ROLE OF MULTI-ECHELON DISTRIBUTION SYSTEMS ON PERFORMANCE OF MANUFACTURING FIRMS IN KENYA

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Role of Multi-Echelon Distribution Systems on Performance of Manufacturing Firms in Kenya

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DECLARATION

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

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DEDICATION

This work is dedicated to my wife Beatrice Kiprono and my sons Daniel Kipkosgei and Lawrence Kiptoo for their devotion and endless support during my studies.

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LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
B2B	Business-To-Business
B2C	Business-To-Customer
CPFR	Collaborative Planning, Forecasting and Replenishment
DC	Distribution Centre
DCs	Distribution Centres
DCS	Distribution Control Systems
DRP	Distribution Requirements Planning
DSS	Decision Support System
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
FGDs	Focus Group Discussions
FMCG	Fast Moving Consumer Goods
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
HR	Human Resource
IBM	International Business Machine
ICT	Information Communication Technology

IDP	Inventory/Distribution Plan
IOS	Inter-Organisation Systems
IT	Information Technology
KAM	Kenya Association of Manufacturers
KCC	Kenya Co-Operative Creameries
MDS	Multi-echelon distribution systems
MTP	Mixture of two Translated Poisson
NACOSTI	National Commission for Science, Technology, and Innovation
NEEDS	National Economic Empowerment and Development Strategy
NSE	Nairobi Securities Exchange
OP	Organisational Policy
PER	Performance
PID	Proportional, Integral and Derivative
P-P	Predicted Probability
QRM	Quick Response Manufacturing
RDC	Regional Distribution Centre
SC	Supply Chain
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference

SMEs	Small and Medium Enterprises
SPSS	Statistical Package for Social Sciences
SWOT	Strengths, Weaknesses, Opportunities and Threats
TBC	Time-Based Competition
UK	United Kingdom
USA	United States of America
VIF	Variance Inflation Factor
VMI	Vendor Managed Inventory
WMA	Weighted Moving Average

OPERATIONAL DEFINITION OF TERMS

Demand Forecasting Systems: It refers to methods used to determine the number of products or services that will be purchased by consumers in the future. These methods include quantitative, qualitative, time series methods, and casual methods (Datta *et al.*, 2007).

Distribution Control Systems: This refers to the activity of checking stock levels to determine and maintain an optimum level of investment in distribution in order to achieve required operational performance (Sila, Ebrahimpour & Birkholz, 2006).

ICT Integration: It refers to a network for information exchange within and across organisations for the efficiency of coordinating actions (Lotfi, Mukhtar, Sahran & Zadeh, 2013).

Lead Time: It refers to the cutback of the time between the initiation and completion of a production process which could otherwise result to higher costs. A long lead time makes it harder for a firm to follow demand fluctuations in volume and product configuration (Ray & Jewkes, 2004).

Multi-echelon Distribution Systems: This refers to the approach used to solve problems associated with costs incurred to maintain a large working capital. The approach help in determining where distribution centres should be located in the supply chain and how buffer stock should be optimised at all levels (Moinzadeh, 2002; Sila, Ebrahimpour &Birkholz, 2006).

Organisational Policy: It refers to rules, policies, and procedures that are critical to guide the organisation in creating structures for its operations. It also includes communication to ensure the objectives and goals of the organisations are aligned and understood by everyone. Human resource management is also critical for an organisation as it caters for the welfare of the most significant resource; its employees (Cummins, 2011).

Performance: It is satisfying end-customer needs and providing feedback regarding customers' needs and the supply chain's capabilities (Singh, Sandhu, Metri & Kaur, 2018).

ABSTRACT

In Kenya today, manufacturing firms experience increased stock-outs due to challenges in managing safety stocks. The difficulties in managing safety stocks in multi-echelon distribution systems make it necessary for the use of technology or ICT. This study sought to establish the role of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. Increasing competitive pressures are forcing companies to increase their rates of innovation. The increasing rate of innovation shortens each product's duration in the market, thereby compressing each product's life cycle. Without proper management, increasing product turnover will increase design and manufacturing costs. Four specific objectives are guiding the study. They include: to examine the influence of demand forecasting systems on performance of manufacturing firms in Kenya; to determine the influence of ICT integration on performance of manufacturing firms in Kenya; to establish the influence of distribution control systems on performance of manufacturing firms in Kenya and to determine the influence of lead time systems on performance of manufacturing firms in Kenya. This study was informed by; Theory of Constraints, E-Perspective model, Channel Coordination Theory, Quick Response Manufacturing Model and Organisational Theory. This study employed a descriptive survey research design to accomplish its goals since it has enough provision for the protection of bias and maximised reliability. The target population comprised of top managers of manufacturing firms that are members of the Kenya Association of Manufacturers (KAM). KAM therefore provided the sampling frame for this study. As of 2017, KAM had a membership of 903 manufacturing firms. A sample of 90 respondents was drawn from this population. Primary data was collected using semi-structured and structured questionnaires which were self-administered. Data obtained was processed and analysed using SPSS version 20.0. Both descriptive and inferential statistics were used in analysis. The results of the data analysis were presented in charts and tables. The study revealed that demand forecasting explained 7.6% of the change in the performance of manufacturing firms in Kenya. ICT integration was found to explain 33.9% of the change in the performance of manufacturing firms in Kenya. The results revealed that distribution control systems account for 18.4% of the change in performance in manufacturing firms in Kenya. The findings revealed that lead time systems accounted for 7.6% of the change in the performance of manufacturing firms in Kenya. The results showed that organisational policy had no intervening effect on performance and multi-echelon distribution systems. ICT integration and distribution control systems are the two elements of multi-echelon distribution systems which were most significant on the performance of manufacturing firms in Kenya. The study concluded that demand forecasting systems significantly influences the performance of manufacturing firms in Kenya. ICT integration significantly influences the performance of manufacturing firms in Kenya. Based on failure to fulfil assumptions for intervening effect, it was concluded that organisational policy had no intervening effect on performance and multi-echelon distribution systems. It was therefore recommended that manufacturing firms should use quantitative methods, qualitative methods, causal methods and time series for demand forecasting systems. Manufacturing firms

should ensure they adopt ICT integration to achieve timeliness, consistency and accuracy in their supply chain. Manufacturing firms in Kenya should employ aspects of distribution control systems as it is one of the most critical elements of multi-echelon distribution systems. These include technology, collaborative models and avoid stock-outs. The manufacturing firms should ensure that they are proactive in activities that reduce lead time systems. It was recommended that manufacturing firms should have human resource development programs and adequate training on new technology and tools used in their respective companies.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globalization and competition among firms have resulted in firms developing a supply chain that can respond quickly to customers' need. In the current business environment, a firm has to reduce costs while improving its customer service level to remain competitive, which also helps maintain profit margins. In order to achieve these goals, a firm should appropriately select the location of the factory and the distribution centre (Lawson, Potter, Pil & Holweg, 2019). As indicated by Cannella, Di Mauro, Dominguez, Ancarani and Schupp (2019), an optimal, efficient, and effective supply chain platform is provided by distribution systems, which also helps to improve performance. Moreover Cannella *et al.* (2019) noted that the distribution systems goal is to maximise the financial ratio, which is relevant to the objective of gaining the maximum return on investment at the minimum cost.

Supply chain system has two levels which include strategic level and operational level. The strategic level primarily is about the cost-effective location of facilities (plants and distribution centres), the flow of products throughout the entire supply chain system, and the assignment in each echelon (Dai, Aqlan, Gao & Zhou, 2019). The operational level is about the safety stock of each product in each facility, the replenishment size, frequency, transportation, and lead time, and the customer service level. Determining an effective supply chain is an essential component of improved performance. In addition, the decisions regarding in which facilities the product should be made and how to serve customers are very critical (Liu, Gao & Xu, 2019).

Most of the manufacturing firms comprise of networks of distribution facilities that procure raw material, converts them into finished goods and distribute the finished goods to customers. The term 'multi-echelon' manufacturing and distribution networks are synonymous with such networks. The distribution locations in the supply chain are called "echelons." Usually, the complexity of a supply chain is related to the number of echelons inside it. Supply chain networks are having multiple layers of distribution locations are referred to as multi-echelon supply chains (Stenius, Marklund & Axsäter, 2018).

Every firm desire to keep customer service and operations efficiency high, while keeping the cost of distribution low. Most firms are still using elementary methods for achieving this goal, such as utilising a Days-of-Coverage ratio or a statistical safety-stock calculation for end-items. Multi-echelon distribution systems (MDS) bring significant advances to answering the old question of where to distribute in the supply chain. Many firms have adopted this technology, but it is still a big mystery to many others (Xu *et al.*, 2009).

