INFLUENCE OF SUPPLY CHAIN PRACTICES ON PERFORMANCE OF TEXTILE AND APPAREL FIRMS IN KENYA

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Influence of Supply Chain Practices on Performance of Textile and Apparel Firms in Kenya

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2019
DECLARATION

This thesis is my original work and has not been presented for a degree award in any other University.

Signature ……………………… Date ……………………………

Kevin Moindi Omai

This thesis has been submitted for examinations with our approval as university supervisors.

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Signature ……………………… Date ……………………………

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DeKUT, Kenya
DEDICATION

I dedicate this thesis to my wife Linda Kwamboka and my daughters Melissa and Itanya who have continuously stood with me and supported me during my research period.
ACKNOWLEDGEMENT

I gratefully wish to acknowledge the valuable and scholarly assistance given to me by my supervisors Dr. Karanja Patrick Ngugi and Dr. David Kiarie under whose guidance this was completed. Its quality reflects their commitment in consistently addressing issues and the enormous amount of time they devoted to ensure it is done. Although the exercise was demanding, their unique way of addressing issues made the whole exercise enjoyable.

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I also offer my appreciation to the input of all my Lectures of Jomo Kenyatta University of Agriculture and Technology: I appreciate the assistance of others who directly or indirectly assisted me in the course of my work but have not been mentioned by name.
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<td>AGOA</td>
<td>African Growth &amp; Opportunity Act</td>
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<td>ANOVA</td>
<td>Analysis of Variance</td>
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<td>CAGR</td>
<td>Compound Annual Growth Rate</td>
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<td>EPZ</td>
<td>Export Processing Zones</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>KNBS</td>
<td>Kenya National Bureau of Statistics</td>
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<tr>
<td>MANOVA</td>
<td>Multivariate Analysis of variance</td>
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<tr>
<td>MDA</td>
<td>Modular Digital Architecture</td>
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<td>MFA</td>
<td>Multi Fibre Arrangements</td>
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<tr>
<td>RBV</td>
<td>Resource Based View</td>
</tr>
<tr>
<td>RoK</td>
<td>Republic of Kenya</td>
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<tr>
<td>SAP</td>
<td>System Applications Products</td>
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<td>SCOR</td>
<td>Supply Chain Operations Reference Model</td>
</tr>
<tr>
<td>SCM</td>
<td>Supply Chain Management</td>
</tr>
<tr>
<td>SPSS</td>
<td>Scientific Package for Social Sciences</td>
</tr>
<tr>
<td>TOC</td>
<td>Theory of Constraints</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
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DEFINITION OF TERMS

Supply Chain Integration: Is explained as flow of information and the physical connection between stakeholders in the supply chain system. It involves alignment of goals and objectives of the supply chain between roles and firms and the connection of these firms and roles through transparent sharing of information electronically or through people to people (Moshkdanian & Molahosseini, 2013).

Supply Chain Relationship Management: This is the practices carried out by an organization to enhance effective conduct of supply chain engagements both in upstream flow and downstream flow. This involves information flows and physical connections among the supply chain system participants (Moshkdanian & Molahosseini, 2013).

Supply Chain Responsiveness: Holweg (2005) defined it as the capability of promptness and the degree to which the supply chain can address changes in customer demand. Responsiveness of supply chain as the capacity of the supply chain to promptly address changes in customer demand.

Supply Chain Practices: These are the set of procedures or activities carried out by a firm to enhance effectiveness of supply chain management (Bellamy, Ghosh, & Hora 2014).

Performance: This is the harmonization of economic, environmental and social objectives to an extent in which an organization achieves its goals and objectives (Hassini et al., 2012).

Modularity Based Manufacturing: This is better explained as a process where a unit of standardization or substitution principles is applied to
the design of the product, the process of production and the design of the organisation within the environment of supply chain (Thatte, 2013).
ABSTRACT

Supply chain has evolved very much in a way that the current modern supply chains are competitive and global as compared to how they were in the past. Modern products in supply chains are characterised by product life cycles that are shorter, rapid production of new product through continuous product research and development, increasingly knowledgeable, well informed, and unpredictable consumers. Such changes have made supply chains to adopt better supply chain practices that can have a potential effect on performance in Kenya, where little is known regarding this relationship. This study thus aimed at determining the influence of supply chain practices on performance in apparel and textile industry in Kenya. The study assessed the influence of supply chain practices on Performance in apparel and textile industry in Kenya and used the following theories: theory of constraints, systems theory, and resource based theory, Supply-Chain-Operations-Reference model and value chain model. The study adopted cross-sectional survey design using quantitative approaches. The study population included 60 textile and apparel firms which are members of Kenya Association of Manufacturers. Data was collected through primary and secondary sources. Questionnaire was used as a primary data collection method, with focus on supply chain practices. Secondary data was used to collect data on various performance measures. Multi Variate Analysis of Variance analysis was used to analyse the data with a view to answering. Results of the analysis are presented through tables, graph and plots. The study findings indicated that there exists a positive and significant relationship between modularity based manufacturing, supply chain relationship management, supply chain integration, supply chain responsiveness and Performance. The results clearly indicated that supply chain practices are important factors in achieving improved performance of supply chains sustainably. The study proposes that manufacturers in textile industry need to first consider external integration in their supply chain practices as this will allow the firm to reap higher benefits from supply chain integration process. The empirical findings suggested that the manufacturers who adopted supply chain relationship management were able to gain benefits both financially and non-financially. The study findings affirm the benefits that accrue to textile firm’s Performance by adopting Performance based on Supply-Chain-Operations-Reference model. Future research can focus on a comparative study of the contributions of supply chain management practices that include supply chain practices and green supply chain management to the textile industry as well as other sectors. Another research can apply longitudinal study to corroborate cross-sectional findings and examine performance prior to and after adoption of supply chain practices in the textile industry at different periods.
CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The study focused on understanding and analysing the influence of supply chain practices on performance of supply chain in the apparel and textile industry in Kenya. Currently, in the global supply chain, firms that are able to forecast the market trends are able to cope with the dynamics in the market and able to satisfy the targeted customers (Riznic & Rajic, 2012; Kimitei, Bonuke, Chepkwony & Kapkiyai, 2015). The ultimate end user of an item in the supply chain determines the success or failure in overall downstream flow of products from the manufacturers point of view and the upstream flow of information from the consumer’s point of view (Towill & Christopher, 2002; Christopher, 2011). Towill and Christopher (2002), highlights that a key component for the survival and competitive success of a company is timely delivery of the right product to the right consumer, at the appropriate price and place. Huo, Zhao and Lai (2014) contended that in the present downstream and upstream supply chains, companies are required to devise ways of meeting the demands of the customer while at the same time maintaining or keeping the same customer (Fantazy, Kumar & Kumar, 2010).

Sohail and Obaid (2015) argued that companies in a bid to ensure timely response to customer demands focus on maximising their core activities triggered by increasingly dynamic customer demands in terms of product variety and customization. As a result of the recent supply chain disruption, companies have to be responsive to the dynamics of the market and the market environment (Kimitei et al., 2015). It is therefore important for managers and researchers to work towards understanding the performance construct in order to avoid such disruptions.
Manufacturing firms’ operations have been characterized by growing world dynamism on product innovation and product life cycles as well as increasingly demanding customers (Wiengarten, Humphreys, Guangming, Fynes & McKittrick 2010). These changes have been observed majorly in the fashion and clothing retail industry and have even been extended to the telecommunication, automobile and electronic industries (Moshkadian & Molahosseini 2013). Still, there is evidence of new competitive supply chain changing to be more global, customer driven and technologically focused, as the life cycle of products shortens and the market witnesses rapid introduction of new products and continuously, as customers increasing demand for faster response, high quality reliable products that perform better from companies that will deliver in the shortest time possible (D’ Souza, 2002).

1.1.1 Apparel and Textile Industry

Pressures in the industry have caused continuous change process in firms, affecting all the areas of supply chains right from the technologies used to a much shortened product life cycle (Thatte, 2007). Christopher (2011) further stated that from the late 1990s changes within the manufacturing industry and their downstream supply chains grew as outsourcing became evident. To respond to these changes, firms have adopted innovative ways and improved manufacturing processes in production. Thatte (2013) argued that downstream and upstream supply chains should be managed in a way to allow for timely response to changing customer demands. To create Performance there is need for creation of responsive supply chain systems both internally and externally (Adebambo & Adebayo 2012).

According to Riznić and Rajic, (2012), supply chain flexibility is the supply chains’ ability to changing both environmental influences both upstream and downstream while responsiveness of the supply chain can be interpreted as the supply chain ability to respond to these market place changes and demands. Therefore, the modern supply chains systems should be quick, effective, and efficient in responding to the customer’s
demand and more importantly, in real time (Makori, Magutu, Omai & Akello, 2016) so as to create Performance in terms of lower lead time, lower costs, better quality and product innovation. Lapide (2013) concurred by citing that new firms in the 21st century need to take into consideration the cost and quality of their products in order to attain a competitive advantage.

The global supply chain, particularly in Europe, Asia and North America has been undergoing restructuring, with focus on low production costs, flexible distribution mechanism to adapt to consumer changes. Most firms in Asia, Europe and America have positioned their supply chain logistics as a key factor to achieving Performance. Firms have developed technologies and come up with innovative ways that reduce the costs as well as time-to-market delivery in order to manage the inefficiencies and weaknesses along supply chain (Cooper, 2010).

Continuous changes in supply chain have occurred to address the weaknesses of supply chain, particularly insufficient traceability, low productivity, high labour costs, inventory problems and shrinkage. Challenges of high labour production among textile and apparel firms have led to increase shifting in production to Asia where labour cost is low. As a result, supply chain practices of textile and apparel firms have improved more so in logistics and distribution as a way of furthering the firm’s performance (Cetinkaya, Cuthbertson, Ewer, Klaas-Wissing, Piotrowicz, & Tysse, 2011).

The global supply chain practices for textile and apparel supply chains in USA have been Adhoc and virtual in nature. Adhoc nature of the global supply chain practices among textile and apparel firms in USA is occasioned by textile firm playing a key role on production, distribution and marketing while the virtual nature of supply chain arises due to the lead role of retail outlets in determining production, distribution and marketing of textile products. The development of virtual supply chain practices in USA has resulted in dwindling fortunes of textile and apparel firms in USA, with significant
retail outlets sourcing for textile products from China and Africa due to cost considerations (Koksal, Strähle, & Müller, 2018).

According to Chaudhry and Hodge (2012) and Varukolu and Poaps (2009) five main stages are involved in the supply chain of garments. The stages include yarn and fiber production, fabrication, garmenting, distribution and finally retailing. In India, the garment supply chain structure involves many players on board and comes with size and operational differences at each supply chain’s stage. Besides the structural and operational differences at various stages, differences are also observed at the various counterparts competing at the same stages (Karthik & Gopalakrishnan, 2014).

The textile and apparel industry is characterized by high labour-intensive activities and developing countries would have tendency to making full use of low cost labour exploits at their disposal to achieve higher levels of performance and competitive advantage. Following the apparel industry being made global, developing countries have adopted poor environmental and social performance measures such as violation of worker’s rights. For instance, in Bangladesh, the garment industry which is valued at $20 billion annually has been characterized by labour rights violations and safety measures that are inadequate, thus causing the death of over two-thousand deaths in the last ten years (Taplin, 2014).

The move by firms from Asian countries to source for raw materials from African countries has worked to improve the value chain of the cotton-textile industry, particularly in cotton acquisition and production. More and more Asian buyers engage directly in the plantation, purchase, and processing of cotton in Africa, with Tanzania, Malawi, South Africa and Botswana leading the integration of Africa on global supply chain through supply of raw materials (Xiaoyang, 2014).

The farm-to-fashion models which ensure that all value added activities along the supply chain including production of cotton to design of fashion are kept in given geography. In
Africa, countries like Uganda and Ethiopia are integrating their textile industry to farm to fashion model through increasing availability of local materials. The same cannot be said in Kenya where integration of textile and apparel firms to the global supply chain through farm-fashion model has not yielded much fruits as per AGOA vision since nearly all fabric used by textile and apparel firms are imported (Giri, & Rai, 2013).

In Kenya, textile and apparel firms continue to depend on expensive imported materials, thus forcing some EPZ firms (particularly manufacturers operating in the country as Multi National Corporation subsidiaries to shift from buying their own materials to CM (Cut-and-Make) contract labour where materials and designs are supplied by customers. Consequently, attrition has become rampant in the sector, which in turn has reduced the potential of generating revenue among companies in Kenya and postponing the necessary efforts required to obtain materials that are available locally which can be used to reduce production cost and time in the apparel sector (Cooper, 2010).

Kenya has around fifty-two textile mills, with 15 of them currently operating less than 50% of their total capacity. The existing textile mills operate using out-dated technologies as well as employs unskilled labour resulting in low productivity. In addition, Kenya’s textile industry at the present time faces a locally produced cotton supply shortage and most of the domestically produced cotton in the country is of poor quality. Resultantly, to meet the country’s demand, 93% of the cotton used in the country for export is imported (RoK, 2015). This state of affairs means that Kenya’s textile sector must choose between expensive fiber and the substandard local material which requires further processing. As a result of these constraints, the apparel manufacturers have to contend with long lead times thus limiting the flexibility of the textile and apparel firms in meeting customer’s needs (RoK, 2015).
1.1.2 Performance

The interaction between a supply chain organization and its social-economic external environment results in Performance; for performance to be sustainable, it must be viable economically, socially and ecologically (Wiengarten et al., 2010; Flynn, Huo & Zhao, 2010). Industries that have more than one dominant strategy are able to realize performance sustainably because their competitors lack similar options to the incumbent firm (Adebambo & Adebayo, 2012; Montgomery & Porter, 2009). Despite numerous advancements and developments in theories on competitive advantage which improves performance, Michael Porter's work on strategies can be divided into: differentiation, cost leadership, focus and diversification. Unlike other scholars dealing with organization strategy, Michael Porter mainly focuses on diversification/focus (Riznić & Rajic, 2012; Porter, 2003; Adebambo & Adebayo, 2012).

According to Porter (2003), adoption and efficient use of these generic strategies can spur the firm’s growth to above average industry results which enhances performance as compared to the competitors. Theories that have developed thereafter are based on Porters theory and so can considered to be an outcome of Porter’s strategy evolving cycle. Riznić and Rajic, (2012) supports this approach and points out that most contemporary managers need to emphasize on cost leadership, focus and differentiation as a way of enhancing performance competitively and sustainably.

Literature focusing on performance and sustainability of supply chain is highly conceptual and normative with most research focusing on case studies while according to Riznić and Rajic, (2012) less empirical research has been conducted in the performance and supply chain sustainability sector. Such gaps call for an empirical study on Performance and how it contributes to sustainability (Thatte, 2013). Since the realization of the important role of the responsiveness of supply chains in the current business environment, it has emerged that there is need to understand the supply chain
practices necessary for organizations to achieve performance in supply chains with a sustainable approach.

Many research findings have highlighted the prominence of integrating sellers, industrialists and consumers on one platform (Olamide and Adeleke, 2013: Makori, Magutu, Omai and Akello, 2016) so as to attain flexibility and speed as elements of sustainable performance. This study seeks to fill the knowledge gap by dealing with practices of supply chain management that facilitate sustainability along the chain, and thus enable researchers to obtain more insight on the activities and scope linked with supply SCM that generates better levels of performance (Wiengarten et al., 2010). Moreover, rise in market uncertainty and technology has caused more firms to adopt modular process and product architectures so as to deal with intensifying demand uncertainty (Tuet al., 2004).

According to Thatte, (2007) effect of modularity centred processes in the developed of goods as the use of changeover principles or unit normalization to manufacturing process design, product design and structural design need to be studied to evaluate how it can enhance performance sustainably. There are many questions puzzling organizations and their managers regarding whether modularity based manufacturing is a supply chain practice or not (Sanchez & Mahoney, 2012). It can be argued that it is significant to explore how the performance of sustainable supply chain is affected by modularity-based manufacturing practice since operations which is a component in value chain model uses modularity processes in product transformation. Equally, this was appealing to the study because there were no previous empirical tests on this. In Kenya, apparel and textile industry carries the great potential of creating employment opportunities, alleviating poverty, contributing to rural development and increased incomes in the country’s arid and semi-arid areas.

Apparel and textile is one of the sectors that has been identified as a sources of rapid economic development in Kenya by enhancing its competitiveness globally especially
with the influence of AGOA (Kamau, 2009; RoK, 2015). Therefore, if the supply of second-hand clothes can be eliminated, apparel and textile industry has been designated as one of the core industries to drive Kenya to industrialization. In fact, at one point the apparel and textile industry was identified as Kenya’s fifth largest foreign exchange earner, but this dropped significantly from mid and late 90s. In the 1990s, there was the liberalization of the economy which brought about an influx of textile goods into Kenya which saw a reduction in the utilization of the average capacity of the Kenyan textile mills by about 50%. Nonetheless, the statistics within the last five years point out that increased government support and the growth of AGOA is facilitating recovery of the sector. According to Kamau (2009), the decline mentioned above was because of supply chain firms not embracing targeted industry specific practices to bring competitiveness and sustainability to apparel and textile industry.

The apparel and textile industry in Kenya consists of the spinning companies which produce sewing thread, yarn (including industrial) and integrated mills which produce various types of fabric products that include knitted and woven fabrics, various types of canvas, fabricated yarns, all types of bags, sweaters for various occasions, various designs and types of shawls, different kinds of towels, baby nappies and products that are knitted together. Manufacturers of garments are responsible for the production of both local and international markets of different garments and mostly, their modularity is not well understood. AGOA which is the largest company that deals with exportation of garments in the US ranked Kenya as the top exporter of ready-made garment exports in the past 15 years (The Kenyan Textile and Fashion Industry, 2015). Around 50% of the Kenyan manufacturers of garments deal with production of men’s wear such as pants, woven robes and chemise, woven and knitted garments and Kaunda suits (for men).

Sanchez and Mahoney (2012), suggest that this current environment wherein textile firm operate calls for organizations to be more concerned with customer needs and the diminishing resources. Supply chain flexibility and responsiveness is needed.
Resultantly, Ontita (2016) points out that modern supply chains must respond efficiently, effectively and rapidly to customer demand and in turn generate Performance in terms of lower costs, increased quality, product innovation and reduced time to market (Kimitei et al., 2015). Christopher (2011) and Riznić and Rajic (2012) also support this notion and recommended in the late 20\textsuperscript{th} century that it is necessary for companies seeking competitive differentiation to focus on quality and cost as market entry qualifies while lean manufacturing and responsiveness are regarded as older winners. Sustainable use of resources has not featured as it is a measure of continuity.

1.2 Statement of the Problem

Performance is a multi-dimensional construct measured through different indicators, all with an aim of evaluating whether organizational goals have been achieved. Performance in the textile industry is conceptualized along different dimensions such as financial performance, export performance and organizational performance. Export performance analysis of textile and apparel industry has dominated performance measurements among different scholars (Uddin & Rahman, 2015; Kim, 2019).

In Kenya, export performance in the textile industry grew from US$8.6 million in 2000 to upwards of US$332 million in 2014. However, for the period between 2015-2016, export performance for textile and apparel firms reduced below the 2014 industry sales. Additionally, organizational performance of textile industry in Kenya has over the past five years experienced significant challenges resulting to the reduction in number of operating textile firms by 45% (Musau, 2018). Extant literature shows that performance challenges experienced by textile firms in Kenya are occasioned by different factors: long order-to-delivery times, high production costs and inadequate supply of local textile raw materials (Tuigong & Kurgat, 2015). A situation that has resulted in poor financial performance of textile firms in Kenya leading to many firms winding up operations.
Andebe (2012) argues that performance of textile firms is significantly determined by supply chain practices. The supply chain practices-performance relationship evidenced in closure of firms necessitates more studies to investigate existence of such relationship. A major concern of the present study is the effect of supply chain practices on performance of textile firms given the changing consumer demands, in-adequate supply of local raw materials and production challenges in a dynamic and competitive environment in the global supply chain. This calls to question the ability of local textile firms to perform better amidst supply chain challenges. In light of the aforementioned concern, this study was aimed at determining the influence of supply chain practices on performance of textile and apparel firms within a sustainability perspective.

1.3 Objectives of Study

1.3.1 General Objectives

The study’s general objective was to determine the influence of supply chain practices on performance in apparel and textile industry in Kenya.

1.3.2 Specific Objectives

The specific study objectives for the research were:

1. To determine the influence of modularity based manufacturing of a firm on performance of textile and apparel firms in Kenya.
2. To establish the influence of supply chain relationship management of a firm on performance of textile and apparel firms in Kenya.
3. To assess the influence of supply chain integration of a firm on performance of textile and apparel firms in Kenya.
4. To determine the influence of supply chain responsiveness of a firm on performance of apparel and textile firms in Kenya.
1.4 Study Hypotheses

The study derived the following research hypothesis based on the research questions above.

1. \( H_0 \): There was no significant relationship between modularity based manufacturing and performance of apparel and textile firms in Kenya.

2. \( H_0 \): There was no significant relationship between supply chain relationship management and performance of apparel and textile firms in Kenya.

3. \( H_0 \): There was no significant relationship between supply chain integration and performance of apparel and textile firms in Kenya.

4. \( H_0 \): There was no significant relationship between supply chain responsiveness and performance of apparel and textile firms in Kenya.

1.5 Significance of Study

Management: Supply chain manager will benefit immensely from the findings of this study because it addresses the most important practices regarding supply chain competitiveness and sustainability. They will be able better understand the many challenges stakeholders in the textile and apparel industry in Kenya are faced with.

The investors: Investors will also benefit from this research finding since they increasingly want to make greater profits and maintain customer royalty as they seek ways of reducing operational costs.

Policy makers: The research finding will provide policy makers with vital insight to assist them in formulating various policies to support the growth of textile industry by use of the research recommendations.
Researchers and Scholars: The study will be of great importance to the researchers as they will gain both theoretical and practical experience on supply chain practices that hinder or promote sustainable competitiveness in Kenya.

1.6 Scope of the Study

The primary focus of this research study was on supply chain practices and the performance of the supply chain in Kenya’s apparel and textile industry. The study was undertaken and researched on supply chain practices within the scope of the factors addressed by the research objectives. The study reviewed the past related studies which were explained by the literature review.

1.7 Limitations of Study

The study of supply chain practices and performance of a firm is broad. Conceptually, this study was confined to the study of supply chains of Kenya’s apparel and textile industry which are under EPZ scheme and under AGOA. The other main limitation of this study was that a few of the managers and executives of the targeted firms considered some of the information that was sought as being sensitive and potentially likely to reveal their strategies to competitors. This limitation was managed by making clarifications and giving assurances that the purpose of the study was purely for academic purposes and was not motivated by any other interest.

In addition to the limitation of information confidentiality, the researcher also faced a limitation in regard to quality of data collected. The questionnaire on Performance was developed based on secondary information and interviews that were informed by key informant guide. As much as the researcher sought to minimize this, the secondary information available was scanty, limited and not updated as required. This had the potential of increasing the standard error of the variables in the study. Finally,
considering that no research philosophy is void of limitation, this study was limited to the extent of the positivistic research philosophy that guided it.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presented a detailed description and evaluation of theories that support the study as well as empirical literature on study variables. The study also presented conceptual framework that was guiding the study and finally it analysed the existing literature to establish various relationships between the research variables and how they had been explained by other scholars and researchers.

2.2. Theoretical Review

A theory refers to a set of principles or statements formulated to explain and make predictions about a phenomenon that are not properly understood. Hawking (1996) also defines theories as analytical tools that are used for explaining, understanding and making predictions on social phenomenon. This study will be based on theory of constraints since modularity based manufacturing is a practice that is only limited to specific chains which have modular based systems; systems theory where every organization and firm is treated as a system with its strengths and weaknesses especially on matters of integration and responsiveness; resource based theory which is wide in its applicability since an organization cannot have a Performance if financial resources and human resources cannot be effectively utilized; SCOR model which encompass the entire supply chain domain by addressing and improving supply chain management decisions within a supply chain environment both upstream and downstream on relationship management, supply chain integration and supply chain responsiveness. Lastly value chain model which concerns itself with primary and secondary activities especially by looking at the functional areas of the organization and linking them to
Performance through evaluating modularity based manufacturing which is within the operations and human resource functions, supply chain responsiveness which encompasses both inbound and outbound logistics and supply chain integration which covers a wide area in supply chain domain. Therefore, theoretical framework is an explanation about the phenomenon. A theory or a model provides the researcher the lens to view the world (Rocco & Plakhotnik, 2009).

2.2.1. Theory of Constraints (TOC)

Based on the TOC (Theory-of-Constraints) as systems, organizations are characterized by constraints that prevent them from realizing their goals. Theory of constraints focuses on two major under lying questions of what are the barriers to effective supply chain and how such problems can be addressed. Secondly, the theory focuses on how can the key members in a supply chain act individually or jointly to address existing constraints.

