filaments in the thread. Therefore, customers may want more, less or no centring (sealing all the filaments with certain intervals to avoid filaments flying off).

Another design change requirement is about the amount of oil in the thread. There is a certain amount of oil in the thread that can range from 0 to 3.5%. Customers may request a different amount of oil in the thread they need. For example, customers in the health sector, usually require fabric without any

chemicals, so they may request thread including no or very small amount of oils.

Thickness of the bobbin is another design change the customers may request because of the capacity of their equipment. Bobbins have certain sizes and they carry a certain amount of thread according to their size. Each machine works with a certain type of bobbin, up to the maximum of 5 kg. Therefore, customers may want a 2-kg bobbin or 3-kg bobbin according to their equipment's capacity, or they may request a bobbin with a certain amount of thread on it by giving a specific number of kg.

Supplier Company 3 can blend the polyester threads with others threads such as elastane and nylon. Customers also may want to change the ratio of blend of the polyester thread. They may want to increase or decrease the ratio of polyester, and Supplier Company 3 can change the ratios within the thread to accommodate this. In this situation, Supplier Company 3 will source elastane or nylon from another supplier, since they only produce the polyester thread in their facilities.

In any design change situation, Supplier Company 3 has to apply the rules of ISO 9000. The interviewee explains how they apply ISO 9000 standards:

“According to these standards, we have to start all stages from the beginning in any case of dissatisfaction. If the fabric quality is not exactly what customers want, they send us a sample of what they want. Then we again analyse that sample to understand what kind of threads and filaments are used in it. Then we produce a similar kind of thread according to the sample and make a new sample to send them. If customers like it and give the sample okay, we start production. We repeat this procedure until reaching customer satisfaction.”

5.5.2. Design Change Impacts on Supplier Company 3

Supplier Company 3 produces 2000 tons of product monthly, which equates to 15000-20000 tons yearly. This scale of production can certainly be affected by design change requests. In any design change situation, if

customers don't want to take the order because it is defective in some way, they inform Supplier Company 3 about their loss. If the customers are in the right, the supplier reimburses them. If, however the customers are not right, they buy the order anyway. Supplier Company 3 proves that they are in the right by using independent quality institutions. This is important, because sometimes the product is not acting the same because of customers' equipment or the way customers use the product, but the customer does not realise this.

The types of the threads Supplier Company 3 produces are obvious. If customers want to turn the product into something that Supplier Company 3 cannot produce, this causes problems. Supplier Company 3 doesn't accept the change in this kind of situation. They instead try to offer an alternative or, if they really don't produce that product, they refer the customer to some other supplier. However, if they do this, they run the risk of losing that customer.

When Supplier Company 3 produces blends of polyester-elastane or polyester-nylon threads, they have to work with other suppliers of elastane or nylon. They produce the polyester in their own facilities but they buy the other mix from other suppliers. This can lead to additional problems, since the suppliers of elastane and nylon have their own work schedule and might struggle to provide the necessary materials when the supplier needs them.

5.5.3. Strategies Against Design Change Requests

Supplier Company 3 has some strategies for avoiding or decreasing the number of design change requests. They set quality standards, which they always try to reach. To do this, they limit their thread types. In this way, their customers know what to expect. Unless it is a profitable business for Supplier Company 3, they are not interested in demands for new products coming from their customers. In this way, they reduce the chances of any design change requests. The interviewee explains this situation by saying:

"I mean we produce limited type of thread. If there is a really big bid, we can take extra components for our equipment and try to produce what they want. If we can produce it, we take the order and start production. If it is a really good and profitable investment for the future, we take the risk."

Supplier Company 3 also makes sure their customers know exactly where they will use the threads. If the customer gives details about the intended use of the thread, the supplier will give them recommendations about the most appropriate type of the threads to use. Sometimes they make a sample and send it to the customers to show them the difference. With this strategy, the number of changes in the product design can be lowered. Since the customers know exactly what they need they don't need to make changes to the product design.

Supplier Company 3 also tries to contact their customers in writing so as to keep records of communication. The interviewee explains the importance of keeping records:

“So we can have a proof of the process and we can use those evidences when necessary. We try to satisfy our customers no matter what happens. The market is so tough; competition is at the highest level so we try not to lose our customers by having any tension.”

In this way, they don't have any arguments with their customers. They just show them the records and this solves all the problems with no tension.

Supplier Company 3 holds quality meetings every six months. In those meetings, they discuss situations such as how many times they have taken a product back, and why and how many times they gave discounts. They discuss each of these questions and investigate the reasons. This strategy helps them find solutions for the problems and move on. They also hold performance meetings to analyse any performance loss. They ask themselves why performance was lower so that they can find out the reasons and come up with solutions. These meetings help Supplier Company 3 investigate if the reason for design change requests is because of them or the customers. Then they create their plan according to this investigation to lower the number of design change requests.

5.6. Supplier Company 4

Supplier Company 4 is a yarn supplier of StarsFashion and it is one of their standard suppliers. They produce thread for especially big firms. They export 70% of the threads they produce, mainly to England, and sell the rest in the national market.

The interviewee, who has been in this business for 22 years, is the export and import manager of Supplier Company 4. The main job of the export-import manager is to make contact with customers. The interviewee first takes note of what customers need and want, then informs the appropriate departments in Supplier Company 4, and follows the production of the order until the order is delivered to the customer. He explains his part in the business:

“Some part of this job is not in my job definition, however I have to follow the order. For example, quality control is not my job but I have to know the results and if the order is okay or not to be delivered. As an export manager, you have to know all levels of the work. You cannot sell a product without knowing what stages it goes through. I even follow the payment side of the work.”

Broadly, the consecutive order of the process inside Supplier Company 4 is to take the order, send it to production department, take it from production for delivery, arrange the delivery, quote a price, deliver the order, and pass the work to the finance department. As a final stage, finance department takes care of cash flow, the cost of production, etc.

5.6.1. Design Change Process

Production of threads takes times depending on the type of thread. Thread consists of numbers and compositions. Composition means ratios and these ratios are changeable. Supplier Company 4 has 2 types of thread: fancy and classic. Fancies consist of the mixture of different synthetic threads such as polyamide and acrylic. Fancy threads take 1 week to be ready. Classic threads, which are 100% cotton, cotton acrylic, cotton viscose, cotton wool, or linen, take

2 days. Threads have numbers such as 3, 5,7,10,12 and 14. This is a global standard used all over the world. Threads have to be produced according to what the customer wants and what equipment customers have. Production is weighed as 70% fancy threads and 30% classic threads. Fancy threads are produced more since it is low in volume and high in added value. Supplier Company 4 produces classic threads all year around, since some of their customers export to a country in the Southern Hemisphere where seasons are reversed. However, classic threads are high in volume but low in added value, which is not profitable for Supplier Company 4. Supplier Company 4 measure orders according to their added value. The interviewee explains the added value:

“Think about 2 products, one for summer and other one for winter. Summer one cost 1 TL; winter one is 10TL. Everybody can produce the summer one but only some people can produce the winter one. It means winter one has more added value than the summer one.”

For the thread producers, thread is made out of season; i.e. in summer, they produce threads for winter, and in winter, they produce threads for summer. Winter threads are mostly fancy threads, whilst classic threads are more appropriate for summer.

There are lots of production stages in thread business. Preparing the thread, preparing the colours, colouring the thread, drying the dyed thread, taking the thread for packaging and packaging. If customers want any design change in these production stages, Supplier Company 4 has to charge customers according to the contract. The interviewee recounts a true event he has just experienced:

“One of my customers gave me the order and we went through production. In the stage of preparing the thread, the customer called me and said that his own customer changed the colour. He said that he informed me immediately. I had to stop the production. But I was in the preparation stage so I was lucky enough I didn’t have to stop the thread preparation. If I was in the colouring stage, it was nearly impossible for me to stop that stage. I had to

charge the customer for changing the colour. We face this kind of situation many times.”

Supplier Company 4 experiences far more design change requirements in summer clothes because of trends. In winter, people want to wear thick clothes to stay warm. As long as it is slightly fashionable, it is acceptable for people. In summer clothes, suppliers are working with very thin fabrics and it shows flaws. For example, the interviewee claims the colour red shows even the smallest flaws. Summer collections typically use flashy colours like red. The interviewee says the red colour is the most fearful colour for them.

Supplier Company 4 has 1 design change request out of 10 orders. There are colour and design changes. For example, a store sees and likes a design and decides the colours and the model, then suddenly decides to change the verified model because it sees another design in another store and realise that it has nothing like that. This affects production in Supplier Company 4. The colour change requirements occur more often than thread change requirements, according to the interviewee. Because the thread type that their machine works with is obvious, thread change requirements are rare. However, the most important point is the time of the production when there is a design change request. If a design change requirement comes after Supplier Company 4 prepared the order, this is a production loss for the supplier. The supplier then asks questions such as ‘Can I meet all those expenses or can my customer meet the expenses?’ This depends on the relationship between the supplier and the customer. The interviewee says:

“You must lose a fly to catch a trout. This proverb is valid all around world. If I have really strong relationship with my customer, if I am waiting his repeat orders and if I coloured 250-500 kg thread with a wrong colour, I wouldn’t charge my customer for this.”

Supplier Company 4 gives maximum 1-week for production and preparation of threads. After one week, they have to pass to production stage. They have to work within the lead-time because the customer they work with

also gives a lead-time to its own customer. The interviewee explains this situation:

“It is like a chain. I give 2-3-4 weeks, according to the type of the thread, to my customer to deliver the order. If I exceed the lead-time, it would increase my problems such as fine. If you exceed lead-time for 2 days, you are fined %2; if you exceed for 3 days, you are fined %3. So we always add up +2 day to our lead-time.”

The supplier has to anticipate each small issue like machine malfunction or delivery problems to avoid any fine. They have to inform customers to use those 2 days for this kind of troubles. The interviewee says:

“Because of lead-times, I have missed lots of orders, especially from England because England is such a different market. It is not like the rest of Europe. It is so different with their life style and work ethic. You have to be direct and clear. They have no tolerance. They only accept those +2 days according to our agreement; otherwise they don’t accept the order.”

According to the interviewee, Turkey is at a really high level in terms of textiles. They experience very few problems with Europe regarding quality. Their main problem is lead-times. Europe (including England) wants really short lead-times. Therefore, Supplier Company 4 has to keep stock up. If not, customers may not order from them again.

The interviewee compares the number of design change requirements 10 years ago with the number today and says:

“10 years ago, we have almost never got a design change requirement. Never... Now, consumers have new ways of searching and fashion is changing so quickly. 10 years ago, if there was a trend, that trend will continue for 4-5 years. But right now, it doesn’t take even 6 months. Most trends continue for 3 months. It is so changeable. Fashion means change. However, if consumer demands form 50% of new trends, the other 50% is formed by the strategies of fashion brands. These brands try to make the trends obligation. For example,

you cannot find 10 years older trends right now. You have to choose what the fashion brands put in front of you. Change in the fashion means change in the production. 10-15 years ago, there was no colour change or quality change. My customer was waiting in front of the organisation for the threads. As long as they took the thread, they could determine the model or cut on their own. Colour wasn't important at all. But now, we have to comply with our customers. They are the big buyer and big sellers. They are very important for us. Everybody should comply with them."

5.6.2. Design Change Impacts on Supplier Company 4

Design change requests have several effects on Supplier Company 4. Performance is one of the factors affected by design change situations. Changes in the number of threads can be an example of product design changes. As stated above, threads have numbers such as 3,5,7,10,12,14, which are the same all over the world. Customers can change the number of threads to suit the model of the product they wanted, or their equipment. The interviewee gives an example of this situation to explain how a change in the thread number affects the supplier:

"If a change occurs in the order, it affects my performance very bad. For example, the customer wants 30-numbered thread and I started production. After starting the production, if the customer changes the number from 30 to 20, it crashed me out. The customer stays totally okay in this kind of situation but I have to give an emergency alarm in the company."

Design change requests also affect the cost side of the business in Supplier Company 4. The supplier and the customer deal with each other in good faith. If the supplier is able to use the product that has already been produced for some other orders, and if the supplier has a good relationship with the customer, the supplier prefers not charging the customer for it. Under normal conditions, the supplier would charge the customer, because they are in the production stage and altering the order means they will have to change all the production plans and all the costs will be affected. However, since the

company is trying to satisfy their customer and keep their business for the future, they prefer not to charge them in these situations.

However, according to the interviewee, in any reverse situation, customers definitely charge the supplier no matter what. The suppliers have to accept the charge since it is their own fault.

These design change situations affect the supplier's production efficiency. Taking the product back from the machines and beginning a new production takes time, and losing time costs money. The interviewee explains how a design change affects cost by giving this example:

"I have to spend my 5 hours for the preparation of new production. What happens to my 5-hour production? If I produce 100 tons of thread in a month, that situation decreases my production by %2-3. I am talking about just one change situation. If you think that we are living many of design change situation such as another colour changes, number changes, both colour change and number change, it decreases my production to up to 20% because preparation of the thread is not that easy. Preparation, putting the thread on the machines, production, drying, taking the thread back from the machines... It takes lots of time, which means cost."

Design change requests also cause problems on the delivery side. In the textile business, transportation is quite important. Supplier Company 4 also has lots of delivery jobs. They prepare the order in their facilities, load it to the truck, and it will arrive in Istanbul after 2 days and enter the harbour. The next day, the ship will depart, and after 10 days it will be in the destination point. Transportation typically takes 2 weeks in the textile business. If Supplier Company 4 sends the order earlier, then they can receive the repeat order earlier, which is good for them. If they send the order late, they may not get a repeat order. Hence lead-time is the biggest problem for Supplier Company 4. Fashion retailers in Europe and England want fast lead-times. Suppliers in Turkey have advantages compared to other markets. The location of Turkey is really advantageous, because it is very close to England and Europe. When a customer in England gives Supplier Company 4 an order, they can send it to the customer after just 10 days. The order will be in the customer's storage in 2-

2.5 weeks. If the same customer places an order to somewhere in Asia, shipping alone will take 45 days.

All these problems caused by design changes affect departments, employees, and working hours. When Supplier Company 4 tells the workers to re-produce the order and deliver it in a certain time, the workers can experience different reactions. They don't want to do the same thing again. It affects people psychologically. In design change situations, the interviewee says they have lots of colour problems after a re-work. Because the workers are not motivated to re-work, it causes quality problems.

There can be quality problems in the production stage other than re-work. For example, there are points called variation in the thread, which cannot be seen in the production stage. However, the manufacturer will see the flaws when they start knitting with the thread. Those flaws occur because of the variation points in the thread.

Another problem affecting quality is colour. For example, the upper parts of the bobbin can absorb the colour very well but the lower parts cannot. In the textile sector this is called barre. Barre cannot be seen in the production stage; it only becomes apparent in the knitting process. To avoid this situation, Supplier Company 4 has their own knitting machines in their facilities. They knit the threads from all sides looking for any barre. They never deliver an order without this quality control. However, despite this they sometimes fail to notice those quality problems. Design change requests increase the amount of barre problems. When a colour change requirement comes, the workers can be confused and miss those problems.

Design change also damages the customer relations of Supplier Company 4. The interviewee recalls a true event he experienced:

“5 years ago, he (a customer) made lots of design changes. We tolerated 3 times but he changed the design 4th time in the same month. I had to charge him for all the design changes however he didn't accept; he said he has a right to change his products' design. I missed lots of other orders in the meanwhile. We couldn't work together. Sometimes we, my customers and I, badge each other to death. Especially with The English... They make lots of

changes and then I say 'you cannot put me in this kind of hard situation' and then they say 'ok, you can go now'."

5.6.3. Strategies Against Design Change Requests

Supplier Company 4 has some strategies for avoiding or decreasing the amount of design change requests. One of the strategies is stocking up on the most wanted and needed products. In this strategy, the supplier prepares certain materials, colours them, and keeps them in their storage. The interviewee explains this situation:

"For example, the most wanted thread colours are black, red, beige, dark blue. There are 10 international colours. In these colours, boldness or paleness is not important at all. For example, black is the very first colour you can stock up. However, you cannot stock the colour yellow up, because it never is used often. So there are standard colours and when your customer wants one of those colours you immediately send it without any waiting time. Red is also one of those standard colours. Red is also a very painstaking colour since even the littlest fly can show itself causing a flaw. We have to be very careful about the red colour in the production stage. In the black colour, it doesn't matter how many fly clings on to thread; it never shows itself. In fancy threads, it is the same; no fly shows itself."

Supplier Company 4 stocks the materials they need the most. Before the season starts, which is in the beginning of summer, there are fairs all over the world. In these fairs, Supplier Company 4 determines which number of threads will be used for the next seasons. According to these observations, they prepare those numbers of threads without colour and stock them to use in production. After each fair, Supplier Company 4 does this with different numbers that will be used in those seasons. When their customers make a change in design, it won't be as much of a problem since they already have the base threads on hand.

Another strategy is to make a colour priority plan with the customer. For example, some of the customers of Supplier Company 4 always want black

thread. It is used extensively in both summer and winter collections. Supplier Company 4 makes the black colour ready and stocks it for those customers. According to this colour priority plan, suppliers make the products that are used the most ready. In case of any design change, suppliers send the stocked products in the first place with the approval of the customer. Until those products are delivered to customers, suppliers take care of any product design change.

Supplier Company 4 has to be ready for anything. One strategy is to add an extra 2-3 days to the lead-time in case of any misfortune. For example, if Supplier Company 4 has a design change situation and if they can solve it inside the company, they are using those 2-3 days, so it does not cause any delay. Some customers of Supplier Company 4 are very strict about lead-time, so these +2-3 days help them in this situation.

Another strategy is to keep employees for extra hours to make the design change without any delay. They will change the colour without saying anything to the customer. However, if the colour is really critical they have to inform the customer to get approval. If the colour is not critical, they can do it with the old lead-time without saying anything to the customer. However, when Supplier Company 4 informs the customer, they have to be really quick. They have to make up those lost days applying the colour change requirement in the production process. The interviewee explains how fast they are working in any design change requests:

“So we are working very high speed. That’s why customers choose us. For example, my customer is telling me about the design change requirement and e-mailing me the new colour at night. He expects that I will reply back in the morning but I am finding the new colour at the same night and going to the factory and working on it all night. In the morning, I am immediately sending the new colour for customer approval. I do it all time. That’s how we avoid from time-loss.”

Another strategy is to use the prepared product for another order while producing new product for the customer that wants a design change. In this

way, they avoid any extra cost but they still lose time. The interviewee tells a story from his own experience:

“Last year, one of my customers wanted a thread change. I was able to use those threads for another order so I accepted it. But I wouldn’t accept it if there was no place to use it. I would have to charge my customer.”

The most important strategy for avoiding any design change situation is first to detail the order, then start production. If Supplier Company 4 skipped a little detail, they would achieve very different results. This is the biggest risk in textiles. They have to know every detail about the product design and question each detail in the product. For this, the interviewee claims that they need educated workers in the textile sector. The workers have to know what is or what isn’t capable of being changed. The interviewee explains why they need educated workers by saying:

“For example, if you write down NM20-2 instead of NE20-2 for the thread code, your whole order will be useless and this mistake is made a lot. That’s why we need educated textile workers. There are educated engineers but there are no educated workers around. There should be technical high schools for this. We are trying to educate the workers here but you can do this to a certain levels. Additionally, after educating a worker, he/she can move to another company for better salary since he/she is educated now.”

5.7. Supplier Company 5

The special area of Supplier Company 5 is fabric. They produce fabric in variable contents according to the domestic and foreign market’s needs. To address all needs of markets, they provide a wide range of fabrics such as polyester, viscose, linen, cotton and many others. They also do printing and base painting on fabrics.

Supplier Company 5 determines their product range by attending trade fairs 2-3 times a year. They accordingly prepare designs and collections for

these fairs and share them with potential customers by using presentations and scheduling customer visits. The interviewee, who is responsible for export to the UK market, explains what has been done every year in those trade fairs:

“For example, speaking for myself, I prepare 5-6 small collections and visit my customers abroad for 2-3 days. We visit just our customers. Other than that, we present the designs, samples, and works according to their desire when we came back.”

Whilst Supplier Company 5 prepares fabrics according to their customers' needs; the customers can also make samples for their customers by using the fabrics Supplier Company 5 has prepared. After that process, the goods are treated as a final product and become an order for Supplier Company 5. Other than that, customers, especially in England, may give their own designs (called “art work”) to Supplier Company 5. Designers in the supplier company draw the designs one by one in the design department. Supplier Company 5 then sends the designs to customers. If the designs are approved, Supplier Company 5 puts the sample stage into operation. If some small changes are made in designs, the design department works on the designs until all designs get approval. After this approval, customers contact the supplier and ask to give an order.

In the sample stage, customers want to see the design they have approved on fabric. Employees in the sample department draw the template; the variant department also work with the different versions of colour tones. Then, the samples are sent back to the customers again. After approval, Supplier Company 5 passes to the production process. If there is anything wrong with the sample, the sample department works on the same sample until they get approval from the customer.

Supplier Company 5 has different order sizes starting from 1000 meters and going up to 5000 meters. In the production stage, exactly the same product the customer approved is produced through different stages such as printing, colouring, drying, washing, and finishing stages.

After the production process, Supplier Company 5 carries out quality control tests such as burning the thread etc. In the last quality control stage,

they carry out a 100% quality control inspection. Even for an order of 50,000 meters, Supplier Company 5 will carry out quality control for each meter of 50,000 meters of fabric. When they finish the quality control stage, Supplier Company 5 re-sends this quality-controlled sample to the customers. If they get approval, they export the order.

The time taken for these processes varies between 1 week or 5-6 weeks, depending on design and production amount. The average time for finishing all stages is about 5 weeks from design stage to exporting the order.

Supplier Company 5 do not produce raw fabric in their facilities, they source it from another supplier. If a customer gives an order and Supplier Company 5 has no raw fabric on hand, they have to wait for raw fabric to come. In this situation, Supplier Company 5 may have to extend the lead-time. The interviewee describes this situation:

“For example, when the customer sends us the design; sometimes we have already had raw fabric in ordered stage or the supplier is sending raw fabric during the design drawing stage. However sometimes, the amount of order could have been decided later on but we don’t have enough amount of raw fabric or the amount has been already decided but we don’t have any raw fabric on hand when design came to us.”

In situations when Supplier Company 5 has to extend the lead-time, they think about Customer Priority. They give priority to their continuous customers and the ones who have already made an order. If a customer only wants to see the design and has not yet placed an order, Supplier Company 5 will not prioritise them as much. They arrange their customers in order according to their priorities and their importance to avoid lead-time extensions. Supplier Company 5 also decides this importance according to the business of their colour, design and production departments.

5.7.1. Design Change Process

In the textile sector, there are report groups called ‘template report’. Supplier Company 5 uses ‘64-report’ for their design process. If the customers’

design does not fit to the supplier's template, which is 64-report group, the design department in Supplier Company 5 explains that the design does not fit with the template and they speak to the customer and ask them to either make it smaller or bigger. Designers mostly make a sample with 64-report group and show it to the customers to convince them to make this change. They adjust the designs according to the template and share this with the customers. Sometimes, customers exclude the sample and do not want to continue.