Distribution system optimisation is keeping stock levels and service requirements at equilibrium. In doing so, the change in demand and supply should be taken into consideration (Zhang & Wang, 2019). The balancing act gives many firms a significant challenge. They find it difficult to match their supply to their customers' demand. It is therefore imperative that firms that effectively address this challenge reflect good performance especially on their profitability. Given that stock is critical to all firms, it is important for them to maintain low levels of the same and sell quickly to realize profits. However, the firms are not the only determinant of how stock moves as a supply chain system today has many stakeholders. There are suppliers and distributors who also play a significant role in the supply chain. The many layers of stakeholders mean additional safety stock will be needed hence a large working capital. Multi-echelon distribution systems approach attempts to solve problems associated with costs incurred to maintain a large working capital. This is because it employs a holistic view of the supply chain system to take into account effect of safety stock in each layer in the supply chain. The approach help in determining where distribution centres should be located in the supply chain and how buffer stock should be optimised at all levels. This optimisation of the supply chain system has an impact on costs and eventually profitability (Zhang *et al,* 2019).

Multi-echelon distribution systems boost the ability of manufacturing firms to meet their customers' needs with optimal safety stock (Nguyen, Sharkey, Mitchell &

Wallace, 2019). Having addressed the problem of running out of stock as well as having a large working capital than required, the profitability of manufacturing firms improve significantly. This is true whether the firms are operating in global, local supply chain or both. One of the major reasons why manufacturing firms adopt multi-echelon distribution systems is that they can avoid losses involved when there is a stock out or in holding extra stock. Having a sound distribution system is critical for any organization. It is therefore important to make use of appropriate techniques for lowering distribution costs at the same time optimising service levels. This will reflect improved performance and profitability for such an organisation. However, reducing the safety stocks in distribution should in no way affect customer service levels. Multi-echelon approach addresses this concern by keeping more stock at the outer nodes so that the customer service level is not affected while reducing the overall level of safety stock in the distribution system. This system, however, should not in any way affect customer service. The firms should be in a position to forecast demand (Zhang *et al,* 2019).

1.1.1 Global Perspective of Multi-echelon Distribution Systems

Supply chains may consist of several stages where each stage is associated with a process such as the procurement of a raw material, the production of a component, the manufacture of a subassembly, the assembly of a final product, its transportation from a central distribution centre to a regional warehouse or from a regional warehouse to a store (Hua & Willems, 2016). Indeed, many real-world supply chains can be characterised as large and complex multi-echelon systems since they may consist of thousands of stages incorporating both assembly and distribution processes. Several examples of such multi-echelon systems were illustrated by Willems (2008) for industries such as computer hardware, semiconductor, industrial chemicals, consumer goods, and aircraft engine. A challenge facing these multi-echelon systems is the efficient management of inventory when demand is uncertain, operating costs are important, and customer service requirements are high.

Fichtinger and Yates (2017) have shown that savings realised by using the multi-echelon systems approach for Hewlett-Packard's Digital Camera and Inkjet Supplies business exceeded $130 million. Eruguz (2014) asserted that the multi-echelon systems-based models produced 7% of average inventory reduction at Procter & Gamble's business units. Wieland et al. (2012) have described a multi-echelon systems project at Intel and indicated that after its implementation, inventory levels were reduced more than 11% providing average service levels exceeding 90%.

Geographically, North America has highly embraced multi-echelon distribution systems. This is as a result of having a significant proportion of manufacturing firms and a high penetration of technology in its manufacturing industry. A high demand for multi-echelon distribution systems is expected in countries with high growth in manufacturing such as China, South Korea, India, Vietnam, and Indonesia (Ferreira, 2009).

Pitamber (2014) observed that European light vehicle manufacturers had high regard for parameters adding into performance. European manufacturers scored highly in flexibility, lead time, order delivery and responsiveness. This could be attributed to agile supply chain strategies that they followed. On the contrary, American manufacturers scored least in product variety, order delivery and lead time. This perhaps could be attributed to a focus on a lean supply chain. These observations show that quality is critical for vehicle manufacturers. As Ambe (2014) observed, there was no noteworthy variance in quality among vehicles manufactured in Europe, Asia, and America.

In Asia, Schein (2004) evaluated the distribution management practices of 150 small and medium-sized enterprises in Vietnam. The study revealed that only 2% of these entities used distribution management theories to manage their inventories while 98% of these entities indicated that they used owner/manager experience to manage their distribution. In addition, although a higher percentage of these enterprises indicated that they prepared distribution budgets frequently, they acknowledged that they could not monitor their distribution on a more constant basis

1.1.2 Regional Perspective of Multi-echelon Distribution Systems

Pitamber (2014) investigating critical parameters utilised by firms manufacturing vehicles in South Africa found that excellence or quality was critical for performance. Quality was followed by delivery, and reliability. Pietersen (2012) evaluated the distribution management practices of 199 small and medium scale enterprises in Ghana. The study found that 56.3% of respondents prepared their distribution level on a monthly basis, while 39.7% of the respondents never kept a record of their distribution levels. Furthermore, only 17% of respondents bought their raw material from foreign companies.

In Uganda, Abanis, Sunday, Burani, and Eliabu (2012) investigated the distribution management practices of 386 SMEs. The authors found that the majority of respondents did not review their distribution levels on a monthly basis. The results also indicated that most of these enterprises did not review their distribution budgets and distribution turnover regularly. In addition, there was no proper authorisation of distribution purchase amongst these entities.

In a South African study, Pitamber and Dharup (2014) examined the distribution control and valuation procedures amongst 173 small and medium-sized enterprises. The study found that 53.5% of the respondents used economic order quantity whereas a smaller percentage (36.4%) of respondents used theories of distribution management. In addition, 58.4% of the respondent's indicated that they review that distribution level.

In Nigeria, the National Economic Empowerment and Development Strategy (NEEDS) introduced in 2004 sought to boost the manufacturing sector. The aim was to achieve industrial capacity utilisation of 70%. Even though the objectives of NEEDS did not materialise, it led to the modest growth of the manufacturing sector in Nigeria between 2004 to 2007 (Banjoko, Iwuji & Bagshaw, 2012). Policy failures among other things continue to limit the development of the industry making the operating environment complex and unpredictable (Oluwale, Jegede, & Olamade, 2013). Manufacturing firms in Nigeria, analyse data and information to address such uncertainties as well as informing their strategies and actions (Oluwale *et al.,* 2013).

Kazeem, Orsarh, Ehumadu and Igbinoba (2016) in Nigeria pointed out the essence of having a suitable demand forecasting model. They used a case study of a fruit juice manufacturing firm to show the importance of selecting a suitable and relevant forecasting model for a firms product. Four models were tested, and they included a moving average model, exponential smoothing model, weighted moving average and linear regression model. The model with minimum mean absolute percentage error was considered suitable as it minimised forecasting error. Kazeem et al. (2016) recommended moving average model for demand forecasting in a fruit juice manufacturing company in Nigeria.

1.1.3 Local Perspective of Multi-echelon Distribution Systems

Manufacturing is an essential sector in Kenya's economy since it makes a substantial contribution to the country's economic development (Snyder, 2006). With substantial growth continuing in the manufacturing industry, Kenya is poised to be among the fastest-growing economies in East Africa, according to the World Bank Group's economic analysis for the country (World Bank, 2016). However, as a share of GDP, Kenya's manufacturing firms has been stagnant in recent years. Low overall productivity and large productivity differences in firms across subsectors point to lack of competition. Manufacturing firms in Kenya are characterised by elongated or overextended chains of retailers (Snyder, 2006) which, in turn, mean long chains of transactions between chain members and consumers. Manufacturing firms in Kenya are faced with problems of wrong forecasting due to lack of enough distribution management information. Unavailability of integrated distribution management has affected productivity at manufacturing firms leading to reduced profits. Firms should boost their level of productivity by managing the flow of stock to sustain growth and increase the contribution of the manufacturing firms' competitiveness.

Kenyan manufacturing companies have been exposed to global competition with the liberalisation of the East African regional market. The manufacturing companies from developed counties like China, Korea, Japan, USA, and Russia have ensured that they compete regarding cost, quality, technology, customer satisfaction and other competitive strategies as they pursue to achieve competitive advantage over the

Kenyan products. Kenyan manufacturing companies are also facing the challenges of high cost of raw materials, poor transport network, high taxation, price volatility and the high cost of energy that hinder them to compete favourably (KAM, 2012). This has posed as a challenge to managers in manufacturing companies in Kenya as they strive to achieve competitive advantage in regional and global markets. With considerable empirical research on management as well as models aimed at solving problems experienced by business firms, managers in most organisations are trying to implement the critical management concepts to ensure that they achieve the combined benefits of improved cost, flexibility, dependability, and quality (Hayes, Glynn & Shanahan, 2005).

Manufacturing companies in developing countries in which Kenya is also included are now increasingly integrating the management practices in their business operations to ensure that they also compete favourably in the dynamic global market. Although some studies have been done on the concept and context of management practices in Kenya, there is limited information within the context of the manufacturing industry. Okanda, Namusonge and Waiganjo (2016) investigated the influence of supply planning practice on the performance of the unit of vaccines and immunisations in the Ministry of Health, Kenya. They found out that supply planning practices, if adopted by the unit of vaccines and immunisations, would increase their performance positively. Arani, Mukulu, Waiganjo, Wambua and Wambua (2016) investigated the influence of strategic sourcing on resilience in manufacturing firms in Kenya.