To improve the system’s description, this involves the identification of constrains and prescription of solutions which focus on implementation of corrective measures that must be undertaken. Constrain diagnosis facilitates improvement of systems by enabling organizations to direct limited resources towards the weakest parts of the system. The ultimate goal in the lower-end of a supply chain, for example, can be realized through: Throughput (T), Inventory/Product (I/P) and Operating Expenses (OE). Throughput is defined as the amount of products that can be handled in a given period, inventory is list of general items and operating expenses is the amount of money proposed for investment in effectiveness and for responsiveness (Nowakowska-Grunt & Moroz, 2013).

There are two types of constraints as suggested by theories, these constrains include internal and external constraints. Where internal constraints are those within the system like the workers, procedures or processes and external constraints are those outside the organization like physical or policy constraints. While physical constraints are
equipment which depends on usage, people who can lack a skill and policy constraint can be written regulations or unwritten practices that pose challenges that hinder a system from attaining its goals. Thus an organization will focus on increasing T, reducing I/P and reducing OE. This study is concerned with supply chain management practices and Performance. There are constraints that complicate attainment of Performance and they are poor practices, undifferentiated quality products, lack of supply chain focus and long lead times (Gumus & Guneri, 2007).

The theory of constraints argue that Performance are constrained by many different factors along the logistic process. Thus the theory proposes that all the major actors in supply chain logistics ought to respond in a way that will have the greatest impact on profitability of the firm. A key tenet of the theory is that constraints in logistic process affect the Performance. In this regard TOC stresses the importance of addressing logistic constraints as a way of improving firm performance. Kim, Mabin & Davies (2008) suggests that Logistic-Process-Responsiveness (LPR) can only be improved to the degree that constraints in logistic process are addressed. This highlights the importance of TOC theory in investigating the effect of supply chain responsiveness on performance of firms through LPR component of the theory.

Hudnurkar, Jakhar & Rathod (2014) opines that in Operation system Responsiveness (OSR), non-physical constraints are key determinants of how production and system operation will responds to changes in consumer demand. Hence, it is evident that theory of constraints not only helps in ascertaining the constraints in supply chain but developing responsive measures that can improve operation systems of a firm towards more profitability. Based on the premise of the theory, performance of textile firms is affected the degree to which supply chain is responsive to consumer demand and hence the applicability of the theory to study.
2.2.2. Systems Theory

System theory focuses on the status of complex systems in society, nature and science, and is a framework that can be used to describe and investigate a group of objects that operate as a unit resulting in some outcome (Rudolf, 2011). A system can refer to a society, an organization or any informational or electro-mechanical artefact. Generally, it refers to organized social units of projecting to have outcomes from inputs interacting with outputs (Mammy & Caddy, 2006).

Through system theory, organizations can operate to be adaptive, offer learning and regulatory capabilities necessary to ensure that performance and sustainability are enhanced for the survival and competitive success of a company is timely delivery of the right product to the right consumer, at the appropriate price and place. Supply chain responsiveness relates to the level to which forms can adapt and respond quickly to changes and therefore this theory was helpful in understanding how responsive are textile firms supply chain.

The theory also stresses on the importance of minimizing the possibility of conflicts between responsibilities and processes, through promoting effective coordination among all elements in the system, with communication among the system being an important element (Jaradat, Adams, Abutabenjeh & Keating, 2017). Furthermore, the system determines resource allocation, defines objectives and gives unit corresponding responsibility while identifying probable synergies as it assumes control over operational performance. Each system is characterized by dynamism which is the ability of a system to detect changes in its environment and adopt appropriately. Finally, a system should formulate principles and goals, which plays a key role in preserving its identity (Puche, Ponte, Costas, Pino & De la Fuente, 2016).
As modern System become complex, organisations are increasing their tendency of bring together both their external and internal systems to help them achieve their supply chain goal. These integrations can take the form of managerial integration, operational integration and geographical integration. System theory allows organizations to integrate buyers and consumers in the supply chain thus making it more effective. Integration is a characteristic of companies that have linked their external customers and suppliers with their internal processes keenly and in unique supply chains (Mohammadi, Ghazanfari, Nozari, & Shafiezad, 2015). Thus an understanding of supply chain integration is best suited through system theory.

Puche, Ponte, Costas, Pino, & De la Fuente (2016) indicates that the applicability of system theory to supply chain practices is premised on the principles that governs the viability of the theory. The first principle of the theory represents the operational (autonomous) units managing the different production elements. A key component of modular manufacturing theory is how to divide complex systems into smaller modules and evaluating them separately to enhance their management. To this extent, Helou and Caddy (2006) applied systems theory to modular manufacturing principles of dividing complex system to smaller and management system to improve effectiveness and efficiency in manufacturing process. This affirms that the system theory suits investigation of modularity based manufacturing in the current study.

The second principle of the theory is that management of different processes and responsibility is without challenges and hence the need to address conflicts in the system through proper coordination. Proper coordination in supply chain happens through the good information sharing system, key components of supply chain relationship management. Autry & Golicic (2010) states without good information sharing, supply chain will be afflicted by coordination challenges resulting to poor Performance. Puche, Ponte, Costas, Pino and De la Fuente (2016) emphasizes that coordination in supply chain system is needed at both internal level and external level. Supply chain integration
emphasizes that Performance can only results to improved firm performance depending on external integration systems and internal integration systems put in place. This brings to the fore the role of supply chain integration in enhancing coordination within the firm, with clients and suppliers. System theory provide an understanding on supply chain integration practices and supply relationship practices amongst textile firms in Kenya (Rudolf, 2011). The above information show the importance of system theory in investigating supply chain integration, supply relationship management and supply chain responsiveness among textile firms in Kenya.

2.2.3. Resource Based Theory (RBT)

The performance of firms can be predicted and explained through the RBV (Resource-Based-View) and the ensuing RBT (Resource-Based-Theory) (Barney & Clark 2007). To achieve competitive performance Peteraf and Barney (2003) point out that the economic value of firms must be higher than the competitor’s marginal breakeven in its product market. Equally, other firms must be unable to imitate its strategy’s and benefits.

In terms of supply chain, the RBV focuses on capabilities, resources and strategic assets. The theory also explains firm performance in terms of strategic resources like network flexibility, core competence and absorptive capacity. Combining resources in a unique way, for example, enables firms to obtain a competitive edge over their competitors that are unable to employ a similar strategy. Equally, firms can obtain a competitive edge through the ownership of scarce assets and resources and by excelling in core capabilities and competencies (Knudsen 2003).

Based on the RBV, a competitive edge can be obtained by partnering firms through integration of specific asset which are valuable, non-imitable, rare and non-substitutable. Lavie (2006) analysed the mechanisms for giving firms competitive advantage through RBV theory and suggested that RBV can develop competitive advantages through
strategic supplier partnerships and stronger supplier networks. Lewis et al. (2010) suggested that the firms can improve its competitive advantage through information sharing with partners. A recent study by Abushaikha (2014) studied supply chain integration from a resource based view perspective affirming the importance of the theory in studying supply chain integration.

Textile and apparel firms adopt supply chain practices such as supplier relationship management, modular manufacturing, supply chain responsiveness and supply chain integration. This study recognized the role of RBV on understanding how supply chain practices can offer intangible resources to textile firms resulting to performance improvement. Hence this theory was applied to investigating how supply chain practices influences performance of textile firms in Kenya.

2.2.4 SCOR Model

In 1997 Supply-Chain-Operations-Reference (SCOR) was introduced by The Supply-Chain-Council (SCC). The improvement, addressing and communication of decisions in supply chain management in supply chain environment in the company are what the SCOR as a tool is used and customers of a company inclusive (Tu et al., 2004). The model also determines the essential business processes that are necessary to meet the demands of customers (Simchi-Levi et al., 2000). Supply chain collaboration can also result from the need for specific resources or resource complementarity by measuring specific Performance through defined metrics.

The SCOR model advocates for a lean supply chain where waste has been eliminated and the metrics in the SCOR model entails measuring supply chain plans which include sale and operations planning, source which include upstream flow from supplier side, make whose main concern is at the transformation stage where there is manufacturing, assembly and kitting, deliver entails transportation optimization and lastly return where the measures entails shipping mistakes and product quality. The SCOR model has
remained as the greatest supply chain management planning tool (Tu et al., 2004). The SCOR model enhances competitive performance through differentiation strategy, cost leadership and response. Systems theory, resource-based theory (RBT) and SCOR model triggered hypotheses two and four.

All the main components of the SCOR-model including Plan, Source, Make, Deliver and Return are critical intra and inter-organisation process. Planning entails configuring and designing of supply chain and enables firms to realize a competitive edge. The component focuses on the major planning tasks which include enabling partners along the supply chain to develop joint business plans, formulating process improvement plans, determining the quality objectives of supply chain, conducting material and demand replenishment plans and setting up production plans. Decisions in the Plan area have either a direct or indirect effect on all the activities along the supply chain.

The Source component focuses on obtaining material and infrastructure. In particular, the component deals with supplier selection, inventory management, supplier network development, supplier performance evaluation and keeping delivery promise. The Source also addresses supplier payments and the appropriate time for receiving, verifying and transferring products (Soffer & Wand 2005). To make sourcing of raw material efficient to the firm, Huan, Sheoran and Wang (2004) suggests that firms need to develop strategic supplier partnership and have strong supplier network responsiveness. This affirms the link between supplier chain relationship and responsiveness, and sourcing model of SCOR theory showing its applicability in the investigating supplier relationships and supply chain responsiveness in the current study.

Make stage focuses on demand transformation through production and manufacturing. It includes packaging, production, inventory process, product stage releasing and material flow. The component also deals with the management of equipment, production network, facilities and transportation. To achieve customer satisfaction and supply chain competitiveness, the Make stage emphasizes on technology application, knowledge
management and staff skill. The Make component is viewed as a make-to-order, make-to-stock, or engineer-to-order, with workers as the most valuable asset (Georgise, Thoben, & Seifert, 2012). Hwang, Han, Jun & Park (2014) point out that dynamic teaming hold great potential in enhancing production network in manufacturing firms. They further assert that modularity relies on technological change which is central to make stage. This only highlights the importance of SCOR model in understanding modularity based manufacturing among textile firms.

The main focus of the Delivery decision component is quality service expectations, order management, delivery plans, inventory management, transportation, warehousing and export and import regulatory compliance. The component also focuses on receiving orders from clients and invoicing them once products have been received. Supplier chain responsiveness, particularly logistic process responsiveness are included in delivery model. To fully realize this in delivery strategy, Thilakarathna, Dharmawardana and Rupasinghe (2015) argues that all major partners in supply chain delivery should be fully integrated.

Based on SCOR-model performance metrics along the supply chain are classified into two: customer-facing and internal-facing metrics. Responsiveness, flexibility and reliability are the main features of customer-facing metrics. Assets and costs, on the other hand, are the main elements of the internal-facing metrics. The metrics are the main determinants of economic performance, social sustainability and environmental performance. Manufacturing firms use the SCOR-model performance metrics to define process, activities and associated performance measures along the supply chain (Georgise, Thoben, & Seifert, 2013).

The SCOR-model benefits deliveries by fostering commitment along the supply chain and quality assurance through joint planning on quality standards that are reflected in supply chain customer-facing performance. Studies by Kocaoğlu, Gülsün and Tanyaş, (2013): Thilakarathna, Dharmawardana and Rupasinghe, (2015) have demonstrated the
applicability of SCOR model in supply chain management thus affirming the applicability of the model to the current study. In this study, SCOR-model was employed to analyse the modular based practices, supply chain relationship management practices, supply chain integration practices and supply chain responsiveness practices among textile and apparel firms in Kenya.

**SCOR Model in Textile and Apparel Firms**

- Price negotiation
- Production sample
- Administration
- Production Scheduling
- Weaving
- Finishing
- Fabric test
- Cutting
- Sewing
- Washing
- Pressing
- Packing
- Factory to port
- Port to distributor

**Figure 2.1: SCOR Model**
2.2.5 Value Chain Model

Value chain can be explained as a collaboration of firms that work together to meet market demands (John DelVecchio, 2004). The value chain usually entails at least one primary value supplier and many other secondary suppliers that enhance the value of products or services that is finally presented to the buying public. Besides describing the activities around and within an organization, value chain analysis links such activities to an analysis of the firm’s competitive strength. Porter classified processes as either primary or secondary activities. Primary activities are those a firm cannot give out and are part of its core competencies and they are deemed to support its operations (Porter, 2003). Inbound logistics encompasses the coming in or movement of parts, materials and/or finished products from the supply side to the point of assembly or transformation which can be a manufacturing plant, warehouse or a retail store.

Inbound logistics within textile industry entails cutting costs and increasing efficiency in their logistics activities. There is always emphasis on suppliers to deliver the product in time. The personnel are trained on how to handle the material when they load and unload the material at factory and warehouse. Thus, they are able to manage delivery times and customers demand more efficiently. Effective supplier networks occupies a major role in ensuring that stronger in bound logistics systems exists in textile industries. Sukati, Hamid, Baharun, Alifiah, and Anuar (2012) argues that to minimize supply chain disruption, stronger supplier networks is necessary for effective inbound logistics. The crucial place of supply chain responsiveness in value model bring highlight the significance of value model in analysing supply chain responsiveness.

Second, there are operations which are concerned with the manufacturing of products form inputs to outputs (Porter, 2003). Within, the textile industry, the production of customized garments includes more in-house planning to make sure that the factories have the capacity to manufacture garments and deliver them in time. This normally involves dynamic teaming, with production team working closely with the product
development team and customer service team. A process made easier through supply chain integration and supply chain partnership as this requires a strong relationship between the company and its suppliers.

Third, outbound logistics focuses on movement and storage of final products and information flow from the production to the consumer. Forth, sales and marketing which deal the selling of product or service as well as the communication processes, creation, delivery and exchange offerings that provide value for customers, partners, and society. Equally, sales and marketing focuses on all those activities vital to sustain service/product working effectively for the buyer after it is sold and delivered (Porter, 2003).

Value chain performance is supported by a number of activities including procurement and human resource management. Procurement is one of the support activities as it focuses on obtaining raw materials that require transformation. Other support activity is HRM (Human-Resources-Management) which centres on activities such as recruitment/hiring of personnel, staff capacity building and development, staff compensation and staff retrenchment. HRM plays a critical role because dynamic teaming in a manufacturing environment is more of an administrative human resource activity (Mohan, 2012). Through HRM support activities, value chain model argues manufacturing firms develop stronger and effective dynamic teams. Of importance is dynamic teaming to modular based manufacturing, a major supply chain practices investigated in the current study.

Performance according to value chain model is attributed to the degree to which value chain activities work together to support each other resulting to improved performance (Thoa, 2006). Most often, organizations are supply chains or value system elements; thus, value chain analysis covers the entire system where an organization operates. This model was central in analysing the effect of supply chain responsiveness and supply chain relationship management on performance of textile firms in Kenya.
2.3 Conceptual Framework

Conceptual framework refers to a precise description of the phenomenon being investigated through visual or graphical depictions (Mugenda 2008). The supply chain practices under consideration are: modularity based manufacturing, supply chain relationship management, supply chain integration and supply chain responsiveness. The dependent variable was Performance that was measured among other indicators profits, lead time, recordable customer complaints, number of product mix and number of certified customers. There existed a very strong relationship between independent variables. Supply chain was also assumed to be agile supply chain that employed Just in Time practice.
Supply Chain Practices

Modularity Based Manufacturing
- Product modularity
- Process modularity
- Dynamic teaming

Supply Chain Relationship Management
- Strategic supplier partnerships
- Customer relationships
- Information sharing

Supply Chain Integration
- Internal integration
- Vertical Integration
- External Integration

Supply Chain Responsiveness
- Operations system responsiveness
- Logistics process responsiveness
- Supplier network responsiveness

Performance
- Profits
- Lead Time and Product Mix
- Recordable Accidents

Independent Variables

Dependent Variable

Figure 2.2: Conceptual Framework
2.3.1 Modularity-Based Manufacturing

Modularity based manufacturing practices involve use of substitution principles or standardization unit to process, product and organization design (Thatte, 2007). When an organization redesigns and restructures its operation process, it is likely to realize high level of modularity once their features are recombined or disaggregated to new arrangement with limited functionality damage (Schilling & Steensma, 2001). Dividing complex systems into smaller modules and evaluating them separately enhances management. Through modularity, organizations can obtain various benefits including increased product feasibility, economies of scale, component change, reduced lead time, product variety and upgrading products, among others (Coronado et al., 2004). Equally, the definitive advantage of modularity in terms of enabling firms to cope with uncertain environments continues to make the concept popular. The concept, for example, has enabled the computer industry to intensely increase its innovation rate. Manufacturers, on the hand, rely on modularity when dealing with increasingly complex technologies and respond swiftly to the rapidly evolving customer demand through the creation of greater product varieties from a set of common subassemblies and modules.

The success of modularization relies on three forces: the accelerating rate of technological change, empowerment of customer by advanced networking and computing technologies, thus rising demand in variety of product at reduced prices and rise in products that are more complex because of increase in technology (O’Grady, 1999). Most organizations, particularly in the computer industry have realised the potential of modularity to revolutionize their entire system (O’Grady, 1999). SAP and Oracle, which develop software deliver a wide range cartridge or of software that facilitate creation of custom applications (Marshall, 1996).

Existing literature, as pointed out by Lee (2004) concur that supply chains which apply product modularity are more responsive because the process aids in product postponement. Tu et al., (2004) developed product, process and dynamic teaming
modality as the three main dimension of manufacturing practices that is based modularity. Product modularity involves product standardization modules to facilitate rearranging/reassembling into various functional forms that are shared across different product lines (Tu et al., 2004).

Process modularity involved the standardization of manufacturing process modules in order for them to be re-sequenced with ease so that new modules can easily be added instantly as response to product requirements changes (Tu et al., 2004). Three principles guide this process; these three principles include standardization, re-sequencing and postponement. As a result of the rapidly evolving manufacturing environment in today’s world, there is need for supply chain workforce to have a dynamic structure that does not resemble traditional teams which were cross-functional. Although teams within functional units might lack flexibility they are often tightly integrated to enhance efficiency (Pine, 1993). There is need for company to break up the teams that are tightly coupled and establish networks of modular that are loosely coupled and working units that are flexible in order for these groups of people, processes and technologies to be easily reconfigured within the organization hence meeting the ever-evolving customer needs.

2.3.2 Supply Chain Relationship Management

Lapide, (2013) described supply chain relationship management as the activities an organisation undertakes to enhance effectiveness of supply chain engagements both in upstream flow and downstream flow. We have relationships where the buyer and supplier do not have that closeness on one end and on the other end, we have adversarial relationships which have single sourcing as an improved level within the spectrum as it is characterised by lack of mutuality in thought and in action. According to Donlon (1996) some of the element of supply chain relationship includes information sharing, continuous process flow, supplier partnership, and cycle time compression.
Regarding supply chain management, Tan et al., (1998) states that purchasing; quality and customer relations are some of the main practices. Alvarado and Kotzab (2001), links supply chain relationship and management through core competencies, inter-organizational system and using postponement to eliminate excess inventory. Similar practices on customer relationship, strategic supplier partnership and information sharing have been used in this research. In terms of strategic supplier partnerships, the research focuses on enhancing downstream the responsiveness of supply chain. Notably, the downstream responsiveness of supply chain in the textile and apparel industry can be enhanced through: customer relationship; supplier partnerships which are strategic; and sharing of information.

Strategic supplier partnership can be explained as the relationship between suppliers and firms which is long-term in nature promotes mutual problem solving efforts and planning among supply chain partners while leveraging the operation and individual participating firms strategic capabilities (Li et al., 2006). Moreover, the practice enables firms to operate effectively and closely with few rather than many suppliers that have been selected merely on the basis of cost (Thatte, 2007). When suppliers are included in the product-design process firms are able to identify better technologies and components, offer cost efficient design alternatives and assist in design assessment (Thatte, 2007).

CRM (Customer-Relationship-Management) refers to all the practices used to prioritize clients such as developing relationships that are long-term, management of consumer complaints and customer satisfaction enhancement (Li et al., 2005). Successful CRM along the supply chain entails downstream and upstream supplier integration of customers considering that each entity in a supply chain is a supplier as well as a customer (Tan et al., 1999). CRM can be divided into three major levels: customer facing, functional and company-wide practices. Werner and Reinartz (2004) state that the purpose of customer facing perspective is to develop a single view of the customer
through all contract platforms and to distribute the customer intelligence to all customer-facing functions. As such, the customer facing level enhances CRM by harmonizing information across contract channels and time (Reinartz et al., 2004). At the customer-facing level, Hoyer (2004) states that CRM can be divided into three major stages: relationship initiation, maintenance and termination; which increases the profit and value of the relationship. The customer facing perspectives is appropriate to the textile and apparel industry.

Information sharing is another critical practice in supply chain management. Information sharing is the access of private information among trade partners, which in turn facilitate easy monitoring of the movement of orders and products along the supply chain (Simatupang & Sridharan, 2002) and this, can be enhanced by having a flexible information system.

According to Simatupang and Sridharan (2005) information sharing involves obtaining, processing, storing, presenting, retrieving and distributing data along the supply chain. The data in the information sharing process deals with various aspects of the supply chain including forecast and demand data, inventory location and status, performance and order status and cost related data. For information sharing to be effective, Simatupang and Sridharan (2005) point out that the data must be accurate, relevant, reliable and timely. Such data increases supply chain visibility and facilitating effective decision making (Davenport et al., 2001).

To make the supply chain competitive, Lummus and Vokurka (1999) point out that supply chain concepts must be properly defined and information needs to be shared freely. Equally, availability of up-to-date and accurate marketing data at every stage of the supply plays a critical role in developing a seamless supply chain (Childhouse & Towill, 2003). However, some supply chain partners are unwilling to share information, particularly because sensitive information such as production schedules and inventory level can provide some edge to competitors (Ballou et al., 2000).
2.3.3 Supply Chain Integration

SCI (Supply-Chain-Integration) refers to the intra and inter-organization level of strategic collaboration between manufacturers and supply chain partners (Flynn et al., 2010). On the contrary, Kwon and Suh (2005) describes supply chain integration as a strategic tool that enables firms to reduce operation costs, and thus increase stakeholder value by linking all players along the supply chain including customers and suppliers. Though these definitions emphasize that SCI is closely linked to collaboration and working with various partners as a single entity, it lacks a clear agreement on its constructs (Zhang & Huo, 2013). SCI involves two major levels: external and internal integration. Unlike external integration that evaluates the collaboration between suppliers and firms, internal integration deals with supporting functions and product integration in a firm (Schoenherr & Swink, 2012).

External integration can be viewed as collaboration of the focal organization with its clients, supplier integration or both (Prajogo & Olhager, 2012). To determine supply chain integration in the cloth and apparel industry, this research focuses views external SCI in terms of both supplier and customer integration. Internal integration, on the other hand, combines different divisions in a firm into a single unit by eliminating functional barriers. As such, instead of viewing functional divisions in a firm as silos, they are viewed as integrated processes.

On the contrary, internal integration is defined as the collaboration and interaction process where purchasing, manufacturing and logistics operate in a cooperative manner to realize outcomes that are mutually acceptable for a firm (Liu et al., 2013). Moreover, Yeung et al. (2009) broadens the definition of internal integration to include the practices, strategies, behaviours and procedures of an organization. The definition also includes relying on cross functional corporation and information system integration to facilitate information sharing in an organization.
Therefore, inter-functional interaction, communication, cooperation and collaboration process that unites functional areas into a cohesive organization (Swink et al., 2007). Internal integration focuses on cross functional teams which bring together specialists that are carefully selected (Elgazzar et al., 2013). Through internal integration, firms can easily coordinate and combine internal resources to enhance competencies across domains such as cost, performance, quality and delivery (Frohlich & Westbrook, 2001).

Vertical integration as key components of internal integration involves decisions that seek to determine whether business units should be used by firms to provide some goods or services internally or by procuring them externally from vendors. Vertical integration also involves aligning various supply chain activities under one company’s management. Vertical integration can be achieved through vertical contracts and vertical financial ownership (Huang, Yen & Liu, 2014). Vertical financial ownership relies on mergers and acquisitions to eliminate boundaries in a firm which include resale price maintenance, exclusive dealing and exclusive territories (Mahoney, 1992). Through the shift of organizational asset ownership, vertical integration tends to increase a firm’s capability to cooperate inputs directly in comparison to long-term contractual arrangement which is long-term. Nonetheless, most vertical financial ownership theories are more inclined towards the vertical integration strategy models. This research is underpinned by vertical integration based on the vertical contracting concept.

2.3.4 Supply Chain Responsiveness

SCR (Supply-Chain-Responsiveness) refers to the degree and capability of promptness that supply chains can react to changes in consumer demand (Koçoglu et al., 2011). In the rapidly evolving business environment it is important to develop more responsive and flexible supply chains and organizations. Swift and apt response to the rapidly evolving customer needs will enable firms to succeed in the present business environment which is highly volatile and unpredictable and adjust to various supply chain disruptions (Christopher & Peck, 2004; Muhammad, Sule, Sucherly & Kaltum,
This research deals with SCR from the customer demand perspective. The customer demand perspective focuses on operation system, logistic process and responsiveness of supplier network.