According to Supplier Company 5, some customers know what they want. They know the size and measure; they even know the perimeter of the circle in the design. On the other hand, some of them do not give any information regarding their design. This type of customer makes more design changes than the others. For example, they often critique the design 2-3 times.

There are several stages before the production stage, such as designing stage and sampling stage. Customers are expected to make design changes in those stages, when model, colour, and design can easily be changed. However, despite these stages, there are customers who still make design change requests in and after the production stage.

Design changes are made the most. Sometimes, customers have to change the design because of the supplier's template. If Supplier Company 5 has to make some changes to fit the design in the Report (64), they share this essential change with the customer. For example, a customer may want the flower on the front side of a blouse, but it does not fit with the supplier's report (64). The supplier needs to make the design smaller to fit it onto the front side of the blouse and show it to customer. Since sometimes customers do not even know what they need, Supplier Company 5 makes these kinds of suggestions and guidance as well.

5.7.2. Design Change Impacts on Supplier Company 5

Design change requests have lots of impacts on Supplier Company 5. First of all, the supplier creates a sample repeatedly. This, of course, costs them extra. Customers can change the quality in the product design to get the order cheaper. However, each design does not work with each fabric. When a design is printed on different quality fabric, it makes a difference. The same

thing happens in the colouring process. For example, there is a big colour difference between polyester and cotton. Each colour looks different in each type of fabric. In these situations, Supplier Company 5 has to print the design on 4-5 different fabrics of various qualities so that the customer can see the difference between the samples. However, all these extra samples mean extra costs for the supplier.

Design change requests also affect Supplier Company 5 in terms of labour quality. In case of product design change, employees should deal with the same work to make the intended design. This may cause a delay in the production process. If the customer is scheduled for a next day delivery, because they gave this order with a certain lead-time, it would be a problem. Customers might be expecting to load the order in 5 weeks. But if there is a change, that postpones the schedule about 2-3 days. That means a loss for the customer. Therefore, this causes a pressure on Supplier Company 5 and makes them alarmed.

Supplier Company 5 experiences problems in the lower level departments. There is a certain tension between them and managers in case of any design change requests. Supplier Company 5 prefers not to share this with the customers. If they need to explain the tension for some reason, they do it in a polite way.

Employees in lower levels experience some difficulties with time in any design change requests. Instead of working on the next waiting design or order, they still have to deal with the previous one over and over again. That causes a delay in Supplier Company 5's work. A design change request has a chained effect in Supplier Company 5. For example, if customers ask 5 times for a change, Supplier Company 5 will inform them that they have to wait, because the changes are delaying other orders. However, customers are not always understanding about this. The interviewee has a lot of customers including StarsFashion that are not understanding in these situations. Germany asks for a 5% discount immediately as well.

Since design change requests create a chain-like effect inside Supplier Company 5, these requests can cause delays in designing and colouring, as well as issues such as wrong paint, flaking, or having to use different colours. All these human mistakes can be a result of a change in the product's design.

The interviewee explains how they correct the mistakes caused by design changes:

“Let’ assume that you have already printed the design, but the mistake has been found in the middle of the process. How do you react and interfere to that half incomplete print? We do not watch the process. There is an officer in charge. He informs us if there is a problem. And, we decide together whether we stop the machine or not. Of course, sometimes they don’t share the problems with us. But we recognize these problems during the control stage.”

Sometimes, customers ask to change the colour after samples are sent to them. In this situation, Supplier Company 5 could experience a delay during production process, printing could be incorrect, and orders may remain insufficient. Supplier Company 5 shares all stages with their customer. For example, they inform the customers that they will be late and ask them to be prepared for that delay.

Their customers can yell at Supplier Company 5 during these information stages. They prefer keeping quiet if the customer is right. The interviewee explains why they are keeping quiet:

“We have to be. If they are wrong, we use a proper language to tell the problem. We try to keep our customers. If there is no problem with losing that customer, we yell at them too. However, it affects our motivation. Our performance drops naturally. Every day we have a problem. Everybody is having trouble. We fight every day. We all do. Our motivation is falling. But, if we get what we want in the end, we try to ignore these problems.”

Since Supplier Company 5 always has tension with the customer they sometimes hurry or disrupt their work. However, customer satisfaction is their priority no matter what.

5.7.3. Strategies Against Design Change Requests

The very first strategy Supplier Company 5 follows is to know the English market very well. According to the interviewee, English companies ask for cheaper goods in terms of price because they buy a huge amount of goods. They are also very different in terms of lead-time, in that they ask for everything to be done very quickly. They always work with a fast track system. The main reason for using that system is rapid demand and competition. England takes a lot of goods from Turkey and Supplier Company 5 is in competition in Turkey as well. Therefore, the faster they can produce their products the better.

The second strategy is to make an offer if the order is defective. The interviewee describes how they make an offer in their own words:

“We offer either a discount or take the initiative to reproduce since we believe the customer does not buy that order. Sometimes, we never reflect these kinds of issues and interfere to these problems. For example, we had 50,000 meters fabric and there is a very small dark blue spot instead of light blue. I say, “Look, you cannot find better than this and we have no chance to fix it. You can cut this area and evaluate it in some other works” to the customer, share this with the customer before exporting process and I solve the problem.”

Supplier Company 5 also tries to offer alternative carrier types if they are going to be late in lead-time. They send the order by plane in order to make the delivery on time. This can help them gain or retain a customer.

Another strategy is to inform the customer about each stage. Supplier Company 5 shares every single step with the customers. They do not move to the next step without customers' approval. They share the information with the customer even if they have discussed things many times between the units and receiving approval. In this way, the chance of any mistake being made in a design change situation is lowered.

To reduce the design change requests, Supplier Company 5 gives customers some suggestions and recommendations about the product in the very beginning of the order. The interviewee gives an example of how they make recommendation to their customers:

“For example, if you want use that quality for this design, it works; but if you use the other quality for the same design, it degenerates. We also need to draw and create a template for this quality. It will be a time-loss for you and us.”

Supplier Company 5 shares these issues with their customer because sometimes the customer does not know the difference. When Supplier Company 5 gives them a suggestion they can make the right choice in the early stages of the order.

5.8. Supplier Company 6

Supplier Company 6 is a strategic fabric supplier for StarsFashion. It is a complete fabric production facility with a whole production line. Their UK based customer list includes the 1922 Clothing Company, Galafort Ltd., Next, Marks and Spencer, Topshop, etc. They generally work for women’s wear but they also produce men’s wear.

There are two types of weaving carried out by this company. One of them is to weave greige yarns into the fabric and then dye it in the colouring department; the other method is to dye the greige yarn in the colouring department and then weave it into the fabric in the weaving department. The company carries out both methods in their facilities.

The company uses two different materials, dyed or greige yarns. If they have an order of greige yarn, they first weave a fabric from undyed yarn according to the quality the customer wants. Then they dye it in the colouring department. If they have an order of dyed yarn, they first dye the greige yarn in the colouring department before they weave it into the fabric. All these procedures depend on the type of the fabric, since different fabrics require different procedures. Some fabric types have to go through specific machines before or after the weaving procedure.

Supplier Company 6 makes lots of different products at different quality levels. Therefore, they treat orders according to these specifications.

3 interviews were carried out in Supplier Company 6. One of the interviewees is the owner and general manager of Supplier Company 6. The second interviewee is the manager of the thread department and the colouring department, who is responsible for buying, selling, producing threads, and handling problems in both departments. The third and the last interviewee is the export manager who is responsible for exporting to the UK market.

The export department in Supplier Company 6 takes care of orders coming from overseas. There are several people responsible for different countries. The third interviewee is responsible for England. In general, the export procedure starts with trade fairs. The managers who are responsible for different countries attend fairs and set up a stand with their own fabric samples (swatch cards). These swatch cards have the logo of Supplier Company 6 on it and they are about 50 cm square. The managers give the swatch cards to potential customers, who contact Supplier Company 6 because of these samples. Sometimes they want the same quality; sometimes they want a change in the content of the product. Supplier Company 6 has a laboratory where they can carry out colour analysis. The interviewee from the colouring department explains the procedure:

“For example, if our customer wants green, not red like in our swatch card, they immediately send us a sample. Than we produce it in our laboratory to make our own sample; and we send it to the customer with a couple of alternatives. If our customer gives us ‘okay’, we start the production.”

For this reason, fairs are highly important for Supplier Company 6 to increase their customer capacity. Orders coming from these fairs go directly to the export managers in Supplier Company 6.

According to the interviewee who is the export manager responsible for England, England is very picky and "leading them a merry dance". They want different fabric types, such as jacquard, and different patterns - for example, requesting flower patterns with leaf and branch details. Supplier Company 6 doesn't have a printing department in their facilities. They send their fabrics to other companies to get printed. English companies request a lot of printing

business and often ask for complicated processes, such as printing on jacquard fabric. This causes a lot of work for supplier Company 6.

In any design change request, the first department customers communicate with is the export department. Export managers in Supplier Company 6 are also customer representatives. They take care of orders, change requirements, and any other complaints and criticisms coming from customers. They pass the customer requirements through the relevant departments. For example, if customers want an unusual design, the export managers pass this information through to the design department.

5.8.1. Design Change Process

In normal product orders, Supplier Company 6 has certain procedures to be followed before an order passes to the production stage. Customers give the export manager the specifications of the thread, such as the quality type and number of the thread. They also give the required standards of the thread such as washing fastness and rubbing fastness. After this, the export manager determines if the supplier can or cannot meet these standards. They may say which standards Supplier Company 6 can meet and which standards they cannot. After the customer and the supplier come to an agreement on specifications and standards, the supplier accepts the order.

In any design change situation, customers liaise with the export managers in Supplier Company 6. They explain which part of the product they want to change. Sometimes the customers may want their own quality. They may want different alternatives with different thread types. For example, Supplier Company 6's samples are 100% cotton but customers may want 50% cotton and 50% polyester. The content may change but they can apply any requirements to the product.

If the customers want the same quality as the swatch card, Supplier Company 6 asks them to send their own samples. After taking their samples, the supplier sends them to the "swatch card" department and instructs the "swatch card" department according to the customers' requirements, such as 5-meter sample or 1-meter sample. The "swatch card" department prepares a sample according to the information given. If the customer gives their approval,

Supplier Company 6 then starts production. Their loom masters then prepare the weaving machines according to the width and weight of the order. They try to work very fast. If there is an urgent order, Supplier Company 6 makes it a priority by pausing any other works.

If the customer wants Supplier Company 6 to create their pattern, the export managers then inform the design department. If customers already have a pattern on hand, they send it to the supplier. The export managers then send the pattern to the design department and then the “swatch card” department prepares a sample according to quality, colour, and the pattern the customer wants.

If a new order comes, Supplier Company 6 opens a new production form. For example, there is an order for 1360 meter of fabric. The export manager immediately calls the head of storage to ask if they have thread on hand. If they have, the export manager informs the colouring department and starts the process. If customers want ready-to-dye fabric Supplier Company 6 supplies from overseas, the supplier dyes them according to the colour the customer wants. If the customer approves, Supplier Company 6 starts production.

Supplier Company 6 can give shorter lead-time (e.g. 2 weeks) if they use ready-to-dye fabric. Their normal lead-time for most orders is 4 weeks. Materials such as jacquard and other materials that take longer to be produced have 5 weeks lead-time. If fabrics that are difficult to produce have a design change requirement, all the steps have to be repeated.

To respond to a design change, Supplier Company 6 needs 1-2 days to create the pattern from the beginning and put it on the weaving machine. It has to be a very short and quick process. The most important factor is if Supplier Company 6 has thread on hand to use immediately. Most of the time, they face the difficulty of thread stock. They don't have a thread production facility so they have to buy it from another company. Sometimes, that other company may also not have the thread in stock. It therefore takes Supplier Company 6 a week to meet the thread need. However, if they have enough thread to work with, they can immediately put it on the production line (if the weaving machines are available). Supplier Company 6 works based on incoming orders. For example, they don't buy 5000 kg thread and save it in stock. If they have a 2000 kg order,

they immediately source the necessary thread and work with it. They have an employee responsible for taking care of this thread supply. They instantly inform him and he buys the thread and passes it through the designer and weaver. However, sometimes the customers need a special type of thread. This can be challenging to find and buy. Other than that, it takes Supplier Company 6 1 week at most to respond to a design change.

Supplier Company 6 tries to respond every time a customer wants a design change if it is a really good customer. If they are not able to do it in that time, they try to explain their situation and find another way to solve the problem.

5.8.2. Design Change Impacts on Supplier Company 6

After production of the order, the customers may not like the standards or specifications of the order. In this situation, Supplier Company 6 starts an investigation. If everything the supplier produced is exactly as they agreed with the customer, Supplier Company 6 will not accept any charge or accusation. In this scenario, if customers want to make any design changes, they need to place a new order. Supplier Company 6 cannot cancel the production of the old order. They have to deliver the old order with the wrong specification and standards even if the customer does not accept the order.

Supplier Company 6 encounters some problems when they have design change requests from customers. Customers may want Supplier Company 6 to work with a totally different quality, which they have never tried before. Sometimes, Supplier Company 6 is not able to find the thread type customers want. Unfortunately, sometimes, in these situations, they cannot be responsive enough. However in general, they find alternative ways to overcome the situation. The interviewee from the export department says:

“For example, we can say that we cannot do that change but we can do it with a very similar quality or with a very close shade of your colour. Sometimes, they can like our options and we start working with the chosen option. Sometimes, type of the thread may not be suitable for our machines because each loom works with certain types of threads.”

It may take too long to source the thread as well. On top of thread delay, there may be another order consisting of dyed yarns, which means the colouring and weaving machines are required for other orders. According to the export manager, it may take 2 weeks to make the machines available. When you add the 1 week needed to find a thread supply to these 2 weeks, it may take up to 3 weeks to re-start production for a design change.

During a design change, the most unexpected problems are machine errors and employees' mistakes. For example, when the fabric is inside the machine, the machine may malfunction; or customer and supplier decide on the colour but colourists make mistakes about the shade. These are the most unexpected and unwanted problems during a design change process as they add time up to the process that is already time consuming.

The head of colour department says that they have lots of design change requests as well but they also have standards for this.

"We have colour measurement machines. It has some values like delta. Our customer can say that he wants that delta value under 1. If it is above 1, he has already had a right to object to the order. We cannot decide if it is the colour they wanted by using our eyes. Let's say we end up in court with the customer; we have to prove it. That's why there are standards. That's why we want certain data from our customers."

However, customers don't understand the standards, according to the head of the colour department. In some cases, the colour measurement machine shows that Supplier Company 6 is right about the colour but the customer says that he doesn't understand the machine and that the colour is wrong. Or a customer gives Supplier Company 6 his own thread to be coloured without realizing it is rotten, and accuses the supplier of making the threads rotten while colouring. Supplier Company 6 can face these kinds of problems also even if they have standards.

In these situations, the supplier may end up taking the order back and starting a new production. Both performance and money loss occur, as well as demoralisation of workers, which leads to machine errors and employees'

mistakes. When something happens in the factory like errors and mistakes, Supplier Company 6 cannot deliver the order on time. They try to inform the customers about the delay. Sometimes the customer might understand their good intentions and not cause problems.

There are lots of problems arising from design change every day in Supplier Company 6. They try to solve them within the company without telling the customer anything. They prepare a report for each action and need.

However, there are some times when the customer is not understanding about the situation and makes this a problem. In these situations, the head of the colouring department can make strategic decisions. If the customer is very problematic they can decide not to work with them. If it is a really good customer, they can close one part of the facility and put the whole focus on one department. If the order is really going to advance the company, they can take some risky orders. While making these strategic decisions, it creates tension inside the company. Supplier Company 6 has really tight schedules. Sometimes when the production line is a little bit late, Supplier Company 6 has to put pressure on employees, which causes stress. This can create further problems, which can cause Supplier Company 6 to exceed the lead-time. In this situation, they inform the customer, but this can cause problems with the customer. In some cases, when Supplier Company 6 exceeds the lead-time, even by 1 day, the customers immediately want a discount. This hurts the supplier and creates extra cost.

Despite all these negative effects of product design changes, the general manager of the Supplier Company 6 mentions that the changes in the products' design make several good contributions to the supplier company. For example, changes in product designs increase variety in the product lines so that suppliers can take new orders for newly designed products.

5.8.3. Strategies Against Design Change Requests

Supplier Company 6 feels they have to protect themselves by saving cost. To do this they don't accept every order coming from customers. Sometimes, some customers may want 50 meters of one fabric, 100 meters of another fabric. However, at that time Supplier Company 6 may not be able to

produce that kind of small order because they generally have big orders in their production lines. Therefore, they give their customers a minimum order amount. For example, if customers order at least 1000 meters of fabric, they accept the job. This is a precaution Supplier Company 6 takes for avoiding design changes. If a customer asks the supplier to send their swatch cards, but after the third time they still have not placed any orders, Supplier Company 6 doesn't accept working with that customer. They make their other customers a priority.

Decisions about customer priority inside Supplier Company 6 belong to the export department, since they don't have any flexibility. Their customers are very strict about lead-times. They have to supply, dye, weave, finish, and deliver the order in the lead-time given by the customer.

Transportation is also another dimension of the work. After the order is ready, the customer has to see the finished product. Supplier Company 6 sends a sample of the finished product to the customer. If the customer is happy with the sample, then Supplier Company 6 starts delivery. This is the other reason why the export department takes priority in the company. Another reason for the export department taking priority is that some customers of Supplier Company 6 have their own customers. The interviewee in the export department explains this reason:

"This season we had really big problems with one of our Tunisian customers. I send the order at weekend; it takes couple of days to reach that Tunisian guy, then he sends it to his own customer after working on it. So it takes over one week for that order to be delivered to the last part. We have to satisfy our customers for this reason. It, of course, depends on the country's location. This doesn't create any problem with European countries for us unless the priority is with us."

Therefore, giving the priority to the export department helps the supplier avoid time-loss, increase responsiveness, and ensure customer satisfaction for their important customers.

Supplier Company 6 is faced with design change requirements every day. They generally try to persuade the customers to work with their options

such as their qualities and colours because this reduces costs. At this point, the export manager says that it is very important to know customers:

“If you know what that customer wants, you can guess if he will like the sample or not or which part he is not going to like. You are working with the sample according to your customers by taking initiative. We sometimes send the order without any confirmation since we have already knew that he is going to like it. If a customer causes lots of money and time loss, we eliminate it day by day. Of course, we are trying to meet their design change requirements but if they are really waste of time and of money we don’t work with them next time.”

The head of the colouring department also mentions how important it is to know the customers:

“We are trying to talk. Always... We try to understand customers’ intentions. Sometimes, they throw mud at your work to avoid any payments. If we sense this kind of misuse, we prefer not working with them next time. If we know that that specific customer is very honest and understanding, we then use all the opportunities on hand to help them.”

Supplier Company 6 also follows the strategy of informing. According to this strategy, the earlier you inform the customer, the less stress you cause, and the more professional you act. Customers can take precautions and show less reaction to any problem. It is also easier to compromise with the customer about any conflict.

Supplier Company 6 prefers working in shifts. In this way, they don’t have any problems such as working extra hours. This also helps to decrease the number of mistakes and errors caused by employees and the machines they oversee.

5.9. Supplier Company 7

Supplier Company 7 is large and financially strong company, which supplies fabric to StarsFashion. It is one of the standard suppliers of StarsFashion. Supplier Company 7 works without stock. They produce the necessary raw materials after they take the order from customers. They have two different production units inside their facilities; thread production and fabric production. They produce their own threads and fabrics.

Two interviews were conducted in this supplier company. One was with the head of the production department of the fabric department and the other one is the production manager of the fabric department.

In the normal order process in Supplier Company 7 customers send their design to the marketing manager. They want customers to send the design because models' colour, designs, and patterns could change according to that year's fashion trends. Customers make decisions about which trends they will apply to what kind of fabric. However, they may not know how the pattern will look on the fabric. For this reason, they send the design to the marketing manager of Supplier Company 7. Customers let Supplier Company 7 decide on the quality of the sample fabric, since they have already had a quality deal at an agreed price. The design department prepares a sample for them, combining the designs and quality they requested, and sends this sample back to the customers. Customers look at the sample and if they approve the sample, they place the order with the supplier.

Because Supplier Company 7 has a strong presence in the industry, their customers think twice before requesting a design change. Despite their strong name, they still receive design change requests coming from their customers.

5.9.1. Design Change Process

In case of any design change, customers make some criticisms, such as a change in the place of a flower. This feedback process does not happen once or twice; but rather it is a continuous procedure. Because of this continuity, the sample and production department employees of Supplier Company 7 prepare

themselves for these continuous visual changes. After the customers send their feedback and wishes to the design team, the employees in the design team restart the procedure. If customers do not like the quality, the entire procedure restarts from the beginning.

Supplier Company 7 is prepared for the possibility of visual critiques, and these do not cause major problems. However, if the customer has a problem with the feel/texture of the fabric or a problem with the design on a knitted fabric, the supplier has to start again from scratch. Since not every design is suitable for every fabric, requests for fabric changes mean the supplier may have to change other factors such as machine, thread, frequency etc.

When a design change is requested, the marketing manager immediately informs the responsible person in Product Development and Production Departments. The person in charge in the Production Department is responsible for all the machinery and workers. They organize everything in the production department, so they know which machine has what type of thread or which machine is working for which customer. If there is a change requested after the production stage, the marketing department gets in touch with them. They arrange all the machines, employees, weaving looms, and prepares the threads etc. Supplier Company 7 takes care of this responsible person very well and tries to make them happy, since they get stressed out about the design changes. They give them a good salary and try to create a comfortable working environment by giving them more authority.

5.9.2. Design Change Impacts on Supplier Company 7

Supplier Company 7 is affected by design change requests for several reasons. For example, at times of normal workload, designers in Supplier Company 7 like and enjoy what they are doing and feel that they have done a great job. However, when customers make criticisms and say, "This is not a good work, let's change place of that flower", this causes a loss of motivation. From the designer's point of view, they have laboured over this work and spent 3 days on it. They see themselves as experts. However, somebody who is not an expert is coming and trying to change the work according to their wishes. Designers in Supplier Company 7 are experts with 10 years of experience and

a degree in textiles. This makes the situation frustrating for them. Accordingly, these criticisms coming from customers cause motivation loss and designer mistakes. These issues and wishes also cause an extra workload for the employees.

No matter how small and easy the design changes are, even if employees in Supplier Company 7 have already prepared themselves, they make the employees nervous since they have a very busy schedule. Employees believe that they are finally done with this piece of work and they move on to the next job. When customers request a change, employees get annoyed since that happens a lot. This affects the working environment a lot by causing a loss of motivation and time.