Okello and Were (2014) explored the influence of management practices on performance of the selected NSE listed food manufacturing companies in Nairobi Kenya and the study revealed that product development process, distribution management, lead time, technology and innovation have a significant influence on the performance of food manufacturing companies in Kenya. Gichuru, Iravo, and Arani (2015) carried out an empirical investigation on the influence of Collaborative Practices on Performance of Food and Beverages Companies. Their study found out that ICT integration practice and resource sharing practice has a positive influence on the performance of the company. Amemba, Nyaboke, Osoro and Mburu (2013) did a study on elements of green supply chain management and established green supply chain management leads to enhanced production efficiency and reduced wastage culminating in an improved performance of the organisation. These studies, however, have not examined the performance of organisations in the context of multi-echelon distribution systems.

1.1.4 Manufacturing Firms in Kenya

Manufacturing sector plays a significant role in achieving economic growth. In Kenya, the manufacturing sector contributes to the employment of a large population of the country's workforce and also contributes about 13% of Gross Domestic Product (GDP). Apart from being a significant source of foreign exchange, manufacturing provides opportunities for economic diversification. Manufacturing firms in Kenya have Kenya Association of Manufacturers (KAM) as their lobby association. The lobby organisation engages the government and public in articulating the interests of the members especially those involving budgets, registration, infrastructure and public relations (KAM, 2016).

Kenya's manufacturing sector is the largest in East Africa. However, when compared with other industrialised economies, it is still small (World Bank, 2016). Some interventions to the manufacturing sector have been proposed in the Vision 2030 which will lead Kenya to be globally competitive and prosperous economy. These interventions include; strengthening the capacity and local content of domestically manufactured goods, increasing the generation and utilisation of research and development results, raising the share of products in the regional market from 7% to 15 % and developing niche products for existing and new markets (Lwiki *et al.,* 2013).

Kenya has earmarked the manufacturing sector and its importance is classified above the other sectors regarding multiplier effects towards solving macroeconomic challenges of unemployment, unbalanced international trading, and utilisation of available raw-materials especially agricultural value addition. As a consequence, the Government of Kenya established the Ministry of Industrialization and developed several strategic sessional papers to guide the industrialisation and development of the manufacturing sector (Marikio, 2014). Fourteen (14) sub-sectors make up the manufacturing sector in Kenya. These include; metal and allied, tobacco, energy, Leather products and footwear, paper and board, pharmaceutical and medical equipment, motor vehicle and accessories, chemical and allied, building construction and mining, electrical and electronics, timber wood products and furniture, plastics and rubber, textiles and apparels, food and beverages (KAM, 2016).

Most manufacturing firms have networks of distribution facilities that procure raw material, converts them into finished goods and distribute the finished goods to customers. The term 'multi-echelon' manufacturing and distribution networks are synonymous with such networks. The places where inventory is kept in the supply chain are called "echelons." Usually, the complexity of a supply chain is related to the number of echelons inside it. Supply networks are having multiple layers of inventory locations are referred to as multi-echelon systems (Sihag, 2016). Managing inventory can be a challenging task for manufacturing firms with many products in multiple locations all over the country. The challenge magnifies when locations are placed in different tiers or echelons of the enterprise's distribution channel.

1.2 Statement of the Problem

Manufacturing firms use safety stock to protect themselves against increased supply risk, longer lead times or faster service requirements (Tang & Musa, 2011). It, therefore, requires effective demand forecasting. In Kenya today, manufacturing firms experience increased stock-outs due to challenges in managing safety stocks. The difficulties in managing safety stocks in multi-echelon distribution systems make it necessary for the use of technology or ICT (Lotfi, Sahran & Zadeh, 2013). According to Mathae, Paul and Mbura (2018), there is a problem of bullwhip for manufacturing firms in Kenya as small changes in end item demand amplify order oscillations as one move up in the supply chain. This problem shows a lack of integration and coordination of actions across different distribution locations.

For many manufacturing firms, distribution costs account for over 50 % of total production costs. However, an effective distribution system can achieve a saving of approximately 6% of total costs (Clauss & Bouncken, 2019). Ideally, multi-echelon distribution systems should help a firm avoid unhealthy distribution costs and running out of stock (Ralston, Blackhurst, Cantor & Crum, 2015). This has remained elusive for manufacturing firms in Kenya perhaps due to the choice of technology for distribution systems (Ali & Hingst, 2018; Grant, 2018). Customers want to receive ordered products as soon as possible (Christopher, 2011). Short delivery time is therefore of great importance to customers. Failure of this short time delivery time has limited the availability of products in distribution systems of manufacturing firms in Kenya.

Previous studies have attempted to highlight problems in distribution systems and their performance. KAM (2013) attributed customer dissatisfaction New KCC downstream chain to a poor distribution system that reduced firm profits by 48%. For example; Mathuva (2013) conducted a study on influence of distribution systems on performance of an organization and found that a good distribution system can improve organisational effectiveness. The study presented conceptual gap since it used distribution systems as the only variable. Albarune and Habib (2015) in their study demonstrated forecasting practices in supply chain management (SCM) in various areas, particularly life science and retail chain using secondary data and found that the limitation and few practical solutions on forecasting were useful in the business organisation. The study presented contextual, conceptual and methodological gaps. In addition, Olamade, Oyebisi and Olabode (2014) examined the effect of ICT integration on performance of organizations in Nigeria and found that ICT had enabled organisations to communicate, coordinate and learn effectively. It was also found that the role of ICT in communication and coordination of business processes had become critical for organisations. They depend on ICT for efficient knowledge acquisition, distributing information and knowledge management. The study presented contextual, conceptual and methodological gaps. It is amid these research gaps that this study sought to establish the role of multi-echelon distribution systems in performance of manufacturing firms in Kenya.

1.3 Objectives of the Study

This study was guided by one general objective and four specific objectives outlined in the subsequent sections.

1.3.1 General Objective

The general objective of this study was to establish the role of multi-echelon distribution systems in the performance of manufacturing firms in Kenya.

1.3.2 Specific Objectives

The specific objectives of this study included:

i. To examine the influence of Demand Forecasting Systems on the performance of manufacturing firms in Kenya
ii. To determine the influence of ICT Integration on the performance of manufacturing firms in Kenya
iii. To establish the influence of Distribution Control Systems on the performance of manufacturing firms in Kenya
iv. To assess the influence of Lead Time Systems on the performance of manufacturing firms in Kenya
v. To investigate the intervening role of Organisational Policy on the relationship between Demand Forecasting Systems, ICT Integration, Distribution Control Systems, Lead Time Systems and the performance of manufacturing firms in Kenya

1.4 Research Hypotheses

This study tested the following five null hypotheses

H_{01}: Demand Forecasting Systems has no significant influence on the performance of manufacturing firms in Kenya

H_{02}: ICT Integration has no significant influence on the performance of manufacturing firms in Kenya

H_{03}: Distribution Control Systems have no significant influence on the performance of manufacturing firms in Kenya

H_{04}: Lead Time Systems have no significant influence on the performance of manufacturing firms in Kenya

H_{05}: Organisational Policy has no intervening effect on the relationship between multi-echelon distribution systems and the performance of manufacturing firms in Kenya

1.5 Significance of the Study

An insightful study is needed to investigate effect of distribution control systems on performance. This study will mitigate the operational costs as well as erroneous forecasts emanating from inappropriate use or lack of adopting demand forecasting, ICT integration, distribution control systems and lead time. It will also improve the speed of production hence achieving supply dependability. This study is, therefore, justified as it will contribute to provision of information that is useful in understanding the role of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The study will be of significance to the following sectors:

1.5.1 Stakeholders

This study will be of great significance to many among them manufacturing firms' managers and future study. The manufacturing firms' managers are expected to benefit immensely from the findings of this study as it may challenge them to embrace demand forecasting, efficient ICT integration systems, distribution control systems and reduce lead time to enhance the performance of manufacturing firms they manage hence increasing their competitiveness in a dynamic market.

1.5.2 Scholars and Academicians

This study also will make available literature on the influence of demand focusing; ICT integration, distribution control systems, and lead time on the performance of manufacturing firms for future study since the topic have not been thoroughly researched.

1.5.3 Public and Private Sector Organizations

Public sector organisations use distributions systems to achieve increased efficiency and cost savings (faster and cheaper) in government procurement and improved transparency (to reduce corruption) in procurement services. Multi-echelon distribution systems are often part of the country's larger efforts to better serve its citizens and businesses in the digital economy.

1.5.4 State Corporations and Government Agencies

Some State Corporations which do manufacturing might use the findings from the study to improve their performance in tendering, auctioning, vendor management, catalogue management and in contract management as well as other information and networking systems, such as electronic data interchange and enterprise resource planning.

1.5.5 Government and Other Policy Makers

The government and other stakeholders involved in policy-making in procurement, logistics, and supply chain would also benefit from the findings of this study. Evidence of an empirical study will inform the regulatory framework hence making the field more practical and sustainable. As the government seeks to promote manufacturing sector to generate more opportunities in the economy, it can understand better how demand forecasting, distribution control systems, lead time and organisational policy influence performance of manufacturing firms in Kenya.