OSR (Operation-System-Responsiveness) which involves: production and system operation, refers to the firm’s operation system ability to deal with unpredictable customer demand. To satisfy customer demand, service operation at each stage must be timely and reliable. Thatte, Rao and Ragu-Nathan (2013) point out that efficient OSR must minimize costs and eliminate wastage of resources at no-value added activities. Equally, through OSR assets must be rapidly arranged or re-arranged and the manufacturing system’s operations must respond to customer trends (Wu, 2001; Lummus et al., 2003). As such, the firm must rapidly respond to them. Therefore, OSR involves the manufacturing and production systems ability to respond instantly to events that are unexpected as well as accommodating non-routine or special customer requests in a swift manner.

LPR (Logistic-Process-Responsiveness) is the capability of an organisation’s distribution, outbound transportation and warehousing system to rapidly react to consumer demand changes. Logistic management focuses on warehousing, packaging, transportation, delivery order tracking, shipping, reverse logistics and inventory management (Thatte & Agrawal, 2017). LPR components involves selection of elements that rapidly respond to and accommodate broad demand changes in short period, adjust the capacity of warehouse to deal with changes in demand, handle various products, vary transportation carriers, alter the package of in-transit products to meet discreet customers’ requirements and customize products close to the customer. The flexibility and speed of logistics in the supply chain creates value for the customers of a firm to serve the distinct needs of customers Mandal, 2015).

SNR (Supplier-Network–Responsiveness) refers the capability of major suppliers to rapidly deal with downstream and production changes in an organization’s demand. The
presence of flexible and responsive partners is one of the key components of SNR. The firms’ ability to react swiftly to changes in customer demand relies on the suppliers’ respond time to make volume changes (Thatte, Rao, & Ragu-Nathan, 2013).

In case of supply chain disruptions because of, emergence of new technology, cut-throat competition or terrorist threats, the supply chain network must be prepared to respond to any ripple effect. Supplier network flexibility is a critical in responsiveness to changes in consumer demand; hence, SNR is an important dimension of SCR in this research. To remain competitive, firms must meet the continuous changes in customer needs through introduction of new products. As such, various stages of the supply chain including sourcing raw materials, manufacturing and distribution and delivery must be highly responsive. To be highly responsive, firms must identify suppliers that can add new products quickly as well as make the required changes (Danese, Romano & Formentini, 2013).

2.3.5 Performance of Textile and Apparel Firms

Firm performance relates to the extent to which an organization achieve its goals and objectives. Firm performance in multi-dimensional constructs that takes different dimension depending on which aspect of performance is under focus. Hassini et al. (2012) postulates that current systems of measuring performance are not suitable for the textile industry as performance measurement needs to take into consideration sustainability and Performance through different supply chain practices. The purpose of this research is to determine various performance aspects which are geared to sustainability and determine how they can be measured within the various sectors of SC operations.

The TBL (Triple-Bottom-Line) is one of the frameworks that measures performance by focusing on sustainability aspects of profit, planet and people (Elkington, 1997). The framework is in line with Chen et al. (2012) proposition in regard to the development of
qualitative assessment approaches that encompass societal, environmental and economic dimensions. The earliest performance framework for sustainability measures such as environmental, economic and social aspects was developed by Farrell (Farrell, 1996). However, the framework was qualitative rather than quantitative. A framework that focused specifically on performance in line with firm sustainability and supply chain practices was also developed by Veleva and Ellenbecker (2001). Accordingly, there framework consists on various measurement indicators for social, environmental and financial performance that suits the current study.

While focusing on the UK food supply chain, Yakovleva (2007) introduced another performance measurement for sustainability that incorporated environmental, economy and societal concerns. The framework incorporated balanced scorecard concepts and classified their indicators into three major groups: environmental, economic and social. (Cetinkaya et al., 2011). The multi-criteria framework developed by Erol et al. (2011) integrates all the dimensions of sustainability and supply chain practices based on balance score card model. (Hervani et al., 2005; Patlitzianas et al., 2008)

Environmental dimension of performance in sustainability framework of the following measures: fugitive non-point air emissions, underground injection on-site, stack or point air emissions, releases to land on-site, discharges to receiving streams and water bodies, discharges to publicly owned treatment works, other off-site transfers, on-site and off-site energy recovery, on-site or off-site treatment, on-site and off-site recycling spill and leak prevention, total electricity use, total materials use other than fuel, total fuel use, and total water use (Hervani et al., 2005; Patlitzianas et al., 2008).

Economic dimension of performance in sustainable framework is related to the degree to which a firm achieves its financial goals and obligations. This is normally measured through profitability, sales, return of assets and return on equity performance. However, economic performance is also measured through subjective means on the above mentioned financial indicators (Zhu et al., 2005; Wang, 2012; Bai et al., 2012).
Social dimension (Norman and MacDonald, 2004) concentrate on social concerns under the performance framework. These are classified into the following: diversity, unions/industrial relations, health and safety, child labour and community. It is based on the three dimensions of performance within sustainability perspective that this study was modelled along.

2.4 Empirical Literature

Thatte (2013) in his study titled supply chain responsiveness through modularity based manufacturing practices established that the ability of suppliers to change the volume of a product formed a criterion in selection of supplier in the automotive industry. In some various industries such as electronic industry; volatility of demand presents a unique problem to suppliers to vary output in correspondence with demand. In this study, he recommended further research in the apparel and textile industry.

Hsiao, Sharon and Rahman (2015) carried a research on “the impact of buyer-supplier relationship and purchasing process on Performance: a conceptual framework.” In the paper, they discussed six variables which are; trust, communication, interpersonal relationships, cooperation and power dependence. In their discussion, they concluded that the above variables are positively related to Performance but their measurements lacked the element of sustainability which is of my interest.

Various research studies have been done on the performance of social supply chain in textile industry. Köksal, Strähle and Müller (2018) conducted a study whose aim was to examine the effect of sourcing practices on social sustainability and performance in textile supply chain. The study employed use of qualitative data from semi-structured interviews. The study findings indicated that social sustainability in textile and apparel firms supply chain is characterized by strong supplier integration, with supplier development and coordination being key in supplier integration. A related study has been conducted by Köksal, Strähle, Müller and Freise (2017) who did a study through
literature review methodology to assess social Performance in textile and apparel industry. These studies use qualitative methodologies that are considered by some scholars as weak in understanding the social sustainability and performance concept in textile and apparel firms hence the current study.

Kim and Kim (2017) carried out a study that sought to find out how supply chain management was affected by various aspects. The study was based on qualitative methodology that used document analysis of Chief executive Officer (CEO) letters and reports in textile. The study indicated that sustainable Performance management trends encompass economic, social and environment in textile and apparel firms. This study was limited to understanding the trends in Performance without delving on relationship between supply chain practices and Performance.

Oelze (2017) in his study sought to examine the barriers and enablers for sustainable Performance in textile industry through use of literature reviews and key informant interview. The findings revealed that certain aspects of firms’ collaboration can enhance Performance and provides barriers of implementation process. Further, the study established that the degree of information sharing is a major barrier in sustainable supply chain implementation in textile industry.

Hossain and Roy (2016) did a study to identify the impact of Supply Chain Management (SCM) for sustainable growth in Readymade Garments (RMG) sector of Bangladesh. Through use of secondary data the study revealed that the supply chain practices are not significant predictors of sustainable growth in garment industries. The study concluded that supply chain practices have not fully contributed to sustainable growth of textile firm in Bangladesh. Although the study focused on supply chain practices and sustainable growth in textile and apparel firms, it did not include environmental performance and social performance but was limited to economic performance.
2.5 Critique of Existing Literature

Musau (2018) conducted a cross-sectional descriptive study on the effects of supply chain determinants of organizational performance with a focus on the measures of profitability, reliability and responsiveness among textile manufacturing firms in Kenya. The results indicated that information sharing, logistic responsiveness, buyer-supplier relationship and operational process responsiveness positively affect organizational performance. The study was premised on the theories of game theory, relational exchange theory, Supply chain network theory and lean theory. However, Agha, Alrubaiee and Jamhour (2012) argues that the theories of supply chain network, lean theory and relational exchange theory are deficient in analysing Performance effects from a sustainability perspective which was not tested in the study. Hence, the current study tested the theories of RBV, SCOR model and system theory are seen as fitting performance from sustainable perspective (Choi, Min, Joo & Choi, 2017).

A study by Anjum, Kashif and Riaz (2016) analysed the supply chain integration effects on operational performance of textile firms in Pakistan. Customer integration, supplier integration were proved to have a significant effect on operational performance. As much the current study demonstrate the importance of supply chain integration on firm performance the results are limited to operation performance raising question on effects of SCI on other aspects of operation performance. Another drawback of the study relates to the focus on external internal (customer and supplier) while ignoring internal integration that is central in organizational coordination in Performance. Hence the current study will fill the gap on other dimensions of performance in textile industry and internal integration among textile firms.

Köksal et al. (2018) carried out a study whose aim was to investigate the role of sourcing practices on performance of textile supply chain. Through the use of qualitative data from semi-structured interviews in the study, the study revealed that performance
on textile and apparel firms supply chain is affected significantly by strong supplier networks and external integration. The study highlighted the contribution of supply chain integration on Performance. Related study has been conducted by Köksal et al. (2017) who did a study through literature review methodology to assess effects of strategic supplier partnerships on performance of textile and apparel industry. Although these studies demonstrate the importance of supplier network responsiveness and strategic supplier partnership, these studies failed to explore the other components of supply chain relationship management and supply chain responsiveness that contribute to better Performance in textile industry.

Sudarshan & Rao (2013) investigated the modular based manufacturing practices in garment Industries and the findings of the study indicated that garment factories have adopted both process and product modularity. Similarly, Ramdass & Pretorius (2011) sought to analyse the implementation of modular manufacturing in South African textile industry. Study results showed that modular based manufacturing has been implemented to varied levels among different textile firms in South Africa due to a number of challenges. However, this is as far as the scope of the aforementioned modular based studies and this portends inconclusive evidence on the potential impacts of modularity based manufacturing on performance. The current study sought to address this gap, more so the effects of modular based manufacturing.

Hossain and Roy (2016) did a study to identify the impact of Supply Chain practices (supplier relationship management and supply chain integration) on growth of firms in Readymade Garments (RMG) sector of Bangladesh. Through use of secondary data the study revealed that the supply chain practices are not significant predictors of sustainable growth in garment industries. The study concluded that supply chain practices have not fully contributed to growth of textile firms in Bangladesh. This study was premised on the theory of resource based model thereby raising the questions on the effect of supply chain practices on performance of textile firms.
Ishtiaque, Siddiqui & Ahmed (2019) did a study whose aim to establish an understanding of relationships among information and communication technology, integrative capabilities, operational responsiveness and dimensions of performance in a developing economy, with Pakistani selected as the context. The results show that the best way to achieve operational performance through ICT investment as it improves operational responsiveness and by extension operational performance. Technology based responsive (TBR) system which was the scope of the study is not well developed in other developed countries textile industry outside Asia that are yet to adopt. Thus it important to investigate applicable supply chain responsive system in developing countries in Africa and their effects on performance.

Thatte (2013) carried a research on supply chain responsiveness through modularity based manufacturing process in textile industry. In his research, he found out that modularity based manufacturing is positively related to supply chain responsiveness among textile firms. This research was carried out in the American supply chain system which is not responsive from the literature review. Additionally the study investigated the modular based manufacturing-supply chain responsiveness relationship without delving on the joint effect these supply chain practices on performance of firms.

Fukunishi (2012) carried a study with a focus on the performance of Kenyan Textile and He found out that local firms have no tolerance to economic shocks and they are susceptible to temporal negative profits due to better supply chain practices. The study did not go as far as establishing the effect of supply chain practices on performance of textile firms in Kenya but was only limited to identifying the challenges hampering the performance of firms in Kenya.

management is but one of the elements of operational responsiveness, a sub component of supplier chain responsiveness and therefore the study cannot be considered as complete in providing understanding on effect of OPR on performance of textile firms in Kenya.

2.6 Summary of Literature

The literature reviewed supply chain management practices and Performance. These practices included modularity based manufacturing, supply chain relationship management, supply chain integration and supply chain responsiveness. Reviewed literature generally agreed that these practices were specific to some industries and if implemented, there was to be performance by looking at specific sub-constructs. Research suggests that modularity based manufacturing was specific to apparel and textile industry and Information Technology Programming. In addition to this, supply chain relationship management and supply chain integration are more universally pronounced and supply chain responsiveness enhances the fastness with which a particular product can be delivered to the ultimate customer.

The study suggests that there can be Performance but there is need to study if it leads to profits and sustainability, it can enhance product quality through differentiation and innovativeness and lead time reduction. Moreover, research has shown that a firm with well-developed and maintained relationships with customers and supply chain stakeholders enhances Performance. Literature review also noted the importance of logistics and distribution management through the movement of goods from manufacture ring to distribution centres then to the final point of consumption. To conclude, literature discussed the theoretical foundation of various constructs that were used in this research: supply chain practices which in the view of the researcher were modularity based manufacturing, supply chain relationship management, supply chain integration, supply chain responsiveness and Performance being the dependent variable.
2.7 Research Gaps

Köksal, Strähle and Müller (2018) stated that majority of studies on supply chain effects on performance of textile firms are conducted in Western and Asian countries with less studies conducted in African countries (Anjum, Kashif & Riaz, 2016; Hossain & Roy, 2016; Ishtiaque, Siddiqui & Ahmed, 2019; Köksal et al. 2017). The reviewed studies, supply chain practices effects on performance has been examined through different variables including: supplier relationship management, supply chain integration and supply chain responsiveness. However, these studies have not examined the effect of modularity based manufacturing as a supply chain practices on performance of textile industries in both developed and developing countries.

Reviewed studies show that supply chain practices have been identified as possible divers and enablers of Performance. However, there exist less empirical studies that have sought to explore the relationship between supply chain practices and performance from a sustainability perspective. A number of studies that have been carried out are limited to operational performance, organizational performance and financial performance. These studies have ignored other aspects of performance such as social and environmental performance. Although there exists some local studies that have focused on some of the supply chain practices effects on either organizational performance or operational performance. The reviewed studies have also used subjective measures of performance, and hence such studies suffer from low effect size.

This study therefore intended to fill these pertinent gaps in literature by studying the selected independent variables on the relationship between supply chain management practices and performance of textile and apparel firms. This study adds value to existing literature by providing empirical evidence on the supply chain practices of a firm in the apparel and textile industry and fills the existing contextual, methodological and conceptual gaps.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter expounds on the various stages and phases that were followed in completing the study. It started by explaining the research design that was adopted; according to Sekaran (2010) a central part of research was to develop an efficient research strategy. Based on the model and variables developed in chapter two, this chapter covered the research design and research methodology used to test the variables. In particular, issues related to research design, the population, the type of data collected, sampling frame, sample and sampling techniques, data collection instrument, data collection procedure, pilot test, validity and reliability of the instrument, and the data analysis and presentation were discussed.

3.2 Research Philosophy

Scientific research philosophy is a system wherein the researcher’s thoughts for generation of new knowledge are premised on. This system is composed of some related aspects of: methodology, epistemology and ontology. Research methodology that is selected should be positioned within a given philosophical school (Markus, 2007). Research philosophy refers to a researcher perception of the world and how that perception give rise to assumptions that underpins one’s research process. Research philosophies are broadly categorized into positivism, interpretivism, realism or pragmatism (Antwi & Hamza, 2015).
The positivist philosophy explores reality based on observation and reason, giving rise to empirical studies and experiments. The opposite of positivist philosophy is the interpretivist research philosophy, which argues that the social world is best understood in a subjective manner. Thus, this school of thought ascribes a special place to the researcher’s subjective experiences and interests. Realistic research philosophy combines positivist and interpretivist research philosophies, and is based on subjective views of human nature (Barnham, 2015).

The final category of research philosophy is pragmatist research philosophy that is concerned with factual problems while paying special attention to developing practical solutions to address the problem thereof. In this perspective, the researcher is free to choose the methods, techniques, and procedures that meet the researcher’s objective. Pragmatists are action-oriented and they see the world as unified in empirical evidence to address a problem (Creswell & Poth, 2017). This perspective underpinned the current study as the researcher’s aim was to address a problem through practical recommendations.

3.3 Research Design

A research design is architecture or a roadmap that guides the gathering, collection, and analysis of data and is a complete plan for how research study is conducted according to the data required in order to investigate the research questions in an orderly manner (Maxwell, 2013). Sekaran (2010) states that a good research design has a clearly defined purpose, and has consistency between the research questions and the proposed research method. According to Roller and Lavrakas (2015), this is simply the framework or blueprint for the research. Orodho (2003) define the research design as a framework for the collection and analysis of data that is suited to the research question. Orodho (2003) defines research design as the scheme, outline, or plan that is used to generate answers to the research problem.
The study adopted descriptive study designs. A descriptive research design determines and reports the way things are (Mugenda & Mugenda, 2003). (Maxwell, 2013) observes that a descriptive research design is used when data is collected to describe persons, organizations, settings or phenomena. The design, since it used key informant guide to design the questionnaire, had enough provision for protection from bias and maximized reliability (Kothari, 2011). Descriptive design uses a pre-planned design for analysis (Schwandt, Lincoln, & Guba, 2007). Descriptive design identifies the existing variables in a specific situation and describes the relationship that is present between the variables. Besides, helping in testing of hypothesis, the study design offers benefits in cost and time effectiveness and hence its suitability for the study.

3.4 Target Population

According to Kothari (2011) a population refers to the entire group of people or things of interest that the researcher wishes to investigate. Sekaran (2010) and Mugenda & Mugenda, (2003) defines population as an entire group of individual or objects having common observable characteristic. Since the variables under study are dependent on the individual firms within a supply chain, the unit of observation in this study was a firm.

The target population in this study was 60 firms which represent the number of operational textile and apparel firms in Nairobi. The unit of analysis were the textile and apparel firms while the unit of observation were the managers that represented the firms. Each of these firms deal with the manufacturing of apparel and textile products for export. Data available from the government of Kenya, (2015) revealed that there were, at the time of data collection, twenty one (21) companies that operate in Kenya’s EPZ and thirty nine (39) companies that operate under MUB (manufacture under bond) also called duty alienation scheme under Kenya Association of Manufacturers of which both are under AGOA.
3.5 Sample and Sampling Technique

The study used census to select the participating firms since the target population of the firms was small. According to Creswell (2015), a census targets ‘individual enumeration’ which was a firm in this study. After the selection of participating firms through census, the study used purposive sampling to select a respondent from each firm as guided by Maxwell (2015). This was used to select respondents who met the inclusion criteria of the study in filling the questionnaire. The study had a sample size of 60 that equated to number of textile and apparel firms in Kenya.

3.6 Data Collection Methods

Reynolds et al., (2011), defines data collection as a means by which information is obtained from the selected subjects of an investigation. The research was based on primary and secondary data.

3.6.1 Primary Data

The primary research data was collected using a questionnaire. Questionnaire was used for its advantages in guiding the respondents through categories of responses, reduced time in data collection and cost. A questionnaire was administered to the senior executives and middle level managers of the textile and apparel industries under EPZ and KAM. The questionnaire was self-administered or was administered by a research assistant. This involved the researcher visiting each participating firm, in consultation with the firm’s management, a key person was identified to be the respondent and he/she was requested to fill the questionnaire on his/her own and give back the filled questionnaire to the researcher or research assistant.
3.6.2 Secondary Data

Secondary data was collected in regards to the performance of textile firms. This involved safety reports, financial performance reports, sustainability reports and personal report written by the managers of textile and apparel firms. Reports were reviewed to gain more insights on the performance of the firms along the dimension of social, financial and environmental aspects.

3.7 Data Collection Procedure

Quantitative data collection methods were applied. Data Collection is central in research process as any mistake made in data collection procedure results to increased errors associated with data therefore leading to inaccurate results. Likert scale based on five point scale of: 1) Not at all 2.) To small extent, 3) Moderate extent, 4) Large extent, 5) Very large extent was used.

3.8 Pilot Study

Cooper and Schindler (2011) mentioned that a pilot test is conducted so as to detect weaknesses in the design, instrumentation and to provide proxy data for accurate selection of probability sample. According to Kothari (2011), a pilot study can be conducted by giving the intended questionnaire to just a few people with an intention of pre-testing the questions. Pilot study is an activity that assists the researcher in determining limitations, flaws, or other weaknesses within the interview or questionnaire design and allows them to make necessary adjustments prior to the implementation of the study (Kvale, 2007).

The rule of thumb requires that 1% of the sample should be formed by the pilot test (Cooper & Schilder, 2011; Creswell, 2015). In the study 5 textile firms were selected for the pilot out of the 60 firms. However, these firms were not included in the main study
to avoid bias during data collection. To increase the sampling size of the pilot, the study included a sample size of 3 respondents from each of the firm. Thus the sample size of the study was 15. This was important as it allowed for reliability analysis to be carried out through the statistical software. The pilot study was conducted using the same instrument that was administered to the respondents prior to the main study.

3.8.1 Reliability of Data Collection Tool

Reliability can be explained as the degree or extent to which research instrument produce consistent results over and over again when applied in similar conditions (Mugenda & Mugenda, 2003). For this research study, the researcher was established through pre-testing the questionnaire with a selected sample from among the population. Cronbach’s alpha test is a statistic which was used to measure the accepted range of consistency or reliability of our variables. Reynolds et al., (2011), propose that a reliability index of a minimum of 0.6 is satisfactory for any research instrument. However, in this study, Cronbach’s alpha type of reliability co-efficient of > 0.7 or higher was used for all the four independent variables and results were tabulated. The study results indicated that all the independent variables had a Cronbach’s alpha of more than 0.7 indicating that the study instruments was reliable.

3.8.2 Validity of Research Instrument

Zikmund, Babin, Carr & Griffin (2009), indicated that validity describes the criteria of the effectiveness of the design in using processes of measurement that captures the data with the intention of addressing the research questions. Triangulation was used by the researcher to enhance the external validity of the research instrument in order to ensure the results of the study reflect similar outcomes elsewhere and be generalized to other populations or situations. Triangulation is when different ways of looking at the findings are employed to get a true fix on a situation. According to Cooper and Schilder (2011) by examining the results from several perspectives Triangulation is able to validate the
methodology. This research used a questionnaire as a primary data collection instrument and secondary data was collected from various research journals, annual performance returns to the ministry of Trade and Industrialization (K), submitted performance reports to Export Processing Authority (K) and KAM as obtained from their departments of Statistics and Research, information contained in various monitoring documents as archived on AGOA website were used to collect secondary data. By combining data sources and methods triangulation opens the way for more credible interpretations (Decrop, 2004).

With regards to validity, Jayamaha, Grigg and Mann (2008) define it as how well an instrument measures what it purports to measure. Content, criterion and construct validity are three main forms of validity (Toni & Tonchia 2001; Jayamaha et al., 2008). According to Toni and Tonchia (2001), content validity can be determined statistically by subject experts and by reference to literature. Whereas criterion validity refers to the predictive nature of the research instrument in order to obtain an objective outcome, construct validity measures whether or not a variable is an appropriate definition of the construct (Toni & Tonchia 2001).

To achieve construct validity, questions were organized around the specific objectives of the study. Content and criterion related validity was achieved by consultations with supervisors, fellow students pursuing the degree of doctor of philosophy in supply chain management and experts in instrument development. Views and comments from these stakeholders were used to upgrade the instrument. The use of supervisors and experts opinion enhanced content and criterion related validity.
3.9 Data Analysis and Presentation

3.9.1 Quantitative Analysis

Patton (2006) describes data analysis as a procedure which entails the act of packaging the collected data, putting it in order and structuring its main components in order to drive meaning from the data. Quantitative data was collected and analysed using descriptive statistics by running it in a software SPSS version 24 and presented through frequencies, percentages, means and standard deviations. Data analysis involved transforming the independent variables to get one computed score that was used to carry out factors analysis and regression analysis. MANOVA was used to analyse the data and answer research questions. Analysis was conducted through SPSS version 24. The data results were presented through tables, charts and figures.

Regression Analysis

A multiple regression model was used on each variable to measure the relationship between the dependent and independent variables. The regression model was as follows:

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \]

Where \( Y = \) (Textile Firm Performance), \( \beta_0, \beta_1, \beta_2, \beta_3, \beta_4 \) are the regression coefficients to be estimated

\( X_1 = \) modularity based manufacturing

\( X_2 = \) supply chain relationship management

\( X_3 = \) supply chain integration

\( X_4 = \) supply chain responsiveness

\( \varepsilon = \) error term at 95% confidence level.
Inferential statistics used Analysis of Variance (ANOVA) for each variable and Multi-Variate Analysis of Variance (MANOVA) for all independent variables was used where tests for multivariate normality where Mahalanobis distances were calculated. Mahalanobis distance which is the distance of a particular case from the centroid of the remaining cases was used (Tabachnick & Fidell 2007). To test whether the data had multivariate normality, Mahal distance was compared to critical value that was determined by chi-square table and degree of freedom. Critical value table was adopted for each variable and was used to test the significance of the overall model at 95% level of significance. According to Mugenda (2008) analysis of variance and multi variate analysis of variance was used because it makes use of the F – test in terms of sums of squares residual.