According to the head of the production department, design changes are very personal and don't apply to general customer taste. Even the customers try to do their best to catch the trends by attending fashion weeks and visiting the capital cities of fashion. The Head explains this:

"That does not mean that you will sell 10,000 m when you change the place of the 'leaf' because, this is purely a business based on a visual stuff. You believe that replacing the leaf is a good call; however, you do not know that other people find that good. Maybe they want it in another place. It is probably would better if that change made by a professional who is very good at what he does but, this is also a risk. Because professional tastes could mingle with personal tastes for sure and at the end, you are having a "personal choice". That's why making too many small design changes do not make sense after a while. They say they make changes according to the pulse of the market but when they are released to the market, they are not favoured in the market."

Design change requests may also cause systematic chaos in the software that Supplier Company 7 uses, resulting in time being wasted and extra working hours. The production manager explains this chaos by saying:

"For example, we present our samples to the customers and have an 'okay' from them. We make the software system entrance and give the barcode. Let's say the customer then decides to change the thickness of the fabric. That

causes chaos in the software system since we have already given the price. However, when the quality changes, price will be changed too. So we re-set the price. We also need to change the details in the system. For example, they asked thickness level as 80, but after that they changed the thickness level as 60. So, we change the details and renew the record. Then we need to re-weave the swatch cards and re-present them to the customers. These are also a waste of time and an extra work.”

Design change requests lead the suppliers to renew their products such as different fabric/yarn qualities and different fabric/yarn types to catch the trends that their customers request. This increases the cost. Since Supplier Company 7 is a big company they can tolerate that cost. However, the equipment may not work since each yarn/fabric type must be produced in a specific machine. Orders for new products may not turn up instantly. Therefore, the new equipment sometimes sits idle for months, or works slowly. That is also a waste of time, which means labour loss and extra cost.

5.9.3. Strategies Against Design Change Requests

Supplier Company 7 has the advantage of being a large and strong company and they use this to help with many issues. They have quite strict contract conditions. For example, they do not start production until getting an exact confirmation. They take a lot of precautions before production begins. Sometimes they confirm the order a few times before they start production. The fabric production department manager mentions their policy:

“In our policy, after the production phase the customer has no chance to intervene. Let’s say we are asked for 500 m order, and the customer called us in the first 200 m and said he wants to change the colour. We say that we are sorry we need to count this 200m as a sold. In that situation, we may accept to work on different colours to satisfy our customer. But, during that time we need to check whether the machine can be paused.”

If a machine needs to be paused, it causes a loss of money and time for Supplier Company 7. Therefore, if a machine needs to be paused, they generally consider that order reserved and sold. At this point, if the customer still wants to make a change they need to give a new order to Supplier Company 7. The production should not be stopped. However, in some situations, the work that the customer wants to be changed may coincidentally overlap with another work that uses exactly the same colour and fabric. This causes less of a problem for Supplier Company 7 and in this case they may not reflect this to their customer. However, if there is no overlap work/substitute work at the same time, the customer does not have any choice but to buy the product. Small textile companies may experience such problems but not Supplier Company 7.

To avoid these problems, Supplier Company 7 chooses their own customers. The companies that are not financially strong cannot work with Supplier Company 7. Therefore, financial problems such as a customer not being able to buy the product usually do not occur for Supplier Company 7.

5.10. Supplier Company 8

Supplier Company 8 is a preferred supplier of Starsfashion. They are a family-owned design company that creates tailor-made designs for companies. This supplier company is established in London and they also work together with raw material suppliers. Supplier Company 1 is one of the companies that works with Supplier Company 8.

Supplier Company 8 gets design orders from StarsFashion and creates a design for them. After the design is ready, Supplier Company 8 sends the design to the other supplier of StarsFashion, which is Supplier Company 1. Supplier Company 1 deals with the production side of the order.

Three interviews were conducted in Supplier Company 8 to understand the effects and reasons for design changes. One of the interviewees is the general manager of Supplier Company 8. The second one is the sales manager and the last one is a designer working in Supplier Company 8.

The interviewees are quite concerned about the environment and how they can improve environmental conditions. Design change requests to them are a cause of air pollution, which is a result of overwork in the factory by repeating the production stages, and the increased amount of delivery of the samples because of the criticisms made by customers. Therefore, they are quite sensitive about design change processes.

5.10.1. Design Change Process

After Supplier Company 8 gets the design order, designers working in Supplier Company 8 start to create a design according to their customer's needs. After the design creation process, they send the sample to StarsFashion for approval.

If they get the 'okay', they immediately forward the design to Supplier Company 1 to be produced. Supplier Company 1 starts to produce a sample from the given design, since the customer wants to see the design on the fabric. The rest of the procedure takes place as described in the section about Supplier Company 1.

If StarsFashion does not approve of the design sent by Supplier Company 8, they send their feedback about the design to Supplier Company 8. Supplier Company 8 then starts working on the criticisms and changes the design in the direction of customer's feedback, until they get the customer's approval. After they get the 'okay' they forward the design to Supplier Company 1 to be produced.

5.10.2. Design Change Impacts on Supplier Company 8

In this design change process, interviewees complain about the communication system between the supplier and the customer. Today's information system is definitely better than previous systems. Before, they used to use fax machines to communicate with each other; now they use e-mails, which are faster. However, e-mails are not perfect. Feedback is often better understood through seeing or touching the design/fabric in question. Therefore, in any design change situation, the supplier side may go and see the customer

in their workplace to understand what they mean about the feedback they have given. This causes time-loss and money-loss to the supplier.

The design change process also has effects on designers in Supplier Company 8. Designers sometimes have to create a design very quickly for a customer in a hurry. The designer in Supplier Company 8 asked:

“How can we designers be expected to be creative in a restrictive time period as short as couple of hours? Creativity needs inspiration, time and better done in relaxation.”

5.10.3. Strategies Against Design Change Requests

As an environmentally concerned company Supplier Company 8 has different ideas about how the industry can be more efficient and productive. They assume that if countries turn into local suppliers, this would be more beneficial for the environment since it decreases air pollution. Working with local suppliers will also increase domestic production and allow full use of the labour force. It will also help increase responsiveness to design change requests.

Even though Supplier Company 8 has these ideas to help decrease the amount of design change requests, it doesn't depend on them to change this situation. It needs a bigger force to change the situation and persuade customers to use local suppliers. Therefore, they only can try to know their customers well. The sales manager from Supplier Company 8 reports that,

“If we know our customer well and if we have really long-lasting relationship with it, we are trying to satisfy them no matter what. We face up all challenges such as increased costs, time-loss, and increased amount of waste for our customers. Customer satisfaction is the very first aim for suppliers.”

6. DATA ANALYSIS

6.1. Introduction

In this chapter of the thesis, the data obtained from the interviews within the case organisations will be presented and interpreted in 'The Data' section. The 'Data Coding' section will explain how the data is coded. Data coding is helpful, since it breaks the verbal data into smaller units, which are easier to analyse (Sharon, 2004 pp.134-137). Data coding allows categorising of the data. After the data is presented and coded, how the data analysis methods are applied to the data will be described in the 'Data Analysis' section. The applied data analysis methods include classification of the data, pattern matching, and explanation building. Classification of the data is necessary to arrange the coded data according to their relations with each other. To classify the data, the impacts of product design changes were turned into a table. After the table was created, the researcher categorised the data to better understand the impacts of the product design changes. Through pattern matching, how the obtained data relates to previous findings, which were outlined in the conceptual framework, is established. In the 'Theory Building' sub-section, data is compared with the previous literature to provide a rationale for the findings observed in this thesis.

6.2. The Data

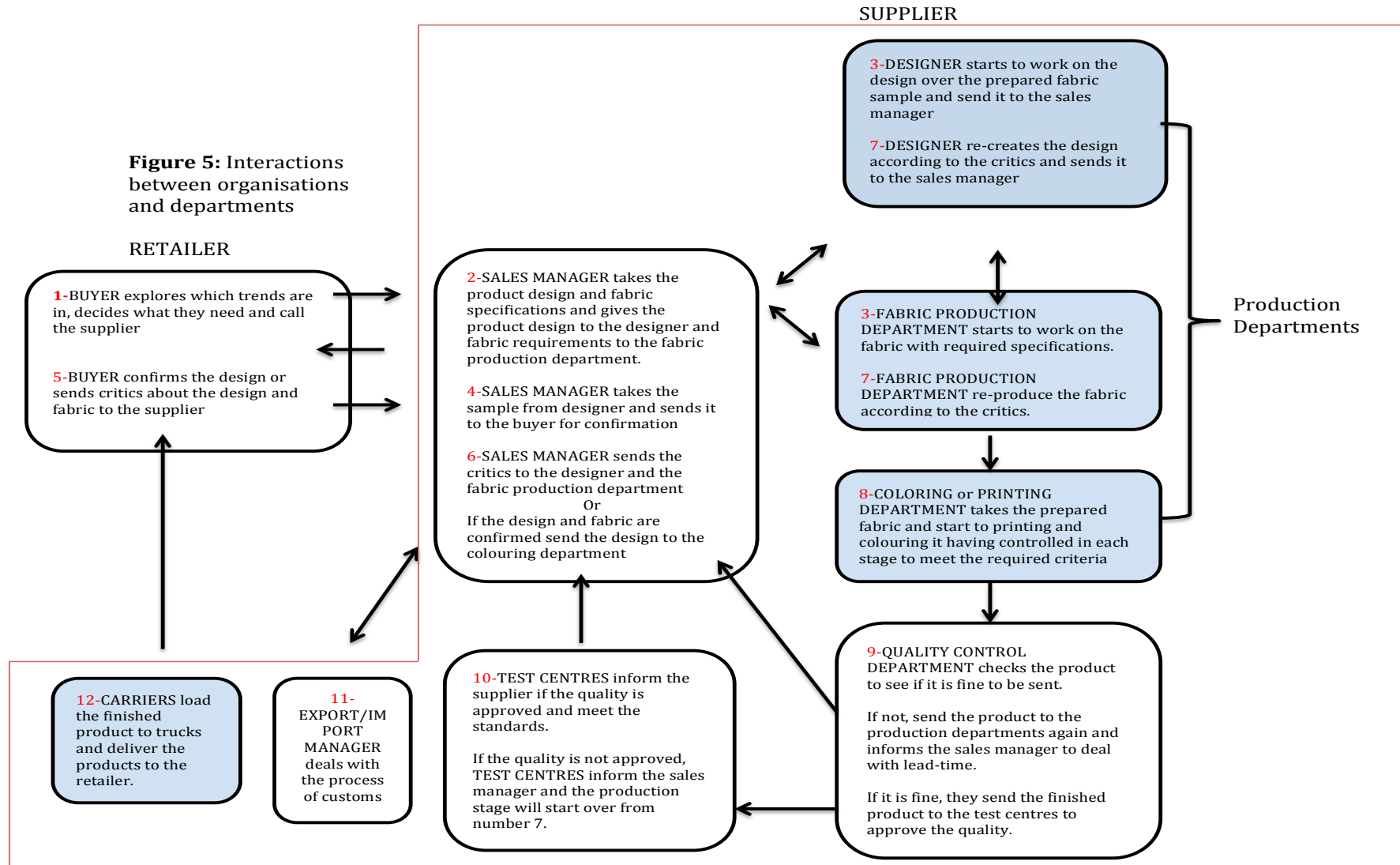
The information obtained from the interviews is illustrated in **Table 2** and **Figures 5-6** to understand and visualise relations clearly. In **Table 2**, all the impacts of product design changes that supplier companies experienced are listed. In this table, the researcher merged data with synonymous meanings into one category, and showed this by using the forward slash sign (/). More information regarding how the data were merged can be found in the 'Data Coding' section in this chapter.

In **Figure 5**, the data obtained from the interviews have been put together to show the interactions between the retailer, the supplier, and the departments in the supplier companies during a normal order process.

In **Figure 6**, the production flow in the supplier companies is created using the interview data to understand the production stages in detail.

Table 2: The impacts of product design changes suppliers have experienced

	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8
Different perceptions of 'good design'/ Design problems	✓					✓	✓	✓
Lack of textile and technology knowledge of customers	✓							
Defects in the production	✓				✓			
Taking the order back	✓					✓		
Legal acts	✓		✓					
Risky strategic decisions/increased possibility of making mistakes	✓	✓				✓		
Repetition of stages	✓	✓			✓	✓	✓	
Communication problems between supplier and customer	✓				✓	✓		✓
Shorter time for re-production/time-loss	✓				✓		✓	✓
Increased working hours	✓	✓		✓		✓	✓	
Backlog of other orders	✓	✓			✓	✓	✓	
Motivation loss	✓				✓	✓	✓	
Increased customer expectations	✓							
Unstable production plans due to increased production time, shortage of materials		✓		✓	✓	✓	✓	
Tension among employees/departments/ customers				✓	✓	✓	✓	
Broken relationship with customer		✓		✓	✓	✓		
Less production due to missing orders				✓				
Labour (human) quality problems	✓				✓	✓	✓	
Chaos in the software							✓	
Performance reduction				✓	✓	✓		
Increased cost		✓		✓	✓	✓		✓
Quality problems	✓			✓	✓			
Delivery problems	✓	✓		✓	✓	✓		
Lead-time	✓	✓				✓		
Keeping product diversity in the product lines						✓		
Taking new orders with each new product design						✓		
Increased air pollution								✓
Decreased domestic production								✓
Decreased local labour force								✓



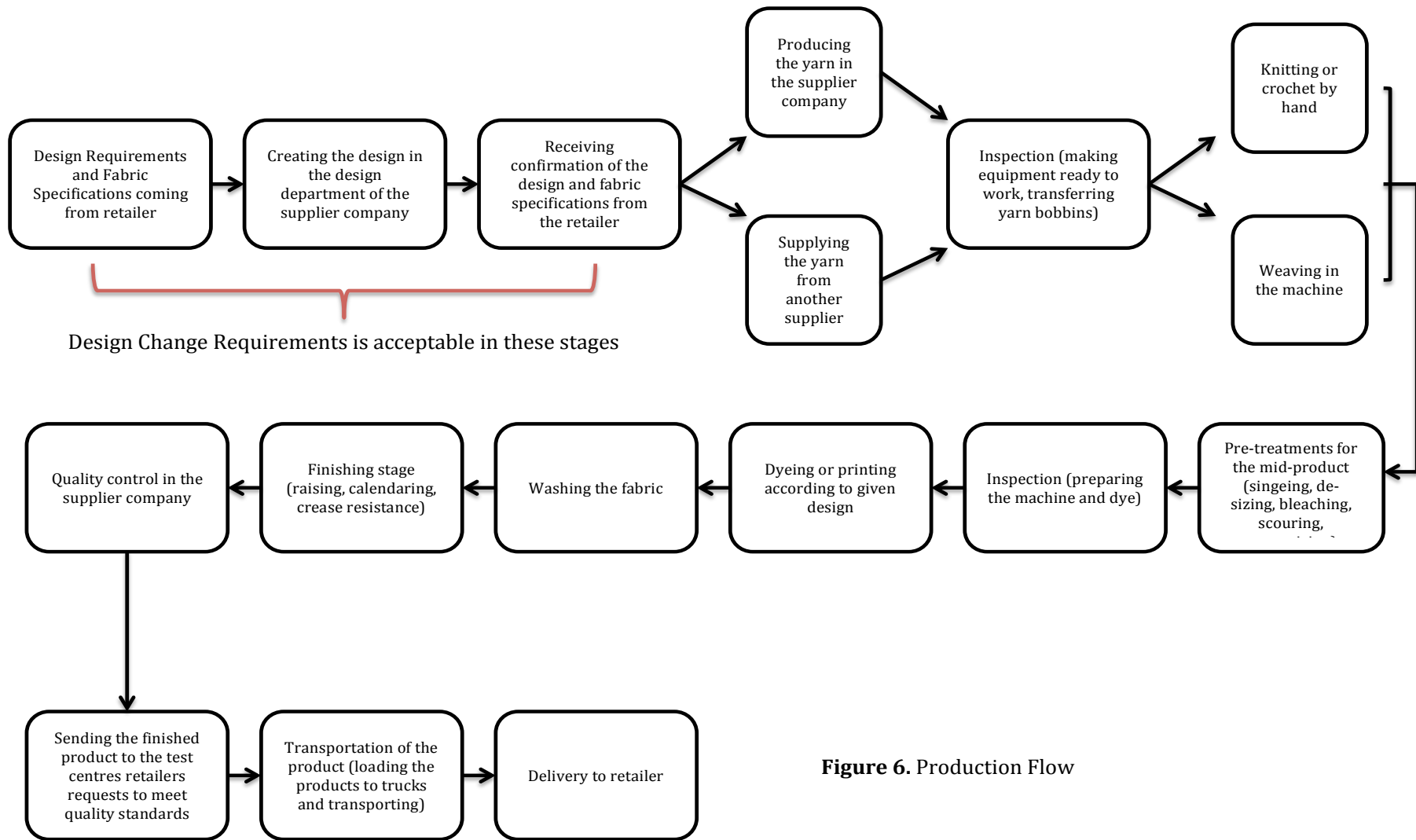


Figure 6. Production Flow

6.3. Data Coding

This thesis does not focus on a certain concept or theme since the object of the research is to establish the overall impacts the suppliers experience as a result of product design changes, rather than some specific impacts the supplier companies experienced in a product design change situation. If this thesis investigated how many times supplier companies experienced one specific impact (e.g., taking the order back) during the product design change process, then frequency of this specific impact would be important in this case. However, this research is not interested in analysing the data regarding frequency or how many times a certain code was experienced by a supplier. This thesis is primarily interested in the presence of any impact for each participant, no matter how many times the impacts are experienced because the aim of this thesis is to understand what suppliers experience during the product design change process.

For this purpose, all the data regarding the impact of product design on suppliers is listed (Onwuegbuzie & Teddlie, 2003). However, the data that fall into the same category are merged into one to create a simpler version of the dataset. The reasons for why the data was merged into one are outlined below.

Different perceptions of good design / Design problems

In the interviews, some of the participants recount that a customer and a designer working in the supplier company mostly have different design tastes. They have different perceptions about what constitutes a good design. On the other hand, some of the participants mention that customers often have problems with the tone of the colour or the shape of pattern after the design is created, which they name 'design problems'. These customers are not clear about what they want, which may result in changes in the perception of good design. All these design related problems the participants mentioned are merged into the category of 'different perception of good design' since colour and pattern are the main elements when deciding if the design is good or not. Therefore, these two data categories are merged into one since they basically have the same meaning.

Through this, we can see that design is very personal. The meaning of a good design can change in a short time even according to the customers. They may change their ideas about what colour or pattern will look good on a fabric. Additionally, if they are not very clear about their perception of good design, the designer working in the supplier company may have to use their own preferences when creating design.

Risky Strategic Decisions / Increased possibility of making mistakes

Likewise, 'risky strategic decisions' and 'increased possibility of making mistakes' are merged together because they refer to the same fact. These two categories are expressed with different words; however, when the researcher dug down deep in the interviews, it is understood that the participants were referring to the same thing.

When asked "How are your strategic decisions affected by design change requests?", some of the participants explain that any change in the product design can cause risky strategic decisions, which can result in the possibility of failure. Some other participants answer this question by saying that product design changes coming from the customer can cause them to make mistakes due to the wrong decisions they made during the design change process. These two responses from participants again refer to the same concept with different expressions.

Shorter time for re-production / Time-loss

Here, participants refer to the same fact since shorter time for re-production means time-loss for the production of the order. Some participants stated that they have less time for re-production due to product design changes; some participants mention that they have time-loss during the production of the order. Since these two data have the same meaning, they are merged into one.

Tension among employees / departments / retailers (buyers)

Lastly, when asked the question of 'What kind of effects do design changes cause in the workplace?', all participants mention that they experience tension. Some of them state that they have tension with their co-workers; some of them express that they have tension across departments; some of them

mention they have tension with their customers during the design change process. Since all participants mention that they have tension when the customers require a design change, all these data are merged together.

All the listed data can be found in the **Table 2**. However, to clarify the data codes and avoid ambiguity, an explanation for each data code will be given below. (Explanation for the merged data categories was already given above.)

Lack of textile and technology knowledge of retailers (buyers)

According to the suppliers, customers (retailers or buyers in this case) do not know about textiles, because they often request impossible design changes. For example, there are multiple yarn types. Some of them are suitable for re-colouring process. However, some of them are impossible to re-colour. Suppliers indicate that customers almost always insist on changing the colour even if the type of yarn is not suitable and there is no equipment to change the colour.

Defects in the production

When there is a product design change, suppliers mostly accept these change requests. These requests of design change result in re-production of the product in a tight schedule, which means poor quality control mechanism. Re-producing the product as fast as possible and poor quality control mechanisms cause defects in production.

Taking the order back

When design change requirements are made after the production stage started and the design change requirements are impossible to meet, suppliers may have to take the produced amount of order back. In this situation, retailers mostly do not accept the order because it does not have the necessary specifications as the retailer want. This ends up either with suppliers taking the order back to protect their relationship with retailers or with the legal acts between supplier and retailer.

Legal acts

Conflicts between supplier and retailer sometimes end up in the court; and legal actions can take place. As mentioned above, when design change requirements were made after the production stage begins and those requirements could not be met, retailer may not accept the order. In this case, suppliers may sue the retailer since they made design change requirements at a late stage. Also since design changes have some negative impacts on quality of fabric/thread and cause a busy schedule, suppliers sometimes prefer to send the order without making any quality control, which causes that retailer may not accept the order. In this situation, suppliers may deal with customs procedures when they have to take the order back. Customs procedures are quite time consuming and expensive.

Repetition of stages

To make a change in the product design, some of the production stages have to be repeated. For example, the production stages for a yarn include inspection of the yarn, singeing, bleaching, dyeing, washing, and finishing.²⁴ With each design change, all or some of these stages have to be repeated to create the required design.

Communication problems between supplier and retailer (buyer)

Because of a distant relationship between customer and supplier, suppliers may not understand clearly what retailers want. Since textile is all about touching and feeling, suppliers sometimes cannot communicate in an effective way about the design changes they are asked to make.

Increased working hours

To make the design changes, employees in the supplier company have to overwork.

²⁴ These production stages of a yarn are indicated by interviewees.

Backlog of other orders

Since any product design change causes repetition of the production stages, they may squeeze their production plans, which results in a backlog of other orders.

Motivation loss

Increased working hours, backlog of other orders, and working on the same order several times due to product design changes can all cause motivation loss for employees.

Increased retailer (buyer) expectations

Customer relation is the most important factor for the customer. For this reason, suppliers almost always accept product design change requests. This increases the customers' expectations; and customers believe that any design change is possible.

Unstable production plans due to increased production time, shortage of materials

When a supplier accepts design change requirements, they have to fit the reproduction of the product into their production plan. This results in continuous changes in production plans, and accordingly tight schedules. Furthermore, suppliers may not have the necessary materials on hand and have to wait for them to be supplied or produced. This delay in procurement of the materials can cause unstable production plans.

Broken relationship with retailers (buyers)

In case of design change requirements that are not fulfilled, suppliers might have a broken relationship with their customers.