1.6 Scope of the Study

The field of multi-echelon distribution systems and performance is a wide one. This study focused on four elements of multi-echelon distribution systems namely demand forecasting, ICT integration, distribution control systems and lead time. This study focused on ten elements of performance which included quality, flexibility, costs, supplier reliability, innovation, responsiveness, order delivery lead time, final product delivery reliability, product variety, and asset management. The study was done on 903 manufacturing firms in Kenya which were members of Kenya Association of Manufacturers as at 31st December 2017 (KAM, 2017). The study covered the whole of Kenya. The study narrowed down to manufacturing firms since they are engaged in the sophisticated distribution of their products. In addition, the manufacturing sector contributes significantly to the Gross Domestic Product (GDP) in Kenya (between 10% to 11% which was approximately 62 billion in 2017 according to KAM (2017). The sector also creates employment opportunities and therefore critical to the economy of the country. The study was conducted between November 2017 and May 2019.

1.7 Delimitations of the Study

The study encountered some challenges. It was a challenge to schedule interviews with procurement managers of manufacturing firms in Kenya. The study had to make constant reminders for them to fill study questionnaires. Another challenge encountered was suspicion of information gathering by rival firms. The procurement managers were initially reluctant to give information as they were not sure whether it was their competitors gathering information. The limitation was mitigated by assuring the procurement managers that the information given would remain confidential and would be used exclusively for academic purposes. Manufacturing firms are not located in a central location but dispersed all over the country. This made data collection hard as transport, and logistics were difficult to manage. The study mitigated this by adding more time than earlier allocated to cover the desired number of manufacturing firms and increasing the number of research assistants who helped in the collection of data.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers the literature review in the study. It starts with the theoretical framework where theories from which the study borrows are discussed. The chapter also presents the conceptual framework which shows the relationship or interaction between variables diagrammatically. The next sections comprise of review of study variables and research gaps. The chapter ends with a summary.

2.2 Theoretical Framework

This study has employed different theories to help bring clarity on the role of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The study borrowed from the theory of constraints, e-perspective theory, channel coordination theory, quick response manufacturing theory, and organisational theory to build critical concerns on the phenomenon under investigation.

2.2.1 Theory of Constraints

The theory of constraints was authored by Eliyahu Goldratt (1984). The Theory of Constraints is a methodology for identifying the most important limiting factor (i.e. constraint) that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor. In manufacturing, the constraint is often referred to as a bottleneck. The theory addresses manufacturing efficiency. According to this theory, efficiency of a manufacturing system can be improved through identification and addressing of the procedures that are restraining it (Nan, 2011). The major tenet of the theory is that the strength and efficiency of a chain is determined by its most fragile link. To make the chain strong and efficient, addressing its weakest links is critical. In supply chain, these weakest points can be seen in firms having extended lead times, unfulfilled orders, overtimes, large working capital or running out of stock as well as having the wrong materials in orders (Goldratt, 2017). These are the bottlenecks manufacturing firms are likely to face especially in a multi-echelon supply chain, and they must employ the right systems to enhance their operations so they can meet the projected performance.

As indicated by Šukalová and Ceniga (2015), the theory is founded on the belief that an organisation that maximises the output of every machine will not perform as well as one that ensures the flow of materials and value created through its operational performance. Theory of constraints emphasises focus on effectively managing the capacity and capability of these constraints if they are to improve the performance of their organisation. This can be achieved by tea processing firms applying appropriate multi-echelon distribution systems. Firms have struggled to invest in the technology and organisational structures needed to achieve to-date systems synchronisation that enables coordinated distribution flows (Fawcett & Magnan, 2002). The theory of constraints methodology proposes that performance is dependent on the systems applied by manufacturing firms (Nagurney, Daniele & Shukla, 2017). In the perspective of the Theory of Constraints, performance measurements are based on a simple relationship that highlights the role of multi-echelon distribution systems on progress toward performance. The proof of effectiveness for any distribution control system is the extent to which it increases the operational performance of a firm. For manufacturing firms to confirm that the bottlenecks on their processes do not limit them from running efficiently, they need to embrace the use of multi-echelon distribution systems that can facilitate operational efficiency (Eltantawy, Paulraj, Giunipero, Naslund & Thute, 2015).

This theory is relevant to the current study in the sense that it explains the variable on demand forecasting systems context in multi-echelon distribution systems. The theory helped the study understand how constraints can hinder the performance of manufacturing firms in Kenya. Safety stock is distributed across different distribution locations with different customer needs which makes demand forecasting difficult. Firms have quantitative, qualitative, casual and time series methods for demand forecasting at their disposal. The method or combination of methods used largely depends on the situation. Firms have had a problem in choosing the right demand forecasting method due to various constraints in their operating environment. Demand forecasting methods also have their weaknesses which might prevent manufacturing firms from acting proactively in customer demand anticipation (Xu *et al.,* 2001).

2.2.2 E-Perspective Model

Hammarkvist, Hakansson and Mattsson developed the e-perspective model in 1982 (Anderson, 2002). The model holds that a network is comprised of three concepts that include actors, resources and activities. The relationship between the different actors is essential in order to understand the network. All actors form their networks but are dependent on each other (Hakansson & Johanson, 1992). The relationships are characterised by continuity, multiplexity, and specificity. Over time mutual knowledge and trust create a framework for future business among the actors in the network. The actors can be linked to each other through technical, social, cognitive, legal, economic and other ties.

Information and Communication Technology (ICT) plays three central roles in e-perspective theory (Leu, Kinzer, Coiro & Cammack, 2004). First, ICT allows firms to increase the volume and complexity of information which needs to be communicated with their trading partners. Second, ICT allows firms to provide real-time supply chain information, including inventory level, delivery status, production planning, and scheduling. This enables firms to manage and control its supply chain activities. Third, ICT facilitates the alignment of forecasting and scheduling of operations between firms and suppliers, allowing better inter-firms coordination. As such, the problems in coordinating supply chain activities which often are hindered by time and spatial distance can be reduced (Paulraj, Chen & Flynn, 2017). Effective ICT connection improves the integration between supply chain partners regarding material flows. Many firms have adopted the use of internet in their operations. Even though business-to-business (B2B) trade has enjoyed a quieter existence online than business-to-consumer (B2C) (Barratt & Rosdahl, 2002) the benefits are significant as seen from procurement performance in a B2B setting (Min & Galle, 2001).

Integration of technology and business processes presents a strategic link for creating efficiencies in the development of highly complex products (Narasimhan, 2010). Purposeful technological infrastructure should be a functional part of an organisational structure, especially as regards to the distribution of technological competence, information, and responsibilities among business departments. Integration of individual technological processes and their inputs and outputs, integration of technology and other business processes, or integration of market demands and technological capacities, all these processes require building up a functional technology infrastructure/network. This technology infrastructure should be designed to run production as well as other business processes, including data centres that enable ICT to be used as a platform upon which business decisions are made (Gold, 2001). The theory informs the variable on ICT integration. The theory was found to be relevant to the current study since it explains how the adoption of ICT in manufacturing is able to enhance the network system of the firm and improve performance.

2.2.3 Channel Coordination Theory

The channel coordination theory was developed by Kumar in 1992 and further reviewed by Malone and Crowston in 1994 (Arshinder, Kanda & Deshmukh, 2011). According to this theory, coordination is the management of interdependencies of stakeholders working to achieve a common purpose (Malone & Crowston, 1994). It is is necessary to integrate processes in a supply chain to achieve desired results. Channel coordination models involve multi-echelon distribution systems, multiple decision makers, asymmetric information, as well as paradigms of manufacturing, such as mass customisation, short product life-cycles, outsourcing and delayed differentiation (Kumar, 1992).

The channel coordination theory applies to this study in explaining how firms can determine and maintain optimum investment in distribution to achieve the required operational performance. This theory recognises the essence to manage dependencies in a distribution system if at all different entities are to engage in efforts with the aim of achieving mutual goals; elimination or low levels of stock outs at minimum distribution cost. The theory has cautioned on the costs involved against blindly joining inter-organisational distribution systems and sharing information under different operational conditions as this may hurt firms (Arshinder *et al.*, 2011).

Further investigation has been recommended on the conditions that channel coordination is beneficial to every firm. The theory was found suitable for this study since it informs the variable on distribution control systems.

2.2.4 Quick Response Manufacturing Model

In 1998, Rajan Suri proposed a new alternative and complementary approach to Lean Manufacturing called Quick Response Manufacturing (QRM). Such approach focuses its efforts on reducing the lead time in environments characterised by a high variety of products and customisation. Quick Response Manufacturing is rooted in the concept of Time-based competition (TBC). Time-based competition is a broad-based competitive strategy emphasising time as a significant factor for achieving and maintaining a sustainable competitive advantage. It seeks to compress the time required to propose, develop, manufacture, market and deliver products. QRM, therefore, advocates a companywide focus on short lead times that include quick response to demand for existing products as well as new product and design changes (Suri, 2010a).

The theory has two distinct core features; the power of time and understanding and exploiting system dynamics. The power of time concerns the replacement of traditional productivity, cost and on-time delivery metrics using reduction of the lead time as the unique comprehensive performance measurement. Understanding and exploiting system dynamics entail recognising the relationship between the variables that affect lead time and, therefore, giving better guidance to the improvement efforts for these variables to maximise their effects on the reduction of lead time (Suri, 2010b).