3.9.2 Assumptions of the Regression Model

Any regression model must meet certain assumptions which justify the use of linear regression models for testing relationships among variables. The model was assumed to meet the following conditions: linearity between dependant and independent variables, normality of the population data, Multicolinearity, Homoscedasticity (constant variance) of the errors and autocorrelation, Independence of the errors that is (no serial correlation). Violation of any of the conditions affects the use of robust parametric scores and would mean using non-parametric tests that are less robust in providing valid and reliable results.

3.9.3 Variable Definition and Measurement

Variables are the observable characteristics or events that assume a range of values during the research. Dependent variable is the outcome variable measured in each subject, which is influenced by the predictor variable manipulation. The study was focused on understanding whether supply chain practices influence the performance of textile firms in Kenya. These involved 5 variables related to the study: supply
relationship management, supply chain integration, modularity based manufacturing and supply chain responsiveness and performance in the textile industry. In correct measurement of the variables leads to incorrect and invalid results and hence significant attention is paid to how the variables are operationalized during data collection.

The operational definition of a variable refers to how a variables is measured in any given study. This normally varies from study to study based on the concept used, theory applied and even methodology used. To operationalize the research variables, the study used indicators for supplier relationship management measured at the following sub-components of strategic supplier partnership, customer relationship management and information sharing. Modularity based manufacturing was measured through various indicators at product modularity, process modularity and dynamic teaming. Supply chain integration was measured through indicators at the level of external integration, internal integration and vertical integration while supply chain responsiveness was measured at the level of operation process responsiveness, logistic process responsiveness and supplier network responsiveness. Performance of textile firms was measured at the level of social, environmental and financial.

3.9.4 Diagnostic Tests

a) Test for Outliers

Cox (2006) defines an outlier as an observation that is distant from other observations. He further explains that such a case may occur as a result of among other reasons; variability in the measurement, error in experiment, or as a result of heavy-tailed distribution. Statistical scholars explain that making interpretations based on data with outliers can be misleading and therefore compromise the quality of the research output (Gujarat, 2003). While there are a myriad ways of testing for presence of outliers, Gujarat (2003), recommends the use of a box plot as a convenient way of graphically presenting groups of data using quartiles. Box plot indicate variability of observations
outside the upper or lower quartiles thus outliers can easily be observed and removed for a good analysis (Cox, 2006). In this study, box plot was used to check for presence or absence of outliers.

Absence of multivariate outliers was checked by assessing Mahalanobis Distances among the study’s participating firms. A multiple linear regression with all of the dependent variables of the MANOVA as the independent variables of the multiple linear regression and with the dependent variable as firm ID was run. The Mahalanobis Distances got from the analysis was compared with critical chi-square value at $p= 0.05$, with degrees of freedom being the number of dependent variables. Also, Linearity Test was carried out through a scatter plot matrix with the scatter plot observed to note if all the dependent variables are linearly dependent.

b) Test for Multicollinearity

Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated (Gujarat, 2003). Among other consequences of multicollinearity is that the estimate of one variable’s impact on the dependent variable while controlling the others tends to be less precise than if predictors were uncorrelated (Cox, 2006). Scholars recommend the use of Variance Inflator Factor (VIF) method to test for multicollinearity (Gujarati, 2003). Using this method, if the VIF=1, it will indicate no correlation, if the $1 < \text{VIF} < 5$, it will indicate moderate correlation and if, $\text{VIF} > 5$ to 10, and then it will be highly correlated. Greene (2003) contends that if there are two or more variables that will have VIF of around or greater than 5, one of such variables must be removed from the regression model as this indicates the presence of multicollinearity. This was tested to ascertain the absence of multicollinearity as explained in section 4.10.2 of the study.
c) Test for Heteroscedasticity

Heteroscedasticity refers to “differing variance” (Green, 2003; Gujarati, 2003). Gujarati (2003), asserts that the existence of heteroscedasticity can be a concern in the application of regression analysis as it can invalidate statistical test that assume the modelling error are uncorrelated and normally distributed. In order to check for heteroscedasticity, the study used Breusch-Pagan & Koenker Test to test for heteroscedasticity. However, the study used Koenker test as the sample size of the study was small, 60 firms.

d) Normality Test on the Dependent Variable

In order to make inferences, from an analysis, assumption of normally distributed dependent variable is important. One of the methods used to check for normality is P-P test. According to Field, (2009) a P-P test is a plot of percentiles of a standard distribution against the corresponding percentiles of the observed data. When conducting P-P test, the resulting plot should show an approximately straight line with a positive slope of normality which was used and tested in section 4.10.3 under chapter four.

e) Principal Component Factor Analysis

In this study, factor analysis was done using principal component analysis. The aim was to identify the least number of factors that account for common variance in a set of variables as proposed by Rahim & Margner, 2005. All variables in the study were subjected to SPSS version 24 for factor analysis and the outputs summarised in the tables. Rahim & Margner (2005) assert that researchers should use a factor loading threshold of 0.4 given that any higher loading than this may not be met in real life data.
3.10 Test of Hypotheses

A statistical hypothesis is defined as an assumption about a population parameter Gujarath (2003). This assumption may be true or not. Green (2003) argues that hypothesis testing refers to the formal procedures used by statisticians and researchers to accept or reject statistical hypotheses. Hypotheses testing were done using the p-value for this research. A small $p$-value (typically $\leq 0.05$) indicated strong evidence against the null hypothesis, so the null hypothesis was rejected and large $p$-value ($> 0.05$) indicated weak evidence against the null hypothesis, so null hypotheses was accepted. For this research, if the p-value $>0.05$, then it was considered insignificant.
CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The main objective of this research was to determine the influence of supply chain practices on Performance in apparel and textile industry. This was done by examining four specific objectives based on the influence of modularity based manufacturing, supply chain relationship management, supply chain integration and supply chain responsiveness on Performance in apparel and textile industry in Kenya. This chapter focuses on presenting the empirical results of the study. First, it presents the preliminary findings of the characteristics of the sample and data collected, and secondly, it focuses on the descriptive statistics. Descriptive interpretation provided for the values of the individual variables and their components based on inferential statistics which provide frequencies, percentages and averages (or mean). Thirdly, data analysis focuses on testing the study hypothesis. In this regard, the interpretations of the significance of these findings as obtained from data analysis were presented and supported the model developed from the literature review by data analysis.

4.2 Response Rate

As shown in Table 4.1, respondents from 55 firms participated in the study. Out of the total population of 60 firms, 5 firms were selected for pilot study and as a result were not included in the data collection thus giving us 55 firms that participated. 52 firms returned the questionnaire and this comprised of 94% of the targeted 55 firms. Response rate is a key determinant to the performance of regression analysis, with major effect on whether data met assumption tests or not. 94% was very good and it was confirmed by Baruch and Holtom (2008), who contend that a response rate of over 90% is a very
good. A response rate of 100% is excellent; however it was not achieved in the study. This was attributed to absence of response facilitation in the study and by some firms not giving the researcher permission to collect data. These results can compared to the findings of Alli and Habib (2012) who had a response rate in a similar study carried out on supply chain practices in textile industry.

Table 4. 1: Response Rate

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returned Questionnaires</td>
<td>52</td>
<td>94</td>
</tr>
<tr>
<td>Non-Returned Questionnaires</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.3 Results of Pilot Study

4.3.1 Validity and Reliability

The validity of the model constructs was assessed by exposing the variable item responses from the questionnaire to factor analysis. Content validity which is the adequacies with which the test items or variables represent the conceptual domain of interest was undertaken. The Exploratory Factor Analysis (EFA) determines the least number of factors which can account for the common variance of a set of variables. This process reduced the number of items that fall below 0.4 level and thus strengthening the content validity of items contained in the factors. However in the study all the factor loading were above 0.4 thus showing that the variables meet content validity.

The analysis outcome of reliability scores of the independent variables revealed that all the variables had a score of over 0.7. In confirming reliability, the Cronbach’s alpha was used. The findings were found to be acceptable and therefore reflected on the validity of
the instrument used. This is supported by (Fowler, 2000; Sekaran, 2003) who pointed out that the commonly acceptable Cronbach alpha value has to be well above 0.70. Likewise, Aggarwal (2004) suggested that a Cronbach’s alpha value greater than 0.60 is considered reliable. This directive was also supported by Benko, Farias & Cordeiro (2011) who claimed that Cronbach’s alpha values between 0.60 and 0.80 are also acceptable.

Table 4.2: Reliability Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modularity Based Manufacturing</td>
<td>0.818</td>
<td>0.822</td>
<td>15</td>
</tr>
<tr>
<td>Supply Chain Relationship</td>
<td>0.802</td>
<td>0.811</td>
<td>15</td>
</tr>
<tr>
<td>Supply Chain Integration</td>
<td>0.749</td>
<td>0.784</td>
<td>15</td>
</tr>
<tr>
<td>Supply Chain Responsiveness</td>
<td>0.726</td>
<td>0.752</td>
<td>15</td>
</tr>
<tr>
<td>Average</td>
<td><strong>0.773</strong></td>
<td><strong>0.792</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

4.3.2 Missing Value Analysis

The analysis of missing values of the data was carried out to understand the overall missing data patterns. From the missing value analysis, the results indicated that the missing values were less than 20% in the variable and values section, (Figure 4.1). These results indicate that the data was thus suitable for analysis as supported by Tabachnick & Fidell (2007). However, further analysis on the missing values pattern was necessary to gain more insight on missing values pattern.
From the missing value patterns in the Figure 4.2 below it was evident that missing values were minimal and were present across nearly all variables and thus the overall effect of the missing values was negligible in the study. The missing data was viewed completely at random thus had limited effect on the outcome of the study. This is supported by Tabachnick & Fidell (2007) who argues that missing value patterns less than 20% and spread across all the variables has insignificant effect on study model. The missing values were dominant on the question of type of apparel that the firms deal with. This covered other types of apparel, suits and shirts. This variable was not of interest in the study model as such this has limited effect on the regression model. This data was suited for model fitting as the explanatory variables in the study had minimal missing values, with only the first question on customer relationship variable having 3 missing values. However, the impact of this on the model was minimal as this was a sub-component of supply chain relationship management.
4.4 Demographic Characteristics of the Respondents

4.4.1 Gender of the Respondents

Gender is a major determinant in the adoption of best management practices and it would show the level of role delegation in a supply chain environment. In terms of gender, the study results showed that 56% of the respondents given were male while 44% were female. These results imply that gender representation is a key element in dynamic teaming, a supply chain practice that determine the Performance in textile and apparel industry. These findings are consistent with previous studies which revealed that
gender representation is important in textile and manufacturing process (Hancock & Sandunis, 2016; ILO, 2011).

Figure 4.3: Gender of the Respondents

4.4.2 Education Level of the Respondents

As tabulated in Table 4.3, 73% of respondents had university level of education, while 27% had secondary level of education. According to the results, it was established that there is high level of education among the management of the textile and apparel firms that export in Kenya, with majority having higher level of education. These findings suggest that most of the textile firms in Kenya are likely to adopt best supply chain practices thereby enhancing the performance of such firms. Higher levels of educational attainments tend to expose an individual to new knowledge or best practices within the supply chain. Pine (2003) argued that higher levels of education among managers and owners increases positive attitude towards learning, making managers perceive more information and to be more open to new and creative alternatives. Thereby managers/owners show themselves to be more flexible and being good enough to
achieve consensus and speed in adopting best supply chain management practices. These findings are supported by the results of Salume (2012) who found out that there exists higher level of education among textile manufacturing firms in Tanzania. These findings suggest that textile and apparel firms have the potential to engage in best supply chain practices.

Table 4.3: Level of Education

<table>
<thead>
<tr>
<th>Highest level of formal education</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary Level</td>
<td>14</td>
<td>27</td>
</tr>
<tr>
<td>College/University Level</td>
<td>38</td>
<td>73</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.4.3 Years of Operation of Textile and Apparel Firms

This was considered important in the study since the years of operation of a business are a key determinant to the degree to which a firm adopts supply chain practices. As shown on Table 4.4, 60% of the firms had been in operation for over 5 years while the remaining 40% had been in operation for between 3-5 years. The study results indicates that majority of the firms have most likely adopted operation performance strategies thereby contributing to enhanced Performance. This is in agreement with the findings of Marwah, Thakar & Gupta (2014) who established that years of operation also heavily contribute to Performance in the manufacturing industry.

Table 4.4: Years of Operation of Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Years of operation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5 years</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>Over 5 Years</td>
<td>31</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
4.4.4 Organizational Size

As indicated in table 4.5, 60% of the firms had over 200 employees, 25% had between 101 and 200 employees, 9% had between 50 and 100 employees while 6% had less than 50. One of the striking features revealed from the results is that majority of firms in textile industry in the sample are large firms that employ more than 200 employees. This shows that firms in the textile industry are not small but large firms. Similarly, such patterns were evident in China and Ethiopia, where it was indicated by Wang and Sarkis (2013) that most textile and apparel firms are large firms and not small firms. These finding demonstrate that most textile and apparel firms have the potential to adopt best practices for supply chain management thereby making the study suitable.

Table 4.5: Number of Employees

<table>
<thead>
<tr>
<th>Number of employees</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 200</td>
<td>31</td>
<td>60</td>
</tr>
<tr>
<td>101-200</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>50-100</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Less than 50</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.4.5 Primary Production Process

On the question of the primary production process of the textile and apparel firms as presented on table 4.6, the study findings revealed that 16(30.7%) of the respondents mentioned that their firms use make to stock, while 18(34.6%) of the respondents agreed that their firms use make to order process, with 3(5.7%) and 15(28.8%) of the respondents stated that their firms use engineer to order and assembly to order process respectively. These findings indicate that the dominant processing order in textile industry is make to order. This suggests that push supply chain strategy is dominant
among the textile and apparel firms in Kenya followed by pull supply chain strategy. These findings also tallied with those of Rabbani, Niyazi, & Rafiei, (2016) who confirmed that make to stock order is still the dominant production process among textile and apparel firms in developing countries.

### Table 4.6: Production Process in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Position in the business</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer to order</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Make to Order</td>
<td>18</td>
<td>34.6</td>
</tr>
<tr>
<td>Assembly to Order</td>
<td>15</td>
<td>28.8</td>
</tr>
<tr>
<td>Make to Stock</td>
<td>16</td>
<td>30.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>52</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### 4.5 Descriptive Analysis

The study had four specific objectives as shown in chapter one of this work. This section explores data analysis based on the findings of each objective. The data was obtained from statements based on a Likert scale questionnaire that had values assigned as 5=Strongly Disagree, 4=Disagree, 3= Neutral, 2=Agree, and 1=Strongly Agree. The analysis below was presented using frequencies and descriptive statistics and then followed by statistical modelling using regressions and correlations.

#### 4.5.1 Modularity Based Manufacturing

The first objective of the study was to establish the influence of modularity based manufacturing of a firm on Performance. This objective was measured based on 3 factors: Dynamic teaming, product modularity and process modularity. Results are presented in section 4.5.1 to 4.5.3 below.
4.5.2 Dynamic Teaming

The study sought to understand the role of dynamic teaming in modularity based manufacturing processes as a supply chain practice. The study findings revealed that respondents agreed that production teams can be restructured in such a way to align with the response to production/process changes, reassigned to different production tasks and easily reorganized teams are used in our plant (mean 1.76, 2.09 and 1.89 respectively). Further the study revealed that respondents agreed that production team members are capable of working on different teams without difficulty in accessing necessary resources. This was supported by 1.89 and 2.07. Overall, the dynamic teaming had a mean of 1.94 showing that respondents agreed that dynamic teaming practices are carried in the textile and apparel firms. These findings show that dynamic teams in textile and apparel firms are characterized by an ability to adapt and create change in the production process. Thus it can be concluded that textile firms adhere to team characteristics and team effectiveness in their supply chain practices. These findings concur with results of Thatte (2013) who found out that large manufacturing firms have team effectiveness in production teams.
Table 4.7: Dynamic Teaming Practices in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production teams can be reorganized in response to production/process changes</td>
<td>40%</td>
<td>49%</td>
<td>7%</td>
<td>4%</td>
<td>0%</td>
<td>1.76</td>
</tr>
<tr>
<td>Production teams can be reassigned to different production tasks</td>
<td>29%</td>
<td>49%</td>
<td>9%</td>
<td>11%</td>
<td>2%</td>
<td>2.09</td>
</tr>
<tr>
<td>Production teams that can be reorganized are used in our plant</td>
<td>35%</td>
<td>47%</td>
<td>11%</td>
<td>7%</td>
<td>0%</td>
<td>1.89</td>
</tr>
<tr>
<td>Production team members are capable of working on different teams</td>
<td>36%</td>
<td>47%</td>
<td>13%</td>
<td>4%</td>
<td>0%</td>
<td>1.87</td>
</tr>
<tr>
<td>Production teams have no difficulty in accessing necessary resources</td>
<td>11%</td>
<td>59%</td>
<td>22%</td>
<td>9%</td>
<td>0%</td>
<td>2.07</td>
</tr>
<tr>
<td><strong>Average /Mean</strong></td>
<td>33%</td>
<td>50%</td>
<td>10%</td>
<td>7%</td>
<td>0%</td>
<td>1.936</td>
</tr>
</tbody>
</table>

4.5.3 Product Modularity

The study sought to understand the role of product modularity as a component in modularity based manufacturing processes as a supply chain practice. The results indicated that the respondents strongly agreed that the products can be decomposed into separate modules and that product features have standardized interfaces (mean 1.44 and mean of 1.38 respectively) as product modularity actions. These imply that product modules in textile firms can be transferred to variant product lines and progressive product development projects. Thus, it can be concluded that textile and apparel firms
have high product modularity with product components that are highly interlinked with well-specified interfaces across the components. These results are in line with the findings of Sudarshan and Rao (2013) who concluded that textile and apparel firms have product modules that can be separated in different standard modules.

Further, the results revealed that respondents agreed that products are customizable through the addition of feature modules as requested. The interfaces of product components are designed such that they accept a variety of other components and the products are designed to be easily re-configured (mean = 1.87, 1.51 and 1.75 respectively). These results suggest that textile and apparel firms can engage in mass customization with high level of variety. This supports the assertion of Yang, Kincade and Chen-Yu (2015) that product modularity improves customization of products.

**Table 4. 8: Product Modularity Practices in Textile and Apparel Firms**

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our products can be decomposed into separate modules</td>
<td>56%</td>
<td>31%</td>
<td>4%</td>
<td>7%</td>
<td>2%</td>
<td>1.44</td>
</tr>
<tr>
<td>Our product features have standardized interfaces</td>
<td>62%</td>
<td>24%</td>
<td>7%</td>
<td>4%</td>
<td>2%</td>
<td>1.38</td>
</tr>
<tr>
<td>Our products can be customized by adding feature modules as requested</td>
<td>38%</td>
<td>49%</td>
<td>4%</td>
<td>7%</td>
<td>2%</td>
<td>1.87</td>
</tr>
<tr>
<td>The interfaces of our product components are designed to accept a variety of other components</td>
<td>51%</td>
<td>33%</td>
<td>7%</td>
<td>4%</td>
<td>4%</td>
<td>1.51</td>
</tr>
<tr>
<td>Our products are designed to be easily re-configured</td>
<td>36%</td>
<td>51%</td>
<td>7%</td>
<td>2%</td>
<td>4%</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>48%</td>
<td>38%</td>
<td>6%</td>
<td>5%</td>
<td>3%</td>
<td><strong>1.558</strong></td>
</tr>
</tbody>
</table>
4.5.4 Process Modularity

The study sought to understand the role of process modularity as a sub-variable in modularity based manufacturing processes as a supply chain practice. From the study findings it was established that the respondents agreed that production processes are designed as adjustable modules, production process allow customization, production process allow for rapid re-configuration and only minor equipment modifications are required for different product varieties (mean = 1.53, 1.66, 1.72 and 1.78 respectively). Additionally, the findings demonstrated that respondents strongly agreed that production process can dichotomized into standard sub-process to produce standard units (1.33). These results suggest that textile and apparel firms can engage in mass customization with high level of variety. This supports the assertion of Yang, Kincade & Chen-Yu (2015) that product modularity improves customization of product of different varieties.

Table 4. 9: Process Modularity in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our production process is designed as adjustable modules</td>
<td>40%</td>
<td>56%</td>
<td>2%</td>
<td>2%</td>
<td>0%</td>
<td>1.53</td>
</tr>
<tr>
<td>Our production process can be broken down into standard sub-processes</td>
<td>58%</td>
<td>42%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1.33</td>
</tr>
<tr>
<td>Production process modules can be rearranged so that customization sub-</td>
<td>44%</td>
<td>56%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1.66</td>
</tr>
<tr>
<td>processes occur last</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our production processes are designed to be rapidly disassembled</td>
<td>40%</td>
<td>60%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1.72</td>
</tr>
<tr>
<td>Only minor equipment modifications are required to produce different</td>
<td>38%</td>
<td>62%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1.78</td>
</tr>
<tr>
<td>products.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>44%</td>
<td>55%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1.604</td>
</tr>
</tbody>
</table>
4.6 Supply Chain Relationship Management

The second objective of the study was to establish the influence of supply chain relationship management of a firm on Performance. This objective was measured based on 3 factors: Strategic supplier partnerships, customer relationships and information sharing. Results are presented in the section below.

4.6.1 Strategic Supplier Partnerships

The study sought to establish strategic supplier partnership practices of textile and apparel firms. The results of this study indicated that firms put quality consideration as the number one criterion in selecting suppliers (mean = 2). The respondents agreed that a firm occasionally solve disputes jointly with suppliers, the firm helps suppliers to improve their product quality, the firm includes key suppliers in planning and goal setting activities, and the firm actively include key suppliers during new product development processes (mean=2). The overall mean of the strategic supply partnership was found to be 2 thus showing that respondents were in agreement that strategic supplier practices have been adopted in textile and apparel firms. The findings showed that textile and apparel firms recognize supplies as partners on a regular basis. These results are consistent with the findings of Sodhi, & Son (2009) who established that supply chain partnership in manufacturing firms goes beyond planning activities to integration activities.
Table 4.10: Strategic Supplier Partnerships in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>We put quality consideration as our number one criterion in selecting suppliers</td>
<td>27%</td>
<td>51%</td>
<td>16%</td>
<td>7%</td>
<td>0%</td>
<td>2.02</td>
</tr>
<tr>
<td>We regularly solve problems jointly with our suppliers</td>
<td>31%</td>
<td>56%</td>
<td>7%</td>
<td>4%</td>
<td>2%</td>
<td>1.91</td>
</tr>
<tr>
<td>We have helped our suppliers to improve their product quality</td>
<td>31%</td>
<td>38%</td>
<td>20%</td>
<td>9%</td>
<td>2%</td>
<td>2.43</td>
</tr>
<tr>
<td>We actively involve our key suppliers in new product development processes</td>
<td>33%</td>
<td>40%</td>
<td>20%</td>
<td>7%</td>
<td>0%</td>
<td>2.47</td>
</tr>
<tr>
<td>We include our key suppliers in our planning and goal-setting activities</td>
<td>40%</td>
<td>36%</td>
<td>13%</td>
<td>7%</td>
<td>4%</td>
<td>2.33</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>32%</td>
<td>44%</td>
<td>15%</td>
<td>7%</td>
<td>2%</td>
<td>2.23</td>
</tr>
</tbody>
</table>

4.6.2 Customer Relationships

The study also sought to analyse customer relationship among textile and apparel firm. In respect to the findings of the study, the respondents affirmed that the firms frequently measure and evaluate customer satisfaction, the firm encourages the customers to seek assistance from the firm by easing the process, the firm evaluate the importance of its relationship with customers, the firm frequently determine future customer expectations and the firm regularly consult with customers so as to improve responsiveness, reliability and other standards (mean = 2) as shown on Table 4.11. The findings of the study suggest that customer relationship practices in textile and apparel firms encompass customer relationship (re)initiation and maintenance. This concurs with the assertion of Reimann, Schilke, and Thomas (2010) that customer relationship initiation and customer relationship management are key process to any firm.
Table 4.11: Customer Relations Practices in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>We frequently measure and evaluate customer satisfaction</td>
<td>53%</td>
<td>44%</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>1.51</td>
</tr>
<tr>
<td>We make it easy and encourage customers to seek assistance from us</td>
<td>49%</td>
<td>38%</td>
<td>9%</td>
<td>4%</td>
<td>0%</td>
<td>1.69</td>
</tr>
<tr>
<td>Evaluate the importance of our relationship with our customers</td>
<td>42%</td>
<td>42%</td>
<td>11%</td>
<td>4%</td>
<td>0%</td>
<td>1.78</td>
</tr>
<tr>
<td>We frequently determine future customer expectations</td>
<td>31%</td>
<td>42%</td>
<td>18%</td>
<td>7%</td>
<td>2%</td>
<td>2.07</td>
</tr>
<tr>
<td>We regularly consult with customers in setting our reliability, responsiveness and other standards</td>
<td>38%</td>
<td>44%</td>
<td>13%</td>
<td>4%</td>
<td>0%</td>
<td>1.84</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>43%</td>
<td>42%</td>
<td>10%</td>
<td>4%</td>
<td>0%</td>
<td>1.778</td>
</tr>
</tbody>
</table>

4.6.3 Information Sharing

On supply chain relationship, the study also sought to establish the information sharing practices. In terms of information sharing, More than 80% of the respondents were in agreement that their trading partners communicate fully the issues that affect their business while 16% were indifferent. From the findings it was established that the respondents affirmed that trading partners keep the firms abreast about issues that affect business and that the trading partners share business knowledge of core business processes with textile and apparel firms (mean=2). This further shows that sharing in textile and apparel firms encompasses operational level. This supports the conclusion of Mäkinen (2017) that information sharing in manufacturing firms is predominantly operational. The results also revealed that respondents agreed that the firms are always informed about events or changes that may affect the other trading. This demonstrates that information shared in textile firm includes forecast information. This affirms the
assertion of Marinagi, Trivellas and Reklitis (2015) that forecast information is one category of information shared in manufacturing firms. In addition, the results showed that the respondents were in agreement that information shared between partners is reliable. This implies that the relationship between the partners is characterized by trust. This support the conclusion of Lotfi, Mukhtar, Sahran and Zadeh (2013) that trust is a key component of information sharing in firms. Further, the research revealed that respondents were in agreement that information sharing involves frequent face to face meetings with suppliers. This concurs with the argument of Baihaqi, Beaumont and Sohal (2008) that information sharing should be integrated in a firm’s operation.