Less production due to missing orders

Suppliers may miss the coming orders because of their tight schedule due to product design changes; and this leads to lower production volume for suppliers.

Labour (human) quality problems

Because of increased working hours, motivation loss, backlog of other orders and tension between employees/departments, labourers are more prone to make mistakes and labour related quality mistakes increase.

Chaos in the software

For each design change, the purchase order form has to be renewed; the specifications of the product have to be changed. For example, when the type of fabric is changed due to product design changes, the price of the fabric, delivery time, and production processes the fabric needs are all changed in the purchase order form. This may cause a mess in the software.

Performance reduction

Supplier performance decreases because of all the negative impacts of product design changes. Defects in production, labour related quality problems, and long lead-times can all cause a reduction in the supplier's performance.

Increased cost

Product design changes may increase quality related costs (costs due to defects in the production and labour related quality problems), delivery costs (costs due to cancelling the arranged carrier and arranging a new carrier) and costs due to missing the lead-time.

Quality problems

Defects in production due to poor quality control mechanisms, labour related quality problems, failing quality control standards due to product design changes, and repeated quality control tests are examples of quality problems.

Delivery problems

Suppliers have to spend extra time in order to re-produce the product, which may cause delivery delays. Cancelling the arranged delivery date, setting up a new delivery date, and potentially changing the carrier or changing the type of carrier are the main delivery problems suppliers experience.

Lead-time

In some cases, product design changes extend lead-time, since making a change in product design takes extra time due to repetition of production processes, repeated quality control tests, and extended delivery times. On the other hand, retailers may not accept any extension in the lead-time. In this case, suppliers have shorter time for re-production, which still creates lead-time problems for the supplier.

Keeping product diversity in the product lines

After one month of ordering (for example) a flower pattern, the retailer may want to change the pattern in another month because of changing trends. This leads to product diversity in the market, which keeps the market dynamic. This means a continuous workflow to suppliers.

Taking new orders with each new product design

Any change in the product design is an advantage for the supplier. Because of a changed design, suppliers can get repeat orders for the new design.

Increased air pollution

Because of repetition of production processes and increased amount of delivery, carbon dioxide emission increases and air is more polluted.

Decreased domestic production

Changes in products' design lead to excessive costs for retailers. To decrease costs, retailers globalise their sourcing and manufacturing activities, which results in decreased domestic production.

Decreased local labour force

Since retailers prefer overseas sourcing and manufacturing, the local labour force decreases.

6.4. Data Analysis

Once interviews had been transcribed and translated a description for each case was developed, which can be found in 'The Case Descriptions' chapter. This approach is useful for organizing case studies (Lin and Zhou, 2010). Following this, the results of the interviews were collected in tables and figures to see the relations clearly. The researcher developed an analysis of the case studies that identified the main features, and identified the data related to the supplier companies. The researcher then arrived at a personal classification of the information. The results were collected and compared to converge towards a common classification of the case study. This process was helpful to obtain an objective view of the cases and to reduce the amount of data to compare. At the end of this personal classification, five broad categories of codes were identified which described: (a) the departments most affected by product design changes in the supplier companies, (b) the non-physical impacts of product design changes on the supplier companies, (c) the physical impacts of product design changes inside the supplier companies, (d) the impacts of product design changes on performance, e) positive impacts of product design changes.

Pattern matching across the cases enabled a comparison of the emergent empirical patterns, which can underpin explanation building (Yin, 2009). The explanation building was further substantiated by comparison with previous research and theory, which in-turn supported the refinement of the interpretation of case studies. All of the collected data was included in the analysis, with the most pertinent aspects directing and informing the data analysis.

6.4.1. Classification of the Data

After identifying all the impacts of product design changes on the supplier company, the researcher turned this data into a table, which helps us classify the impacts into four categories.

Category 1 – Non-physical effects that product design changes created

To form this category, the researcher separated the non-physical effects, which are generally unfamiliar to the retailer company, out of the rest of the impacts. These effects of product design changes are generally experienced in the supplier companies and retailers are rarely aware of them.

- Different perception of what constitutes good design between suppliers and customers
- Lack of textile/technology knowledge of the customer (the retailer, in this case)
- Communication problems with the customer
- Motivation loss of the employees
- Increased customer expectations
- Tension among employees and departments
- Broken relationship with the customer

Category 2 – Physical effects of product design changes

In this category, the researcher looked for the physical effects of product design changes in the supplier companies.

- Defects in production
- Taking the order back
- Legal acts
- Increased working hours
- Backlog of other orders
- Labour related quality problems
- Chaos in the software
- Repetition of stages
- Risky strategic decisions due to increased possibility of making mistakes

Category 3 – The departments most affected by product design changes

To create category 3, the researcher first identified the impacts according to the departmental impacts of product design changes. According to the classification of the data, the most affected departments in the supplier company are:

a) Production Department –Shorter time for re-production

Time-loss

Defects in production

Unstable production plans (Continuous changes in the production plan, and accordingly tight schedule)

Increased production time

Decreased amount of production due to missing

orders

b) Delivery Department – Delivery problems (Changes in delivery time, arranging a carrier that is not previously worked with, increased cost of delivery)

c) Design Department – Different perception of good design

Limited time for being creative

d) Purchasing Department – Shortage of materials

Category 4 – Product design effects on performance of the supplier companies

To form this category, the researcher searched for the performance measures in the conceptual framework that was developed in 2.9, which are related to cost, quality, delivery, lead-time, and responsiveness.

- Increased cost of production
- Quality problems
- Labour related quality problems
- Delivery problems
- Increased lead-time
- Performance reduction

Category 5 – Positive effects of product design changes

To form this category, the positive impacts of design changes over the supplier company were defined. The positive effects of product design change:

- Keeping product diversity in the product lines
- Taking new orders with each new product design

6.4.2. Pattern matching

When developing the conceptual framework, the researcher created a pattern from the previous literature to have a validated basis for comparing the collected data. I also developed a pattern by using the findings to find out if the developed pattern matches with the pattern of the conceptual framework.

As illustrated in **figures 7 and 8**, the researcher colour-coded the matching impacts of product design changes. The same colours in Figure 7 and 8 show that this study results match with the conceptual research framework.

According to the results of the pattern matching method, product design impacts including delivery problems, unstable production plans, shortage of materials, repetition of stages, communication problems with the customer (lack of communication), limited time for being creative in design and different perceptions of good design between supplier and the customer (design problems) match with each other.

The impacts of product design changes on supplier performance in this study include increased cost of production, quality problems, labour related quality problems, delivery problems, increased lead-time, and increased customer expectations (responsiveness level). All these impacts also match with the conceptual framework.

Other impacts that do not match with the conceptual framework are the non-physical and physical effects of product design changes within supplier companies. The purpose of this thesis was to fill in those gaps in the literature. These effects emerged from this detailed study looking for the impacts of product design changes on supplier companies.

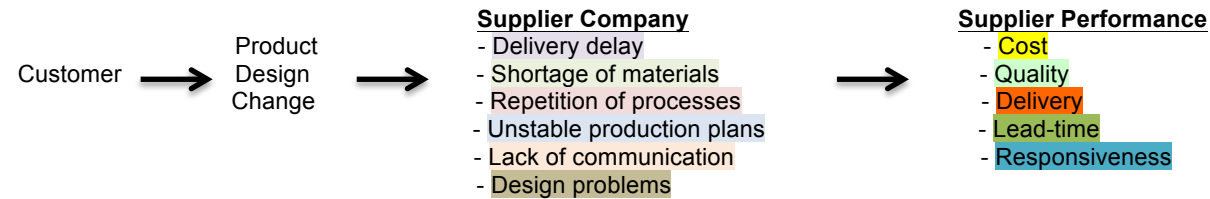


Figure 7: Conceptual framework

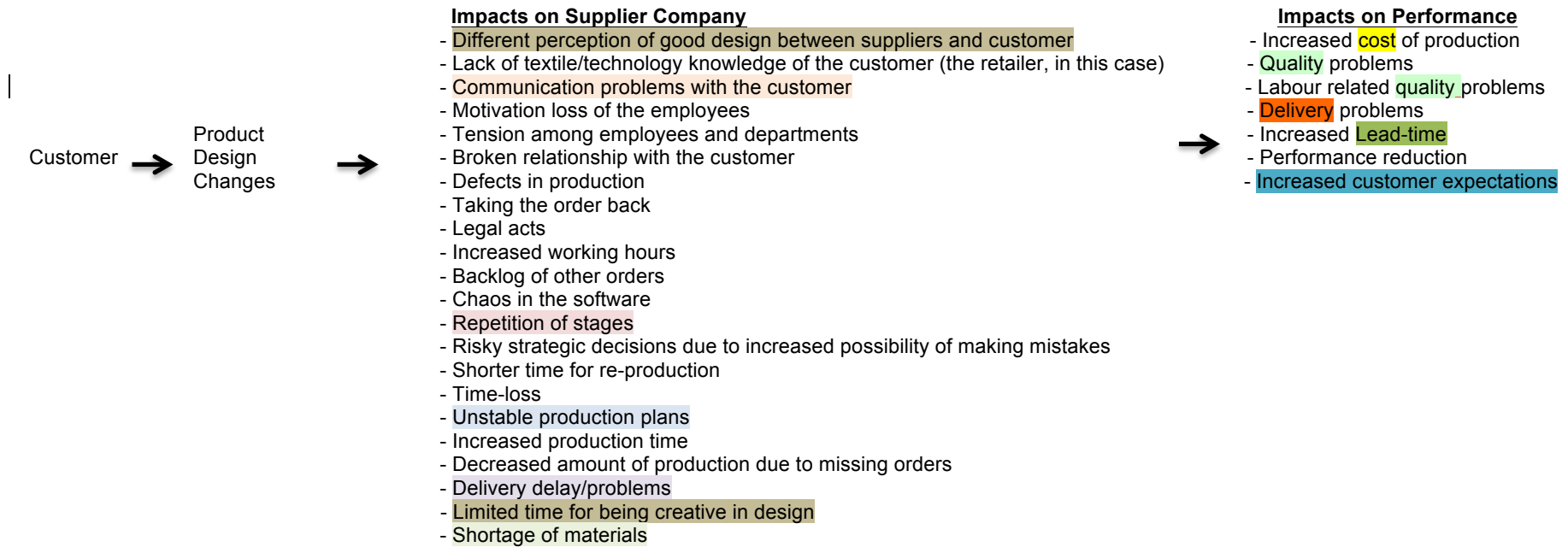


Figure 8: Pattern developed by this research

6.4.3. Explaining the Findings

In this thesis, the data collected in the interviews will be compared to the previous literature to find out if the findings match with the findings of previous studies. I aim to make the findings of this study more reliable and trustable by using the explanation building method (Yin, 2009).

The results of this thesis show that product design changes have many impacts on supplier companies in the fashion industry. This shows that product design is more than a step in the NPD process. It is an important factor affecting the supply network and performance. The findings support the theory that product design is one of the factors that affects production cost and delivery of the product (Child, 1991). Any change in the product design has power over delivery and production costs according to the impacts found in this study, such as increased cost and delivery problems. This thesis revealed that the non-physical and physical problems that suppliers experience during product design changes might cause delays in delivering the products to customers. Any change in product design may also cause production problems such as increased production time, time-loss, and defects in production, all of which can add to the production cost. The supplier companies then try to save that increased cost of production by selling their products at a higher price to the customer for their next order.

This thesis also found that product design changes have several effects on supplier companies such as delivery delays, supply uncertainty due to the shortage of materials, repetition of processes, and unstable production plans. The same results were revealed by the studies of Lin and Zhou (2011), Baiman et al. (2001), Sharifi et al. (2013), and Perks et al. (2005). These studies show that supplier companies may have communication and design problems because of design change requests coming from customers (the retailer or the buyer, in our case). The current study also found that suppliers and customers may have communication problems in any design change situation. Retailers who request a design change in their products may have difficulty explaining what changes they need in their products. In addition, product design in the fashion industry relies heavily on employees feeling the product and seeing the product in reality. Changes in product design sometimes couldn't be understood

completely by suppliers. The designers may experience the same problems and they may have difficulty creating a new design because of misunderstanding design change requests.

This thesis also supports the findings of Lin and Zhou (2011) and Christopher et al. (2008), that product design changes impact the quality, cost, delivery, and lead-time of the product. In addition to the impacts on cost and delivery (explained above), quality and lead-time of the products are also affected by product design changes. Product design changes may cause defects in production and repetition of production stages. According to the interviews conducted for this research, suppliers are not always able to realize the defects in production and this can cause them to deliver defective products to customers. Additionally, products may go through the production stages several times because of design change requirements and this repetition can lower the quality of the products. Our findings also support the study of Love (2002), which explains that product design changes need extra effort and repetition of processes.

The interviews conducted for this thesis revealed that responsiveness is the primary objective that the supplier companies strive to reach. They try to meet their customers' expectations in order to retain their customers. For this reason, they try to be responsive to any design change requests made by their customers. However, product design changes make it hard to be responsive, since design changes increase the responsiveness time. Thus, we can conclude that product design is an important factor in defining the responsiveness level of the company as Christopher et al. (2004) found in their studies.

This thesis reveals the non-physical effects that supplier companies experience during a product design change process. These effects have not been documented in the existing literature. For example, product design changes cause suppliers to experience tension between employees and departments, motivation-loss of employees, and stressful working environments during a product design change situation. Different perceptions of good design, lack of textile/technology knowledge, increased customer expectations and broken relationship with customers are other non-physical impacts of product design changes.

According to the results of this research, different perceptions of good design between suppliers and retailers, lack of textile/technology knowledge of the retailers, and increased retailer expectations may show up during any product design change. For example, the definition of good design might be different for supplier and retailer. While a good design means a technically successful design for suppliers, it means an easy-on-the-eye design for customers. This may cause repetition of the sample stage, which results in time loss, extended lead-times, and reduced production times.

Likewise, lack of textile/technology knowledge of retailers comes to light in the design change process in conjunction with different perceptions of good design. Retailers might prefer a visually good design rather than a technically good one, since they don't understand the technical side of design. For the same reason, they also may want impossible design changes.

To maintain their relationship with retailers, suppliers almost always accept design change requirements coming from retailers at the cost of their whole production plans. This increases retailer expectations and causes problems for suppliers, since suppliers already work at the upper limits of their production capacity. A small unwillingness on the part of the supplier when making a design change might cause a broken relationship with retailers.

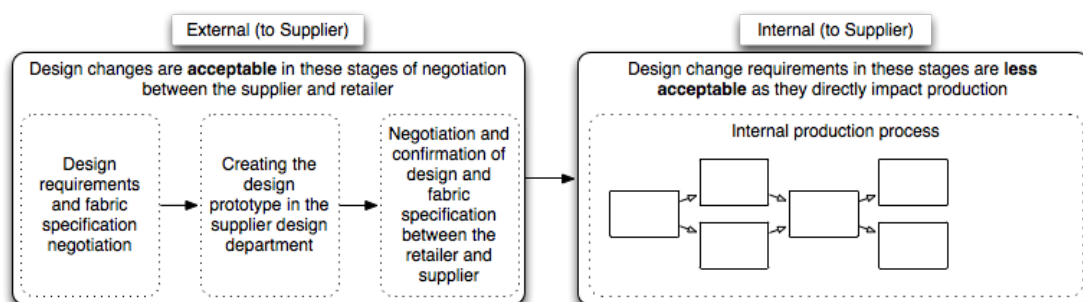
This research makes a great contribution to the literature by revealing these non-physical impacts of product design changes on supplier companies. With the findings of this thesis, retailers might better understand how product design change requests really impact the supplier companies and they might gain an insight into the impacts of product design changes on supplier companies.

7. FINDINGS

The results of the interviews are summarized in this section with extracts from respondents to illustrate the key points. In the first section of findings (Section 7.1.), the impacts of product design changes are explained in the context of the operations of this unique and fast-moving innovation supply network in the fashion industry from new design to final delivery. **Figure 9** illustrates the location of tensions within the project lifecycle in relation to the demand for design changes. Whilst negotiation occurs outside of the supplier organization this is perceived to be acceptable whilst inside the supplier organization it is more likely to create tension. In the second section (Section 7.2.), the strategies that suppliers follow in case of any design changes to prevent any negative impacts of product design changes will be explained.

Figure 9: Simplified illustration of where tensions lie within the production life cycle.

The boxes within the production process on the right reflect different teams, for example, design, sales, fabric, colour and print production and quality control.



7.1. Impacts of Product Design Changes

7.1.1. Impact on Project Life Cycles (PLC)

Respondents explained that the quick cycle of trends in the fashion industry means that colours and prints continuously change, which further

shortens lead-times. For example, a retailer might give a repeat order for flower printed fabrics for 3 months' time. However, after the supplier has completed the third order, the retailer might ask to change the flower print to a geometric print, since sales of the former have fallen and geometric print is now in fashion. For any single product there can be many such details, such as fabric, colour, cut, style, stitching etc., that may be repeatedly changed because of changes in the style preferred by final consumers.

Even small design changes such as these can mean that the production plans of suppliers are severely disrupted and delivery is delayed. Some interviewees emphasized that suppliers are torn between meeting the customer's new design requirements and working for another retailer's order. They also complain that this kind of situation affects suppliers' motivation since it results in increased working hours and backlog.

The result of all this is not just shorter PLCs, which in itself might be beneficial to all parties. On the contrary, the rapid impact of demand fluctuations from consumers to retailers to suppliers means that the entire supply network is constantly subject to repeated changes in some aspects of the product design in order to meet fast-moving preferences of final consumers.

7.1.2. Impact on Labour Force

Product design requirements of the manufacturer have changed significantly and this has resulted in additional tensions for all parties involved. The number of design requirements manufacturers requested from suppliers has noticeably increased in 10 years according to the export manager from Supplier Company 6 which supplies yarn to StarsFashion. The export manager says;

“10 years ago, we were getting almost no design request because 10 years ago, the most important thing was the quality of the fabric. People were looking for long-lasting fabrics with a “nice touch”. Now, design is more important than other qualities consumers are looking for. Therefore, our customers are more focused on design and pay special attention to what kind of design they need. This naturally turns out that we have more design change

request today than we had before.”

The increased number of design change requests has serious effects on employees working in the supplier company. Since employees have to work on the same order repeatedly due to changes in the product design, they experience loss of motivation and time. They sometimes discuss these issues with the managers or heads of department because of the amount of the design change requests. They question the managers about the amount of design changes. They don't want to spend all their time on the same work since they have other orders to work on. These repeated production stages make employees work faster but they are not as careful. This causes production mistakes and product failures since textile materials are very difficult to produce.

Producing textile materials consists of many vulnerable production stages such as the steaming stage²⁵, wash-off stage²⁶, tentering stage etc. The employee working in the colouring department from Supplier Company 1 explains the production stages and how they affect the quality and design of the product:

“In the steaming stage, steam has to be hold at the exactly same warmth level all time. The littlest difference in the warmth like 1 or 2 degrees has an impact on the colour of fabric. In the wash-off stage, employees have to use exactly same amount of soap and the water has to be exactly same hardness level for each part of the fabric. Otherwise, the fabric colour most likely will be either different than what customer has wanted or has fluctuation all over it. In the tentering stage, all parts of fabric have to go through the equipment at the exactly same level of speed in the exactly same warmth degree. The smallest difference occurring in these stages is able to change the fabric colour. According to the type of the fabric, these differences affect even the fabric quality.”

²⁵ **Steaming stage:** Fixing the colour of the product by using steam. (Source from:

http://textilelearner.blogspot.com.tr/2011/05/definition-of-textile-steamer-types-of_2791.html)

²⁶ **Wash-off stage:** Supplier Company 2 defines this stage as washing the dyed products to drain the excess colour.

These critical and sensitive processes have to be done carefully by employees; otherwise product failures and production mistakes caused by employees are inevitable. Limited time scales and the tension between employees and managers (and even departments) caused by design change requests result in the employees making the same stages carelessly, because when the design is changed the whole production process must start all over again since design is the first step (see Figure 1).

Tension arising from having a very limited time scale can also damage the motivation of designers and cause delays in work for another design. In this 'design change' situation, the interviews reveal that designers are expected to create new designs very quickly. One designer in Supplier Company 3 asked:

“How can we designers be expected to be creative in a restrictive time period as short as couple of hours? Creativity needs inspiration, time and better done in relaxation.”

Prior to the production stage, design change requests are to be expected in such a fast-moving business. However, design change requests create much greater problems for suppliers after production starts. The sales manager from Supplier 4 explains:

“The fabrics that will be used for that specific design are prepared for print and dye after the consensus of design. However, when the design is changed, the prepared fabric also has to be changed, as all designs are not suitable for all fabrics. Specifications of type of the print and dye can show different reactions to different fabrics, which lead to a product design with printing and dyeing flaws.”

7.1.3. Impact on Buyer-Seller Relationships

The findings reveal that relationships between suppliers and retailers are highly important, as other studies have indicated (Sabri and Shaikh, 2010; F.E.A. Van Echtelt et al., 2008). Many suppliers are willing to stretch their rules in order to keep their customers happy and to maintain a good relationship. For

instance, the export manager from Supplier Company 2 says,

“We treat our customers according to the level of relationship between us. They want to keep the business going on with us; we want them to prefer working with us. Both sides have to be flexible for both of our sake.”

Similarly, the sales manager from Supplier Company 3 reports that,

“If we know our customer well and if we have really long-lasting relationship with it, we are trying to satisfy them no matter what. We face up all challenges such as increased costs, time-loss, and increased amount of waste for our customers. Customer satisfaction is the very first aim for suppliers.”

The sales manager from Supplier Company 1 explains how:

“If we know that one specific customer who is scrutiniser, we never make a move without any confirmation. On the other side, sometimes design change requests for the same product are made so many times that we can exceed the lead-time. In this situation, we can choose not to send samples to save time even the customer is too picky. We immediately start producing the product without any confirmation.”

These kinds of circumstances can mean hard choices for suppliers. The export manager from Supplier Company 1 explains:

“It can end with taking the whole order back and importing it. We try to avoid this consequence as much as possible because after exporting the product once, importing it again is extremely expensive and time consuming”.

Another strategy suppliers reported to us was to finish the product and make the delivery before customers have time to make any changes. Since the cost occurring from design changes after a certain time belongs to the customer, suppliers try to make delivery of the product as soon as possible, thus permitting the retailer little time to make additional design alterations.

Besides preventing design change requests, suppliers also have strategies for reducing the cost when they cannot avoid them. For example, some suppliers gave this as one reason for adopting digital print rather than conventional print. In this way, there is no need to make moulds, which cause extra costs and are less flexible. The sales manager from Supplier Company 4 explains this as follows;

“In conventional print, each colour in a mould costs €100-120. If a pattern consists of 6 colours, it costs suppliers €720. We make about 10 samples for each of our customers; and final cost for us is €7200. To cut mould costs, we use digital prints to make our samples and if there will be any change in design, there is no need to make another mould, we can make it digitally without any extra costs.”