The management of most manufacturing organisations is still based on economies of scale and a cost reduction mentality and thereby incurs a series of dysfunctional effects that is denominated in QRM as a Response Time Spiral (Suri, 2010a). Concerning suppliers, there is a standard practice in purchasing: because items with long lead times are often ordered in large batches, one should negotiate quantity discounts with suppliers due to the amounts being acquired. The problem with such belief is that it results in a Response Time Spiral for purchasing from suppliers.

In QRM, it is essential that the company work with suppliers that are aware of the importance of time and seek to reduce the lead time in its operations. For this, Suri (2010b) emphasises the importance of making suppliers understand the company QRM program, and it is up to the company to train and influence them accordingly. This theory is suitable for explaining the influence of lead time on the performance of manufacturing firms.

Quick Response Manufacturing focuses on a different driving metric to improve manufacturing: lead time. Proponents of this philosophy believe that by reducing the time it takes to produce a product from order to delivery, total costs go down, and quality, delivery, and flexibility all improve. Products with very short lead times are more straightforward to manage. Therefore overhead costs are low. Suri suggested that this singular focus on lead time is the right strategy for specific companies or certain markets. These companies are characterised by a high variety of different products that are produced in one manufacturing system, customers who demand highly customised products, and where demand is highly variable. The most significant benefit with QRM is seen when the customers for these products value short lead times from a supplier over long lead times. Quick Response Manufacturing is a way to drive down lead times to both create a competitive advantage in the marketplace and improve the internal manufacturing operations.

2.2.5 Organisational Theory

Organisation theory emerged from ideas that were advanced throughout industrial revolution era of 1800-1900. Max Weber has contributed significantly to this theory especially his beliefs on bureaucracies. He believed in a legal absolute authority, logic, and order to represent a formal organisation. Weber advocated for a centralized organisational structure where workers' duties and responsibilities are defined clearly and their conduct shaped by policies, rules and regulations (Hemant, 2011).

Weber's ideas did not regard workers as important to organisation performance. It portrayed them as a potential source of inefficiency that could hinder performance of an organisation. Workers were supposed to function as machines from the perspective of Weber's ideas. They emphasized on efficiency of a system, division of labour, and authority or control of the worker. Despite Weber's ideas being outdated and unbalanced, they captured important insights regarding division of labour, process efficiency and control (Daft & Armstrong, 2009).

Henry Fayol is another significant proponent of organisation theory. He was responsible for development of critical management functions to sustain an organisation such as staff recruitment, strategic planning, employee motivation, as well as employee guidance (Hemant, 2011). Taylor outlined his theories based on principles of management. He helped significantly in explaining the role of employees' training, giving incentives through pay, recruitment of employees, and job ethics in organisational performance (Dobbin, 2012).

The integration of Maslow's ideas on hierarchy of human needs into organisation theory brought focus on human influences in organisations. According to Maslow, by the fact that people have different needs, it is imperative that their motivation also should be through different incentives. In this way, organisational objectives are achieved. Maslow also held that the needs people have change over time. It therefore means that as lower needs in the hierrachy are met, new needs up the hierrachy arise (Hemant, 2011; Sapru, 2008).

The organisation theory borrowed ideas from Theory X and Theory Y developed by Douglas McGregor. According to Theory X workers prefer to be directed and are likely to avoid responsibility in every available opportunity. They value financial security above everything else. On the other hand, Theory Y held that workers can learn to take responsibilities. It also perceived workers as self-driven, creative and able to solve problems. The theory also holds that self-actualisation is one of the most significant incentives that an organisation can give its employees (Crozier, 2010; Dobbin, 2012).

Organisation theory indeed cannot be described as an orderly progression of ideas, or a unified body of knowledge in which each development builds carefully on and extends the one before it. Instead, developments in theory and prescriptions for the practice show disagreement about the purposes and uses of a theory of organisation, the issues to which it should address itself (such as supervisory style and organisational culture), and the concepts and variables that should enter into such a theory. However, three critical elements emerge from all the contributions to organisational theory; governance, communication and human resource. Rules, policies, and procedures are critical to guide the organisation in creating structures for its operations. Communication is critical to ensure the objectives and goals of the organisations are aligned and understood by everyone. In addition, it caters for the individual employees who require interpersonal interactions for them to operate effectively. Human resource management is critical for an organisation as it caters for the welfare of the most significant resource; its employees.

2.3 Conceptual Framework

A conceptual framework is an analytical tool used to make abstract distinctions and organise ideas to capture something real and do this in a way that is easy to remember and apply (Shields & Rangarajan, 2013). The conceptual framework in this study shows the interaction of variables. The independent variables comprise of demand forecasting, ICT integration, distribution control and lead time. All these variables are expected to influence the performance of manufacturing firms. The interaction of these variables is shown in Figure 2.1.

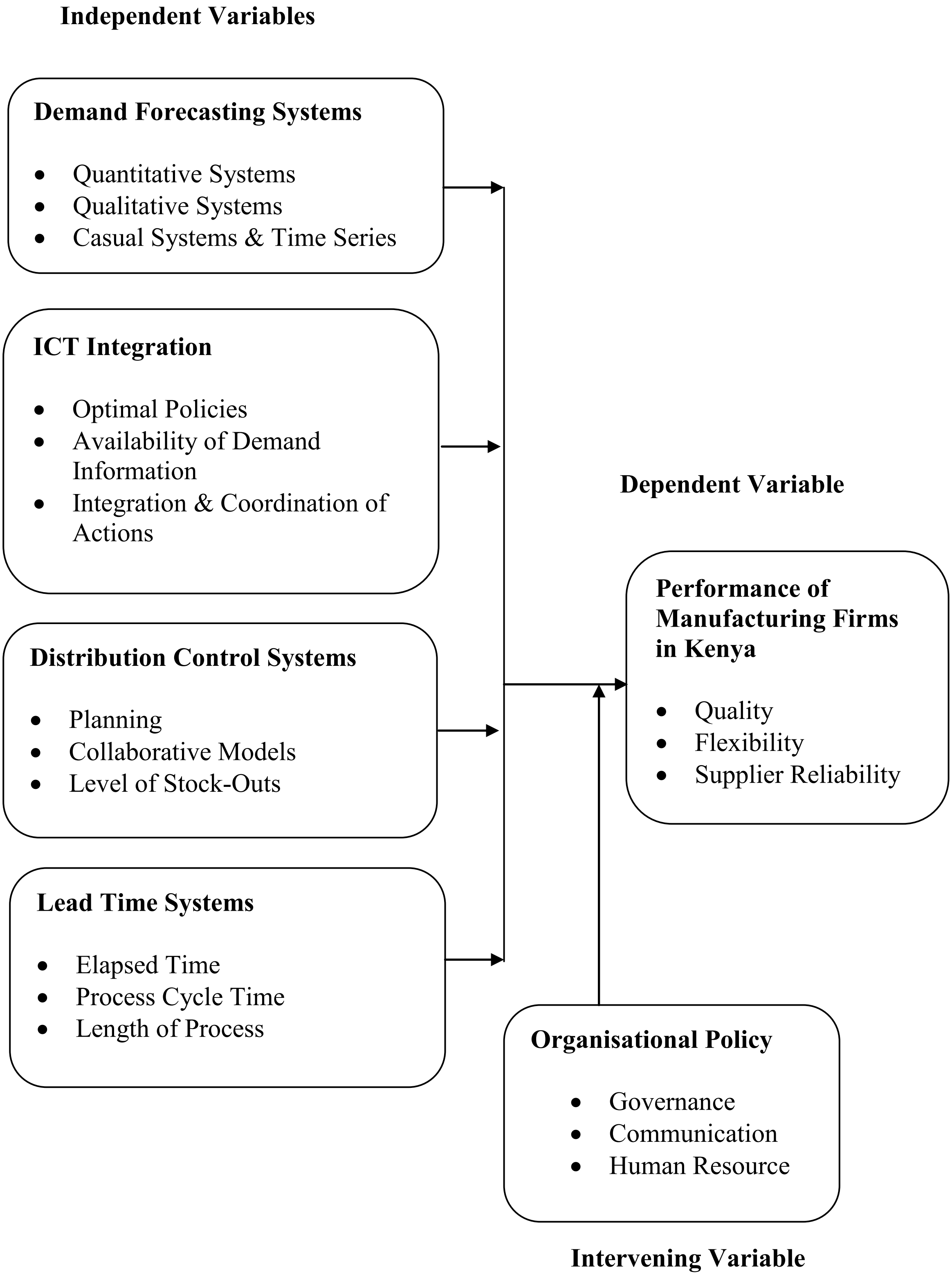

Figure 2.1: Conceptual Framework

Source: *Researcher (2019)*

2.3.1 Demand Forecasting Systems

Forecasting is a prediction or an estimation of an actual value in a future period or for another situation. It is a form of a statement that reveals the future value of interest for a specific period that is used as a prime output in the decision process of management (Stevenson, 2006). The main point of forecasting is to support a company acting proactively in customer demand anticipation. More specifically, the goal of forecasting is to determine, analyse and estimate a likely future customer demand in order to enable a company to bring its capacity on par with it. That allows goods and service providers to meet their customers' needs at minimal cost. Forecasting is a fundamental step in demand management that optimises customer satisfaction through capabilities of the supply chain. It has an impact on the fulfilment of customer requirements, reducing risk and in the measurement of process improvement (Asmus, Cauley & Maroney, 2006).