**Table 4.12: Information Sharing Practices in Textile and Apparel Firms**

<table>
<thead>
<tr>
<th>Statements</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our trading partners keep us fully informed about issues that affect our business</td>
<td>38%</td>
<td>47%</td>
<td>16%</td>
<td>0%</td>
<td>0%</td>
<td>2.32</td>
</tr>
<tr>
<td>Our Trading partners share business knowledge of core business processes with us</td>
<td>51%</td>
<td>31%</td>
<td>13%</td>
<td>4%</td>
<td>0%</td>
<td>1.71</td>
</tr>
<tr>
<td>We are always informed about events or changes that may affect the other trading partner</td>
<td>53%</td>
<td>36%</td>
<td>2%</td>
<td>9%</td>
<td>0%</td>
<td>1.46</td>
</tr>
<tr>
<td>Information exchange between our trading partners and us is reliable</td>
<td>47%</td>
<td>31%</td>
<td>16%</td>
<td>4%</td>
<td>2%</td>
<td>2.05</td>
</tr>
<tr>
<td>We have frequent face to face communication with our suppliers</td>
<td>51%</td>
<td>36%</td>
<td>11%</td>
<td>2%</td>
<td>0%</td>
<td>1.64</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>48%</td>
<td>36%</td>
<td>11%</td>
<td>4%</td>
<td>0%</td>
<td>1.878</td>
</tr>
</tbody>
</table>
4.7 Supply Chain Integration

The third objective of the study was to investigate the influence of supply chain integration of a firm on Performance in apparel and textile industry in Kenya. This objective was measured based on 3 factors: Internal integration, vertical integration and external integration. Results are presented in the section below.

4.7.1 Vertical Integration

In relation to supply chain integration, the study endeavoured into establishing the influence of vertical integration practices among textile and apparel firms. Concerning vertical integration, the study results revealed that the respondents agreed that they frequently are in close contact with their customers, customers give the firm feedback on quality and delivery performance and the firm efforts to remain be highly responsive to customers’ needs (Mean =2). These findings demonstrate that the textile firm are downstream organisations having the strategic partnership with customers. These findings support the results of Nicovich and Dibrell (2007) who established that textile firm are downstream organization. Additionally, the study results indicated that respondents agreed that the firm maintain cooperative relationships with suppliers and that the firm strives to establish and maintain long-term relationships with suppliers. These findings show that textile and apparel firms which are upstream have closer collaboration and coordination with key suppliers. This aligns with the results of Thun (2010) that textile and apparel firms are upstream organization with strong supplier integration.
Table 4. 13: Vertical Integration Practices in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>We frequently are in close contact with our customers</td>
<td>31%</td>
<td>60%</td>
<td>4%</td>
<td>2%</td>
<td>2%</td>
<td>1.84</td>
</tr>
<tr>
<td>Our customers give us feedback on our quality and delivery performance</td>
<td>31%</td>
<td>49%</td>
<td>13%</td>
<td>7%</td>
<td>0%</td>
<td>1.96</td>
</tr>
<tr>
<td>We strive to be highly responsive to our customers’ needs.</td>
<td>53%</td>
<td>31%</td>
<td>11%</td>
<td>4%</td>
<td>0%</td>
<td>1.67</td>
</tr>
<tr>
<td>We maintain cooperative relationships with our suppliers.</td>
<td>47%</td>
<td>44%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
<td>1.62</td>
</tr>
<tr>
<td>We strive to establish long-term relationships with suppliers</td>
<td>38%</td>
<td>47%</td>
<td>13%</td>
<td>2%</td>
<td>0%</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>40%</td>
<td>46%</td>
<td>10%</td>
<td>3%</td>
<td>0%</td>
<td>1.778</td>
</tr>
</tbody>
</table>

### 4.7.2 Internal Integration

Another objective of the study in relation to supply chain integration was to determine the internal integration practices among textile and apparel firms. Internal integration was also studied with the study findings showing that respondents agreed that the firm encourage employees to work together to achieve common goals, rather than encourage competition among individuals (mean = 2). Further the study indicated that respondents agreed that the management is collaborative in making all important decisions and that all members in plant work as a team (mean = 2).

These findings indicate that internal integration in textile firm involves strategic cross-functional cooperation, working together of all key departments and that there is high level of system integration among the departments. These findings align with the results of Toivo (2010) and Zhao, Huo, Selen and Yeung (2011) who established that internal integration in manufacturing firms involve strategic cross-functional cooperation. The
study findings also indicated that the respondents agree that the departments in the firm regularly communicate with each other (mean=2). This shows that information integration is valued among textile and apparel firms. This aligns with the findings of Lotfi, Mukhtar, Sahran & Zadeh (2013) that established that information integration is valued in firms.

Further, the study results showed that the respondents agreed that everyone in the firm works well together and that the level of system integration is high among the departments. This demonstrates that textile and apparel firms operate as a system structure with different departments within the firm linked through regular interaction. This concurs with the findings of Barratt and Barratt (2012) who found out that higher level system integration exists in manufacturing industry.

Table 4. 14: Internal Integration Practices in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statements</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>We encourage employees to work collaboratively to achieve common goals,</td>
<td>47%</td>
<td>31%</td>
<td>11%</td>
<td>7%</td>
<td>4%</td>
<td>1.91</td>
</tr>
<tr>
<td>rather than encourage competition among individuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departments in the plant communicate frequently with each other.</td>
<td>42%</td>
<td>40%</td>
<td>11%</td>
<td>7%</td>
<td>0%</td>
<td>2.49</td>
</tr>
<tr>
<td>Management works together well on all important decisions</td>
<td>47%</td>
<td>44%</td>
<td>9%</td>
<td>%</td>
<td>0%</td>
<td>1.62</td>
</tr>
<tr>
<td>Generally, speaking, everyone in the plant works well together</td>
<td>29%</td>
<td>53%</td>
<td>13%</td>
<td>4%</td>
<td>0%</td>
<td>1.93</td>
</tr>
<tr>
<td>There is high level of system integration among the departments</td>
<td>36%</td>
<td>49%</td>
<td>11%</td>
<td>4%</td>
<td>0%</td>
<td>1.84</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>40%</td>
<td>43%</td>
<td>11%</td>
<td>4%</td>
<td>0%</td>
<td>1.958</td>
</tr>
</tbody>
</table>
4.7.3 External Integration

The third factor in supply chain integration was external integration which investigated relationships between customers and suppliers and the community. The study revealed that the respondents affirmed that cooperative relationships accelerate performance than adversarial relationships (mean=2). The study also demonstrated that the respondents believe that an organization should work in partnership with the surrounding community (mean=2). This demonstrates that the textile firm engages in actor’s integration. This is affirmed by Kemunto (2014) who argues that actor’s integration is important in community stakeholder engagement. On the question of partnership with customers, the study showed that the respondents agreed the organization work as a partner with the customers (mean=2).

On question of partnership with suppliers, the study revealed a confirmation by the respondents that textile and apparel firms partner with suppliers (mean= 2). These findings imply that material integration plays a key role in achieving supply chain integration in textile and apparel firms. According to Huang, Yen, & Liu (2014), material integration are the specific logistics and operational activities that coordinate the flow of materials from suppliers to customers throughout the value stream. Finally, the study revealed that the respondents agreed that the firms have collaborative platforms through which they partner with customers and suppliers (mean=2). This proves that collaboration is key in external integration process in textile and apparel firms. These support the findings of Liu, Ke, Wei, & Hua, (2013) that established that supplier-customer collaboration is central in the success of external integration.
Table 4.15: External Integration Practices of Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statements</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>We believe that cooperative relationships will lead to better performance than adversarial relationships</td>
<td>44%</td>
<td>47%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
<td>1.64</td>
</tr>
<tr>
<td>We believe that an organization should work as a partner with its surrounding community</td>
<td>44%</td>
<td>44%</td>
<td>80%</td>
<td>2%</td>
<td>0%</td>
<td>1.69</td>
</tr>
<tr>
<td>We work as a partner with our customers.</td>
<td>42%</td>
<td>38%</td>
<td>16%</td>
<td>4%</td>
<td>0%</td>
<td>1.82</td>
</tr>
<tr>
<td>We work as a partner with our suppliers, rather than having an adversarial relationship</td>
<td>47%</td>
<td>31%</td>
<td>18%</td>
<td>4%</td>
<td>0%</td>
<td>1.8</td>
</tr>
<tr>
<td>We have collaborative platforms through which we partner with customers and suppliers</td>
<td>29%</td>
<td>49%</td>
<td>11%</td>
<td>9%</td>
<td>2%</td>
<td>2.07</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td><strong>41%</strong></td>
<td><strong>41%</strong></td>
<td><strong>12%</strong></td>
<td><strong>4%</strong></td>
<td><strong>0%</strong></td>
<td><strong>1.804</strong></td>
</tr>
</tbody>
</table>

**4.8 Supply Chain Responsiveness**

The fourth objective of the study was to determine the influence of supply chain responsiveness of a firm on Performance in apparel and textile industry in Kenya. This objective was measured based on 3 factors: Operation process responsiveness, supplier network responsiveness and logistic process responsiveness and. Results are presented in the section below.
4.8.1 Operation Process Responsiveness

The first factor investigated under supply chain responsiveness was to establish the operation process responsiveness among textile and apparel firms. The results of the study indicated that firms respond swiftly to changes in product volume demanded by customers (mean = 2). The results of the study also indicated that the respondents agreed that the firm quickly respond to changes in product mix demanded by customers as well as regularly addressing problems jointly with suppliers (mean=2). These findings demonstrate that the product operation responsiveness in textile and apparel firms is characterized by flexibility. This concurs with the results of Mandal (2015) that found out that flexibility is key component of responsiveness. On the third question, the results showed that the respondents agreed that the firm effectively speed up emergency customer orders (mean=2). Further the results indicated that the respondents agreed that the firms address demand changes through rapidly reconfiguring equipment and rapidly changing manufacturing processes (mean=2). These findings indicate that textile and apparel firms have service operation responsiveness geared to provide reliable, timely satisfaction to customers. These results are consistent with the findings of Sodhi & Son (2009) who established that supply service operation responsiveness is central in manufacturing firms.
Table 4. 16 Operation Process Responsiveness

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>We respond rapidly to changes in product volume demanded by customers</td>
<td>24%</td>
<td>46%</td>
<td>12%</td>
<td>10%</td>
<td>8%</td>
<td>2.04</td>
</tr>
<tr>
<td>We respond rapidly to changes in product mix demanded by customers</td>
<td>30%</td>
<td>34%</td>
<td>20%</td>
<td>12%</td>
<td>4%</td>
<td>1.98</td>
</tr>
<tr>
<td>We effectively speed up emergency customer orders</td>
<td>36%</td>
<td>29%</td>
<td>23%</td>
<td>10%</td>
<td>2%</td>
<td>2.43</td>
</tr>
<tr>
<td>We rapidly reconfigure equipment to address demand changes</td>
<td>31%</td>
<td>38%</td>
<td>28%</td>
<td>3%</td>
<td>0%</td>
<td>2.37</td>
</tr>
<tr>
<td>We rapidly change manufacturing processes to address demand changes</td>
<td>27%</td>
<td>33%</td>
<td>22%</td>
<td>7%</td>
<td>1%</td>
<td>2.23</td>
</tr>
<tr>
<td><strong>Average/Mean</strong></td>
<td>30%</td>
<td>36%</td>
<td>21%</td>
<td>8%</td>
<td>3%</td>
<td>2.21</td>
</tr>
</tbody>
</table>

4.8.2 Logistic Process Responsiveness

The second factor investigated under supply chain responsiveness was logistic process responsiveness. The findings of the study demonstrated that the respondents were in agreement that textile and apparel firms have a number of warehouses and distribution facilities (mean= 2). The respondents agreed that firms can rapidly adjust the capacity of the warehouse to address demand changes. Further the study demonstrated that the firms effectively delivers expedited shipments (mean= 2).

The study also found out that the respondents agreed that it is easy for the firm to add or remove distributors and easy for the distributors to change delivery modes (mean= 2). These results show that logistic process is an important component in responsiveness of supply chain strategy in textile and apparel firms. This agrees with the study of Reimann, Schilke and Thomas (2010) that logistic process responsiveness is integral component of supply chain responsiveness in firms.
Table 4. 17 Logistic Process Responsiveness in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are a number of warehouses, loading capacity and distributors facilities</td>
<td>44%</td>
<td>29%</td>
<td>24%</td>
<td>3%</td>
<td>0%</td>
<td>1.53</td>
</tr>
<tr>
<td>We can rapidly adjust warehouse capacity to address demand changes</td>
<td>38%</td>
<td>38%</td>
<td>21%</td>
<td>3%</td>
<td>0%</td>
<td>1.66</td>
</tr>
<tr>
<td>We effectively deliver expedited shipments</td>
<td>36%</td>
<td>36%</td>
<td>19%</td>
<td>9%</td>
<td>0%</td>
<td>1.74</td>
</tr>
<tr>
<td>It is easy for our firm to add new carriers and other distributors or remove current ones</td>
<td>31%</td>
<td>42%</td>
<td>21%</td>
<td>3%</td>
<td>2%</td>
<td>2.03</td>
</tr>
<tr>
<td>It is easy for our distributors to change delivery modes</td>
<td>35%</td>
<td>37%</td>
<td>20%</td>
<td>9%</td>
<td>0%</td>
<td>1.88</td>
</tr>
<tr>
<td>Average/Mean</td>
<td>39%</td>
<td>37%</td>
<td>19%</td>
<td>5%</td>
<td>0%</td>
<td>1.77</td>
</tr>
</tbody>
</table>

4.8.3 Supplier Network Responsiveness

The third factor investigated under supply chain responsiveness was supplier network responsiveness. In this regard, a question was asked as to establish whether, in a short time, major suppliers change product mix. The study revealed that the respondents agreed that major suppliers change product volume and mix in a relatively short time (mean =2). Further the study showed that major suppliers have an admirable record of on-time delivery with the textile and apparel firms, expedite the textile and apparel firm’s emergency orders (mean=2) and major suppliers provide quick inbound logistics to us. The study findings revealed that supplier network flexibility is a crucial
component of the supply chain responsiveness in textile and apparel firms. In addition, the findings indicated that the supply chain system in textile and apparel firms is responsive across all various component stages, from the raw materials through to finished products, distribution and finally delivery. Thatte, Rao and Ragu-Nathan (2013) argue that flexibility in the supplier network is an important ingredient of being responsive to changes in customer demand.

Table 4. 18 Supplier Network Responsiveness in Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Statements</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major suppliers change product volume in a relatively short time</td>
<td>27%</td>
<td>45%</td>
<td>29%</td>
<td>0.0</td>
<td>0%</td>
<td>2.29</td>
</tr>
<tr>
<td>Major suppliers change product mix in a relatively short time</td>
<td>43%</td>
<td>40%</td>
<td>11%</td>
<td>7%</td>
<td>0%</td>
<td>1.71</td>
</tr>
<tr>
<td>Major suppliers have outstanding on-time delivery record with us</td>
<td>38%</td>
<td>32%</td>
<td>23%</td>
<td>8%</td>
<td>0%</td>
<td>1.56</td>
</tr>
<tr>
<td>Major suppliers effectively expedite our emergency orders</td>
<td>47%</td>
<td>31%</td>
<td>16%</td>
<td>4%</td>
<td>3%</td>
<td>2.03</td>
</tr>
<tr>
<td>Major suppliers provide quick inbound logistics to us</td>
<td>38%</td>
<td>36%</td>
<td>17%</td>
<td>9%</td>
<td>0%</td>
<td>1.54</td>
</tr>
<tr>
<td>Average/Mean</td>
<td>39%</td>
<td>37%</td>
<td>19%</td>
<td>5%</td>
<td>0%</td>
<td>1.81</td>
</tr>
</tbody>
</table>
4.8.4 Performance of Textile Firms

Table 4.19: Performance of Textile and Apparel Firms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit</td>
<td>52</td>
<td>-505,000</td>
<td>22,100,000</td>
<td>6,771,860</td>
<td>934,467</td>
</tr>
<tr>
<td>Accidents</td>
<td>52</td>
<td>3</td>
<td>28</td>
<td>14</td>
<td>12 accidents</td>
</tr>
<tr>
<td>Product Mix</td>
<td>52</td>
<td>3</td>
<td>26</td>
<td>12</td>
<td>8 products</td>
</tr>
<tr>
<td>Lead Time</td>
<td>52</td>
<td>4</td>
<td>215</td>
<td>48</td>
<td>51 days</td>
</tr>
</tbody>
</table>

The study sought to measure Performance through economic performance, environmental performance and social performance on different indicators listed as profits, accidents, product mix and lead time. A total of six indicators were used in the study. However, during data collection insufficient (less than 20%) was collected on number of certified suppliers and recordable complaints. As a result these variables were excluded from the analysis due to missing data of over 60%.

Results of the analysis on Performance are presented below. Table 4.19 gives the descriptive analysis for the performance of textile and apparel firms in Kenya. The study included only 4 variables out of 6 study variables due to non-availability of data and this is in line with Acock (2005)’s recommendation that if variable under study has more than 60% as missing data, it can be excluded from analysis. On the economic performance change in profits was used as a variable. The table shows the average change in profit as 6,771,860. This suggests that on average textile firms have recorded profits. This support the findings of Ontita (2016) who concluded that most textile and apparel firms with EPZ zone in Kenya make profits.
On lead time and product mix measures, the study revealed that the average lead time of the textile firm is 48 days. This contradicts the study by World Bank (2015) that indicated an average mean of 30 days as the lead time. This can be explained by the sample size of the study; the current study targeted all exporting textile firm’s managers while the World Bank study targeted wide range of stakeholders in the textile industry. Concerning product mix, the study results indicated that the average for product mix was found to be 12 products which is approximately consistent with the findings of a study by EPZ Gladys (2014) that indicated that product mix of 14 products per firm for textile and apparel firms in Kenya. This shows that textile and apparel firms in Kenya have diversified into various products to improve their performance in the market. The two measured social performance.

Environmental Performance was measured through recordable accidents. For Accidents, the study revealed that the average accidents are 14 accidents per firm per year. This is relatively lower than the findings of Gebremichael and Kumie (2015) that established occupational accidents in a year to be 136 accidents in Ethiopia. This can be attributed to relatively best occupational and safety practices that have been put in place in Kenya as opposed to Ethiopia.

4.9 Factor Analysis

Factor analysis was used in the study to identify the key supply chain practices that are important to textile and apparel firms in Kenya. Factor analysis helped the study to reduce the supply chain practices to relevant factors that are central to textile and apparel firms in Kenya. This was helpful in the study as the researcher was able to compare the effect of supply chain factors through factor analysis and the study variables. Factor analysis was also selected to allow the researcher understand variables with the greatest power effect as hierarchical regression did not suit the study as the sample size was small. This is central in understanding the variables with highest power effect on
Performance. This section focuses on the procedure used to arrive at the supply chain practices factors that were used in the study analysis through data reduction technique. The section is arranged in the following ways: suitability of data for factors analysis, selection of factors using the eigen value and scree plot and rotation of factors.

4.9.1 Checking the Suitability of Data for Factor Analysis

The Bartlett’s Test of Sphericity and Kaiser-Meyer-Olkin (KMO) are the preferred statistical tools to check the suitability of data for factor analysis. The study used KMO to check if the data was appropriate for factor analysis. A rule of thumb is that a low KMO between 0-0.4 shows that the data is not appropriate for analysis while KMO values between 0.5 and 1 show that the data is appropriate (Malhotra 2007). In this study, KMO value fell within the acceptable range at 0.678, implying that the data for this study is factorable. The KMO values lie between minus infinity and plus one (Kaiser 1970). KMO values in the region of 0.4 and 0.5 show a weak factor-analytic data, while a good factor-analytic data is when KMO is approximately 0.80 and excellent data occurs when the KMO value is around 0.90 (Kaiser 1970). However, the study KMO value of 0.678 is suitable for factor analysis. This implies that the patterns of correlations are relatively compact and so the factor analysis yields relatively reliable factors.

Table 4. 20: KMO Test

<table>
<thead>
<tr>
<th>KMO TEST</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</td>
<td>0.678</td>
</tr>
</tbody>
</table>

4.9.2 Selecting a Method of Factor Extraction

To extract the underlying factors of supply chain practices, Principal Components Analysis method was used. This method was important in ensuring that data was
reduced without losing any information and in providing main factors in the study. The study used Kaiser’s eigen value greater than 0.7 rule, percentage of variance methods and scree test. The methods are illustrated in the subsequent sections.

4.9.2.1 Kaiser’s Eigen Value

According to the rule, factors are retained for interpretation only if they have eigenvalues which are large and presence of large eigenvalues shows the usefulness of factors while small Eigen values allude to non-importance of the factors (Huck 2012). Following the Kaiser rule, the study retained seven extracted factors. The retained factors are reported in Table 4.21 below. The retained factors indicate that these factors are the most important supply chain practices to textile and apparel firms and by extension can portend significant effect to Performance. A discussion as to why these factors are considered important in supply chain practices and Performance is presented in section 4.9.3

Table 4. 21: Kaiser’s Eigen Value Results

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic Teaming</td>
<td>2.004</td>
</tr>
<tr>
<td>Product Modularity</td>
<td>1.906</td>
</tr>
<tr>
<td>Process Modularity</td>
<td>1.646</td>
</tr>
<tr>
<td>Strategic Supplier Partnerships</td>
<td>1.341</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>1.171</td>
</tr>
<tr>
<td>Customer Relations</td>
<td>1.076</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>0.789</td>
</tr>
</tbody>
</table>

The screen plot was also used to determine useful factors to retain in the study model as supply chain practices. The shape of the scree plot is examined to identify the point at which the last big drop takes place or where the line levels off. According to the scree
graph plotted for this study, the line seem to level off after 7 factors, as depicted in Figure 4.4 below.

![Figure 4.4: Scree Plot](image)

4.9.3 The Naming and Interpretation of Factors

**Factor 1: Dynamic Teaming**

Referring to Table 4.21, factor one is dynamic teaming and has an eigenvalue of 2.004. The factor comprises five items. The Cronbach alpha for this factor yielded a value of 0.87, indicating the reliability of the factor. Dynamic teaming approach has the advantage of pushing garments faster while enabling the operators to respond to customer requirement much faster. It allows employee to take responsibilities for their processes therefore ensuring quality output. This indicates that dynamic teaming is crucial because this will enable a business to adapt to the dictates of the continuously changing market.
The importance of dynamic teaming in enhancing Performance was confirmed by several studies. For example, a study of Performance in apparel industry by Karami (2008) found that the composition of team members is key to improving Performance in Apparel industry. Jorosi’s (2008) study of supply chain management practices among apparel firms in Hong Kong also confirmed that supply chain teaming approach has positive influence on Performance. A study by Chiu & Okudan (2014) also reports about the importance of dynamic teaming. The result of the study by Thatte (2013) further consolidates the importance of dynamic teaming. Therefore, studies in different context have proven that dynamic teaming play a part in enhancing Performance.

**Factor 2: Product Modularity**

Referring to Table 4.21, factor two is product modularity and has an eigenvalue of 1.906. The factor consists of five items. The Cronbach alpha for this factor yielded a value of 0.79 indicating the reliability of the factor. Forbes and Seena (2006) assert that a product modularity is crucial as it organizes workers to achieve (1) horizontal coordination in the assembly to complete garments and (2) continuous communication and adjustment in work methods to share short cuts, reduce bottlenecks, and eliminate defects. In an analysis of the role of modular product design on the performance of textile and apparel firms, French et al. (2009) affirm the benefits associated with product modularity in manufacturing in the garment industry through his study which indicated an increase in production line by 10%, while labour efficiency improved by 15% and the morale of the employees improved with education, training, open communication and above all, being treated with dignity. Mazzarol et al. (2009) and Dincer et al. (2006) further confirmed the factor as important in Performance.