All these strategies reduce tensions in the supplier companies and help maintain the long-term relationship between supplier and customer by keeping the customers satisfied.

The end result of all these impacts of design changes is that the supply network performance decreases and individual suppliers are less productive.

The type of tensions in the supply network that are created by changes in product design and how those tensions affect network performance are summarized in **Table 3**.

7.1.4. Impact on Standard and Preferred Suppliers

Different departments in StarsFashion come together to create a range. In this process, they sometimes work with their strategic suppliers. StarsFashion has a specific department for communicating with their strategic suppliers to understand them in the right way. The employees in this department know how to speak their suppliers' language and know what is or what is not possible to make when creating a range.

These strategic suppliers are chosen according to StarsFashion's criteria such as trading ethically, sourcing responsibly, and assuring the safety and human rights of the workers in their global operations. StarsFashion tries to

improve their strategic suppliers' working conditions and provide training and support.

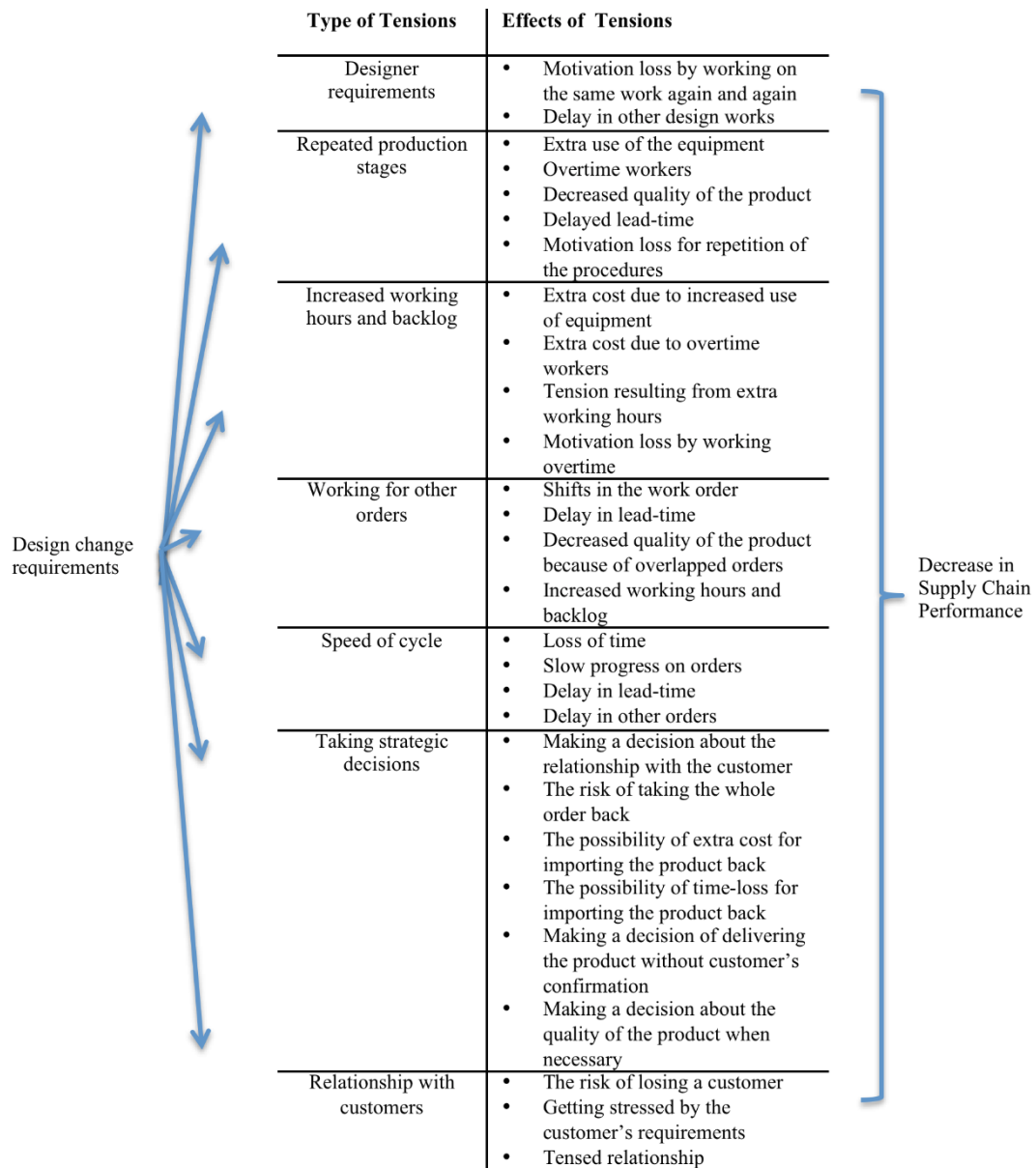
However, in this thesis, most of the suppliers who participated in this research are not strategic suppliers for StarsFashion. This means that StarsFashion does not work with most of the participants to create a range. Thanks to the official documents and the interview conducted with Supplier Company 1 and 6, the researcher was able to determine that StarsFashion provides support for their strategic suppliers. Supplier Company 1 opened their Digital Print Department four or five years ago to follow the latest development in the industry and they did it on the suggestion of StarsFashion. This allowed them to save the cost of conventional print and to save time from making moulds. Thus, they could be more responsive to StarsFashion's design change requests. StarsFashion is also very careful about working conditions and working hours of the employees working in their strategic supplier companies. So, we can assume that the increased amount of design change requests coming from buyers may improve the conditions of the strategic suppliers. Buyers may help and support suppliers to make them more responsive to their requests.

However, the rest of the suppliers, which are preferred and standard suppliers of StarsFashion, may experience adverse working conditions such as increased working hours and stressful working environment in any design change situation. It has been mentioned that these suppliers face many challenges such as increased cost, time loss, and increased amount of waste when buyers make design change requests. They face all these challenges with each product design change but still try to be responsive enough not to lose any customers. However, without any support, they cannot make any progress towards better working conditions or increased profits. They are not able to improve their infrastructure by adding new equipment or parts to the existing machines in order to be more responsive to their customers. Without any strategy or support, raw material suppliers make no headway in growing their business or increasing profits.

While StarsFashion gives a lot of support to their strategic suppliers and are careful about their working hours and conditions, they might leave the preferred and standard suppliers in difficult conditions. The employees in

StarsFashion's preferred or standard supplier companies work extra hours in tense work environments with less developed infrastructure. They try to respond to any design change requests with their existing facilities.

Table 3: Results of the tension types



Type of Tensions	Effects of Tensions
Designer requirements	<ul style="list-style-type: none"> • Motivation loss by working on the same work again and again • Delay in other design works
Repeated production stages	<ul style="list-style-type: none"> • Extra use of the equipment • Overtime workers • Decreased quality of the product • Delayed lead-time • Motivation loss for repetition of the procedures
Increased working hours and backlog	<ul style="list-style-type: none"> • Extra cost due to increased use of equipment • Extra cost due to overtime workers • Tension resulting from extra working hours • Motivation loss by working overtime
Working for other orders	<ul style="list-style-type: none"> • Shifts in the work order • Delay in lead-time • Decreased quality of the product because of overlapped orders • Increased working hours and backlog
Speed of cycle	<ul style="list-style-type: none"> • Loss of time • Slow progress on orders • Delay in lead-time • Delay in other orders
Taking strategic decisions	<ul style="list-style-type: none"> • Making a decision about the relationship with the customer • The risk of taking the whole order back • The possibility of extra cost for importing the product back • The possibility of time-loss for importing the product back • Making a decision of delivering the product without customer's confirmation • Making a decision about the quality of the product when necessary
Relationship with customers	<ul style="list-style-type: none"> • The risk of losing a customer • Getting stressed by the customer's requirements • Tensed relationship

7.2. Strategies suppliers follow in case of design change

The results of the case study revealed that suppliers have their own strategies to avoid the negative impacts of product design changes. These strategies were categorised according to the objectives suppliers try to reach by using these strategies. Four categories came out from the results of the interviews: Strategies to prevent product design changes, strategies to minimise the impact of product design changes on cost, strategies to minimise the impact of product design changes on lead-time, strategies to minimise the impact of product design changes on quality. Each of these strategies will be elaborated below.

7.2.1. Strategies to prevent product design changes

- Working too fast: One of these methods to avoid product design changes is unexpected and simple: working too fast! Suppliers mentioned that if they worked fast enough, retailers do not have any time to make any design change. In this way, suppliers are both preferred for their fast-paced performance, and they do not engage in changes in product design.

- Knowing retailers well: When suppliers know retailers well, they can develop a certain profile for each of them. These profiles help suppliers know retailers very well, so they can treat them accordingly. For example, if one customer requires a design change most of the time, they can take precautions, such as taking customer approval constantly, and detailing the order as much as possible. This method also works for different countries. For example, when suppliers develop profiles for countries, they can be familiar with the kind of the product design each country likes. (e.g., America loves big prints, France uses basics, and England prefers heavy styles.) When suppliers know characteristics of countries well, they can perform the exact style that country needs, which reduces changes in product design.

- Avoiding unreliable customers: Suppliers sometimes meet unreliable retailers. These retailers cause a lot of work for supplier companies, and they probably do not buy the product at the end of deal. They cause sample-traffic until they decide on a certain design, which results in time-loss and extra cost for suppliers. To avoid these negative impacts supplier companies always want the cost of the sample. If the retailer is still problematic, suppliers do not work with them.

- Detailing the order as much as possible: When suppliers detail the order well, retailers can finalise their decisions, and this prevent product design changes significantly. Skipping a little detail would result in different product designs, which cause product design change. To detail the orders, suppliers make sure retailers know exactly where they will use the threads/fabrics. When they give details about the intended use of the thread, suppliers may give them suggestions and recommendations about the most appropriate type of the threads/fabrics to use because sometimes retailers do not know the difference. When retailers know exactly what they need they don't need to make changes to the product design.

- Limiting the product types: Some of suppliers prefer to limit their product types to avoid product design changes. In this way, their customers know what to expect, and this limitation of supplier companies significantly reduce the possibility of product design changes coming from retailers.

- Keeping written records: Some of suppliers are very strict about the terms of contracts. These suppliers prefer to contact retailers in writing. In this way, they can keep records of communication. When there is a product design change requirement, violating the terms of agreement, they definitely do not accept these requirements. They just show retailers the records and this solves all the problems with no tension. In this way, they don't have any arguments with retailers. However, only financially strong supplier companies are able to follow

this strategy since smaller supplier companies always try to retain or gain retailers.

- Having customer approval for each step: One strategy to prevent design changes is to take a lot of precautions before production begins. For example, some suppliers do not start production until getting an exact confirmation from retailers. Sometimes they confirm the order a few times before they start production. They share the information with retailers even if they have discussed things many times between the units and receiving approval. In this way, customers make sure what they exactly want, which means less likely changes in product designs.

7.2.2. Strategies to minimise the impact of product design changes on cost

- Including the possible cost in the price of product: Another strategy that suppliers follow to minimise the effects of product design changes is to calculate the cost of misfortunes and include it in the price of the product. In this way, suppliers do not have any extra cost resulting from product design changes. Most of the time, suppliers have already foreseen the possibility of a design change. To protect themselves from the negative impacts of design changes, suppliers mostly include most of the possible costs in price of the product.

- Sending extra samples to retailers: Another strategy to avoid costs is to send lots of samples to customers. In this way, they avoid sample traffic and prevent the laboratory from re-work, which means time-loss and extra cost.

- Using the same mould: Suppliers use the same mould in case of any product design change to avoid any costs coming from re-producing a new mould. Producing a mould is a costly activity, but necessary for production. If there is a

change in the colour of the product, suppliers use the old mould to produce the newly designed product. If they produced a new mould for each change in product design, it would be costly for supplier companies.

- Using the same fabric: Another precaution for design changes is to use the same fabric for both the sample fabric and the production (original) fabric. Most of the time, when retailers want a pattern sample, suppliers use a different (mostly, cheaper) fabric to show the pattern. However, in this method, suppliers use the same quality fabric in their samples to show a pattern. This helps retailers see the pattern on the original fabric, and in this way, they have a clear idea of how their product will look. If retailers have a criticism about the sample, this strategy makes those criticisms happen in the earlier stages of the agreement, which is less costly for supplier companies.

- Using the prepared order for another retailer: Another strategy is to use the prepared product for another order while producing new product for the customer that wants a design change. In this way, they avoid any extra cost but they still lose time. In some situations, the work that the customer wants to be changed may coincidentally overlap with another work that uses exactly the same colour and fabric. The probability of this coincidence is quite high, since trends are global and retailers use the same fabric/thread types to create their own designs.

- Making offer: Another strategy is to make an offer if the order is defective. At the end of product design changes, retailers may not be satisfied about the final state of the product. In this situation, suppliers offer either a discount or take the initiative to reproduce. If retailers do not have time for re-production, suppliers sometimes try to persuade retailers to buy the product with a discount to minimise the cost, arising from production of an unsold product.

- Putting 'minimum amount of order' criteria: Sometimes, some retailers may want very small amounts of different products at the same time. These small

amounts may pose a problem for suppliers, especially when these retailers have a design change requests because suppliers generally have big orders in their production lines. Making the necessary changes for very small amount is costly and supplier companies do not earn any profit from this. Therefore, they give retailers a minimum order amount. For example, if retailers order at least 1000 meters of fabric, they accept the job. In this way, suppliers do not have to deal with unnecessary and costly design changes.

- Persuading customers to work with different options: Supplier companies generally try to persuade retailers to work with their options such as their qualities and colours because this reduces costs. Since suppliers have specialised in producing their own fabrics/threads, they know how to handle design changes of the products they get used to work with. Therefore, they can make any design change proficiently, causing less time-loss and costs.

7.2.3. Strategies to minimise the impact of product design changes on lead-time

- Moving on without customer approval: Most of the design changes create delays and suppliers can expire the lead-time. In this kind of situation, suppliers deliver the order if they believe that the design change is perfectly done. With this strategy, both sides don't lose any more time. However, suppliers take a great responsibility of trust by giving strategic decisions about the fabric, colour, pattern, quality, and knitting.

- Trusting their own quality control system: Sometimes suppliers might have to trust their own quality control instead of international quality test centres. If suppliers pass over the lead-time and if the products pass their own tests, they don't wait for the results of other test centres and immediately start to load the order to trucks and send it to retailers. All these strategies are risky for suppliers because if there is even a little defect in the product, retailers can reject the product, send it back, or ask for a discount or refund.

- Adopting new technologies: Adapting the facilities to new technologies is another strategy to prevent time-loss resulting from design change requests. For example, digital print is a newly emerging technology. Using digital print technology makes the process faster, which allows the supplier to be more responsive to design changes. Also, using digital print, especially while preparing samples, minimises (i.e. sets to zero) the moulding cost, since samples are created in a digital platform. However, adapting new technologies is costly for supplier companies, since having the necessary equipment and education for these technologies is quite expensive.

- Controlling the external and internal communication firmly: Suppliers control the internal and external communication firmly to realise design changes early and implement the changes in the early stage of production. For this purpose, they develop a report system inside their companies allowing the managers to know what is going on in the production department. In this way, they can be more responsive to design changes, and they can change the product design without any delay in lead-time. To ensure the external communication suppliers follow the strategy of informing. According to this strategy, the earlier you inform retailers, the less stress you cause, and the more professional you act. Retailers can take precautions and show less reaction to any problem. It is also easier to compromise with retailers about any conflict.

- Adding extra 2-3 days to regular lead-time: One strategy to catch lead-time is to add an extra 2-3 days to the regular lead-time in case of any misfortune. In this way, suppliers can meet design change requirements without any delay in lead-time. This strategy works well with the retailers who are very strict about lead-times.

- Stocking up the most wanted and needed products: Suppliers stock the materials they need the most. For example, yarn suppliers prepare specific numbers of threads without colour and stock them to use in production. When retailers make a change in design, it won't be as much of a problem since they already have the base threads (greige yarn) on hand. In this way, suppliers do

not lose any time for waiting the base threads; they immediately start to work on new product design.

- *Making a colour priority plan*: Another strategy is to make a colour priority plan with retailers. According to this colour priority plan, suppliers make the products that are used the most ready. In case of any design change, suppliers send the stocked products in the first place. Until those products are delivered to retailers, suppliers take care of any product design change. For example, black colour is used extensively in both summer and winter collections. Therefore, suppliers make the black colour ready and stock it for retailers. Suppliers can work faster in this way even if a design change happens.

- *Keeping employees for extra hours*: Another strategy is to keep employees for extra hours to make the design change without any delay. In this way, when there is a change in product design, suppliers make the necessary changes quickly, without causing any delay in lead-time. However, this strategy may result in motivation loss, stressful work environment, and accordingly, product defects related to the labourers' distractibility.

- *Offering alternative carrier types*: Suppliers offer alternative carrier types if they are going to be late in lead-time. They send the order by plane in order to make the delivery on time. This can help them gain or retain a customer.

- *Giving priority to the export department*: Supplier companies give the priority to export departments, since they don't have any flexibility. Since the global retailers are very strict about lead-times, suppliers have to supply, dye, weave, finish, and deliver the order in the lead-time given by these retailers. This strategy works well to retain or gain global retailers, which are the most profitable ones. Therefore, giving the priority to the export department helps the supplier avoid time-loss, increase responsiveness, and ensure retailer satisfaction for the important retailers.

7.2.4. Strategies to minimise the impact of product design changes on quality

- Working in shifts: Some supplier companies prefer working in shifts. In this way, they don't have any problems such as working extra hours. This also helps to decrease the number of mistakes and errors caused by employees and the machines they oversee. This strategy also prevents employees from motivation loss and working in a stressful environment.

- Regular quality meetings: Supplier companies hold quality meetings regularly, mostly every six months. In those meetings, they discuss situations such as how many times they have design change request, how many times they have taken a product back, and why and how many times they gave discounts. They discuss each of these questions and investigate the reasons. This strategy helps them find solutions for the design change problems and move on.

- Regular performance meetings: Supplier companies also hold performance meetings to analyse any performance loss. They ask themselves why performance was lower so that they can find out the reasons and come up with solutions. These meetings help suppliers investigate if the reason for design change requests is because of them or the customers. Then they create their plan according to this investigation to lower the number of design change requests.

8. DISCUSSION

This research sought to establish how product design is affected by fast changing trends in the fashion industry and what impact these changes have on suppliers and their performance across international borders. In summary, this case study of one of the largest retailers in the UK, and a sample of its international suppliers, suggests that the change in the culture of fashion has affected the requirements for retailers who demand more frequent product design changes. This has had direct effects on the suppliers that operate across regional, national and international borders.

In the discussion section, categorisation of the data was based on the positive and negative impacts of product design changes. Since this is the broadest category that can be made in the dataset, it will be easier to discuss all the effects. The negative impacts are examined in two parts: internal and external. In the 'internal impacts' section, the categories are taken from Category 3 (the departments most affected by product design changes), which can be found in the 'Data Analysis' chapter. Since all the other categories are represented in this category, the section about the negative impacts is explored through using the departmental impacts of product design changes. In the 'external impacts' part, the impacts that are external to the supplier companies are examined.

In the first section, some of these impacts that positively affect the suppliers will be discussed. In the second section, the adverse effects of product design changes will be discussed. The adverse effects will be examined in two parts. The first part concerns the negative impacts that enact internally, within supplier organisations, across related departments. The second part analyses the external impacts, including the other challenges that stay out of the supplier company. The internal and external impacts are now elaborated on in finer detail.

8.1. Positive Impacts

According to this research, changes in products' design rarely have positive impacts on the supplier companies. Most of the impacts are negative

and hurt the suppliers. Positive impacts include keeping diversity in the product lines, which results in taking new orders because of changes in design. As seen in the previous literature, design helps differentiate products (Veryzer and Borja de Mozota, 2005; Van Echtelt et al., 2008); this differentiation of products helps retailer companies maintain a strong position in the fashion market (Lin and Zhou, 2011; Menguc et al., 2013). This diversity in the product lines within the retailer company, and between the retailer companies, results in different products being manufactured. This research also confirms that, for suppliers, this means taking more product orders, which results in an increase in profit. Profit increase gives suppliers the opportunity to grow (Kuo et al., 2012). Suppliers can upgrade their production facilities and access new production technologies thanks to the increase in the profit coming from more product orders.

Any requirement about design changes can oblige suppliers to be more responsive. According to the results of this research, suppliers make a great effort to respond their customers' requests, and this high responsiveness level establishes a strong bond with customers, and builds trust (Bruce and Daly, 2006) and commitment (Mukherji and Francis, 2007) between the suppliers and their customers. Suppliers participating in this research explain that this high responsiveness level resulting from design change requests mostly results in follow-up orders (Thomas et al., 2004) and continuance of the orders (Hartley et al. 1997). For retailers, this high responsiveness level of suppliers means successful products and increased financial performance (Ellram and Stanley, 2008; Christopher et al., 2012).

However, not every supplier can meet the responsiveness level that retailers require. This can result in changes in suppliers. According to the results of this research, suppliers are very nervous about losing their customers because of an insufficient level of responsiveness. When retailers cannot find the required level of responsiveness, they may prefer to work with another supplier which has a higher level of responsiveness. Therefore, suppliers push their limits to stay responsive at the highest level. This research reveals that this pushing creates tension inside the supplier company such as product-related quality problems, labour-related quality problems, lead-time problems, delivery

problems, problems with retailer relations, and problems in terms of labour relations. These negative effects of product design changes as divided into the departments will be examined in detail in the following sections.

8.2. Negative Impacts

The research results about the impacts of product design changes on suppliers are mostly negative. In this part, the internal and external negative impacts will be discussed in detail.

8.2.1. Internal Impacts

From the suppliers' point of view, a requirement to change a design leads to challenges across the organisation from the shop floor to the boardroom. This research reveals that supplier companies have negative effects throughout the company when experiencing design change requirements. Contrary to previous research, this research takes the suppliers' perspective when examining the impacts of product design changes and scrutinises each department under the requirements of product design changes. The most notable departments mentioned include design, purchasing, production (for example colouring and pressing), sales, and delivery. Tensions experienced in each department are now discussed.

8.2.1.1. Design department challenges

Whilst design in and of itself is a creative process (Jerrard et al., 2008), continuous changes to designs stimulated externally has led designers to suggest that they felt pressured to be creative continuously. The associated anxiety surrounding their feeling of having to be creative all of the time puts a great burden on designers, and this has reportedly led to a loss of motivation. This impact may not be visible to the external retailer, but it is a direct result of the external demands and a removal of autonomy from the suppliers. This was

also reported surrounding mismatching attitudes and considerations for design between the designers and design department and the external retailer. Whilst communication is undoubtedly a contributor to this issue as previously reported (Handfield and McCormack, 2005; Khan and Creazza, 2009) it is probably only a part of the problem given the anxiety around the issue of continuous creativity.