Determining an estimate quantity of products or services required by customers in the future is demand forecasting. A number of methods are used to conduct demand forecasting but can be categorized into four based on their approach. They are time series methods, casual methods, qualitative, and quantitative methods (Datta *et al.*, 2007).

Quantitative methods make use of previous numbers or quantities to predict the same in the future. Examples of quantitative methods of forecasting include last period demand, simple and weighted moving averages, and multiplicative seasonal indexes. Each of them utilises varying formula to predict products and services that will be sold in the future (Stevenson, 2006). Qualitative method utilises subjective approach that largely rely on the opinion as well as feelings of experts in the field on how a specific product is likely to move in the market. Market research and previous life cycle of a product play significant roles in the opinion rendered by the experts. On its own, this method is not reliable hence the need to combine it with other methods. However, it is the method of choice when past numbers or quantities of products sold are not available to facilitate utilisation of quantitative method of forecasting (Datta *et al.*, 2007).

There are two types of time series method; one that is dependent on frequencies and another one that is dependent on time. This method has an assumption that sales of a product for a certain period will behave the same in the future. Given previous data, therefore, one can be able to calculate sales estimates in the future (Arnold et al., 2008; Cheng and Wu, 2005). Time series method take into account many different factors of demand including randomness, stability, trend and cycle (Mentzer & Moon, 2005).

Casual methods of forecasting demand have the assumption that there are fundamental events or occurrences that influence sales of products and services (Xu *et al.*, 2001). These events or occurrences include holidays and seasons. A boutique, for instance, may sell more products during Christmas and New Year festivities than any other period in the course of the year. Prediction based on seasons or events can help businesses be in a position to predict sales hence stock appropriately and have enough workers to cater for increased demand (Xu *et al.*, 2001).

2.3.2 ICT Integration

ICT serves as an essential approach for the survival of enterprises and enabler of integration. With the advancement in information and communication technology, ICT integration has become more conceivable. Furthermore, ICT integration has become more efficient by the global introduction of long-term cooperation and coordination which leads ultimately to the improvement of companies' competitive advantages. A lack of ICT integration can result in inefficiency of coordinating actions within the units in the company or organisation (Lotfi, Mukhtar, Sahran & Zadeh, 2013).

Gallego and O'zer (2001) searched optimal policies for with and without demand information-sharing cases in a two-stage, where the retailer batches orders and faces Poisson demands. Cheng and Wu (2005) show how ICT integration can reduce distribution costs in a two-level chain with multiple retailers. Dejonckheere *et al.* (2004) show that ICT integration is very beneficial, if not indispensable in order-up-to-S policies since the magnitude of the bullwhip can thus be significantly reduced at higher levels in the chain. However, they note that ICT integration cannot wholly eliminate the bullwhip.

Supply chain systems are prone to fluctuations and instability. Small changes in the end item demand can create distribution and order oscillations that amplify as one moves up in the supply chain (Stevenson, 2006). This phenomenon of amplification of oscillations through the supply chain is also known as the bullwhip effect (Xu *et al.*, 2001). Demand information could significantly reduce the bullwhip effect. Xu *et al.* (2001) observed that sharing of the demand forecast and distribution information is effective in reducing order fluctuations and safety stocks.

Chen *et al.* (2000) demonstrate the fact that smoother demand forecasts reduce the bullwhip effect, and longer lead times increase it. They also show that for both moving average and exponential smoothing forecasts, the very inclusion and need for estimation of a linear trend parameter into the forecasting model results in increased bullwhip. Dejonckheere *et al.* (2004) analysed the effects of constant, linear, and quadratic exponential smoothing algorithms on the bullwhip. They show that the bullwhip emanating from the trend detection algorithms (linear and quadratic or exponential smoothing) are reduced by lowering the exponential smoothing constant used in these algorithms. Datta *et al.* (2007) analysed the relationships between demand and order forecasting and the bullwhip effect and proposes an advanced forecasting model that is known as Generalized Autoregressive Conditional Heteroscedasticity (GARCH) for supply chain management.

ICT has enabled organisations to communicate, coordinate and learn effectively. The role of ICT in communication and coordination of business processes has become critical for organisations. They depend on ICT for efficient knowledge acquisition, distributing information and knowledge management (Olamade, Oyebisi & Olabode, 2014).

ICT is also enabling organisations adapt to dynamic markets as business environment changes. Organisations that have adopted ICT are making their operations more efficient and also enhancing their performance. Technology therefore has become one of the main ingredients of growth and development for many organisations

(Perez, 2001). This is due to a number of factors most of which are from the changes in business environment or markets, changes in how organisations operate and changes in customer preferences (Farrell, 2003).

There are many innovations today as compared to previous years. Technology is largely credited with these kind of innovations. It has proved to be a powerful tool in development of new attractive products as well as new efficient business processes. Technology has also enabled diffusion of innovations from one sector to another and even from one organisation to another. Market information has become readily available courtesy of technology. In production, technology has enabled investment in innovations that improves efficiency, quality and responsiveness (Brynjolfsson & Hitt, 2000; Litan & Rivlin, 2000).

2.3.3 Distribution Control Systems

Distribution Control Systems (DCS) have evolved significantly (Amiri, 2006; Mathuva, 2013). The system can be customised for requirements of large organisations as well as small organisations. The concept of distribution control systems is to collapse a large structure into small subsections. This brings control down to the unit level where adequate response time to customer demand is effective. Exchange of information among the different control units is critical for integrated decision making at the factory, product line or plant level.

The distribution control systems enable management of a procedure to take place in many varying stages of reasonable abstract complexity. Control functions can be categorised into diverse tiered stages. At the bottom of the system is where the input devices interact with the process (Amiri, 2006). At this stage regulatory control of process variables is carried out. The next stage in the hierarchy is called tactical level (Hardgrave, Langford & Waller, 2008). This stage improves control by incorporating independent parameters in the process. In the next stage, communication is very critical. It enables exchange of information between remote and local subsystems. At this stage, coordination and integration of different subsystems is therefore important. DCS enables this to be possible as it supports such coordination and integration. The management is able to monitor plant operations in real-time (O'Dennell, Maguire, McIvor & Humphreys, 2006).

Inventories of raw materials, work-in-progress components and finished goods are kept as a buffer against the possibility of running out of needed items (Salawati, Tinggi, & Kadri, 2012). However, large buffer inventories consume valuable resources and generate hidden costs (Salawati, Tinggi & Kadri, 2012). Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss (Nyabwanga & Ojera, 2012). On the other hand, too little inventory often disrupts business operations (Amiri, 2006). Distribution control systems enable a business to determine and maintain an optimum level of investment in distribution in order to achieve the required operational performance. Sila, Ebrahimpour and Birkholz (2006) observed that distribution control aims to meet customer demand. Further, Fawcett & Magnan (2002) argued that firms have to ensure that stock-outs are avoided to meet customer demand without incurring high distribution costs.

O'Dennell, Maguire, McIvor and Humphreys (2006) pointed out that sophisticated techniques have been applied in distribution control such as genetic algorithms to determine optimal ordering at each echelon. Similarly, Mustaffa and Potter (2009) in their study suggested that application of the vendor managed distribution system leads to higher service levels to customers and improvements in key variables such as decreasing stock-outs and elimination of the bullwhip effect. Amiri (2006) identified the various distribution control systems that have been implemented by various industries such as vendor managed distribution and forecasting and replenishment.

According to Hardgrave, Langford and Waller (2008), firms have to acquire the right technology of distribution control systems for managing their inventories. Van der Vaart and Donk (2008) examined distribution control systems through collaborative models. They further discussed the integration of traditional logistics decisions with distribution management decisions using traditional control models. Distribution control systems would integrate the suppliers, factories and customers. However, according to Mathuva (2013), the direction of the relationship between distribution control systems and operational performance of business firms have not been clear. Furthermore, studies on the relationship between distribution control systems and performance have produced mixed results (Asmus, Cauley & Maroney, 2006).

2.3.4 Lead Time Systems

The market today has become customer focused. However, many organisations are having difficulties in creating systems that enable effective response to customers' requirements (Christopher, 2011). These requirements could be those related to product specification, and costing for example, which should be taken into consideration for an organisation to remain competitive (Gunasekaran, Patel, & Tirtiroglu, 2001). Furthermore, timely delivery is of great essence to customers. They want to get items they have ordered immediately (Ouyang, Wu, & Ho, 2007; Da Cunha, Agard & Kusiak, 2007). Lead time therefore determines the ability of an organisation to satisfy the three dimensions of competitiveness namely pricing, delivery time and product differentiation. This lead time is on both ends; that of fulfilling customer order and that of replenishing materials from the suppliers.

Through product differentiation, an organisation is able to make customised products for the customers. This adds value hence creating a competitive advantage for the organisation and its products (Christopher, 2011). However, a manufacturer cannot have all possible product variants in stock due to costs involved. It is therefore not advisable to have customised products before customer order (Daaboul, Da Cunha, & Bernard, 2011). A long lead time is unfavorable to the organisation as it becomes harder to respond to demand fluctuations in volume as well as product configurations. This hinders product availability causing stock-outs hence dissatisfied customers (Ouyang, Wu, & Ho, 2007).