Product modularity portends organizational benefits occasioned by standardization; these benefits are Environmental Performance was measured through recordable accidents. For Accidents, the study revealed that the average accidents are 14 accidents
per firm per year. This is relatively lower than the findings of Gebremichael and Kumie (2015) that established occupational accidents in a year to be 136 accidents in Ethiopia. This can be attributed to relatively best occupational and safety practices that have been put in place in Kenya as opposed to Ethiopia (Salvador et al., 2002). Thus product modularity allows for a significant variety of end items through coordination improvements made possible by modular product architectures.

**Factor 3: Process Modularity**

Referring to Table 4.21, factor three is process modularity and has an eigenvalue of 1.646. This factor consists of five items, and with the Cronbach alpha for this factor yielded a value of 0.82, demonstrating the reliability of the factor (Tu et al. 2004). Process modularity allows companies to increase their capability for production process reconfiguration and allow a more effective use of the existing production capacity (Swaminathan & Lee, 2003).

Process modularity contributes to enhancing manufacturing flexibility. First, product flexibility may be enhanced because changes to existing products are allowed without modifications to the product’s final design. Second, Modularity based manufacturing practices involve application of substitution principles or unit standardization to process, product and organization design (Thatte, 2007). Schilling and Steensma (2001) point that organizations are likely to realize a higher level. Dividing complex systems into smaller modules and evaluating them separately enhances management. Through modularity, organizations can obtain various benefits including increased product feasibility, economies of scale, component change, reduced lead time, and product variety and upgrading products, among others (Coronado et al., 2004). Equally, the definitive advantage of modularity in terms of enabling firms to cope with uncertain environments continues to make the concept popular. The concept, for example, has enabled the computer industry to intensely increase its innovation rate. Manufacturers,
on the hand, rely on modularity when dealing with increasingly complex technologies and respond swiftly to the rapidly evolving customer demand through the creation of greater product varieties from a set of common subassemblies and modules (Tu et al. 2004).

**Factor 4: Strategic Supplier Partnership**

Strategic supplier partnership as a factor had an Eigen value of 1.341 and a Cronbach value of 0.73. The factor was comprised of five components. From Pearce and Robinson (2005), the objective of supplier partnerships in a strategic way increases benefits to by reducing acquisition costs in totality. Since the realization of the important role of the responsiveness of supply chains in the current business environment, it has emerged that there is need to understand supply chain practices necessary for organizations to achieve performance in supply chains with a sustainable approach through the practices that promotes mutual problem solving efforts and planning among supply chain partners (Li et al., 2006).

The inclusion of this factor in supply chain management process in textile industry in this study corresponds closely to the view proposed by Agus (2008) that through strategic partnership with suppliers, it enables organizations to work more effectively with a few important suppliers who are willing to share responsibility for the success of the products ( Li et al., 2006). The basic thought is that strategic supply chain partnerships provide firms with opportunities to improve diffusion of products with minimal cost along upstream and downstream supply chains. This study conforms to the findings of Nyamasege (2015) who established that strategic supplier partnership is an important factor in supply chain management.
Factor 5: Information Sharing

Information sharing with eigenvalue of 1.171 and yielded Cronbach alpha of 0.74. This factor consists of five variables. The degree and extent of information sharing among the suppliers depends on the relationship developed among the partners which eventually enhance Performance (Zelbst et al., 2009). Previous literatures have echoed the importance of information sharing in supply chain management. Information exchange enhance smooth supply chain practices and its can be manifested if the product or services supplied by the seller meets quality and specification as stipulated the buyer (Au & Ho, 2002). A similar study was conducted by Zhao et al. (2002) and established that effective exchange of information in supply chain practices can enhance Performance and reduce costs. Lin et al. (2002) added that exchange of information shorten order cycle time as well as lowering total cost. As such exchange of information is essential in supply chain process. Researcher such as Lee and Whang (2000); Xu, Dong et al. (2001) and Yu, Yan et al. (2001) indicated that exchange of information in supply chain practices greatly enhance sustainability of supply chain management, more so in minimizing the bullwhip effect.

Organizations that encourage information sharing with their suppliers are able to make noble decisions which results to better resource utilization and lower costs associated with the supply chain processes. Firms are able to be more responsive to customers’ need if they are accurate in managing information (Mentzer, 2004). The extent of information exchange is associated with shorter order cycle time and lower total cost. Despite the important of information exchange among the buyer and seller, information share have an impacts to supply chain depending on how that information is conveyed, the recipient and the mode of information conveyance. Li and Lin (2006) did a study on inter-organizational relationships among firms on information exchange quality. The study established that commitment among the partners; common objectives and suppliers’ uncertainty are some of the key aspects in supplier-buyer relationships.
Factor 6: Customer Relationship Management

This factor had an eigenvalue of 1.076 and a Cronbach value of 0.75. The factor consisted of five items. According to Lapide (2013), the practices adopted by organizations to manage customers’ expectations such as managing customer relationship, handling customers complaints and developing customers’ satisfaction level as customer relationships management. Dadzie and Winston (2007) purported that firms with effective approach of managing their customer outdo their competitors in the market in terms of the products they offer. Further this may result to a firm customer based that may develop from high customer satisfaction level and loyalty (Elofson & Robinson, 2007). Firms that are able to that are able to customize their services and products to the need of consumer have made customer relationship a key aspect of supply chain practices (Thatte, 2007). Thus, it is clear that customer relationship is a key aspect in enhancing relationship coordination and partnership across parties involved in supply chain (Wadhwa et al., 2006).

Ata and Toker (2012) investigated the effect of customer relationship management on Performance, with results indicating that CRM adoption had a significant positive impact on both customer satisfaction and organizational performance in the textile (manufacturing) industry. Mohammad et al. (2013) studied the relationship between CRM dimensions and different characteristics of organization performance such as financial, customer, internal process, and learning and growth in Malaysian hotels. The results of this study established customer satisfaction as an important factor in Performance.

Factor 7 Vertical Integration

Vertical integration had an eigenvalue of 0.789. The Cronbach Alpha for this factor yielded 0.71, which indicates that it is reliable. Effective integration of supplier-
customer relationship eases the process of task coordination and is a way of resolving conflicts. According to Swink et al. (2007) coordination and structuring of the supply chain objectives helps to reduce challenges that may encountered in managing supply chain activities. Firms that are able to integrate suppliers and customers in supply chain they are able to come up with an approach that enhance problem solving which results to cost reduction and product development (Danese, 2013). This effort is key in achieving time responses about organization performance, improvement of the product quality and enhances innovation (Rosenzweig, et al., 2003). Customer integration is supply chain integration downstream. It is management and availability of the customers’ data and sharing of the customers’ response to the supplier. Customer integration results to clear understanding of customers’ preference on products as well as developing a good relationship with the consumers. Customer integration entails integrating customers’ opinions in decisions about manufacturing of the good. According to Rosenzweig et al., (2003) customer integration entails the approach that enhances coordination between the manufacturer and the consumers.

As above, Rosenzweig et al., (2003) established that for improvement of the organization performance, firms should embrace the degree of downstream customers and upstream suppliers. External integration of suppliers verse customers is critical, firms that are successful in their sector are those that are able to link their internal and external suppliers with customers preferences (Frohlich & Westbrook (2001). In another study conducted by Schoenherr and Swink (2012) emphasized the importance of integrating suppliers and customers with the aim of improving organization performance. Further, Schoenherr and Swink (2012) pointed that there is need for empirical evidences and research. However, the study of Schoenherr and Swink (2012) suggested that future research on integration needs to introduce empirical evidence in other contexts.
4.10 Inferential Statistics

The data from this research comprised of seven key variables that included product modularity, process modularity, dynamic teaming, strategic supplier relationship, customer relationship, information sharing and vertical integration. The relationship between these variables was investigated by standard multiple linear regression. This was selected because the sample size of the data was 55 firms, and hence would not fit hierarchical regression that would have suited the study. Multiple linear regressions is regarded as an extension of simple linear regression when more than one independent variable is included in the regression model, as was the case in this study. Prior to regression analysis between supply chain practices from factor analysis and Performance, the data were tested to see if they fulfilled the assumptions of multiple regressions.

4.10.1 Diagnostic Tests

4.10.2 Test for Multicollinearity

The study also conducted multicollinearity assumption which tested the relationship matrix through the use of ‘Tolerance’ and ’Variance Inflation Factor’ (VIF). When the degree of multicollinearity is high indicates that there is low tolerance among the indicators. However, when the value of tolerance very high and VIF is the inverse (reciprocal), it indicates the high degree of multicollinearity. According to Cox (2006) to confirm whether multicollinearity is statistically significant the tolerance value must be less than less than 0.10, or a VIF value of more than 4. In this study, the tolerance value exceeded 0.10 which is cut-off level while VIF is less than 4. This means that the data used is reliable since it met multicollinearity assumptions for both correlation and VIF analysis. The absence of multicollinearity in the data demonstrates that the relationship between supply chain practices and Performance can be wholly attributed to the independent variables themselves, and not the relationship between the supply chain
practices. Absence of multicollinearity will also reduce the standard errors in of the variables improving the validity of the study results in understanding the relationship between the supply chain practices and Performance.

Table 4. 22: Multi-Collinearity Tests

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>F-Statistic</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>Dynamic teaming</td>
<td>0.455</td>
<td>0.455</td>
</tr>
<tr>
<td>Product modularity</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Process modularity</td>
<td>0.575</td>
<td>0.575</td>
</tr>
<tr>
<td>Vertical integration</td>
<td>0.63</td>
<td>0.63</td>
</tr>
<tr>
<td>Strategic supplier relationship</td>
<td>0.612</td>
<td>0.612</td>
</tr>
<tr>
<td>Customer relationship management</td>
<td>0.523</td>
<td>0.523</td>
</tr>
<tr>
<td>Information sharing</td>
<td>0.73</td>
<td>0.73</td>
</tr>
</tbody>
</table>

4.10.3 Normality, Linearity and Homoscedasticity

In order to examine the normality, linearity and homoscedasticity assumptions, a histogram, a plot of standardized residuals against predicted values of the dependent variable and a scatterplot are provided in Figure 4.5 below. The study did not use skewness and Kurtosis values to establish normality since it has been argued by Gujarati (2003), that kurtosis and skewness for sample less than 200 does not reveal much difference. Normality and other assumptions should be taken seriously, for when these assumptions do not hold, it is impossible to draw accurate statistical errors which are common in scientific literature and about 50% of the published articles have at least one error. The assumption of normality needs to be checked for many statistical procedures,
namely parametric tests, because their validity depends on it. From the results in figures, it indicates that the shape of the distribution with the bell-shaped histogram approximates to the normal distribution with no much kurtosis and hence the data meets the assumption of normality.

**Figure 4.5: Histogram for Profit**

The results in figure 4.5 indicate that the shape of the histogram is skewed to the left but reasonably normally distributed, with most scores not occurring in the centre. However, according to Pallant (2013) this is common in data with small sample size and has no significant effect on the study regression model.
Figure 4.6: Normality Plot for Profit

The results in figure 4.6 indicate that the most of the values are along the linear line indicating a near normal distribution. Pallant (2013) argues that it is common for small data set not to exhibit perfect normality and this has no significant effect on the study regression model.

Figure 4.7: Histogram for Product Mix
From the results in figure 4.7, the shape of the histogram is clustering around the centre and is bell-shaped. This according to Pallant (2013) shows normality.

![Normal P-P Plot of Regression Standardized Residual](image)

**Dependent Variable: PRODUCT MIX**

**Figure 4.8: Normality Plot for Product Mix**

The results in figure 4.8 show that most of the values are along the linear line thereby proving that data on product mix is meeting the normality assumption. This is supported by the suggesting of Pallant (2013) who argues that data clustering around the line shows normality.
Figure 4. 9: Normality Plot for Lead Time

The result in figure 4.9 shows that the most of the values are along the linear line indicating a near normal distribution. According to Pallant (2013), it is common for small data set not to exhibit perfect fit along the linear line and still be meeting normality assumption.
In this figure 4.10 above, the results indicate that the values of lead time-average are skewed to the left indicating non normality. This is explained by the most scores on lead average clustering between 4 days and 55 days. Pallant (2013) argues that not all variables exhibit normality and this is insignificant in small data set.
The results in figure 4.11 above indicate that the values of lead average are greatly clustering around the centre thus showing that the data meets normality assumption. Berry (1993) contends that when data points cluster around the center of histogram, normality assumption is met.
Figure 4.12: Normality Plot for Accidents

The results in figure 4.12 shows that most of the data points are found along the linear line demonstrating that the data meets normality assumption. This concurs with Berry (1993) assertion that when data points cluster around the centre of histogram, normality assumption is met.
4.10.4 Test for Outliers

The study carried out outlier test through Box plots. However, this was not carried out on the independent variables as they were likert questions, with choices ranging from 1 to 5. Data cleaning was used to ensure that there were no outliers on the independent variables. Outlier tests were carried out on the dependent variables that were continuous variables.

The tests are presented below. From the findings on figure 4.13 it emerged that outliers there was one observation for normal outlier for lead time and two observation for extreme outliers. According to Pallant (2013), normal outliers has no effect on the regression and extreme outliers only have an effect when they are more than 5% of the data. Thus only the outliers for lead time have no effect on the regression model thus they were not excluded. The existing outliers in lead time was linked to data collected and not problems of data entry, and further tests indicated that the presence of outliers did not lead to inflated error rates and substantial distortions of parameter and statistic estimates when carrying out regression analysis between supply chain practices and performance.
The results in figure 4.13 show that only two data points are extreme outliers with the other point being a normal outlier. This indicates that less than 5% of the data points are outliers and has no significant effect on the model if removed.

The result in figure 4.14 shows that accidents did not have any outliers thus the data was suitable for analysis.
Figure 4. 15: Box Plot for Product Mix

The result in figure 4.15 shows that product mix did not have any outliers.

Figure 4. 16: Box Plot for Profit
Based on the results in figure 4.16, it shows that only four data points for the variable profit had normal outliers based on the data collected and analysed. This suggests that the outliers is within the acceptable normal range for the data and this has minimal effect on the regression model. According to Pallant (2013), only extreme values have significant effect on the model when included in regression model and when they exceed 5%. The existing outliers in profit was linked to data collected and not problems of data entry, and further tests indicated that the presence of outliers did not lead to inflated error rates and substantial distortions of parameter and statistic estimates when carrying out regression analysis between supply chain practices and performance

**MANOVA Test for Outliers**

Mahalanobis Distances was calculated for the entire participating firms and the independent variable. The Mahalanobis Distances value was compared with the chi-square critical value at p=0.05 at 4 degrees of freedom. The results revealed that there was absence of MANOVA outliers in the data. This implies that the output generated from the data was not greatly affected by errors occasioned by presence of outliers thereby increasing the precision of the study results.

**Linearity Test**

From the findings in figure 4.23, it was observed that all the dependent variables are linearly dependent hence the data met the assumption test of linearity for MANOVA test. This indicates that the results from data analysis can be relied on to test the relationship between the supply chain practices and Performance.
Checking Multivariate Normality

To test for multivariate normality Mahalanobis distances was calculated. Mahalanobis distance is the distance of a particular case from the centroid of the remaining cases, where the centroid is the point created by the means of all the variables (Tabachnick & Fidell 2007). To test whether the data has multivariate normality Mahalanobis distance was compared to critical value that is determined by chi-square table and degree of freedom. Critical value table was adopted from Tabachnick and Fidell (2007). The
Mahalanobis distance in the table below is less than the critical value from the table, which is 18.47 for 4 dependent variables. This shows that the data does not violate multivariate normality. Thus it can be implied that the output obtained on the results between supply chain practices and Performance can be generalized to the textile and apparel firms in Kenya.

**Table 4. 23: Multivariate Normality Tests**

<table>
<thead>
<tr>
<th>Residuals Statistics(a)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted Value</td>
<td>4.07</td>
<td>34.58</td>
<td>23.35</td>
<td>6.929</td>
<td>52</td>
</tr>
<tr>
<td>Std. Predicted Value</td>
<td>-2.784</td>
<td>1.62</td>
<td>0</td>
<td>1</td>
<td>52</td>
</tr>
<tr>
<td>Standard Error of Predicted Value</td>
<td>1.466</td>
<td>4.145</td>
<td>2.281</td>
<td>0.752</td>
<td>52</td>
</tr>
<tr>
<td>Adjusted Predicted Value</td>
<td>4.08</td>
<td>34.48</td>
<td>23.33</td>
<td>6.891</td>
<td>52</td>
</tr>
<tr>
<td>Residual</td>
<td>-21.455</td>
<td>21.5</td>
<td>0</td>
<td>11.76</td>
<td>52</td>
</tr>
<tr>
<td>Std. Residual</td>
<td>-1.795</td>
<td>1.798</td>
<td>0</td>
<td>0.984</td>
<td>52</td>
</tr>
<tr>
<td>Stud. Residual</td>
<td>-1.812</td>
<td>1.817</td>
<td>0.001</td>
<td>0.999</td>
<td>52</td>
</tr>
<tr>
<td>Deleted Residual</td>
<td>-21.868</td>
<td>22</td>
<td>0.026</td>
<td>12.137</td>
<td>52</td>
</tr>
<tr>
<td>Stud. Deleted Residual</td>
<td>-1.829</td>
<td>1.835</td>
<td>0.002</td>
<td>1.004</td>
<td>52</td>
</tr>
<tr>
<td>Mahalonobis Distance</td>
<td>0.857</td>
<td>13.79</td>
<td>3.968</td>
<td>3.59</td>
<td>52</td>
</tr>
<tr>
<td>Cook's Distance</td>
<td>0</td>
<td>0.022</td>
<td>0.006</td>
<td>0.006</td>
<td>52</td>
</tr>
<tr>
<td>Centered Leverage Value</td>
<td>0.007</td>
<td>0.112</td>
<td>0.032</td>
<td>0.029</td>
<td>52</td>
</tr>
</tbody>
</table>

**Homogeneity of Variance-Covariance Matrices**

**Table 4. 24: Box's Test of Equality of Covariance Matrices**

<table>
<thead>
<tr>
<th>Box's M</th>
<th>145.670</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sig</td>
<td>0.04</td>
</tr>
</tbody>
</table>

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Box’s Test

The output box labelled Box’s Test of Equality of Covariance Matrices tells whether the data violates the assumption of homogeneity of variance-covariance matrices. If the Sig. value is larger than 0.01, you have not violated the assumption. Tabachnick and Fidell (2007) warn that Box’s M can tend to be too strict when you have a large sample size. However in the study, Box’s M Sig. value is 0.04 and this did not violate the assumption of homogeneity. This implies that the results of relationship between supply chain practices and Performance are less likely to be attributed to error and more likely to the variables themselves. This increases the validity of the results.

Table 4.25: Levene's Test of Equality of Error Variances

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profits</td>
<td>0.064</td>
</tr>
<tr>
<td>Product Mix</td>
<td>0.095</td>
</tr>
<tr>
<td>Lead time</td>
<td>0.218</td>
</tr>
<tr>
<td>Accidents</td>
<td>0.165</td>
</tr>
</tbody>
</table>

Levene’s Test Explanation

Levene’s Test, in the Sig. column, values less than 0.05 indicate that you have violated the assumption of equality of variance for that variable. In the current study, none of the variables recorded significant values; therefore, we can assume equal variances. This allowed the study to use the conventional significant test of 0.05 and to carry further analysis.
4.11 Analysis between Supply Chain Practices from Factor Analysis and Performance of Textile and Apparel Firms

This section presents regression analysis between supply chain practices based on factor analysis and Performance. Regression analysis was based on supply chain practices selected through factor analysis, as this allowed the study to select the important supply chain practices for the textile and apparel firms. Regression analysis in this section was carried out against the various dimensions of Performance, with profits, product mix and lead time and accidents being the measures.

4.11.1 Analysis between Supply Chain Practices from Factor Analysis and Financial Performance (Profits) of Textile and Apparel Firms

Regression analysis was performed to test the predictive relationship between two sets of variables, namely supply chain practices and profits which measured economic performance as formulated in the questionnaire that was informed by the key informant guide. The seven supply chain practices were used as independent variables and profits was used as a dependent variable. Table 4.26 presents the regression results showing the predictive power of each factor on profit. The $R^2$ value of 0.431646 implies that the supply chain practices explained 43% percent of the variance in profits realized by the textile and apparel firms while 57% of the profits of textile and apparel firms can be explained by other study variables excluded in the model.

Table 4. 26: Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Squared</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.657</td>
<td>0.431646</td>
<td>0.4058</td>
<td>3.7516</td>
</tr>
</tbody>
</table>
a. Predictors: (Constant), Dynamic Teaming, Process Modularity, Product Modularity, Strategic Supplier Partnerships, Customer Relationship Management, Information Sharing, Vertical Integration

b. Dependent Variable: Profit

Table 4.27: ANOVA for Profit

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean of Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>11.564</td>
<td>1</td>
<td>11.564</td>
<td>5.28046</td>
<td>0.028</td>
</tr>
<tr>
<td>Residual</td>
<td>118.258</td>
<td>51</td>
<td>2.31878</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>129.822</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.27 shows the results of ANOVA test which reveals that the variable supply chain practices statistically and significantly predicted the profits of textile and apparel firms in Kenya, F (1, 43) = 5.28046, p< .05, R² = 0.4316

The F value of 5.28046 shows that the association between supply chain practices and Performance measures was significant at p<0.05. Using the Analysis of Variance (ANOVA) to test the significance of the overall model, the results as tabulated in Table 4.27, suggested that the overall model is significant at 5% level of significance (p<0.05). This implies that supply chain practices are considered significant in explaining economic Performance and that model is significant at 5%.

(a) Regression Co-efficient
### Table 4.28: Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standard Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Standard Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.398</td>
<td>0.148</td>
<td>2.19</td>
<td>0.031</td>
</tr>
<tr>
<td>Dynamic Teaming</td>
<td>0.532</td>
<td>0.0614</td>
<td>1.419</td>
<td>2.247</td>
</tr>
<tr>
<td>Product Modularity</td>
<td>0.2908</td>
<td>0.0756</td>
<td>1.974</td>
<td>3.413</td>
</tr>
<tr>
<td>Process Modularity</td>
<td>0.1623</td>
<td>0.0853</td>
<td>0.168</td>
<td>1.981</td>
</tr>
<tr>
<td>Strategic Supplier Partnerships</td>
<td>0.188</td>
<td>0.0713</td>
<td>1.881</td>
<td>2.146</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>0.1912</td>
<td>0.0345</td>
<td>1.675</td>
<td>3.846</td>
</tr>
<tr>
<td>Customer relationship Management</td>
<td>0.092</td>
<td>0.048</td>
<td>0.78</td>
<td>2.106</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>0.2346</td>
<td>0.078</td>
<td>1.465</td>
<td>2.345</td>
</tr>
</tbody>
</table>

Dependent, Profit

The beta coefficients in Table 4.28 shows that dynamic teaming makes the most significant contribution to profits ($\beta=0.532$, $p<0.05$), followed by product modularity ($\beta=0.298$, $p<0.05$), followed by vertical integration ($\beta=0.2346$, $p<0.05$), followed by information sharing ($\beta=0.1912$, $p<0.05$) and strategic supplier partnerships ($\beta=0.188$, $p<0.05$). However, process modularity ($\beta=0.1623$, $p>0.05$) and customer relationship management ($\beta=0.092$, $p>0.05$) showed insignificant contributions to profits. While process modularity and customer relationship management showed an insignificant relationship with profits, they did not show a negative relationship with profits, but instead contributed slightly towards profits.
From the study findings it was established that there exists a positive and significant relationship between dynamic teaming and profits. The result shows that for a unit change in dynamic teaming there is 0.532 positive changes in profits of textile and apparel firms. Further, it is observed that the value of dynamic teaming is less than the significance level of =0.05. This implies that dynamic teaming could be used to improve the profits of textile and apparel firms. According to Sudarshan & Rao (2013) the most important aspect of modular manufacturing is team members’ culture and attitude, as this play significant role in enhancing the manufacturing agility of a firm through allowing operators to work as a ‘family’ to attain high performance and productivity levels that can be reflected in higher profits. Popoola’s (2000) study of modular manufacturing in South Africa revealed that dynamic teaming enables garment firms to have higher profits. The findings of this study support the results of Ramdass & Pretorius (2011) who confirmed that dynamic teaming influences the amount of profits that garment firms make.