As Baiman et al. previously reported (2001), changes might be desired by a customer but not feasibly enacted. The retailer's lack of knowledge, design logic, and experience in the textile industry lead to conflicts between the retailer and supplier that add pressure to an already demanding and lean design and production cycle. Design for manufacturing (Yim and Rosen, 2008) and cooperation across and within organisations within the design and production departments may help overcome these problems. These types of collaborative solutions have been demonstrated to provide a solution in other industries and should be applied here (Clark and Fujimoto, 1991; Benghozi et al., 2000; Sharifi and Pawar, 2002) to reduce tension and potentially gain an advantage in cost, quality and lead-time.

8.2.1.2. Purchasing department challenges

When facing a quick turnaround on design change demand, suppliers inevitably face shortages of materials that were not previously anticipated, especially the key components (Lin and Zhou, 2011; Baiman et al., 2001; Sharifi et al., 2013; Perks et al., 2005). This issue is borne out of designs not being appropriate for all types of fabric, leading to an internal requirement to change and re-organise the materials, catalysing the shortage of key components. In turn the change in material and sequential demand for the rapid production of new materials leads to additional production costs, production downtime and delays in lead-time.

This research confirms that product design led to the lack of material in the supplier's context, which was also present in previous research (e.g., Perks et al., 2005; Lin and Zhou, 2011; Christopher et al., 2012). However, these studies assess the outcome of this situation for the retailer. They suggest that shortage of materials as a result of a design change can create trouble for

retailers, such as reduced supply chain performance. However, this research takes the suppliers' perspective and questions how suppliers have a shortage of materials and what happens after the material shortage.

This research reveals that shortage of materials is a problem that is mostly caused by retailers. Due to product design change requirements that are untimely and hard to meet in a short time span, suppliers can experience shortage of materials, especially key components. Since key materials are used for most of the orders, suppliers may arrange the materials on hand according to each customer. However, in any case of product design change, suppliers may be in need of more key materials to make the required design change, which may cause tension throughout the supplier companies. Suppliers can experience a decrease in their responsiveness level, which is a main performance criterion for retailers evaluating suppliers. Because of increase in the production time of the required design, suppliers may experience increased labour and production cost, increased labour-related quality mistakes, increased product quality problems, and delayed delivery. All these tensions can be experienced due to shortage of materials caused by a product design change.

8.2.1.3. Production department challenges

Design change requirements may affect the cycle of production since it may cause repetition of the production processes such as colouring, pressing, and quality control, which result in additional costs and material waste. All of these problems can lower the production performance of the supplier company (Khan et al., 2012) frustrating the retailer who will attempt to apply consistent pressure to their suppliers.

Previous research presents that product design changes may cause suppliers have unstable production plans (Christopher et al., 2012; Lin and Zhou, 2011). This research adds to this result and stresses further impacts of product design changes on the suppliers' production department. In addition, this research provides a deep insight into the underlying reasons of this impact and explains how and why this impact is generated in consequence of design

change. This study suggests that design change requirements may cause several tensions in supplier companies. Untimely design change requirements may leave suppliers with a short amount of time for re-production of the required design. This would be hard to manage since suppliers already have an on-going established production process for the other customer orders. This situation can cause unstable production plans. This research also reveals that suppliers are not able to make design changes on time in any case of untimely design change requirement since they mostly experience time loss in the production process while arranging existing production of other customer orders. This also causes decreased production due to missing orders since suppliers have to deal with required design changes and other existing orders. Because of this tight schedule, workers tend to make more production and quality mistakes due to working overtime and through loss of motivation. This results in defects in production of the ordered product.

Consequently, this research provides a deeper insight into the impacts of product design changes on suppliers' production departments and adds to previous findings, revealing the production process under the requirement of design changes in detail.

8.2.1.4. Delivery challenges

Unfortunately, changes in product design frequently result in an extension for delivery time, since the design change process takes more time than the normal lead-time due to the additional set-up and change in production as detailed above. Thus, suppliers are obliged to use different delivery companies than the ones they normally work with. For example, if shipping is assigned to take place every 14 days, delays may require additional delivery schedules that incur extra costs, exceed contractually agreed lead-times, and require changes to the mode of delivery.

The competitive environment in the fashion industry apparently gives retailers a perceived license to put pressure on suppliers (Newman and Cullen, 2002; Hogarth- Scott, 2015). Suppliers are often forced to meet retailers' extremely demanding design requirements because suppliers' major concern is

failing and thus losing their customers. Because of this fear, smaller supplier companies are either unable or unwilling to invest in marketing, design and innovative activities (Carson, 1985).

Small supplier companies may have limited confidence to implement new systems to meet and be more responsive to retailers' requirements.

8.2.2. External impacts

This study comes to the forefront due to bringing a new perspective in regard to the relationship between product design changes and suppliers. While examining each department of supplier companies in detail, this research also scrutinises the external impacts of product design changes on suppliers.

Design change requirements have several impacts that are external to the supplier company. Rapid design changes affect the relationship between buyer and supplier, and suppliers' ability to be responsive. It also has ethical, employment and environmental impacts. These challenges will be explained in detail in this section.

8.2.2.1. Power Challenges

The impact on the relationship between retailer and supplier is the main implication of rapid product design change requirements. Throughout the literature, it is consistently mentioned that an effective relationship between supplier and retailer results in benefits to both sides (Wong, 1999; Dossenbach, 1999; Bowen, 2000; Harland, 1996; Lamming, 1996; Bidault and Cummings, 1994; Valsamakis and Groves, 1996). However, the findings in this study suggest that the relationship is not equal and is perceived, at least by the suppliers, to be mostly beneficial to the retailer. Suppliers who participate in this research have limited ability to enact power over their relationship with retailers. This research reveals that one of the suppliers' biggest concerns is losing a customer and missing a chance to take a repeat order. Therefore, they do their best to meet retailers' design change requirements, even though they face many challenges internally. Retailers can easily change the supplier and work

with other global suppliers, which are always ready to take orders. This situation puts a great deal of pressure on supplier companies and gives them limited power.

Through globalization, retailers have had the chance to achieve great profits through low cost and flexible labour forces, reduced purchase prices, and the relationship between retailer and supplier shifting away from partnerships (Jones, 2000). Under these circumstances, the major retail companies have the power to 'make or break' the success of smaller suppliers in particular (Werner and Stengg, 2001). It seems that this situation has not changed as a result of the fast fashion changes in the fashion industry. Rather, strong networks of global suppliers have enabled the success of the demand for continuous changes to designs, which has further strengthened the retailer's position to demand rapid changes from suppliers.

8.2.2.2. Challenges of Being Responsive

Quick changes in product design are a result of the desire to offer the newest trend to the customers (Christopher et al., 2004). These rapid product design changes cause projects to have shorter life cycles in the fast fashion industry, which requires shorter lead-times, faster inventory turnover and high order fulfilment rates (Barnes and Lea-Greenwood, 2006). In these difficult conditions within the industry, suppliers have to be responsive at a high level, whilst also being efficient while working with low costs. Those constant changes in the products' design require more than a high level of responsiveness. As mentioned above, those suppliers that are not able to be responsive enough face many risks, such as losing a customer, missing repeat orders, and gaining a reputation for not being responsive. This research reveals that suppliers experience great tension while trying to meet customer requirements due to some internal but mainly external problems.

Retailers create supply chain strategies like just-in-time sourcing (Bruce et al., 2004) and quick response systems (Fernie and Azuma, 2004; MacCarthy and Jayarathne, 2010) to get the highest level of responsiveness. However, this research suggests that these strategies work when there is a repeat order with

no design change requirement. Thus, in this research, it is revealed that design change requirements have a huge impact on the responsiveness level of suppliers.

This research also introduces the strategies that suppliers use to avoid the impacts of product design change and to remain responsive enough. Some of these strategies include knowing retailers well, detailing the order as much as possible, having retailers' approval for each step, and sending extra samples to retailers. These strategies help suppliers know the exact need of retailers and approve this need a couple of times to minimise the chance of having design change requirements which directly affect responsiveness level. Moving on without retailers' approval, trusting their own quality control system, adding an extra couple of days to regular lead-times, stocking up on the most wanted and needed products, keeping employees on for overtime, and giving priority to the export department are other strategies suppliers use to reduce production time and lead-time. Using these strategies, suppliers quickly respond to retailers' needs and requirements.

However, in order to become more responsive, some ethical (Barnes & Lea-Greenwood, 2006), employment (De Brito et al., 2008) and environmental issues (Saicheua et al., 2012) are being ignored. Those impacts of product design changes will be examined in the next sections.

8.2.2.3. Environmental Challenges

This research reveals that another important external impact of rapid product design changes is the heavy environmental burden resulting from increased transportation mileage. Because of product design changes made more than once, suppliers have to send the sample to the buyers multiple times to get their approval. As mentioned before, suppliers try their best to meet retailers' requirements to stay responsive. However, sending samples multiple times to maintain their responsiveness level causes increased transportation mileage and, accordingly, CO₂ emissions. Also, making multiple changes to a product's design shortens the lead-time for suppliers and in order to catch the

lead-time, the orders are delivered by air, which significantly increases CO₂ emissions (Saicheua et al., 2012).

Moreover, because of repeated production stages resulting from constant changes in product design, chemicals and non-renewable natural resources that harm the environment are being used over and over (De Brito et al., 2008).

According to the general manager from Supplier Company 8, transferring to local suppliers from global sourcing can lower some of the environmental effects. In this way, CO₂ emissions lower as the transportation mileages decrease. Also, all manufacturers should consider re-cycling the clothes to reduce the harm to the environment.

8.2.2.4. Ethical and Employment Challenges

This research approves that product design change requests increase the time pressure on the production of orders and shorten lead-times in the fast fashion industry. These conditions lead to suppliers using unethical working practices in the supplier company and abusing the employees in the work place (Barnes & Lea-Greenwood, 2006).

Most of the suppliers of the fast fashion industry are located in developing countries, which already have poor working conditions. These suppliers mostly employ young and uneducated people. Since the production process in the fashion industry does not require highly skilled workers, young and poorly educated people are preferred in the production process. These people also accept work at lower wages for long working hours. The other employees working for lower wages are women and children, which are the majority of the workforce in developing countries (Viederman, 2013).

In a workplace including uneducated workers, women and children, poor treatment such as discrimination, long working hours and low wages can be practiced (Ichimura, 2011).

As was also observed in the current study, to overcome these poor working conditions in supplier companies, traditional monitoring methods such

as codes of conduct and inspections obviously fail to deliver good results (Welford and Frost, 2006; Reynolds and Bowie, 2004).

9. IMPLICATIONS

In the implication section, theoretical, knowledge and managerial implications of the study will be examined. In the theoretical implications, the researcher will explain how this research makes contributions to existing theories, and discuss possible further research related to the tensions across supplier companies. In the knowledge implications, the new perspectives and approaches to the subject are explained. In the managerial implications, practical uses of the results are defined to help practitioners make practical decisions.

9.1. Theoretical Implications

9.1.1. Understanding how design changes impact on suppliers

The fashion industry has always been a design-led industry that brings with it a great emphasis on product design, and this makes design changes to products one of the most important brand differentiators. The most interesting aspect of this research is to show how painful the process can be, and the direct effect this has on supplier companies.

The impacts of product design on supply chain processes are discussed in previous research, but the impact of any change in product design on supplier companies is not a well-studied area in the literature (Christopher et al., 2012) This research fills this gap and also contributes to the literature by taking the suppliers' perspective. This research develops a different approach toward modelling of supplier companies in case of any issues related to retailers. Recent research has focused on improving the performance and responsiveness of suppliers for the benefit of retailers (Qrunfleh and Tarafdar, 2012; Thomas, 2013; Marsillac and Roh, 2012). Since the researcher solely focuses on supplier companies, before and after stages of product design changes in supplier companies are examined in detail and all impacts on suppliers are clearly observed.

The metaphysical effects of design changes are underrepresented in the literature as well. This research brings light to this under-researched subject. One of the most well known studies investigating the relationship between product design changes and the supplier company is the research of Lin and Zhou (2011), which is used to generate the conceptual framework of this research. In their research, they revealed that product design changes have negative impacts on supplier companies, such as delivery delays, supply uncertainty, shortage of materials, repetition of processes and unstable production plans. This conceptual framework gave this research a place to start and helped the researcher to understand what to look at and where to look in the first place. Thanks to this framework, the investigation started by asking the right questions, then the researcher could lead the investigation according to the purpose of the research. Thanks to the investigation led by the conceptual framework, this study brings a wider perspective to the physical impacts of product design changes and adds to the existing theory of Lin and Zhou (2011) by investigating the metaphysical effects of product design changes, such as tensions and stress on suppliers.

Some of the studies have a purpose of designing the supply chain in the best way possible to increase the efficiency of the retailers' NPD process (e.g., Ragatz et al., 1997; Peterson et al., 2005; Roper et al., 2015). However, this thesis focuses on the behavioural (metaphysical) and structural (organizational) effects of a problem that is caused by the retailer company for the supplier company. This perspective provides a wider approach to the problems and its possible effects through the supply chain, since it focuses on improving not only the retailers' condition but also the suppliers' circumstances. This point of view can potentially change the way of operating and modelling the supply chain since more variables (physical and metaphysical) for measuring the supply chain performance and responsiveness can be included in this viewpoint.

According to Stewart et al. (1995), there are four main criteria for retailers to measure supply chain performance; delivery performance, flexibility and responsiveness, logistics costs and asset management. However, this research confirms previous findings suggesting that these performance metrics fall short of measuring supply chain performance, since supply chain performance also

depends on non-physical measures such as relationships and other behavioural issues with supply chain parties involving suppliers (e.g., Gunesakaran and Kobu, 2007). This research also supports the theory of the strong impact of supplier performance on supply chain performance (Kumar Dey et al., 2015). In this study, it is revealed that suppliers are expected to meet performance criteria such as delivery, quality, cost of the order and responsiveness. Since these are the performance measures for retailers to measure their supply chain performance, this research suggests that suppliers' performance may affect the whole supply chain performance.

This research also provides validation to the existing theories, which were built on the relationship between product design and supply chain, such as Christopher et al. (2008) and Lin and Zhou (2011). Christopher et al. (2008) suggests that there is connection between product design and the responsiveness level of the suppliers. This thesis supports this theory by revealing that any change in the product design directly affects the suppliers' responsiveness. Since product design changes create tensions and breaking points in the production process of suppliers, such as repeated production stages, unstable production plans, and tight schedules, suppliers may have decreased level of responsiveness. The results of this thesis also stand by the theory of Lin and Zhou (2011), which asserts that product design changes has a power over the quality, cost, delivery, and lead-time of the order.

9.1.2. Further research on tensions across supplier companies

The tensions resulting from changes in product design have significant impacts on supplier companies, including design development, production, planning, information, supply, delivery, and policy. The case study reported in this thesis extends the unit of analysis beyond the focal company by incorporating the suppliers across international borders and across multifunctional design teams. More research is needed to identify and study in more depth the nature, causes, and effects of these tensions, alongside their antecedents and consequences, in order to better understand how product

design changes have intangible effects both outside and inside supplier companies and potentially in other areas of the supply network.

More participants from the retail sector and supply networks may be included to enhance validity and point to opportunities to test the emergent theory. Incorporation of a wider sample from across the supply network such as global suppliers and international retailers would contribute to the theory testing research.

In this study, raw material suppliers are preferred to investigate the impacts of product design changes on supplier companies. However, the same conceptual framework can be used on different types of suppliers. In this way, it can be revealed how different parties involved in the supply chain are influenced by product design changes. When the impacts of the product design changes on each supply chain party are noticed, tensions can be precluded and the performance of the supply chain can be improved.

The same conceptual framework can be adapted for domestic suppliers as well. In this research, the impacts of product design changes on mostly international suppliers are investigated. However, domestic supplier companies can be preferred and examined in this conceptual framework. It can be instructive to see how the impacts of domestic design changes on domestic suppliers differ from the results of this research.

In addition, this research can be extended to the downstream supply chain. Since this research has been done with the upstream supply chain, a study on the downstream supply chain could reveal the effects of changes in product design on the entire supply chain.

There is also potential for further exploratory research comparing the impacts of product design changes emerging in the supplier companies from different apparel markets, for example across suppliers in Europe and the USA.

The impacts of product design changes on suppliers may also be applied to other sectors, so there is also the opportunity to understand how product design changes affect supplier companies in other consumer goods sectors.

A reverse perspective can also be brought to this conceptual framework. This study has shown how design change requests from retailers affect

suppliers. A future study could also discuss how suppliers impact retailers in terms of product design change.

9.2. Knowledge Implications

This research overall contributes significantly to existing knowledge by taking a holistic approach to the supply network, in particular supporting understanding of the upstream stages of the supply chain with the inclusion of intangible effects of product design changes, thereby filling a gap in extant knowledge. This is important, since prior research such as Khan et al.'s (2008) case study investigating the impacts of product design on supply chain risk, overlooks the importance of product design and its effects on supply chain by only focusing on physical factors, for example cost, affecting the supply chain. This research takes a more comprehensive look to investigate both metaphysical and physical impacts of product design changes on supplier companies by focusing on the tensions affecting suppliers' performance. Metaphysical effects of design changes creating tension in the supplier companies, such as different perceptions of good design between suppliers and retailers, lack of knowledge about the technological side of design, motivation, loss of employees, conflicts of design changes between employees and departments, broken relationships with retailers have been added to the literature by this research.

The research also puts into context that the performance measures adopted by recent research (Gunasekaran and Kobu, 2007; Akyuz and Erkan, 2009) are not enough to generate a complete picture. The retailers couldn't improve the suppliers' performance when they only think about superficial performance measures and metrics, since there are behavioural issues underneath the visible problems. This research suggests that the retailers should improve those behavioural conditions in order to improve supplier performance, instead of just focusing on the financial measures.

This research also adopts suppliers' perspectives to understand the underlying issues, while most other recent research into the apparel supply

chain takes the perspective of retailers (Ferdows, 2000; Christopher et al., 2006; Caro and Gallien, 2007; Khan et al., 2012). These studies aim to increase supply chain performance by improving cost, quality, delivery, lead-time and responsiveness by focusing on the physical factors. However, this thesis takes a supplier side and puts into context that suppliers' performance would be improved better by handling suppliers' internal problems such as tensions, miscommunication, motivation loss, and increased working hours. This perspective might change the retailers' point of view and they might realise that any design change request coming from them causes more problems than they realise.

This research brings deep knowledge to the literature about the underlying reasons of emerging tensions and the subsequent stages of those tensions rising in the case of a design change, as each step of the production process before and after the design changes is investigated in detail. This research also contributes knowledge by revealing how each impact of product design changes creates a chain effect in the supplier companies. As a result of this investigation, it came to light that the suppliers had to deal with the serious consequences of a situation that is seen as merely a change in design. This research puts into context that design changes have serious impacts not only in the supplier companies but also external to the supplier companies. For example, it came to light that even environmental factors and ethics are influenced by design changes.

In spite of these external and internal problems suppliers experience due to any design change requests, the relationship with the retailers (buyers) is the crucial factor suppliers attempt to maintain. The findings reveal that suppliers push their boundaries in order to keep buyers happy, and no matter how hard their situation is, they almost always try to meet their requirements. In spite of the previous research (Bidault and Cummings, 1994; Valsamakis and Groves, 1996; Wong, 1999; Bowen, 2000) suggesting that the relationship between supplier and buyer is beneficial for both sides, this research shows that the relationship between supplier and buyer benefits the buyer side more than the suppliers. With these results, this research aligns with previous studies (Key Note, 1996; Bhamra et al., 1998; Towers, 2000; Werner and Stengg, 2001) explaining that powerful fashion retailers have control over large numbers of

small manufacturing companies with limited power. This might change the perception of the supplier-retailer relationship and create a base for founding a new connection between supplier and retailer, which improves the conditions of both sides.

In addition, this research makes an important contribution to the knowledge by revealing the interactions between departments and the production flow in the supplier companies under a design change situation. Retailers might become familiar with the suppliers' production system and interactions and understand the breaking points in the supplier companies when requesting design change requirements. This understanding might strengthen the relationship between retailers and suppliers, since they could understand each other's tensions and paradoxes better.

9.3. Managerial Implications

9.3.1. Education for designers and managers surrounding implications for design changes

The tensions summarised in this thesis will help both British clothing manufacturers and their suppliers have a better understanding of how much stress product design changes may cause. This thesis will help retailers understand that any changes in the product design may cause stress due to miscommunication, motivation loss, changing work plans, increased working hours, and repetition of stages. As this reveals both the causes and effects of the product design changes in the supplier companies, retailers might become familiar with the tensions rising from design changes. The interactions between departments in the supplier companies and the production flow this research displays might help retailers understand when and where suppliers experience tensions when there is a design change requirement. Therefore, they may get to the root of the problems and overcome difficulties with ease thanks to this improved familiarity with the supplier's experience of the design change process.

This understanding also helps suppliers identify tensions caused by product design changes and find proper ways to reduce the tensions, especially when they experience great pressures caused by manufacturers changing the product design. The identified tensions and their causes and results show possible fields and directions for both suppliers and clothing manufacturers to mitigate the potential tensions when they face a possible product design change.

Moreover, this research shows that retailers are not very educated about textiles, and that they want impossible design changes from suppliers for exactly this reason. This research suggests that retailers should be careful about working with qualified employees who know the technological side of the textile industry and distinguish what is feasible and what is not feasible with each kind of textile material. This may reduce tensions between retailers and suppliers, since those retailers that know the textile manufacturing process well would not request impossible product design from suppliers.

9.3.2. Stronger relations between retailers and suppliers

This thesis will also be helpful for cloth manufacturers to motivate them to strengthen their relationship with their suppliers by finding a common solution such as co-designing, employment of qualified personnel with in-depth knowledge of the textile manufacturing process, and developing better tools for information sharing regarding the performance reducing factors.

The findings reveal that retailers do not view suppliers as important contributors in the overall supply chain process. For this reason, the relationship with suppliers is often underestimated when considering supply chain performance and responsiveness. Instead of a comprehensive evaluation, retailers make several changes about suppliers such as decreasing the number of suppliers they are working with and improving the working conditions of their strategic suppliers. However, whilst these changes can help strategic suppliers gain some benefits from this relationship, it has disadvantages for other suppliers, since small focused suppliers then have no chance to stay in the market. This performance evaluation should be addressed and empowered by better exchange of information and timelier decision-making to prevent the

relationship from deteriorating and provide better forecasting about the supply chain process.

This research has revealed the processes and delicate balances in supplier companies under a design change situation. It is documented in this research that suppliers' production processes are severely affected by the design changes and therefore there is automatically a drop in suppliers' performance. Those retailers who are aware of the sensitivity of this process can better understand suppliers. Retailers who understand the problems of suppliers and the key points suppliers are experiencing in the case of a design change requirement can find creative ways to minimise the problems and reduce tensions relating to the product design. This approach can help strengthen retailers' relationships with suppliers and increase supplier performance, which is beneficial for both sides. This strong relationship with suppliers may create a long-term relationship, which provides retailers with better financial performance and a smooth supply process (Matook et al., 2009), and provides suppliers with repeated customer purchases and stable revenue (Paparoidamis et al., 2017).