Lead time and costs incurred are closely connected on both sides; supplier and purchasing (Ray & Jewkes, 2004). Lead time is positively correlated to the volume of materials needed on the purchasing side. The same is true for the inventory required to avoid running out of stock (Vernimmen *et al.*, 2008).

Problems associated with demand forecasting are positively connected to lead time. To manage costs, there are issues that a supplier has to put into consideration and they include order quantities, batch sizes, and economies of scale and storage of materials as well as manufactured products (Christopher, 2011). The supplier may have other customers to prioritise resulting in delays in delivery of raw materials. This can result into a long lead time. To avoid such uncertainty, an organisation may employ a larger volume of safety stock increasing costs. This affects an organisation's flexibility to respond to changing customer requirements (Gadde, Hakansson, & Persson, 2010).

Working in collaboration among actors involved in the supply chain towards reducing lead time will improve performance. Collaboration among the actors can solve problems associated with lead time through addressing their underlying causes. This largely depends on relationships that exist among the different actors in the supply chain. It is therefore important for all the actors to be aware of factors that may affect their relationships such as cultural differences and understand how to resolve conflicts (Amemba, Nyaboke, Osoro, & Mburu, 2013).

A firm has to pay to supplier's way of handling conflicts and how consistent the supplier is in committing to agreements. The interest of the supplier also must be taken into consideration. Where an organisation has power to influence a supplier's decision, such power must not be abused. This will maintain a good relationship between the organisation and the supplier (Christopher, 2011; Daaboul, Da Cunha, & Bernard, 2011).

Cooperation across the supply chain is critical for improving performance and maintaining competitiveness. Supplier selection process therefore becomes important for organisations seeking long-term successful business relations. The corporate culture of the suppliers chosen is fundamental (Gadde, Hakansson, & Persson, 2010; Ray & Jewkes, 2004). Closely linked to the relationships are goals of the supplier. The suppliers' goals must be aligned to those of the organisation for smooth implementation of solutions to problems that may arise in the supply chain. This can also have a bearing on sharing information across the supply chain (Gadde, Hakansson, & Persson, 2010).

2.3.5 Organisational Policy

Organisational policy refers to rules, policies, and procedures that are critical to guide the organisation in creating structures for its operations. It also includes communication to ensure the objectives and goals of the organisations are aligned and understood by everyone. Human resource management is also critical for an organisation as it caters for the welfare of the most significant resource; its employees (Cummins, 2011). The organisational policy covers some issues such as governance, communication and human resources. Governance is the exercise of authority, direction and control of an organisation in order to ensure its purpose is achieved (Gill, 2002). The connection between governance and organisational performance lies in the multi-dimensional nature of good governance. Narrowly conceived, governance involves ensuring compliance with legal obligations, and protection for shareholders against fraud or organisational failure. Without governance mechanisms in place, there is no direction and proper control of the organisation. Good governance, understood in this way, minimises the possibility of poor organisational performance.

Communication is the act of conveying intended meanings from one entity or group to another through the use of mutually understood signs and rules (Ferguson & Terrion, 2014). It is one of the most fundamental and pervasive of all management activities. Organisational communication can be divided into two components: internal communication and external communication. Internal communication is between employees within the organisation itself. External communication is from the organisation to its external audiences. Many organisational problems are the product of poor communication policies. In addition, levels of organisational innovation may be low because key players in different departments poorly communicate with one another, or worse yet, fail to communicate at all. Good relationships and communication with customers and stakeholders are essential to a business or organisational success. Good communication plays a vital role in maintaining customer loyalty, which brings good will to organisations and increased profits for businesses. Effective external communications with an organisation's external audiences whether it is the form of marketing, branding, public relations, or some other communication vehicle is of utmost importance for an organisation's success.

Human resources are the set of individuals who make up the workforce of an organisation. The term is also used to describe the function within an organisation responsible for implementing policies related to the management of employees (Qasim et al., 2012). Human resource policy refers to the formal rules and guidelines that businesses put in place to hire, train, assess, and reward the members of their workforce (Mathis & Jackson, 2005). Human resource policy when organised and disseminated in an easily used form can serve to pre-empt many misunderstandings between employees and employers about their rights and obligations in the business place. Companies typically have to make revisions to established human resource policies on a regular basis, as the company grows and as the regulatory and business environments in which it operates evolve.

Human resource management policies relate to how the organisation wants to handle key aspects of people management (Armstrong, 2009). They are guides to management thinking and are used by management to achieve organisational human resource objectives (Memon, Panhwar, & Rohra, 2010). The establishment of a human resource policy which sets out obligations, standards of behaviour and document procedures, is now the standard approach to meeting these obligations.

Human resource policies cover the recruitment policies, procedures and rules surrounding hiring, including how job descriptions are developed, positions advertised, candidates vetted and offers made and what the organisation's policy is on hiring relatives. The types of employment supported by the organisation, such as regular full-time, regular part-time, consultant, temporary or other, and whether these categories are entitled to full, partial or no benefits. The conditions the organisation adheres to in employing staff, including employment at will and equal employment opportunity. Employment conditions may also include policies on outside employment, disability accommodation, overtime, conflicts of interest and termination, among others (Memon, Panhwar, & Rohra, 2010). Other employment policies include additional conditions of employment including, but not limited to, introductory/probationary period, personnel data and management of personnel files (Khan et al., 2011).

Organisations' human resource policies clearly define policies on employee compensation and benefits; it states what employees are entitled to regarding compensation and benefits such as salary administration. Policies which cover information on the salary scale or the rationale for determining salaries and conditions for pay increases. The benefits include paid or unpaid time off, including vacation, holiday, sick leave, bereavement leave, leave without pay, maternity and paternity leave and injury duty. Additional kinds of compensation may include benefits such as health insurance or medical compensation, workers compensation insurance, death benefits, pension or retirement plans, professional development benefits, termination pay and bonuses, among others (Terera & Ngirande, 2014).

2.3.6 Performance of Manufacturing Firms

Performance has been recognized as a fundamental goal of business processes in a supply chain. The execution of supply chain management encompasses recognising actors that are critical to link with, the procedures to be interconnected with each of the important actors, and the kind or level of collaboration that is applicable to each situation (Lambert, 2006). Understanding performance is important for monitoring and improving it to gain competitive advantage (Taylor, 2004). Supply chain performance must be measured to improve it. According to Gunasekaran and Kobu (2007), there cannot be an improvement if there are no measures. Measuring supply performance generates understanding of the processes, guides cooperation efforts and enhances supply chain excellence (Fawcett, Ellram & Ogden, 2007).

Performance measurement can be defined as a procedure of is the process of enumerating the efficacy and efficiency of an action by means of a set of metrics (Gunasekaran & Kobu, 2001). It is therefore a multi-dimensional exercise where one metric cannot suffice to enumerate performance (Asadi, 2012). There are many indicators or measures of performance. The few that this study focused on include quality, flexibility, costs, and supplier reliability. Quality refers to the conformity to the requirements or suitability for use. Management of product quality in a supply chain, according to Hugo, Badenhorst and Van Biljon (2004), is a common obligation of all members in the supply chain. It is the incorporation of the quality viewpoint of the supplier quality structure, the internal mechanisms of the concerned firm and the expected quality by the customer. Part of the indicators of quality entail an established quality assurance mechanism, statistical process control, incessant improvement, fail-safe lot traceability, six sigma limits, and incoming quality assurance (Hugo *et al.*, 2004). The quality of a product is associated with the choices and activities regarding the design and conformance to the established design (Jacobs, Chase & Aquilano, 2009). This ensures that a product is suitable for use and meets customers' objectives. It therefore involves recognising the scopes of the product that the consumer needs and establishing a quality control plan to confirm that they are met.

Flexibility refers to the agility to react to random changes in the market (Wisner *et al.*, 2008). It is a dimension that measures how easily organisations are able to react to customer requirements (Jonsson, 2008). Flexibility is critical especially when developing new products. Organisations that are able to develop new products faster remain competitive. However, this requires cooperation among supply chain actors and therefore must be willing to work together closely (Bozarth & Handfield, 2006).

Cost is a significant performance pointer. It entails all expenses connected to operations in a supply chain (Bolstorff & Rosenbaum, 2003). These expenses are incurred in administration, forecasting, transportation, manufacturing, inventory, supplier relationship management and customer service. Cost aspect of supply chain performance is trailed keenly and exhaustively than any other aspect due to its central role (Fawcett & Magnan, 2002). Cost control therefore is a fundamental capability that every organisation seeking to be successful must employ. It cut across organisational structure, culture, processes and technology.

Assessing supplier performance is important for organisations in a supply chain. This helps in identification of suppliers who have excellent reliability. Evaluation of supplier performance also align with developmental needs of organisations as it improve supplier communication, diminish risks and accomplish a partnership founded on solid grounds (Wisner *et al.*, 2012). According to Wisner *et al.* (2008), the reliability of suppliers is critical. Some of the fundamental pointers of supplier reliability are order accuracy, billing accuracy, promises kept and on-time completion.

2.4 Empirical Review

This section presents a review of previous studies done in regards to demand forecasting, ICT integration, distribution control systems, lead time and performance.