With regard to product modularity, the findings showed that product modularity influence profits of garment firms positively. The resultant coefficient suggests that for a unit change in product modularity, there is 0.2908 positive change in profits realised in the textile and apparel firms. This implies that profit improvement can results from the use of product modularity. Product modularity simplifies product customization through the use of reconfigurable modules to create new, possibly unique variants to meet customer demand. This is confirmed by Sharifi and Zhang (2001), who state that product modularity provides manufacturing agility through adopting practices that provide the requisite capabilities; reconfigurable equipment leads to an accurate rapid response to customer requirements. This study demonstrates that product modularity lead directly to higher profits. This is a significant contribution because it validates studies by Vickery et.al (2016) and Teece (2006).
The findings of the study revealed that strategic supplier partnerships have positive and significant influence on profits for textile and apparel firms. From the results, it was evidenced that a unit change in strategic supplier partnerships results to improvement in profits realised by 0.188. This result show that supplier partnership can contribute to enhanced profits. Studies by Shin, Collier and Wilson, (2000); Prasad and Tata, (2000) have suggested that that effective strategic supplier partnership has a direct impact on the overall profits by an organization, with strategic supplier partnership expected to increase an organization’s market share and return on investment, and improving overall competitive position (Stanley and Wisner, 2001). A similar study by Kraus et al. (2006), concluded that strategic supplier partnership has a positive and significant impact on profits of textile and apparel firms.

Concerning the relationship between information sharing and profits of textile and apparel firms, the study demonstrated that there exists a positive significant relationship. This shows that information sharing portends benefits to textile and apparel firms. This can be attributed to what Lee et al., (2010) states as potential advantages through either expected cost reduction or inventory reduction. According to Zhao et al. (2009) if information sharing is used efficiently, the manufacturers are able to reduce the inventory costs significantly when the service levels are maintained. These results are consistent to the findings of the study by Mäkinen (2017) that concluded that information sharing positively affects the performance of supply chain. On the contrary these findings contradict the findings of Huang et al (2003) who concluded that information sharing does not affect profits of firms even if it remains shared.

On the relationship between vertical integration and profits of textile and apparel firms. It was observed that positive and significant relationship exists thereby showing that firms which have adopted vertical integration are more likely to have higher profits. This suggests that vertical integration can be considered as a variable that would be used to enhance profits. According to Guan and Rehme (2012) vertical integration provides
benefits to firms through upstream and downstream actors. Upstream competitors are closer to the material end of an industry’s supply chain, and thus value is added by transferring raw materials into standardised commodities.

Vertical integration encompasses process and cost-leaning mechanisms that facilitate the achievement of a low-cost position (Nicovich & Dibrell, 2007). In divergence, downstream actors are closer to the final consumption of products and services, and value is added through advertising, product positioning, and marketing channels. This allows downstream organisations to have the capability to produce products that meet diversified needs thereby improving profits of firms (Nicovich & Dibrell, 2007). The findings are consistent with previous empirical findings by Wright (2016), which found that vertical integration positively affect the profits of firms.

The findings of the study also showed that customer relationship management does not influence the profits of a textile and apparel firm. Thus, it can be suggested that with every investment that firms make on customer relationship management, profits improvement is not guaranteed. According to Reinartz et al. (2004) customer relationship management has positive effects to the degree to which all the three stages of customer relationship management; initiation, maintenance and termination affects a firm’s profits. Further, he argues that this is not always the case in the manufacturing sector where one of the stages is given more priority than other stages. Studies by Kim, (2012); Ngambi and Ndifor (2015) show support for customer relationship management’s impact on profits on initiation and maintenance, with little support found for termination of customer relationship management. This result contradicts the findings of Ata and Toker (2012) and Mohammad et al. (2013) who established that CRM has a positive effect on organizational profits.
4.11.2 Analysis between Supply Chain Practices from Factor Analysis and Social Performance (Lead Time) of Textile and Apparel Firms

Regression analysis between supply chain practices and Performance as was measured using supply chain practices and lead time.

Table 4.29 presents the regression results showing the predictive power of each factor on lead time. The $R^2$ value of 0.5746 implies that the supply chain practices explained 57% percent of the variance in lead time of textile and apparel firms while 43% of the change in lead time firm can be explained by other study variables excluded in the model.

**Table 4.29: Model Summary**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Squared</th>
<th>Adjusted R Squared</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.758</td>
<td>0.5746</td>
<td>0.5145</td>
<td>3.2890</td>
</tr>
</tbody>
</table>

**Table 4.30: ANOVA for Lead Time**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square of F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>9.381</td>
<td>1</td>
<td>9.381</td>
<td>4.6795</td>
</tr>
<tr>
<td>Residual</td>
<td>108.258</td>
<td>51</td>
<td>2.0047</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>129.822</td>
<td>52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The $F$ value of 4.6795 shows that the association between supply chain practices and lead times measures was significant at $p<0.05$. Using the Analysis of Variance (ANOVA) to test the significance of the overall model, the results as tabulated in Table 4.31, suggested that the overall model is significant at 5% level of significance ($p<0.05$). This implies that supply chain practices are considered significant in explaining lead time, and that model is significant at 5%. 

116
Table 4.31: Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standard Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Standard Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.145</td>
<td>0.267</td>
<td>1.18</td>
<td>0.043</td>
</tr>
<tr>
<td>Dynamic Teaming</td>
<td>-0.133</td>
<td>1.362</td>
<td>-0.892</td>
<td>1.345</td>
</tr>
<tr>
<td>Product Modularity</td>
<td>-0.3703</td>
<td>4.953</td>
<td>-0.059</td>
<td>1.748</td>
</tr>
<tr>
<td>Process Modularity</td>
<td>0.5113</td>
<td>0.6033</td>
<td>0.624</td>
<td>0.885</td>
</tr>
<tr>
<td>Strategic Supplier Partnerships</td>
<td>0.1549</td>
<td>0.4972</td>
<td>0.582</td>
<td>0.773</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>0.092</td>
<td>0.043</td>
<td>0.378</td>
<td>1.026</td>
</tr>
<tr>
<td>Customer relationship</td>
<td>0.056</td>
<td>0.048</td>
<td>0.236</td>
<td>0.481</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>0.356</td>
<td>0.489</td>
<td>1.311</td>
<td>1.980</td>
</tr>
</tbody>
</table>

From the study findings it was revealed that dynamic teaming has a negative influence on lead times for textile and apparel firms. The results show that for a unit change in dynamic teaming, creates a change of -0.133 on lead times of textile and apparel firms. This shows that that dynamic teaming holds potential in reducing lead times in textile and apparel firms. According to Sudarshan & Rao (2013) team approach has the advantage of pushing garments faster while enabling the operators to respond to customer requirement much faster. It allows employee to take responsibilities for their processes therefore ensuring quality output. This therefore contributes to manufacturing agility and reduction in lead times. This results support the findings of Vickery et al., (2016) who concluded that dynamic teaming has a positive influence on manufacturing lead times.

Concerning the effect of product modularity on lead time the study revealed that product modularity reduces lead times in textile and apparel firms. As PM enables manufacture
of modules in parallel and assembles them based on order requirements, cycle time is reduced (Novak & Eppinger, 2001). Improved component availability also reduces cycle time (Jacobs et al., 2007). Thatte (2013), report that system service levels improve with modular architectures and contribute to cycle time reduction. These results concur with the results of Chiu and Okudan (2014) who established that PM reduces cycle’s times in manufacturing firms.

Although product modularity showed a significant relationship with lead times, process modularity indicated a non-significant relationship with lead times. These results suggest that process modularity does not necessarily results to reduce lead time. Roushdy et al., (2015) suggested that process modularity is based on three principles: process standardization, process re-sequencing and process postponement which all must work together for any effect to be felt on manufacturing agility. These support the findings of Vickery et al., (2016) who established that process modularity has no significant effect on lead times.

On strategic supply partnership and customer relationship management, the study findings indicated that there exists no relationship with lead time. This demonstrates that strategic supply partnership and customer relationship management does not necessarily reduce lead time in textile and apparel firms. Although many companies desire to implement supplier relationship management (SRM), the reality is that most firms do not implement it to the full extent necessary to achieve their desirable goals and objectives due to the challenges associated with full-scale implementations and this explains why supplier partnership and customer relationship management have minimum effect on manufacturing lead time as argued by Clark (2006). These findings confirm the results of Roushdy et al., (2015) who found out that supply relationship management does not lead to reduced lead times.

Concerning the relationship between information sharing and lead time the study demonstrated that information sharing does not affect lead time. This implies that level
of information sharing is not associated with shorter order cycle time. This is attributed to existences of poor linkages and poor quality of information that exists in most firms (Zelbst et al., 2009). These findings contradict the results in study by Hsu et al. (2009) who concluded that information sharing leads to reduction in lead time.

Similarly, the study findings revealed that there exists positive relationship between vertical integration and lead time. This implies that firms that practice vertical integration are more likely to have increased lead times. Vertical integration can limit flexibility and reduce information about both input markets and product markets as the firm becomes more insulated. These study findings align with the result of D'Aveni and Illinitch (1992), who found out that extensive vertical integration in a volatile environment increases lead times.

4.11.3 Analysis between Supply Chain Practices from Factor Analysis and Social performance (Product Mix) of Textile and Apparel Firms

Table 4.32 presents the regression results showing the predictive power of each factor on product mix. The $R^2$ value of 0.2332 implies that the supply chain practices explained 23% percent of the variance in product mix of textile and apparel firms while 77% of the change in product mix of textile firm can be explained by other study variables which did not feature in the study model. This implies that Performance in terms of product mix is to a great extent affected by non-supply chain practices.

Table 4. 32: Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Squared</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.483</td>
<td>0.2332</td>
<td>0.1870</td>
<td>4.1884</td>
</tr>
</tbody>
</table>
Table 4.33: ANOVA for Product Mix

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean of Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>7.119</td>
<td>1</td>
<td>7.119</td>
<td>4.6018</td>
<td>0.026</td>
</tr>
<tr>
<td>Residual</td>
<td>82.145</td>
<td>51</td>
<td>1.54990</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>89.264</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.34: Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standard Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Standard Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.312</td>
<td>0.679</td>
<td>2.089</td>
<td>0.034</td>
</tr>
<tr>
<td>Dynamic Teaming</td>
<td>0.114</td>
<td>0.918</td>
<td>1.789</td>
<td>2.347</td>
</tr>
<tr>
<td>Product Modularity</td>
<td>0.234</td>
<td>0.3458</td>
<td>0.210</td>
<td>0.3783</td>
</tr>
<tr>
<td>Process Modularity</td>
<td>0.067</td>
<td>0.312</td>
<td>0.623</td>
<td>1.908</td>
</tr>
<tr>
<td>Strategic Supplier</td>
<td>0.022</td>
<td>0.146</td>
<td>0.489</td>
<td>0.866</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>0.136</td>
<td>0.338</td>
<td>0.583</td>
<td>1.026</td>
</tr>
<tr>
<td>Customer relationship</td>
<td>0.036</td>
<td>0.586</td>
<td>0.783</td>
<td>1.289</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>0.256</td>
<td>0.789</td>
<td>1.118</td>
<td>2.144</td>
</tr>
</tbody>
</table>

From the study findings it was revealed dynamic teaming positively influences the product mix in textile industries. The results show that for a unit change in dynamic teaming leads to 0.114 increases in the number of products. This implies that that dynamic teaming holds potential in increasing product mix in textile and apparel firms.
According to Sudarshan & Rao (2013) the composition of the team is of the utmost importance in improving product mix of textile firm. This result conforms to the findings of Yang, Kincade and Chen-Yu (2015) who established that teaming leads to increased product mix in textile and apparel firms.

Product modularity was also established to be having significant effect on product mix of textile and apparel firms, with the results indicating that product modularity increases product mix by 0.234 units. Process modularity was also found to have significant effect on the product mix, with the results showing that a unit increase in process modularity leads to an increase in product mix by 0.067. These findings show modular manufacturing leads to increased product development in textile firms. Ethiraj and Levinthal (2004) posit that modular designs can improve new product introduction because of autonomous (within component) and modular (mix and match of modules) innovation. These findings validate the results of studies by Thatte (2007), which showed that modular manufacturing increases the product lines of textile and apparel firms.

With regards to strategic supplier partnerships and customer relationship management, the study showed that they have no effect on product mix in textile firm. This result indicates that product development in textile and apparel firms is not affected by supplier relationship management. Bunduchi, (2013) argues that supplier relationship management affects product development to the degree that enhancing factors exists; trust, open communication, linkages, organization resources, relationship history and loyalty. Accordingly, he states that the effectiveness of supplier partnership and customer relationship is dependent of such factors. These findings align to the results of Sjoerdsma& van Weele (2015) who concluded that supplier relationship management does not influence product development in firms.

On information sharing, the study findings indicated that there exists no relationship with product mix. Mäkinen (2017) argues that information sharing is not the key in
Performance but quality of information and level type of information. This varies according to firm thus minimizing the effectiveness of information sharing in Performance. These findings contradict the Marinagi, Trivellas and Reklitis (2015) who asserted that information sharing leads to increase in product line development and product mix.

4.11.4 Analysis between Supply Chain Practices from Factor Analysis and Environmental Performance of Textile and Apparel Firms

In order to identify the relationship between supply chain practices and recordable accidents, a regression analysis was conducted. Table 4.35 presents the regression results for the variables. As shown in Table 4.35, $R^2=0.0841$ indicates that the seven factors of supply chain practices explained 8% percent of the variation in recordable accidents. The F-value of 4.9816 demonstrates that the model is significant in explaining the relationship between supply chain practices and recordable accidents and that they can be predicted.

Table 4. 35: Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Squared</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.29</td>
<td>0.0841</td>
<td>0.062</td>
<td>3.359</td>
</tr>
</tbody>
</table>

Table 4. 36: ANOVA for Recordable Accidents

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean of Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>7.345</td>
<td>1</td>
<td>7.345</td>
<td>4.9816</td>
<td>0.018</td>
</tr>
<tr>
<td>Residual</td>
<td>78.145</td>
<td>51</td>
<td>1.47443</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>85.49</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4.37: Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standard Coefficients</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Standard Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.312</td>
<td>0.679</td>
<td></td>
<td>2.089</td>
</tr>
<tr>
<td>Dynamic Teaming</td>
<td>0.228</td>
<td>0.878</td>
<td>1.443</td>
<td>2.347</td>
</tr>
<tr>
<td>Product Modularity</td>
<td>-0.234</td>
<td>0.3458</td>
<td>-0.210</td>
<td>-0.473</td>
</tr>
<tr>
<td>Process Modularity</td>
<td>0.06</td>
<td>0.312</td>
<td>0.645</td>
<td>0.908</td>
</tr>
<tr>
<td>Strategic Supplier</td>
<td>0.022</td>
<td>0.146</td>
<td>0.489</td>
<td>0.866</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>0.136</td>
<td>0.338</td>
<td>0.583</td>
<td>1.026</td>
</tr>
<tr>
<td>Customer relationship</td>
<td>0.144</td>
<td>0.686</td>
<td>0.483</td>
<td>0.34</td>
</tr>
<tr>
<td>Vertical Integration</td>
<td>0.213</td>
<td>0.789</td>
<td>0.618</td>
<td>0.356</td>
</tr>
</tbody>
</table>

The study findings indicated that product modularity influences the number of recordable accidents in textile and apparel firms. The results show that for a unit change in product modularity, recordable accident reduces by 0.234. This shows that product modularity holds potential in reducing recordable accidents in textile and apparel firms. According to Sudarshan & Rao (2013) argue modularity manufacturing improvements
could also be made in the machining and pressing departments in clothing manufacture. There are advanced machine technologies that are programmable, fully automated machinery that could assist in reducing the time of the machining process. The latest technological developments have machinery that could perform a number of sewing operations with minimal human interference. Thus the entire supply chain could use machinery that would be able to reduce the time of production of garments but need to apply the latest technology, not forgetting the fundamental methodology of process improvements. The improvement process addresses the quality of production, reduces the risk of accidents by reducing fatigue of operators, and focuses on the competitive position of organizations. This results support the findings of Vickery et al., (2016) who concluded that modular manufacturing can contribute to reduction in accidents in textile and apparel firms.

Additionally, the study findings indicated that process modularity, vertical integration, strategic supplier partnerships, and information sharing and customer relationship management have no significant relationship with recordable accidents. According to Roushdy et al., (2015), vertical integration, information sharing, customer relationship management and strategic supplier partnerships are external linkages to a firm, and such play minimal role in the manufacture of products. These findings highlight the relationship between various supply chain practices and safety at the work place.

4.11.5 Joint Regression Analysis between Supply Chain Practices and Performance of Textile Firms

MANOVA was carried out to test the relationship between supply chain practices and Performance. MANOVA was used to the study for the advantage that it has over ANOVA in cases where many dependent variables are involved. MANOVA reduces the possibility of type 1 error that is enhanced when ANOVA is used with many dependent variables. Results of the MANOVA analysis are presented in the section below.
As shown in Table 4.38, $R^2=0.524$ indicates that the independent combined variables in this study explained 52.4% percent of the variation in Performance. This implies that supply chain practices are significant predictor of Performance by 52.4%, with 47.6% of changes in Performance occasioned by variables not included in the model.

**Table 4.38: Model Summary**

<table>
<thead>
<tr>
<th>R-Squared</th>
<th>Adjusted R Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.524</td>
<td>0.493</td>
</tr>
</tbody>
</table>

**Table 4.39: Multivariate Tests**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Value</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>Wilks' Lambda</td>
<td>0.127</td>
<td>135.603</td>
<td>0.000</td>
</tr>
<tr>
<td>Modular Manufacturing</td>
<td>Wilks' Lambda</td>
<td>0.457</td>
<td>2.872</td>
<td>0.042</td>
</tr>
<tr>
<td>Supply Relationship Management</td>
<td>Wilks' Lambda</td>
<td>0.29</td>
<td>3.465</td>
<td>0.023</td>
</tr>
<tr>
<td>Supply Chain Integration</td>
<td>Wilks' Lambda</td>
<td>0.068</td>
<td>4.648</td>
<td>0.017</td>
</tr>
<tr>
<td>Supply Chain Responsiveness</td>
<td>Wilks' Lambda</td>
<td>0.164</td>
<td>2.744</td>
<td>0.047</td>
</tr>
</tbody>
</table>

In MANOVA tests, there exists four kinds of test Wilks' Lambda, Hotellings trace test, Pillai trace and Roys tests. However, Wilks' Lambda is recommended for use in cases where the sample size of the study is small (< less) than 200 (Tabachnick & Fidell, 2007). The study results are based on Wilks' Lambda test.

The general regression model arrived at was

$$Y = 0.127 + 0.457X_1 + 0.29X_2 + 0.068X_3 + 0.164X_4$$

where;

$X_1$ = Modularity Based Manufacturing (MBM),

$X_2$ = Supply Relationship Management (SRM),
$X_3 =$ Supply Chain Integration (SCI),

$X_4 =$ Supply Chain Responsiveness (SCR) and

$Y =$ Performance of textile and apparel firms in Kenya. Hence;

Performance = $0.127 + 0.457 \text{ Modularity Based Manufacturing} + 0.29 \text{ Supply Relationship Management} + 0.068 \text{ Supply Chain Integration} + 0.164 \text{ Supply Chain Responsiveness}.$

The Beta Coefficients in the regression model show that all of the tested variables had positive relationship with Performance of textile and apparel firms in Kenya with all the variables tested being statistically significant with $p$-values less than 0.05.

The Y-Intercept ($\beta_0 = 0.127$), predict the Performance of textile and apparel firms in Kenya when all other variables are zero, implying that without the independent variables that include; Modularity Based Manufacturing, Supply Relationship Management, Supply Chain Responsiveness and Supply Chain Integration, the Performance of textile and apparel firms in Kenya will be 0.127.

From the table 4.39, Modularity Based Manufacturing $X_1$ with ($\beta = 0.457, p< 0.05$) has the strongest relationship with the Performance of textile and apparel firms in Kenya, then followed by Supply Relationship Management $X_2$ ($\beta = 0.29, p< 0.05$), Supply Chain Responsiveness $X_4$($\beta = 0.164, p< 0.05$) and finally Supply Chain Integration $X_3$ ($\beta = 0.068, p< 0.05$) respectively. From the analysis, all four independent variables (Supply Chain Practices) statistically significantly predicted the Performance of textile and apparel firms in Kenya.
The study findings indicate that there exists a positive and significant relationship between Modularity Based Manufacturing and Performance of the textile and apparel firms. The results show that for a unit change in Modularity Based Manufacturing leads to an increase in Performance by 0.457 units. This means that Modularity Based Manufacturing leads to improved Performance on the measured metrics for the textile and apparel firms in Kenya.

Sudarshan & Rao (2013) argues that the manufacturer’s cost is always lower in the Modular approach than in the traditional approach in textile and apparel firms. Hence, the Modular approach favors the manufacturer from the operations point of view. This, they argue lead to improved profits for these textile and apparel firms. The benefits of Modularity based manufacturing are affirmed by Chiu & Okudan (2014); Gebremichael and Kumie (2015) who argue that modularity based manufacturing has the advantage of pushing garments faster while enabling the operators to respond to customer requirement much faster, It allows employee to take responsibilities for their processes therefore ensuring quality output. In support of this, French et al. (2009) affirm the benefits associated with product modularity in manufacturing in the garment industry through his study which indicated an increase in production line by 10%, while labour efficiency improved by 15% and the morale of the employees improved with education, training, open communication and above all, being treated with dignity. This concurs with the assertion of Chiu and Okudan (2011) and Thatte (2013) that Modularity Based Manufacturing result in efficient use of resources thus lowering cost of production; benefits which can results to improved profits.

Concerning Supplier Relationship Management, the study revealed that it affects performance of a firm positively. The study results showed that a unit change in Supply Relationship Management results in 0.290 units of textile and apparel firm performance. These findings imply that textile and apparel firms which adopt Supply Relationship Management are likely to experience improved firm performance. According to Al-
Abdallah, Abdallah & Hamdan (2014) Supply Relationship Management hold potential benefits of organization flexibility and cost reduction which can reduce to improved Performance for textile and apparel firms in Kenya. According to Field & Meile (2008), Supply Relationship Management allows firms to streamline and make more effective the supplier processes which results to inventory reduction smoothing production through reducing costs. Further, Nyamasege and Biraori (2015) argues that supply relationships management allow firms to foster coordination that translates to improved supplier performance and organizational Performance. These results are consistent to the findings of Field and Meile (2008) who demonstrated that supplier relationship significantly affects Performance. Previous literatures on supplier relationship management components have echoed the importance of information sharing, supply relationship management component in supply chain management. Information exchange enhance smooth supply chain practices and its can be manifested if the product or services supplied by the seller meets quality and specification as stipulated the buyer (Au & Ho, 2002) thus improving operational performance. These findings are aligned to the studies by Hsiao, Sharon & Rahman (2015); Kimitei, Bonuke, Chepkwony and Kapkiyai (2015) that showed that supplier relationship management contribute to enhanced profits, an organization’s market share and return on investment, and improving overall competitive position.

The study findings also established that there exists significant relationship between Supply Chain Integration and Performance of textile and apparel firms in Kenya. From the findings it was established that a unit increase in Supply Chain Integration results in improved Performance by 0.068 units. The study results indicate the textile firm with an integrated supply chain experience better performance than those firms without the integrated supply chain. Overall, they confirm Frohlich and Westbrook’s (2001) finding that a higher degree of Supply Chain Integration leads to better Performance.
Our study also provides evidence that the findings on the effects of Supply Chain Integration on firm’s Performance in the literature are consistent with (Flynn et al., 2010). Supply Chain Integration allows firms to be closely coupled with customers, thereby allowing transfer of important information to the integrated supplier thereby aligning their production and shipping plans to the final market demand. Integration also enables firms to attain a competitive edge by streamlining business processes and by coordinating activities with business partners (Ataseven & Nair, 2017). These findings supported the results of Kumar et al. (2017) and Kemunto (2014) who concluded that Supply Chain Integration positively impacts on Performance.

Finally, the study results also indicated that there exists a relationship between Supply Chain Responsiveness and Performance. The findings showed that an increase in one unit of Supply Chain Responsiveness results to an increase in Performance by 0.164 units. These findings demonstrate the potential that supply chain responsiveness holds in enhancing Performance of textile and apparel firms. This can be attributed to the benefits of Supply Chain Responsiveness such as providing quick responses to customer demands and preferences and providing an extended enterprise to enhance cooperation thereby making the firm more responsive and flexible to changes in the market (Singh, 2015). These results are aligned with the findings of Sukati et al., (2012) and Ishtiaque, Siddiqui, & Ahmed (2019). who established that supply chain responsiveness gives a firm better performance.

4.12 Summary of Hypotheses Test Results

Hypothesis tests for the study were carried out based on MANOVA test indicated in table 4.40 below. The first study hypothesis was that there is no significant relationship between modularity based manufacturing and performance in apparel and textile industry in Kenya. Based on the p-value < 0.05 the study rejected the null hypothesis that modularity manufacturing has no effect on the performance. This is because p-
value <0.05 indicates strong evidence against the null hypothesis. Thus, the study accepted the alternative hypothesis; that there is no significant relationship between modularity based manufacturing and performance in apparel and textile industry in Kenya.

The second hypothesis in the study was that there is no significant relationship between supply chain relationship management and performance in apparel and textile industry in Kenya. Based on the p-value < 0.05 the study rejected the null hypothesis that modularity manufacturing has no effect on performance of textile and apparel firms. This is because p-value <0.05 indicates strong evidence against the null hypothesis. Thus, the study accepted alternative hypothesis; that there is significant relationship between supply chain relationship management and performance in apparel and textile industry in Kenya.