9.3.3. Stress testing using cause and effect diagram

Moreover, the identified tensions should serve as the collaboration points between departments not only in the supplier company but also in the manufacturer company. The conceptual framework and the cause and effect diagram also should serve as practical tools helping managers to identify and analyse supply chain performance in the context of product design change.

The performance criteria in previous literature (e.g., Stewart, 1995) only looked at the most recent results relating to quality, cost, delivery, and responsiveness when evaluating suppliers. Ultimately, if the quality of the product is good, if the products are delivered on time, if the product design change requirement is met immediately, in other words, if the supplier is responsive enough, retailers assume that these suppliers perform well. However, this research argues that, while assessing supply chain performance or evaluating suppliers, the process of product design changes in supplier

companies should also be taken as criteria. By the fact that the fashion industry cannot be separated from changes in product design (Payne, 2016), retailers working in this sector should also assess their suppliers' performance according to their performance in managing product design changes. The performance of the suppliers should not only be evaluated according to the last results of the physical criteria such as cost, quality, delivery, and responsiveness, but also how they manage tensions and solve problems during the product design change process. The tensions suppliers experienced while fulfilling product design change requests and how suppliers deal with those tensions provide important information about suppliers. The behaviour of suppliers during the product design change process reveals so many things about suppliers' commitment to their work and their honesty and clarity while doing their business. Avoiding these criteria while evaluating suppliers' performance would be a huge mistake for retailers since having long-term relationships based on trust, honesty and dedication produces very positive results for retailers, such as increased financial performance and trouble-free supply processes (Matook et al., 2009; Tang, 2006). If supplier performance metrics involving only physical measures are used while evaluating suppliers, retailers might miss out on those advantages. These metaphysical performance criteria can be developed using the cause and effect diagram that is displayed in this research, and can assist retailers in assessing suppliers' performance.

9.3.4. Supply chain decisions

Generally, the responses illustrate that global supply chains might come with an increased amount of environmental and regional problems due to the increased size of the supply networks. The most mentioned environmental and regional problems include a reduction in the domestic labour force and increased carbon dioxide emissions. Global supply chains might cause a decrease in the number of local employees and contribute to high unemployment levels in the region. Since global supply chains have international suppliers that have cost benefits, the domestic suppliers in the UK do not have the opportunity to improve their business. According to the results, domestic suppliers in the UK are chosen for certain conditions such as the

immediate need for a finished product. Therefore, the number of orders domestic suppliers take is limited.

The results also show that global supply chains cause more carbon dioxide emissions due to the repeated international deliveries of product samples (Saicheua et al., 2012). Making use of domestic resources, even partially, might help local workers to find employment. This approach is also helpful for increasing the level of supply chain responsiveness since it would prevent loss of time due to decreased lead-time and possibility of miscommunication. In addition, the decreased distance required for deliveries means that using domestic resources, which might lower the amount of emitted carbon dioxide.

For these reasons, retailers might design their supply chains to be more responsive to the changes in retail strategy. Instead of sticking to the cost-effective design, they need to explore if low cost production through global supply chains increases risk and risk-related costs. An investigation of global sourcing risk and location advantages might help retailers gain new perspectives when designing their supply chains.

10. CONCLUSION

10.1. Introduction

The relationship between product design changes and supply chain is a neglected issue in the literature (Khan et al., 2009; Lin and Zhou, 2011). Research investigating the relationship between product design and supply chains is limited as a result of a focus on the relationship between NPD process and supply chains, which ignores the product design stage that is the most important part of the NPD process (Khan et al., 2012). Focusing on the product design stage is important because 80% of manufacturing costs, 50% of quality issues, 50% of order lead-time, and 80% of business complexity are affected by the product design stage (Child et al., 1991). However, the existing research (e.g., Mazzola et al., 2015; Thomas, 2013; Caniato et al., 2013; Petersen et al., 2005; Primo and Amundson, 2002; Ragatz et al., 1997) is mostly interested in the relationship between the whole NPD process and supply chains. This research particularly concerns product design and explores how any change in product design has impacts on supplier companies.

Furthermore, the extant literature explores the role of product design in the new product development process to improve supply chain performance and responsiveness by viewing activity from the retailers' side (e.g., Roper et al., 2016; Marsillac and Roh, 2014; Peterson et al., 2005). As a result, there is no research that focuses solely on the process of interaction between product design changes and suppliers. This research attempts to contribute to this area by adopting a supplier side perspective to clearly understand the effects that changes in product design have on suppliers.

A conceptual framework was developed to provide a basis for the research questions. To do this, existing assumptions and principles from previous research were used. The studies of Gunasekaran and Kobu (2007), Christopher et al. (2008) and Lin and Zhou (2011) were used to create a conceptual framework and create a structure regarding the connection between product design changes, impacts on suppliers, and supplier performance. The conceptual framework was useful as it gives the researcher a place to start and helped the researcher begin the investigation with the right questions.

Case study methodology was used for this exploratory research since it is the most appropriate method to explore unexpected issues in depth (Hodkinson and Hodkinson, 2001). The unit of analysis in the case study is the retailer and a sample of its suppliers. This is a single case but within it there are multiple case organisations – the large retailer and a sample of its network of suppliers. Overall, this research has covered a considerable amount of material to analyse and evaluate impacts of product design changes on the supplier companies working for the fashion industry. In total, eight supplier companies working for the same fast-fashion retailer and 20 employees working in manufacturing and associated departments have been interviewed, together with an extensive review of literature and the contemporary industry context. After collecting the data from semi-structured interviews, alongside official documents, observations, website information and document analyses, the results of the interviews were collected in tables and figures to see the relations clearly. Following this, classification of the data, pattern matching and explanation building methods were used for data analysis. The research questions can be answered as the last step.

10.2. Research Question 1 - What impact do product design changes have on supplier companies working in the fast fashion industry?

The results reveal that after a dramatic shift from minimalist trends to embellished trends in the fashion industry, the number of design change requests increased. This rise in design change requests has had a number of impacts on suppliers and has created some problems and tensions in the supplier company. In the past, suppliers were able to ignore the problems and issues resulting from design change requests since these requests were comparatively rare. However, shifts in the fashion industry have caused an increase in design change requests, which means suppliers experience those problems and tensions in their workplace extensively, which they cannot ignore.

According to the research results, there are physical and non-physical effects that suppliers experience throughout the company. Non-physical effects

such as communication problems between the buyer and the supplier, different perceptions about product design, and a lack of textile and technology knowledge on the part of the buyer serve to create more issues during the product design change process. This in turn causes motivation loss among workers, tension among departments, and broken relationships with customers.

The results of this research show that retailers communicate with their global suppliers via telephone, e-mail and face-to-face calls. However, suppliers participating in this research state that textiles are all about touching and feeling, and that the image on the screen may not always be the same as reality. According to the research results, this remote communication style leads to great tension and problems in the fashion industry. Communication problems between buyers and suppliers cause misunderstanding of the specifications of the ordered product. Besides, communication problems can make it impossible for suppliers to understand exactly what the required change is in any product design change situation. All these misunderstandings create tensions between retailer and supplier and the possibility of damaged business relationships.

The retailer's lack of knowledge about the textile manufacturing process leads to tension between the retailer and the supplier. The fact that the buyer does not know what changes can and cannot be made on each type of material causes retailers not to understand the tensions and problems suppliers are experiencing with design change. In this case, the retailer assumes that the supplier is not responsive enough, and may decide to end their relationship. The same is true for the design of the product. The designers who participated in this research stated that each design would not fit into every textile material. Retailers who do not have enough knowledge about textiles also complain if the product design does not look as they require. Thus, while a designer thinks that a design looks very good on a certain textile material, the buyer may think that it does not look good enough on the textile, and require a change of design. Therefore, different perceptions about good design can again lead to tension in the case of a design change.

This research suggests that these metaphysical impacts of product design changes not only lead to problems between the retailer and the supplier, but also cause tension within the supplier company. For example, the retailer's

disapproval of the design and requirement of a design change creates tension between the design department and the managers in the supplier company. The designer tries to explain to managers why the design is very good and why the required design change is not possible. In this case, the manager who is forced by the retailer to change the design is torn between the buyer and the designer. This causes tension between the manager and the designers in the supplier company. In the end, the designers, thinking they are not appreciated even though they did well, lose their motivation.

A different example can be given through the production department in the supplier company. The design change that the retailer requires, when the tight schedule in the production department is taken into account, means that the employees think that it is losing time to work on the re-production of the required design change. This creates tension between the production department and the manager in the supplier company. If the same design is changed several times by the retailer, management experiences a stronger reaction from workers. With a tight production schedule, employees, spending too much time on the same work, lose their motivation. These non-physical impacts of product design changes lead to physical problems in the supplier companies.

Physical problems created by product design changes include defects in production, increased working-hours, backlog of other orders, human-related quality problems, repetition of stages, chaos in the software system, and legal acts.

In the case of design change, the loss of motivation experienced by employees causes the redesigned product, including other orders, to be defective. Employees, who have to re-produce the redesigned product, have to work overtime in order to raise the given amount, even though they already have a tight schedule. In this case, the amount of production mistakes and quality control mistakes increases. This increases labour-related mistakes, and the supplier experiences tension with the retailer again.

Moreover, suppliers repeat the production stages and the quality control stages to meet the required design change. This increases suppliers' production time for a given order, and may cause delays in delivery.

Additionally, suppliers cannot accept other orders due to the time spent on design changes. In some cases, suppliers even face losing existing orders. This causes decreased production and an unstable production plan for suppliers. In some cases, suppliers experience shortages of materials required for design changes, and the waiting period for these key materials causes unstable production plans. The waiting time for the key materials also gives suppliers less time for re-production of the re-designed product. Unstable production plans involving waiting orders, re-designed orders, and missing orders can lead to chaos with the software, and suppliers need to find time to arrange each order.

These negative effects caused by design change requirements force suppliers to take risky decisions; and this, in turn, increases the number of serious consequences. For example, the retailer may not accept the re-designed product because of delivery delays or the retailer may claim a discount for the late-delivered product. In this case, legal actions can take place between the supplier and the retailer, which is extremely time-consuming and costly for suppliers. Suppliers, who want to avoid these serious problems, try to make the required design changes by taking some risky decisions and delivering on time. Risky decisions taken by suppliers include hazardous decisions, such as delivering the product without the retailer's approval of the redesigned product, and relying on their own quality control mechanisms instead of the official quality control centres that the retailer requires. The changes made in products' design bring suppliers to the point of making these hazardous decisions and increase risky decision-making.

Besides these negative impacts that product design changes have on suppliers, there are a few positive impacts. Keeping product diversity in the product lines and taking new orders with each new product design are the positive effects suppliers have experienced due to design changes in products' design.

10.3. Research Question 2 – How do product design changes in the fast fashion industry connect to the performance of supplier companies?

According to Gunasekaran and Kobu (2007) responsiveness level, lead-time, delivery, cost, and quality are the key performance measures when evaluating suppliers. This research suggests that all the physical and non-physical tensions above are able to affect the supplier performance, since they cause increased production cost, human-related and process-related quality problems, delivery problems including delivery delay and conflict between delivery companies, shorter lead-time, and low responsiveness level due to increased customer expectations. For example, the supplier repeats the production stages and quality control stages to achieve the required design change. However, this increases the retailer's production time for a given order. Suppliers having a longer production time for the ordered product have less time for meeting the agreed lead-time. Sometimes, when suppliers have troubles about meeting lead-time due to changes in products' design, they experience delivery delays. In this situation, they may have problems with the delivery company, which is settled for the certain time period.

Moreover, re-using production equipment because of repeated production stages and making employees work overtime to meet the required design changes return as an additional cost to suppliers, which increase the production cost of the supplier. This situation also leads to an increase in process-related and human-related quality problems. Since sometimes suppliers redesign old fabric, this old fabric that is processed several times may lose quality, or the machines re-used several times may produce errors during production, and this may result in producing lower quality products. This causes process-related quality problems. Regarding human-related quality problems, the employees, most of the time workers lose motivation in the design change process because of working overtime, doing the same work for a long time, and due to the stressful environment in the workplace. Therefore, they are more likely to make mistakes while carrying out their job. This situation increases human-related quality problems.

Suppliers experiencing these problems affecting their internal and external environment have an unintentionally decreased level of responsiveness. Even if they try to be responsive enough and force themselves to meet the requirements of retailers, retailers mostly do not recognize their effort. Ultimately, these suppliers are categorised as 'not responsive enough', as they are in the process of being evaluated by retailers. In these evaluation processes, retailers may even decide not to work with these suppliers again.

These results show that the impacts of product design changes on supplier companies seriously affect the performance of the supplier companies in the fast-fashion industry. Since suppliers' cost, quality, delivery, and responsiveness level are seriously affected by product design changes, this research suggests that supplier performance is highly related to such changes of product design.

As well as answering the research questions, this research also makes important contributions to the existing literature by revealing further information in relation to product design changes. For example, the results also show that the most affected departments during product design changes are the production, delivery, design, and purchasing departments. Any change in a product's design affects the production department the most, since design changes have serious impacts on the production department such as shorter time for re-production, time-loss, defects in production, unstable production plans, increased production time, and decreased amount of production due to missing orders. The rest of the departments have problems including delivery problems, different perception of good design, limited time for being creative, and shortage of materials.

This research also reveals the strategies suppliers use to avoid design change requests and to minimise the impacts of negative effects of design changes. For example, to prevent design change requirements, suppliers follow certain strategies, such as working too fast, knowing retailers well, avoiding unreliable customers, detailing the order as much as possible, limiting the product types they produce, keeping written records, and obtaining customer

approval for each step. There are other strategies that suppliers follow to minimise the impacts of product design changes on cost, lead-time, and quality. The strategies to minimise the negative impacts on cost include using the same mould, using the same fabric, sending extra samples to retailers, including the possible cost in the price of the product, using the prepared order for another retailer, persuading customers to work with different options, giving offers, and working with 'minimum order' criteria. The strategies followed for minimising the impacts on lead-time are moving on without customer approval, trusting their own quality control system, adopting new and faster technologies, controlling the external and internal communication firmly, adding an extra two or three days to regular lead-times, stocking up the most popular products, putting together a colour priority plan, having employees work overtime, offering alternatives, and giving priority to the export department. To minimise the impacts on quality, suppliers follow strategies such as working in shifts and having regular quality and performance meetings. These strategies suppliers follow reveal how powerfully they feel the negative impacts of product design changes.

This research also finds that product design changes have environmental and ethical impacts. Any change in the product design may affect the level of transportation mileage due to the increased amount of samples sent to the retailers. This increases the level of CO₂ emissions, which pollutes the air significantly. Repeated production stages, chemicals and non-renewable resources, which are used to make the necessary changes on product design, increase air pollution as well (De Brito et al., 2008). Moreover, since product design changes increase the production time and cause employees to work overtime, global suppliers, mostly located in developing countries, use unethical working practices (Barnes & Lea-Greenwood, 2006) to meet the requirements of design changes. Long working hours with low wages end up with abused employees in the workplace.

These results also show how changes in products' design create a chain effect on supplier companies. The chain that starts with a change in product design continues with sequential problems in the supplier company, and until the retailer end the relationship with the supplier. This explains what an

important role any change in product design plays on the supplier company. This research also makes a difference with this chain effect of the product design changes created in the supplier companies, and makes a significant contribution to the literature.

The findings not only support the study of Lin and Zhou (2011) and Christopher et al. (2012), which were used for developing the conceptual framework, but also adds a remarkable contribution to their findings and consequently to the existing literature. This research is distinguished from previous research by extending the impact of product design changes, including not only physical effects but also metaphysical effects in the literature. This research also adds further physical effects of product design changes on suppliers, investigating more deeply the design change process in the supplier companies. Taking a suppliers' perspective to see more clearly the impacts of product design changes on suppliers is another difference which distinguishes this research.

10.4. Future Research

This research creates a base for future investigations and has important implications for retailer managers. Managers may understand what kind of tension design change requests create in the supplier company and try to find a mutual way to get a higher level of supplier performance. Managers can also realise their own mistakes and decide to correct them to make the design change process work more smoothly. Retailer managers may recognise they have to employ more qualified employees having extensive knowledge of not only the visual side of textiles but also its technical aspects. Employees who know the textile manufacturing process, types and specifications of textile materials may better understand whether a design change is possible and/or whether a design is good enough. This eases the design change process in supplier companies and helps maintain a healthy relationship with suppliers. Managers can eliminate the problems arising from their companies and achieve better performance from suppliers in case of any design change situation.

Future investigators can benefit from this research by including different sectors and different parties in the supply chain. Future researchers may investigate whether changes in product design have any other impacts on supplier companies. The impacts of product design changes on different supplier types, such as domestic suppliers, can be explored and compared to the existing research. Future researchers will make a great contribution to the 'product design' literature by investigating these issues.

APPENDICES:

Appendix 1: Ethical Approval Form.....	182
Appendix 2: Invitation for Supplier Companies to Participate	184
Appendix 3: Participant Information Sheet.....	185
Appendix 4: Participant Consent Statement.....	187
Appendix 5: Interview Guide and Interview Questions.....	188
Appendix 6: Example Transcript.....	190
Appendix 7: Example of Case Study Notes.....	200
Appendix 8: Example of Online Company Reports.....	201
Appendix 9: Example of Official Online Documents.....	202

Appendix 1:

ETHICAL APPROVAL FORM

To:	NIHAN OZKAN
Subject:	Ethical Application Ref: no42-843e
	<i>(Please quote this ref on all correspondence)</i>
25/11/2014 13:37:26	
School of Management	

Project Title: **Impact of rapid, continuous redesign of products on supply chain performance and strategy**

Thank you for submitting your application which has been considered.

This study has been given ethical approval, subject to any conditions quoted in the attached notes.

Any significant departure from the programme of research as outlined in the application for research ethics approval (such as changes in methodological approach, large delays in commencement of research, additional forms of data collection or major expansions in sample size) must be reported to your Departmental Research Ethics Officer.

Approval is given on the understanding that the University Research Ethics Code of Practice and other research ethics guidelines and protocols will be compiled with

[-http://www2.le.ac.uk/institution/committees/research-ethics/code-of-practice](http://www2.le.ac.uk/institution/committees/research-ethics/code-of-practice)

[-http://www.le.ac.uk/safety/](http://www.le.ac.uk/safety/)

The following is a record of correspondence notes from your application **no42-843e**. Please ensure that any proviso notes have been adhered to:

-Nov 25 2014 1:36PM In my judgement all the ethical issues associated with this study have been anticipated and taken into account in the research design. The participant information sheet, participation form and other contact arrangements documented here aim to provide full disclosure and reassurance for all those cooperating with this doctoral research project.
Prof M Saren
23-11-2014

--- END OF NOTES ---

Appendix 2:

INVITATION FOR SUPPLIER COMPANIES TO PARTICIPATE

Dear Company XXX,

Subject: Impact of rapid, continuous redesign of products on supply chain performance and strategy

I am a research student at the University of Leicester who conducts independent research in relation to how rapid redesigning process of existing products in fashion industry affects supply chain performance and overall supply chain strategy and I would like your company to take part.

The research will be conducted across the East Midlands incorporating the cities and counties of Derby, Derbyshire, Leicester, Leicestershire, Loughborough, Nottingham and Nottinghamshire. To see changes in the supply chain performance, secondary data in the company archives will be used. Interviews managers and the other decision makers in the supply chains will take place to understand what decisions they will be making in the redesigning process in relation to supply chain performance metrics. Field visits to the companies' supply chain departments at the beginning, during and the end of each redesigning process will also be performed. The researcher will take notes and make observation about the decisions and changes in the redesigning processes.

Interviews should last about one hour and will be held three times during each redesign process at a time and location convenient to you. All findings will be published in the researcher's thesis and made available to all participating companies directly, and will help to improve the redesigning process in the fashion sector. The results of this research might be used in academic conferences, journals, media interviews, academic blogs.

Please could you reply to let me know if you are happy for me to get in touch with your company?

I hope that you will be able to participate in this research project.

Further information regarding this research is attached to this email. This includes an information sheet with further details. If you have any questions, please do not hesitate to get in touch.

Kind regards,

XXX XXX

Appendix 3:

PARTICIPANT INFORMATION SHEET

Project: Impact of rapid, continuous redesign of products on supply chain performance and strategy

Contact Address: Postgraduate Researcher Nihan Ozkan

School of Management, University of Leicester

University of Road, Leicester, LE1 7RJ

Contact: 07599423984, no42@le.ac.uk

Background information:

The project seeks to understand the following issues:

- What impacts does redesigning process have on supply chain performance in relation to cost, quality and transportation metrics?
- How does redesigning the existing products affect companies' supply chain strategies?

The focus of the research will be telling the barriers that companies face during continuous redesigning process. These barriers include network limitations, fairness of value and cost distribution, ability of responsiveness, changing market circumstances, constant changes of demand forecast, and integration of the entire process. When these challenges of product design are troubleshoot, companies can reduce the number of problems over the lifetime of the process and have a positive impact on all business performance indicators; from turnover and profit to market share and competitiveness.

The data we collect will be used to provide essential information to companies that want to redesign their products for their supply chain performance. This research also offers companies a concrete insight to foresee how their supply chain strategy will be affected by redesign process.

Procedures and protection:

Participation in this study is entirely voluntary. It will involve an interview of approximately one hour in length to take place by arrangement. The researcher will initially contact you by email or telephone.

You may decide not to answer any of the interview questions if you wish. You may also decide to withdraw from this study at any time by advising the researcher interviewing you or by emailing no42@leicester.ac.uk or using the contact detail at the end of this document. If you notify me of your withdrawal, all identifiable data will be destroyed. Once data has been anonymised it will be impossible to identify the origin and cannot be destroyed.

The researcher may ask for clarification of issues raised in the interview some time after it has taken place, but you will not be obliged in any way to clarify or participate further.

The information you provide is confidential, except that with your permission anonymised quotes may be used. If you request confidentiality, beyond anonymised quotes, information you provide will be treated only as a source of background information, alongside literature-based research and interviews with others.

Your name or any other personal identifying information such as your position/job role in the department/company will not appear in any publications resulting from this study; neither will there be anything to identify your place of work. Anonymity will be provided by changing not only the names of the participants and work places but also the personal identifying information such as the position/job role of the participants.

Interviewee data and archival data will be kept in secure manners during and after the research in accordance with the University of Leicester procedure regarding confidentiality.

The information gained from this research will only be used for the academic objectives, which are my thesis and the subsequent publications such as academic conferences, journals, media interviews and academic blogs. It will not be used for any other purpose and will not be recorded in excess of what is required for the research.

Even though the study findings will be published in international conferences and journals, only the researcher will have access to the interview data itself. There are no known or anticipated risks to you as a participant in this study.

If you have any questions about the ethical conduct of this research, please contact Dr. Andrea Davies, the School of Management ethics officer: ajd42@le.ac.uk.

Thank you very much for participating.