The third hypothesis in the study was that there is no significant relationship between supply chain integration and performance in apparel and textile industry in Kenya. The study findings in table 4.40 show p-value less than 0.05 indicating strong evidence against the null hypothesis. Thus, the study accepted the alternative hypothesis; that there is significant relationship between supply chain integration and performance in apparel and textile industry in Kenya.

The fourth hypothesis in the study was that there is no significant relationship between supply chain responsiveness and performance in apparel and textile industry in Kenya. A p-calculated value of 0.047 was established showing strong evidence against the null hypothesis thus alternative was accepted; there is significant relationship between supply chain responsiveness and performance in apparel and textile industry in Kenya.
Table 4. 40: Summary of Hypotheses Test Results

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>p-calculated</th>
<th>p-critical values</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is no significant relationship between modularity based manufacturing and performance in apparel and textile industry in Kenya.</td>
<td>0.042</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>There is no significant relationship between supply chain relationship management and performance in apparel and textile industry in Kenya.</td>
<td>0.023</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>There is no significant relationship between supply chain integration and performance in apparel and textile industry in Kenya.</td>
<td>0.017</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>There is no significant relationship between supply chain responsiveness and performance in apparel and textile industry in Kenya</td>
<td>0.047</td>
<td>0.05</td>
<td>Rejected</td>
</tr>
</tbody>
</table>
CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings, present conclusions and recommendations of the study based on its findings. The chapter further summarizes and recommends specific further research in Supply Chain Management field. The recommendations will help the industry players on how they can improve Performance of textile and apparel firms in Kenya in the local and global market.

5.2 Summary of the Findings

The main objective of the study was to determine how supply chain practices influence Performance in apparel and textile industry in Kenya. The specific objectives of the study were; to determine the influence of modularity based manufacturing of a firm on Performance in apparel and textile industry in Kenya, to establish the influence of supply chain relationship management of a firm on Performance in apparel and textile industry in Kenya, to assess the influence of supply chain integration of a firm on Performance in apparel and textile industry in Kenya as well as establish the influence of supply chain responsiveness of a firm on Performance in apparel and textile industry in Kenya. The outcomes of the findings can be summarized below and this is derived from the research objectives in chapter one.
5.2.1 To Determine the Influence of Modularity Based Manufacturing of a Firm on Performance in Apparel and Textile Industry in Kenya

The results indicated that modularity based manufacturing significantly contributes to Performance sustainably in textile and apparel firms in Kenya. This was supported by factor analysis results that revealed that modularity based manufacturing components (dynamic teaming, product modularity and process modularity) have the largest Eigen value of 2.004, 1.906, and 1.646 respectively. The results indicated apotheosis positive relationship between modularity based manufacturing practices and Performance on an aggregate basis. This study also provides supporting evidences to the literature on the relationships between modularity based manufacturing and Performance.

5.2.2 To Establish the Influence of Supply Chain Relationship Management of a Firm on Performance of Firms in Textile and Apparel Industry in Kenya

The results indicated that there is notable relationship between supply chain relationship management and Performance in Kenya. Further, this was corroborated with the findings of factor analysis that indicated that the three supply chain relationship management constructs (strategic supplier partnership, information sharing and customer relationships) met the cut off of Eigen value with values of 1.341, 1.171 and 1.076 respectively. The results evidently showed the central role SRM plays in the survival of any supply chain business as the environment has become very competitive. Companies have the challenge to respond to varied customer requirements and demand uncertainty.

As for components of supplier relationship management, strategic supplier partnership and information sharing proved to be the components of SRM that significantly affect performance of textile firm. Supplier partnership and development facilitates acquisition of technological and managerial advantage by the supplier’s firm which in return heightens its ability to effectively and efficiently respond to the buying firm’s
requirements in harmony with frequent reliable deliveries. Although such activities of supplier partnership and development are entrenched through information sharing in the supply chain.

5.2.3 To Assess the Influence of Supply Chain Integration of a Firm on Performance in Apparel and Textile Industry in Kenya

The results indicate that there exists an important relationship between supply chain integration and Performance. This was corroborated by the factor analysis findings that showed that a supply chain integration factor (vertical integration) was met by eigen cut-off.

5.2.4 To Determine the Influence of Supply Chain Responsiveness on Performance in Textile and Apparel Industry in Kenya

The study established that supply chain responsiveness contributes significantly to any aspect of Performance in textile and apparel industry. That is, higher level of supply responsiveness leads to Performance on each of the said dimensions. Further, this study also provides supporting indications and collaborative proof to the other literature on the relationships between SCM practices and performance in a supply chain. The results show that good implementation of responsiveness in supply chains will lead to a higher level of performance to a firm.

The empirical results showed the importance of the operations process responsiveness of a firm as it is able to rapidly respond to changes in product volume demanded by customers as a significant measure of ‘responsiveness’. This responsiveness intensifies the competitive advantage through aggregate revenue and delivery dependability. Finally, the measure of supplier network responsiveness can be measured against the ability of a firm’s major suppliers to effectively expedite the firm’s emergency orders is
the single most important measure of ‘supplier network responsiveness’ that overly leads to advanced levels of overall performance of a firm.

5.3 Conclusions of the Study

The study findings showed supply chain management practices that include; supply chain integration, modularity based manufacturing, supply chain responsiveness and supply relationship management significantly contribute to Performance of textile and apparel firms. When the hypotheses were tested in the regression model, the four independent variables (supply chain integration, supply chain relationship management, modularity based manufacturing and supply chain responsiveness) were found to have a significant relationship with the performance of textile and apparel firms in Kenya.

The results clearly showed that supply chain practices play a focal role in achieving improved performance of supply chains. More significantly, the results reinforce the idea that supply chain integration, supply relationship and modularity manufacturing are important in Performance. Another conclusion drawn from the study findings is that supply chain practices affects the dimensions of performance differently, with the study concluding that modularity manufacturing and supply relationship management affect social, economic and environmental performance while supply chain integration affect economic performance of textile and apparel firms. Further conclusion specific to the objective are discussed below.

The study result showed that modularity based manufacturing has a positive and significant effect on performance of textile and apparel firms. Thus affirms the importance of modularity based processes to firms seeking to improve their performance and competitive advantages. Results from factors analysis revealed that product modularity hold the greatest effect on performance of textile firms. Thus it can be concluded that textile firms that invest in product modularity are likely to experience significant performance improvements. Based on the study findings the importance of
modular based processes in textile and apparel industry has been highlighted and affirmed.

The study findings showed that supplier relationship management positive results to improved performance of textile and apparel firms. Thus it can be concluded that firms that embrace supplier relationship management are more likely to experience better performance. Additionally, the study suggest the need for firms to put emphasis on the three components of supplier’s relationship management as they all affect performance of textile firms.

The study demonstrated that supply chain integration affect performance of textile and apparel industry positively. This shows the need for textile firms to pay attention to integrating customer, suppliers and employees in the supply chain process. Results from the factor analysis indicated that textile firms considers vertical integration as more important among the supply chain integration. Based on these results, the study concludes that textile firms ought to prioritize vertical integration amidst other integration components.

From the study findings it was established that supply chain responsiveness affect the performance of textile and apparel firms positively. This demonstrate that firms that have developed an adaptable and flexible supply chain systems are more likely to reap more performance benefits. These results are a pointer to the need for textile firms to continuously develop flexible supply chain in line with the dynamic and changing environment.

5.4 Recommendations of the Study

This research was a validation to the fact that any apparel firm that incorporates supply chain management practices such as: modularity based manufacturing, supply chain relationship management, supply chain responsiveness and supply chain integration will
get a significant benefit on its Performance and more so if it is a textile and apparel firm in Kenya.

The study revealed that supplier chain relationship management has an effect on the performance of textile firms. Based on this the study proposes that textile firm adopt ICT to enhance information sharing with other partners in the supply chain. The study also recommends that managers train their employees on customer relationship management; more so on customer relationship skills. The study suggest also that the managers of textile firm should develop mechanisms for collecting key information on different supply chain metrics and for sharing with other partners. The study suggests that textile firms must pay considerable attention to developing strong works and building trust with suppliers for enhanced performance.

The findings of the study show that supply chain integration has positive relationship with Performance. The study thus suggests managers should involve their customer, suppliers and employees in supply chain practices to achieve improved Performance. Further the findings suggests that needs for forms. This study shows that organizations must textile firm managers should work towards integrating all the constructs of supply chain integration in the firm. From the factors analysis it was established that vertical integration is a significant factors among textile and apparel firms. Thus the study suggest that managers in textile firms ought to establish organizational structures that reduces bureaucracy and facilitates flow of information, coordination and quick decision making. As a way of facilitating integration, the study suggests that textile and apparel firm managers should establish customer feedback mechanism to integrate customers fully into the supply chain. The study suggest that the government through the textile manufacturers association in Kenya can create policies that can promote collaboration among textile firms, suppliers and customers in the textile industry.

The study offers key lessons for managers in textile and apparel industry that new product design decisions and improvements on modular manufacturing will have
insightful effects on Performance of the firm. These improvements will have to be made relatively early in the new product development process. The study recommends that textile and apparel firms prioritize modularity based manufacturing over other supply chain practices as way of improving Performance. This is informed by the study findings that indicated that modularity based manufacturing contribute to approximately half of the change in Performance. The study has several implications for both practitioners and managers. Firstly, by proving the positive impact of modularity based manufacturing, supply relationship management, supply chain integration and supply chain responsiveness on Performance; the study suggests that managers should make appropriate investments on modularity based manufacturing, supply relationship management, supply chain integration and supply chain responsiveness. This will enable the focal textile and apparel firms to efficiently improve their Performance.

The study findings revealed that supply chain responsiveness has a positive significant effect on performance of textile and apparel firms in Kenya. From these findings the study suggests that textile and apparel firm’s managers should adopt inventory management system that can facilitates logistics to meet any changes in customer demand. Further the study findings recommends textile and apparel firms to develop closer and stronger ties as a way of partnership with suppliers as a way of developing strong supplier network flexibility.

5.5 Areas for Further Research

The study adopted a quantitative methodology and this may suffer from inherent weaknesses thus the study recommends the need for further studies that incorporate qualitative approaches or mixed method design. This will help provide more insights that quantitative methodology alone cannot provide. In addition the study suggests for more studies to be done on the supply chain practices-performance relationship but moderating and mediating variable at macro level and micro level firm factors.
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APPENDICES

Appendix I: Introductory Letter to the Respondents

From: Kevin Moindi Omai

P.O Box 406-40202 Keroka

Kenya

Tel: 0725033577

Dear Sir/Madam

SUBJECT: DOCTORAL THESIS RESEARCH QUESTIONNAIRE, DATA COLLECTION

My name is Kevin Moindi Omai. I am a Ph.D student at Jomo Kenyatta University of Agriculture & Technology, and I am currently doing research for my thesis on INFLUENCE OF SUPPLY CHAIN PRACTICES ON PERFORMANCE OF APPAREL AND TEXTILE INDUSTRY IN KENYA to fulfil the requirements of AWARD OF DEGREE OF DOCTOR OF PHILOSOPHY in SUPPLY CHAIN MANAGEMENT.

The data gathering of my research requires your collaboration in filling out this questionnaire. It takes an average of 15 minutes.

I would really appreciate your help. Your response is extremely valuable for my thesis. Please take the time to complete the questionnaire, and if you have any questions, please contact me. Your response will be treated with utmost confidentiality and will be used only for research purposes of this study only.
Thank you in advance for your attention and response.

Yours Faithfully

Kevin Moindi Omai
Appendix 11: Questionnaire Instructions

INFLUENCE OF SUPPLY CHAIN PRACTICES ON PERFORMANCE OF APPAREL AND TEXTILE FIRMS IN KENYA

General Instructions and Information

- This questionnaire is to collect data for purely academic purposes.
- This survey is being conducted by Kevin Moindi Omai, a Ph.D. candidate, Jomo Kenyatta University of Agriculture Technology.
- This research will study Supply Chain Practices and Performance of Apparel and Textile Firms in Kenya.
- We hope to determine various critical practices of a firm for attaining performance.
- Please answer all questions. There is no right or wrong answer. Please provide your BEST estimate.
- If you would like to get a copy of the executive summary of results, please provide the information requested on the last page of the questionnaire.
- If you have any questions, please contact:

  Kevin Moindi Omai
  P.O Box 406-40202
  Keroka
  0725033577

All RESPONSES WILL BE KEPT CONFIDENTIAL. DATA WILL BE USED FOR STATISTICAL ANALYSIS ONLY.
Appendix III: Questionnaire

This questionnaire is meant to gather information regarding Supply Chain Practices and Performance of Apparel and Textile Firms in Kenya.

CONFIDENTIALITY CLAUSE:

All information gathered will be for the purpose of this study ONLY and will be strictly confidential.

Instructions

Please tick √ and fill in to which applies to you as read through each part.

SECTION A: BACKGROUND INFORMATION/ DEMOGRAPHIC DATA

1. Gender:
   a) Male [ ]
   b) Female [ ]

2. What is your highest level of formal education?
   a) No formal education [ ]
   b) Primary level [ ]
   c) Secondary level [ ]
   d) College/University level [ ]

3. How many years has your apparel and textile company been operational?
   a) Less than 5 years
   b) 5 to 10 years 180
4. What type of apparel and textile (SIC Code) your company is in:

<table>
<thead>
<tr>
<th>SIC CODE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blouses (Women)</td>
</tr>
<tr>
<td>2</td>
<td>T-Shirts (Undershirts)</td>
</tr>
<tr>
<td>3</td>
<td>Shirts</td>
</tr>
<tr>
<td>4</td>
<td>Suits</td>
</tr>
<tr>
<td>5</td>
<td>Trousers</td>
</tr>
<tr>
<td>6</td>
<td>Jersey</td>
</tr>
<tr>
<td>7</td>
<td>Other</td>
</tr>
</tbody>
</table>

5. How many employees are in your company?

   a) Less than 1500 [ ]
   b) 1500-3000 [ ]
   c) 3000-5000 [ ]
   d) Above 5000 [ ]

6. Your company’s primary production system is (choose the most appropriate one).

   a) Engineer to Order [ ]
   b) Make to Order [ ]
   c) Assemble to Order [ ]
   d) Make to Stock [ ]

7. Your company’s primary process choice is (choose the most appropriate one).

   Project [ ]  Job shop [ ]  Batch [ ]  Line [ ]  Continuous Processing [ ]
SECTION B: MODULARITY BASED MANUFACTURING PROCESS (MBMP)

1. To what degree do you agree or disagree with the following statements on modularity based manufacturing in textile firms. Kindly indicate your answer (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly Disagree).

<table>
<thead>
<tr>
<th>Statements</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dynamic Teaming</strong></td>
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</tr>
<tr>
<td>Production teams can be reorganized in response to product/process changes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production teams can be reassigned to different production tasks</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Production teams that can be reorganized are used in our plant</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production team members are capable of working on different teams</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Production teams have no difficulty accessing necessary resources</td>
<td></td>
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</tr>
<tr>
<td><strong>Product Modularity</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Our products can be decomposed into separate modules</td>
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<td></td>
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<tr>
<td>Our product features have standardized interfaces</td>
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</tr>
<tr>
<td>Our products can be customized by adding feature modules as requested</td>
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</tr>
<tr>
<td>The interfaces of our product components are designed to accept a variety of other components</td>
<td></td>
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<tr>
<td>Our products are designed to be easily re-configured</td>
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</tr>
<tr>
<td><strong>Process Modularity</strong></td>
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</tr>
</tbody>
</table>
Our production process is designed as adjustable modules

Our production process can be broken down into standard sub-processes that produce standard base units

Production process modules can be rearranged so that customization sub-processes occur last

Our production processes are designed to be rapidly disassembled and re-configured

Only minor equipment modifications are required to produce different products.

SECTION C: SUPPLY CHAIN RELATIONSHIP MANAGEMENT

1. To what degree do you agree or disagree with the following statements on supply Chain Relationships Management in textile firms. Kindly indicate your answer (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly Disagree).

<table>
<thead>
<tr>
<th>Strategic Supplier Partnership</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>We consider quality as our number one criterion in selecting suppliers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We regularly solve problems jointly with our suppliers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We have helped our suppliers to improve their product quality</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>We actively involve our key suppliers in new product development processes</td>
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<tr>
<td>We include our key suppliers in our planning and goal-setting activities</td>
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</tbody>
</table>

Customer Relationships
We frequently measure and evaluate customer satisfaction
We make it easy and encourage customers to seek assistance from us
Evaluate the importance of our relationship with our customers
We frequently determine future customer expectations
We regularly consult with customers in setting our reliability, responsiveness and other standards

**Information Sharing**

Our trading partners keep us fully informed about issues that affect our business
Our Trading partners share business knowledge of core business processes with us
We are always informed about events or changes that may affect the other trading partner
Information exchange between our trading partners and us is reliable
We have frequent face to face communication with our suppliers

### SECTION D: SUPPLY CHAIN INTEGRATION

1. To what degree do you agree or disagree with the following statements on supply Chain Integration in textile firms. Kindly indicate your answer (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly Disagree).
<table>
<thead>
<tr>
<th><strong>Vertical Integration</strong></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>We frequently are in close contact with our customers</td>
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<tr>
<td>Our customers give us feedback on our quality and delivery performance</td>
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<tr>
<td>We strive to be highly responsive to our customers’ needs.</td>
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<tr>
<td>We maintain cooperative relationships with our suppliers.</td>
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<tr>
<td>We strive to establish long-term relationships with suppliers</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Internal Integration</strong></th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>We encourage employees to work together to achieve common goals, rather than encourage competition among individuals</td>
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<tr>
<td>Departments in the plant communicate frequently with each other.</td>
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<tr>
<td>Management works together well on all important decisions</td>
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<tr>
<td>Generally, speaking, everyone in the plant works well together</td>
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<tr>
<td>There is high level of system integration among the departments</td>
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</table>

<table>
<thead>
<tr>
<th><strong>External Integration</strong></th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>We believe that cooperative relationships will lead to better performance than adversarial relationships</td>
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<tr>
<td>We believe that an organization should work as a partner with its surrounding community</td>
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<tr>
<td>We work as a partner with our customers.</td>
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<tr>
<td>We work as a partner with our suppliers, rather than</td>
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</table>
SECTION E: RESPONSIVENESS OF YOUR SUPPLY CHAIN

1. To what degree do you agree or disagree with the following statements on Responsiveness of Supply Chain in textile firms. Kindly indicate your answer (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly Disagree).

<table>
<thead>
<tr>
<th>Operation Process Responsiveness</th>
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</thead>
<tbody>
<tr>
<td>We respond rapidly to changes in product volume demanded by customers</td>
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<tr>
<td>We respond rapidly to changes in product mix demanded by customers</td>
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<tr>
<td>We effectively speed up emergency customer orders</td>
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<tr>
<td>We rapidly reconfigure equipment to address demand changes</td>
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<tr>
<td>We rapidly changes manufacturing processes to address demand changes</td>
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<tr>
<td>Logistics process responsiveness</td>
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<tr>
<td>There are a number of warehouses, loading capacity and distributors facilities</td>
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<tr>
<td>We can rapidly adjusts warehouse capacity to address demand changes</td>
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<tr>
<td>We effectively delivers expedited shipments</td>
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<tr>
<td>It is easy for our firm to add new carriers and other distributors or remove current ones</td>
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<tr>
<td>It is easy for our distributors to change delivery modes</td>
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</table>
Supplier network responsiveness

<table>
<thead>
<tr>
<th>Major suppliers change product volume in a relatively short time</th>
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<tbody>
<tr>
<td>Major suppliers change product mix in a relatively short time</td>
</tr>
<tr>
<td>Major suppliers have outstanding on-time delivery record with us</td>
</tr>
<tr>
<td>Major suppliers effectively expedite our emergency orders</td>
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<tr>
<td>Major suppliers provide quick inbound logistics to us</td>
</tr>
</tbody>
</table>

SECTION F: PERFORMANCE OF YOUR FIRM

1. Please fill in the table on economic performance, social performance and environmental performance for the following years.

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<tbody>
<tr>
<td>Profits (Ksh)</td>
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<td>Lead times(days)</td>
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<tr>
<td>Recordable customer complaints</td>
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<tr>
<td>Number of products mix</td>
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<tr>
<td>Number of certified suppliers</td>
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<td>Recordable accidents</td>
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THANK YOU VERY MUCH FOR YOUR VALUABLE TIME
Appendix II: Key Informant Guide

1. Describe the State of Textile and Apparel firm performance in Nairobi
2. In your opinion, what are some of the performance measurements used by textile and apparel firms? Probe how they measure performance, what are some of the key performance indicators in textile industry
3. What is your understanding of supply chain performance of textile and apparel firms? Probe for chain performance concept application in textile industry
4. How is supply chain performance measured in Textile industry? Probe on the Key indicators used to measure supply chain performance? Probe on costs, profits, revenues etc.
5. What is your understanding of Supply chain performance in textile industry? Probe on its applicability, dimensions (social, economic, environmental etc), frequency of its use in the sector.
7. Describe some of the economic indicators used in measuring supply chain performance. Probe on types of economic indicators used such as sales, costs, number of employees, spending on local suppliers among others.
   (a) Probe on average sales/revenue in a year
   (b) Average number of employees
   (c) Average spending on local supplies in a year
8. Describe some of the Social indicators used in measuring supply chain performance. Probe on welfare of employees and indicators used to measures employee welfare accidents experienced by employees, training given to
employees. Probe on customer complaints, new products launched by employees, employee turnover
(a) Probe on how welfare employees is measured in the firms
(b) Probe further on approximate number of recordable accidents, customer complaints, trainings provided to employees, and number
9. Describe some of the Environmental indicators used in measuring supply chain performance. Probe on waste minimization practices used and their indicators. Probe on reduction in water and energy use, recycling of products, certification of suppliers, supplier training, screening of suppliers through established criteria
(a) Probe on how waste minimization is measured in the firms
(b) Probe on green energy use in textile and apparel firms
(c) Probe further on approximate numbers, costs and metrics involved in water and energy reduction, supplier certification and screening of suppliers.
10. Is there any information on supply chain performance measurement in textile and apparel firms that is worth taking into consideration?
Appendix III: Firms under EPZ

1. Africa Apparel EPZ Ltd
2. Alltex EPZ Ltd
3. Ashton Apparel EPZ Ltd
4. Global Apparels (K) EPZ Ltd
5. Brilliant Garments EPZ Ltd
6. Kapric Apparels EPZ Ltd
7. Hantex Garments EPZ Ltd
8. Kikoy Mall EPZ Ltd
9. Longyun Garments Kenya EPZ Ltd
10. Kenya Trading EPZ Ltd
11. Mombasa Apparels EPZ Ltd
12. Mega Garments EPZ Ltd
13. New Wide Garments (K) EPZ Ltd
14. Royal Garments EPZ Ltd
15. Ricardo EPZ International Co. Ltd
16. Soko EPZ Ltd
17. Tailormade Jeanswear (EPZ) Ltd
18. Suman Shakti EPZ Ltd
19. United Aryan EPZ Ltd
20. Wild Life Works EPZ Ltd
21. Simba Apparel and Textiles
Appendix IV: Firms Under Kenya Association of Manufacturers

1. Apparel Africa Ltd, Mombasa
2. Apparels Trading Co Ltd, Nairobi
3. Bedi Investments (Export) Ltd, Nakuru
4. Binti Apparels Limited, Nairobi
5. Blue Plus Ltd, Nairobi
6. Crown Fashions Ltd, Nairobi
7. Eagle Apparel Export Ltd, Nairobi
8. Emke Garment Kenya Pv Limited, Mombasa
9. Equator Apparels Co. Ltd, Nairobi
10. Excel Clothing, Nairobi
11. Falcon Apparel Exporters Ltd, Nairobi
12. Freba International Mall Ltd, Nairobi
13. Garment label Manufacturers Ltd, Nairobi
14. Heritage Woolen Mills Ltd, Eldoret
15. Kibingo Textiles Ltd, Kerugoya
16. Leena Apparel Ltd, Nairobi
17. Manchester Apparels Ltd, Nairobi
18. Maridadi Apparels Ltd, Nairobi
19. Mash Apparels Kenya Ltd, Nairobi
20. Mega Spin Ltd, Nairobi
21. Res Apparels Ltd, Nairobi
22. Riziki Manufacturers Ltd, Nairobi
23. Sethi Fabric Ltd, Nairobi
24. Teleworld Industries Ltd, Nairobi
25. Zawadi Apparels Ltd, Nairobi
26. Smartex Garments, Naivasha
27. Supra Textiles Ltd, Nairobi
28. Suntan Ltd, Nairobi
29. Phisu Textiles, Nairobi
30. United Textile Industry Ltd, Thika
31. Spin Knit Ltd, Nakuru
32. Londra Ltd, Nakuru
33. Summit Fibres Ltd, Mombasa
34. Raichand Lakhamshi & Sons, Mombasa
35. East African Garment Factory Ltd, Mombasa
36. Ametaa Textiles, Mombasa
37. Emaan Enterprise Ltd, Nairobi
38. Espal (K) Ltd, Nairobi
39. United Textile Industry (K), Nairobi