Appendix 4:

PARTICIPANT CONSENT STATEMENT

Thank you for agreeing to participate in this study. Before we carry out the research, I would like you to read the following statements and confirm your agreement to take part in this study.

Please tick
to confirm

I confirm that I have read and understand the Participant Consent Form ☐

All the questions that I have about the research have been satisfactorily answered ☐

I give my consent to the recording and transcription of the interviews by the researcher. ☐

I give my consent to the using of the anonymised verbatim quotes by the researcher ☐

I understand that my participation is voluntary and that I am free to withdraw from the study at any time, without giving reason. ☐

I understand that the results of this research will be used for the purpose of the thesis and of the subsequent publications and presentations such as academic journals, conferences, media interviews and academic blogs. ☐

I agree to participate.

Participant's Signature:

Participant's name (please print):

Please write your email address below if you would like to receive a summary of the results of this study (no personal results) by email

E-mail:

Date:

If you have any questions, let me know so I can bring necessary documents to make it clear.

Appendix 5:

INTERVIEW GUIDE & INTERVIEW QUESTIONS

Impacts of Continuous Changes of Products' Design on Supply Chain Performance and Strategy

Research Questions:

1. What impacts of redesigning a product has on supply chain performance regarding cost, quality and transportation?
2. How these changes in supply chain performance affect companies' supply chain strategy?

Interview Protocol:

1. Introduction to the Project

- Researcher introduces the project
- Researcher asks interviewee to:
 - Introduce themselves,
 - Talk about their background
 - Discuss how their job role relates to the organization – where do they fit in the organization?

2. Questions about the normal supply chain process:

1. Please describe your department's business function.
2. How does your department operate normally?
3. Do product design changes affect the operation process of your department?
4. Do you have any challenges related to design changes?
 - If yes, what are the most serious impacts of design changes in terms of the challenges you identify? Could you give examples?

3. Questions about the rapid design changes:

5. What is the most required change in product design? Could you give examples?

6. How often is there a change in design to products?

7. What do you think of the number of product design changes ten years ago? In today's fashion market, is the number of product design changes more or fewer than before?

8. How do these design change requests affect your department's performance?

9. How does your department communicate and collaborate with other related departments/partners such as design team and suppliers/retailers during the process of design change?

10. How does your department handle the challenges of design changes?

4. Questions about supply chain strategy:

11. Do you ever consider the supply chain as part of your role? If so, how?

12. Do strategic decisions impact your role? If so, how?

13. Do you contribute to strategic decisions? If so, how?

14. What kind of strategic decisions are being applied during product design changes?

15. How is company's supply chain strategy affected by these continuous changes?

5. Closing questions

16. If following my analysis, I think of another question, is it ok for me to get in touch with you via telephone or email?

17. Do you have any other interviewees who may help me by accepting an interview with me?

18. Would you like to be kept informed of research findings?

Appendix 6:

EXAMPLE TRANSCRIPT

SUPPLIER COMPANY 4 (EXPORT-IMPORT MANAGER)

Could you tell me about your job?

We produce thread for especially big firms. Threads have two types; first one is classic, second one is fancy. Fancies consist of the mixture of different threads. Polyamide and acrylic are the unnatural threads. Wool and cotton are natural threads. Classic threads consist of cotton, cotton-acrylic that have specific percentage. Threads have numbers such as 3, 5, 7, 10, 12 and 14. These are all same all over the world. They have to be produced according to what customer wants and equipment customers have. We export 70% of the threads, mainly to England, and sell the rest in the national market.

What does an export manager do?

Nice question. First of all, he is in contact with customers. He notes what customers need and want, he informs the appropriate departments in the company, he follows the production of the order until the order is delivered to the customer. Some part of this job is not in my job definition, however I have to follow the order. For example, quality control is not my job but I have to know the results and if the order is okay or not to be delivered. As an export manager, you have to know all levels of the work. You cannot sell a product without knowing what stages it goes through. I even follow the payment side of the work.

But you have a finance department right?

Yes, sure. But the finance department has to inform me about the payments. I take the order, send it to production, take it from production for delivery with a certain amount, arrange the delivery, quote a price and after quoting we pass the work to the finance department. Finance department takes care of cash flow, the cost of production, etc.

Ok. You have lead-times for your customers, right?

Sure. We have to work with lead-time because the customer we work with is also giving a lead-time to its own customer. It is like a chain. I give 2-3-4 weeks, according to the type of the thread, to my customer to deliver the order. If I exceed the lead-time, it would increase my problems such as fine (if you exceed lead-time for 2 days, you are fined %2, if you exceed for 3 days. You are fined %3). So we always add up +2 day to our lead-time. You have to estimate every small thing like machine malfunction and delivery problems. You have to inform your customer and use those 2 days for this kind of troubles. Because of lead-times, I have missed lots of orders, especially from England because England is such a different market. It is not like the rest of Europa. It is so different with their life style and work ethic. You have to be direct and clear. They have no tolerance. They only accept those +2 days according to our agreement; otherwise they don't accept the order.

What about design change requirements? Do you have much of them?

Yes. I will tell what happened last time. One of my customers gave me the order and we went through production. There are lots of production stages in thread business. Preparing the thread, preparing the colours, colouring the thread, drying the dyed thread, taking the thread for packaging and packaging... In the stage of preparing the thread, the customer called me and said that his own customer changed the colour. He said that he informed me immediately. I had to stop the production. But I was in the preparation stage so I was lucky enough I didn't have to stop the thread preparation. If I was in the colouring stage, it was nearly impossible for me to stop that stage. I had to charge the customer for changing the colour. We face this kind of situation many times.

Do you charge your customer for the product you have already produced?

Yes, we do. Let's say I coloured 1 ton of product if customer says me I don't want this colour while I am in this stage, I have to charge him for the produced order. I have those rights in the agreement. Before, we used to use fax machine to communicate; now we are using e-mail. So it is easy to prove what we were talking. Our customers are also aware of their responsibilities and rights. If it is my fault I pay, if it is theirs they pay.

How does this situation affect the performance?

If a change occurs in the order, it affects my performance very bad. For example, the customer wants 30-numbered thread and I started production. After starting the production, if the customer changes the number from 30 to 20, it crashed me out. The customer stays totally okay in this kind of situation but I have to give an emergency alarm in the company.

How about cost? You said I charge the customer for any change but is there any other cost in design change requirements?

The customer and we treat each other in utmost good faith. If I am able to use the product I have already produced for some other orders and if I am in a good relationship with the customer, I never charge the customer for it. Under normal conditions, I have to charge the customer because you are in the production stage and you are going to change all your production plans and all your costs will be affected. But since we are trying to satisfy our customer and keep it for the future we are doing this kind of moves. (But they definitely charge us no matter what if we are guilty. We have to accept that because it is our fault.) But it definitely affects my production efficiency. It lowers my production. Taking the product back from the machines and open a new production takes time and losing time means cost. I have to spend my 5 hours for the preparation of new production. What happens to my 5-hour production? If I produce 100 tons of thread in a month, that situation decreases my production by %2-3. I am talking about just one change situation. If you think that we are living many of design change situation such as another colour changes, number changes, both colour change and number change, it decreases my production to up to %20 because preparation of the thread is not that easy. Preparation, putting the thread on the machines, production, drying, taking the thread back from the machines... It takes lots of time, which means cost.

How many days approximately does the production of thread take?

It is changeable. Thread consists of numbers and compositions. Composition means ratios and these ratios are changeable. We have 2 types of thread, fancy and classic. Fancy threads take 1 week to be ready. Classic threads, let's say 100% cotton, take 2 days. But we give 1-week minimum. We have to

prepare the thread in one week. After one week, we have to pass to production stage.

Is there any difference between summer and winter orders?

Yes, exactly. For the thread producers, summer and winter is total opposite. In summer, we produce threads for winter. In winter, we produce threads for summer. As you know, we work in winter to be ready for summer and vice versa. Now, we are working for winter, it means fancy threads mostly. In winter, we produce classic threads, which is more appropriate for summer. Classic threads are 100% cotton, cotton acrylic, cotton viscose, cotton wool, linen, etc.

Are classic thread orders more than fancy thread orders?

Exactly opposite... Fancy threads are ordered more than classic orders. In our company, we produce 70% fancy threads.

Why?

It is low in volume but high in added value. We measure orders with their added value. We are still working with classic threads even though we are in summer because some of our customers export to a country that is in a reverse season. They are high in volume but low in added value.

Could you explain me added value?

Think about 2 products, one for summer and other one for winter. Summer one cost 1 TL; winter one is 10TL. Everybody can produce the summer one but only some people can produce the winter one. It means winter one has more added value than the summer one.

Does summer time have more design change requirements than wintertime has?

Yes. We have extremely more design change requirements in summer clothes because of trends. In winter, people want to wear thick clothes to stay warm. If it is slightly fashionable, it is acceptable for people. In summer clothes, you are working with very thin fabrics and it shows flaws. For example, the colour red shows even the littlest flaws. In summers, we use flashy colours like red. The colour red is the most fearful colour for us.

Then can we say that your productivity lowers in summer term?

Yes. Since volume is large, productivity is low.

Does this affect your cost?

The most important thing is to detail the order, then start production. If you skip a little detail you can achieve very different results. This the biggest risk in textile. For example, if you write down NM20-2 instead of NE20-2 for the thread code, your whole order will be useless and this mistake is made a lot. That's why we need educated textile workers. There are educated engineers but there are no educated workers around. There should be technical high schools for this. We are trying to educate the workers here but you can do this to a certain levels. Additionally, after educating a worker, he/she can move to another company for better salary since he/she is educated now.

How about the delivery/transportation side?

We have 3 types of carrier and 2 types of lead-time. First lead-time is the one you give to the customer; second lead-time is the one you give to your own production department. Lead-time you give to the customer should include the delivery time. We have 3 types of delivery: freight, shipping, and air... We have the power of using all these three according to urgency of the situation. For example, my customer can say that he has 1-ton order but he needs 100 kg of them as soon as possible since he has to adjust the machines to start production. Then I am using airway but I am charging my customer for this because it is too expensive. Since my lead-time generally includes freight delivery not airway, I have to charge them. Sometimes, my customers can say that he wants a freight delivery. Than we deliver the order by freight.

Do the design change requirements affect the delivery?

Yes. For example, you got 5-ton cotton order with the number NM50. I start to produce the thread here; I keep it in my storage, then I am waiting for the colour. I don't give any lead-time until he gives me okay about the colour. After he approves the colour, I am giving him 3 weeks, for example, because sometimes he gives me the colour after 2 weeks. Then, I have to work on this colour in the laboratory for 3-4 days. I am preparing 3-4 samples and send

these samples to my customer with DHL, TNT, etc. If he gives me okay, then I give my lead-time and my lead-time starts. For example, one of my customers gave me small orders with 80 different colours. I gave the lead-time as 4 weeks. He said that's too much. But you gave me 80 colours and small batches. You lower my production; you lower my dye capacity. I have to keep each different colour separated after dying them. All these issues increase my lead-time. He said okay and today I am delivering those threads.

Then we can say it affects the transportation side?

Definitely. In the textile business, transportation is quite important. We have lots of delivery jobs. I prepared the order here, load it to the truck, it will be in Istanbul after 2 days to enter the harbour. Tomorrow, ship will start to move and after 10 days it will be in the destination point. Transportation side takes 2 weeks in our business. Also if you send the order earlier, then you can have the repeat order earlier, which is good for us. If you send the order late, you have a chance not having a repeat order. So lead-time is the biggest problem for us. Europe and England want real fast lead-times. But we have advantages comparing to other markets. Our logistic is really good. We are very close to England and Europe. When my customer in England gives me an order, I can send it to him after just 10 days. The order will be in his storage in 2-2.5 weeks. However, if you think the same customer gives his order to somewhere in Asia, he even cannot have it in 45 days, because only shipping takes 45 days.

Besides, there will be a quality problem too.

Exactly. Turkey is at the really high level in textile. Now, we really don't have any problem with Europa about the quality. The very problem right now, beside the price, lead-times. They want really really short lead-times. You have to keep stock up. If not, you cannot have order.

How and what do you stock up?

You are preparing certain materials, colouring them and keep them in your storage. For example, the most wanted thread colours are black, red, beige, dark blue. There are 10 international colours. In these colours, boldness or paleness is not important at all. For example, black is the very first colour you

can stock up. However, you cannot stock the colour yellow up, because it never is used often. So there are standard colours and when your customer wants one of those colours you immediately send it without any waiting time. Red is also one of those standard colours. Red is also a very painstaking colour since even the littlest fly can show itself casing a flaw. We have to be very careful about the red colour in the production stage. For example, when the manufacturer starts knitting with the red coloured thread, he saw those flaws and immediately stops the production to put the knitted piece of cloth away. At the end of the production stage, he weighs all the flawed clothes and charges the supplier for those flawed clothes. In the black colour, it doesn't matter how much fly clings on to thread; it never shows itself. In fancy threads, it is the same; no fly shows itself. So we are very careful about the red colour.

How frequent do these design change requirements happen?

1 out of 10 order... There are colour and design changes. For example, a store sees and likes a design and decides the colours and the model, then suddenly decides to change the model because it sees another design in another store and realise that it has nothing like that. It of course will affect my production. However, the most important point here is the time of the production when there is a design change requirement. If a design change requirement comes after I prepared the order, this is a production loss for me. Can I meet all those expenses or can my customer meet the expenses? This depends on your relationship. You must lose a fly to catch a trout. This proverb is valid all around world. If I have really strong relationship with my customer, if I am waiting his repeat orders and if I coloured 250-500 kg thread with a wrong colour, I wouldn't charge my customer for this.

Apart from colour changes, is there any thread change requirement?

Yes, the colour change requirements are always more than thread change requirements. Why, because the thread type that their machine works with is obvious. So thread change requirements are not too many. Last year, one of my customers wanted a thread change. I was able to use those threads for another order so I accepted it. But I wouldn't accept it if there was no place to use it. I would have to charge my customer.

When you have a design change situation is there any tension between departments or people?

Yes, this situation affects departments, employees, and working hours. For example, sometimes my customer can say that he is going to lose his job if I don't deliver the order in a certain time period. Then I have to sacrifice and I am telling my workers to re-produce the order and deliver it in that certain time. But, workers can show different reactions. They don't want to do the same thing again. It affects people psychologically. They are not willing to re-work. It causes quality problems. In design change situations, we had lots of colour problems.

How do quality problems happen?

There can be quality problem in the production stage. For example, there are points called as variation in the thread. We cannot see them in the production stage, but manufacturer will see the flaws when he starts knitting with the thread. Those flaws will happen because of the variation points in the thread. This is a quality problem in the thread. The other problem affecting quality is colour. For example, the upper parts of the bobbin can suck the colour very well but the lower parts cannot. We call it barre. You cannot see this in the production stage. You can only see it in the knitting process. To avoid this situation, we have our own knitting machines here. We knit the threads from all sides and looking for any barre. We never deliver the order without quality control. However, we can fail to notice. When a colour change requirement comes our workers can be confused and miss those problems. Today, I have just got an order back due to barre situation.

Do you have any strategy for avoiding these problems?

We have to be ready for anything. One strategy is to add extra 2-3 days to lead-time for any misfortune. For example, if we have a design change situation and if we can solve it inside the company, we are using those 2-3 days without any delay. Some customers are very strict about lead-time, so these +2-3 days help us in this situation. Another strategy is to keep employees for extra hours. We

will change the colour without saying anything to the customer. If the colour is really critical we have to inform the customer to get approval.

Then you are setting a new lead-time?

If the colour is not critical, we can do it with the old lead-time without saying anything to the customer. If the colour is critical we have to say it to our customer to get colour approval. But when we inform our customer, we have to be really quick. We have to win those lost days passing with colour change requirement in the production. So we are working very high speed. That's why customers choose us. For example, my customer is telling me about the design change requirement and e-mailing me the new colour at night. He expects that I will reply back in the morning but I am finding the new colour at the same night and going to the factory and working on it all night. In the morning, I am immediately sending the new colour for customer approval. I do it all time. That's how we avoid from time-loss. (He is always checking his e-mails because his customers shoot him new orders, new requirements. He says he cannot stop communicating with his customers, even at nights.) In this situation, we have to make our employees work for extra hours and it is an extra cost for us. It has psychological effects on them such as motivation loss, working unwillingly.

Another strategies?

We are stocking the materials we need the most. Before the season starts, which is in the beginning of the summer, there are fairs. In these fairs, we determine which number of threads will be used for the next seasons. According to these observations, we prepare those numbers of threads without colour or anything and stock them to use in the production. After each fair, we do this with different numbers that will be used in those seasons. When our customers make a change in design, it won't be problem since we have already had the base threads on hand. Other strategy is that making a priority plan with the customer. For example, our customers always want the black colour. You can wear it anytime, in summer or in winter. We are making it ready and stock it. Then, our customers can say that "send me the black colour until you prepare

the exclusive colours.” I mean he can give me the colour priority and in this way, we can work faster even if a design change happens.

Did you have any relationship with your customers damaged by these design changes?

Yes. 5 years ago, he made lots of design changes. We tolerated 3 times but he changed the design 4th time in the same month. I had to charge him for all the design changes however he didn't accept; he said he has a right to change his products' design. I missed lots of other orders in the meanwhile. We couldn't work together. Sometimes we, my customers and I, badger each other to death. Especially with The English... They make lots of changes and then I say “you cannot put me in this kind of hard situation” and then they say “ok you can go now”.

How many years are you in this business?

22 years.

How frequent were the design change requirements before and now? Is there any difference?

10 years ago, we almost never got a design change requirement. Never... Now, consumers have new ways of searching and fashion is changing so quickly. 10 years ago, if there was a trend, that trend will continue for 4-5 years. But right now, it doesn't take even 6 months. Most trends continue for 3 months. It is so changeable. Fashion means change. However, if consumer demands form 50% of new trends, the other 50% is formed by the strategies of fashion brands. These brands try to make the trends obligation. For example, you cannot find 10 years older trends right now. You have to choose what the fashion brands put in front of you. Change in the fashion means change in the production. 10-15 years ago, there was no colour change or quality change. My customer was waiting in front of the organisation for the threads. As long as they took the thread, they could determine the model or cut on their own. Colour wasn't important at all. But now, we have to comply with our customers. They are the big buyer and big sellers. They are very important for us. Everybody should comply with them.

Appendix 7:

EXAMPLE OF CASE STUDY NOTES

CASE STUDY NOTES – STARSFASHION

- Interviewee X works as a buyer in womenswear.
- Interviewee X has limited information about product design impacts on the supplier companies although she/he works very closely with about 50 suppliers.
- In case of any design change, Interviewee X has many problems with the suppliers. For this reason, design is the most important thing for the fashion manufacturer according to Interviewee X. They check the design of the products over and over. There is a strong connection with departments to ensure the design is correct since design changes shake the company off.
- Interviewee X and his/her team work so hard to catch the trends. They are following bloggers and certain brands constantly.
- Workplace of StarsFashion is very neat; employees look like they know what they are doing. They are experienced and well informed.

CASE STUDY NOTES – SUPPLIER COMPANY 2

- Interviewee Y is one of the suppliers of StarsFashion. He/she also is the owner of Supplier Company 2. He/she is mainly interested in marketing.
- Supplier Company 2 creates its own ranges to sell the famous fashion retailers like Next, H&M, Zara alongside supplying fabric to the fashion retailers.
- During interview, Interviewee Y has had design change requirements coming from StarsFashion. He/she told all the steps Supplier Company 2 will follow after taking this design change requirement and we quickly ended the interview because there was chaos in the supplier company.
- Interviewee Y is very busy, almost no time to talk to me or e-mail me. Somehow, I managed to take his attention. We will see each other again to complete the interview.

Appendix 8:

EXAMPLE OF ONLINE COMPANY REPORTS

Description of principal risk or uncertainty

Business strategy development and implementation

If the Board adopts the wrong business strategy or does not implement its strategies effectively, the business may suffer. The Board therefore needs to understand and properly manage strategic risk, taking into account specific retail sector risk, in order to deliver long-term growth for the benefit of StarsFashion's stakeholders.

How the risk or uncertainty is managed or mitigated

The Board reviews business strategy on a regular basis to determine how sales and profit budgets can be achieved or bettered, and business operations made more efficient. Seasonal and annual budgets together with longer-term financial objectives and cash flow forecasts are produced. The Board and senior management consider strategic risk factors, wider economic and industry specific trends that affect the Group's businesses, the competitive position of its product offer and the financial structure of the Group. The Audit Committee monitors strategic and operational risk regularly and any significant matters are reported to the Board.

Management team

The success of StarsFashion relies on the continued service of its senior management and technical personnel, and on its ability to continue to attract, motivate and retain highly qualified employees. The retail sector is very competitive and StarsFashion's staff may be targeted by other companies.

The Remuneration and Nomination Committees identify senior personnel, review remuneration at least annually and formulate packages to retain and motivate these employees, including long term incentive schemes. The Board considers the development of senior managers to ensure adequate career development opportunities for key personnel, with orderly succession and promotion to important management positions.

Product design and selection

StarsFashion's success depends on designing and selecting products that customers want to buy, at appropriate price points and in the right quantities. In the short term, a failure to properly manage this area may mean that StarsFashion is faced with surplus stocks that cannot be sold at full price and may have to be disposed of at a loss. In the longer term, the reputation of the StarsFashion Brand may suffer. Product design and selection is therefore at the heart of the business

Executive directors and senior management continually review the design, selection and performance of StarsFashion's product ranges. To some extent, product risk is also mitigated by the diversity of StarsFashion's ranges.

Appendix 9:

EXAMPLE OF OFFICIAL ONLINE DOCUMENTS

StarsFashion's ethical trading programme priorities within the supply chain are to:

- Develop and improve workers' conditions, including safety and human rights
- Communicate and support the achievement of compliance to our ethical standards with all our suppliers
- Support our suppliers to achieve continuous improvement through partnership
- Implement sustainable programmes and initiatives with suppliers to improve their capacity and ability to deliver to our ethical requirements
- Continue to develop opportunities to work in collaboration with other Brands and retailers, Governments, trade unions and non-governmental organisations (NGOs), to pursue solutions for some of the more complex and systemic problems within the global supply chain that we cannot resolve alone and to help achieve lasting change

These are supported by StarsFashion's Code of Practice Principle Standards (Principle Standards) which form an integral part of our business and are overseen by our global Code of Practice (COP) team of 46 employees whose role is to build relationships with our suppliers through training and support, as well as undertaking auditing their factories to ensure the Principle Standards are complied with.

- No child labour
- Freedom of association
- Healthy and safe working conditions
- No forced labour
- Fair wages and benefits
- Equal opportunities
- Employment security
- Respectful treatment of workers
- Reasonable working hours

StarsFashion recognises its responsibility to respect human rights throughout its operations. We are committed to ensuring people are treated with dignity and respect and our approach is to implement the United Nations Guiding Principles on Business and Human Rights (Guiding Principles) and to recognise and manage the risk of harm associated with unsatisfactory working conditions, discrimination, modern slavery, human trafficking and forced or bonded labour.

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