2.4.1 Demand Forecasting Systems

Albarune and Habib (2015) conducted a study to demonstrate forecasting practices in supply chain management (SCM) in various areas, particularly life science, retail chain, and FMCG. They depicted the scenario of forecasting practices based on secondary data and represented SCM role, demand management and collaborative coordination among others. In addition, the study revealed the limitation and few practical solutions on forecasting to be useful in the business organisation.

Kot, Grondys and Szopa (2011) observed that efficient management of supply chains is essential in ensuring possibly highest quality of customer service and striving for minimisation of the costs generated by flow between the links. The typical cause of continually increasing costs is excessive inventory levels throughout the chain. The reason for this situation is maladjustment of the level of supply to the level of demand in the market, which results in surplus stock. The starting point for a reduction in inventory levels is forecasting of demand in the market through market prognoses in cooperation with all the links in the supply chain. Therefore, in the aspect of demand forecasting, the character of data flow and the type of cooperation between the links is essential.

Agigi, Niemann and Kotze (2016) observed that in today's globalised and complex business environment, firms are ever more vulnerable to supply chain disruptions, originating both internally and externally from the supply chain. Supply chain resilience minimises the impact of disruption through design approaches, which allows the supply chain to respond appropriately to disruptive events. They investigated the supply chain risks faced by grocery manufacturers in the South African fast moving consumer goods (FMCG) industry and explored supply chain design approaches that enable supply chain resilience. South African grocery manufacturers are faced with distinct risks. While supply chain risk management studies have provided firms with specific guidelines to mitigate risk; supply chains are still vulnerable to unanticipated risks. The literature on supply chain resilience in the South African context is scant. The concept of supply chain resilience provides firms with strategies that are built into the supply chain that allows firms to react and recover swiftly from disruptions.

Furthermore, supply chain resilience strategies assist firms in becoming less vulnerable to possible disruptions. Agigi et al. (2016) conducted the study using a descriptive qualitative research design. Data were collected through semi-structured interviews with senior supply chain practitioners specifically within the South African FMCG grocery manufacturing industry. Their study found that labour unrest is the most common risk faced by the industry. Furthermore, strategic stock and supply chain mapping are of the most useful design approaches to enhance supply chain resilience.

2.4.2 ICT Integration

Nyabwanga and Ojera (2012) carried out a web survey, embarked on exploring and categorising different collaborative functionalities that are offered by electronic marketplaces. As a result, they put forward five types of horizontal and four types of vertical collaborative mechanisms to enhance integration. Although their research is quite comprehensive and exploratory, they define collaboration in extensive terms - "in its broadest sense, joining an electronic marketplace is called collaborative commerce, regardless of whether business participants trade through arms-length market relationships or long-term relationships" (Nyabwanga & Ojera, 2012).

Kollberg and Dreyer (2006) observed that the adoption of information and communications technology is spreading rapidly in supply chain management. As companies seek to improve supply chain efficiency through increased integration, ICT can be considered as a critical enabler for supply chain management by supporting information-sharing. Their literature review within supply chain integration and the impact of ICT indicates that there are various integration dimensions and levels, and different effects and influencing factors. Even though there is a considerable amount of research within the field, the complexity of ICT impact on integration implies that previous studies cover only a limited number of dimensions and variables at a time. Kollberg and Dreyer (2006) proposed a research model that can support in-depth empirical studies seeking to explore how ICT influences integration in supply chain control. The model is developed from literature and incorporates areas of control, ICT, integration dimensions, ICT effects, influencing factors and supply chain integration.

According to Georgise, Thoben and Seifert (2014), with the advancement of information and communication technologies, supply chain integration has been considered a strategic tool for firms to improve their competitiveness. The supply chain integration within processes and between organisations has enhanced value creation. However, the fragmented nature of the business in developing country demonstrates a noticeable difficulty regarding competitiveness and efficiency. Lack of relevant literature on practical experience in supply chain integration in developing countries is one of the challenges. Georgise, Thoben and Seifert (2014) sought to identify the level of inter-organisational and intra-organisational supply chain integration practices. They also analysed the challenges faced in the manufacturing firms in developing countries. Their methodology followed a thorough review of the literature and semi-structured interviews amongst the Ethiopian manufacturing industries. Their study findings highlighted that the prevailing approach to supply chain integration is limited to ad-hoc functional based boundaries within the firm. The supply chain integration enablers are also restricted to the traditional way of communications such as telephone, fax, and letters. They concluded that firms need to focus on those issues that require attention in pursuance of greater Supply chain integration.

2.4.3 Distribution Control Systems

Gadde, Håkansson and Persson (2010) conducted a case study that focused on analysing the Greek government procurement systems carried out by the General Secretariat of Procurement. This study identified tangible (quantifiable) and intangible (difficult to quantify) benefits. Tangible benefits included the cost of supply reduction, tender costs reduction and lead time savings. Intangible benefits included process improvement and organisational benefits.

Amiri (2006) conducted a study on the impacts of distribution systems in the procurement process by analysing the project of Hong Kong Textile. He used SWOT analysis to describe impacts in each stage of the procurement process. Strengths and weaknesses were used as internal performance measurement in the procurement process, for example, efficiency, and effectiveness. Opportunities and threats were identified as the electronic environments that support distribution systems.

Disney, Holmström, Kaipia and Towill (2001) did a study on the implementation of Vendor Managed Inventory (VMI) within a grocery supply chain. They used the Time Benefit analysis tool to identify the particular products most suitable for VMI control from within the supplier's product range. Practical issues concerning the production and distribution process are highlighted. A production and inventory control system is selected and refined and realised via a spreadsheet application. Necessary data for enabling VMI is collated and presented to the production planner by the existing supply chain ERP system and entered into the spreadsheet-based VMI DSS. The DSS then advises the production scheduler on production and distribution targets for both VMI and non-VMI customers. All the data requirements for VMI are readily available from modern ERP systems. It is also possible to design production planning and distribution control systems that are robust to many real-life uncertainties. They reported that the Time Benefit analysis tool quickly highlights the most profitable products in a company’s portfolio for VMI implementation, requiring only data that is readily available. Findings from the analysis of production and inventory control strategies can be easily incorporated into simple Decision Support Systems that are understandable, reliable and useful to production schedules in VMI supply chains.

Enns and Suwanruji (2007) presented a direct comparison of two common distribution planning and control systems, based on the logic used to move material through supply chains. Although there has been much conjecture regarding the relative merits of such systems, their study was a step towards understanding the actual underlying behaviour and tradeoffs in each system. Results indicated that centralised planning and control, as implemented under Distribution Requirements Planning (DRP), is beneficial under realistic situations of time-varying demand and replenishment time uncertainty.

Monthatipkul and Yenradee (2005) proposed a new inventory control system known as optimal inventory/distribution plan (IDP) control system for a one-warehouse/multi-retailer supply chain. The IDP control system includes three major components, namely, a linear programming model, an adjustment rule, and a rationing rule. Implementing the IDP control system begins with solving the proposed linear programming model and then following the obtained optimal inventory/distribution plan by adopting the adjustment and rationing rules. The efficiency of the IDP control system is compared to that of the traditional installation-stock s, Q system (a gradient method to search reorder points and reorder quantities of a warehouse and retailers simultaneously) under two uncertain demand patterns. The experimental results show that the IDP control system gives lower total cost with higher fill rates than the traditional installation-stock s, Q system for the two demand patterns.

INTRANS (2010) a project supported by the Research Council of Norway focused on the results related to the integration of control systems in the Supply Chain (SC) domain and the transport domain. By control system in the SC domain meant any system that supports the decision takings in the SC and by the control system in the transport domain meant any system that supports the monitoring and management of a transport network, such as a road network. INTRANS (2010) looked upon the integration from an interoperability point of view and described the three different types of interoperability, contractual, functional and technical interoperability, providing complete interoperability. It took the role model and functions defined in the ARKTRANS – The Multimodal ITS framework architecture as the starting point and combines it with the Supply Chain Operations Reference (SCOR) model. The study described how complete interoperability could be achieved by a conventional role model for the two domains, a standard set of core functions for the two domains and common information architecture. It also introduced the intelligent goods as a crucial link between the two domains as well as playing an essential role in the decision taking in the SC domain and the monitoring and management of transport in the transport domain.

2.4.4 Lead Time Systems

Bowersox and Closs (2002) demonstrated that improvement in continuity of supplies with reduced lead times will lead to improvement in cooperation and will also enhance cooperation's and communications with reduced duplication of efforts, reduction in material costs and improvement in quality control, which are the main benefits of materials management.

Sirias and Mehra (2005) studied quantity-dependent discounts versus lead time dependent discounts in supply chains through a simulation study. They concluded that the lead time-dependent discount systems could be more promising for the supply chains, especially for the manufacturing sector.

Kun-Shan Wu (2001) developed a mixed inventory policy for a variable lead time when the supplier capacity is assumed to be random. There are optimal operating policies for two kinds of lead times. These include a normally distributed lead time and a distribution-free lead time. They derive an optimal bound (bound on the policy) for order quantity, reorder point and lead-time that minimises the total cost. Optimal bounds were developed for a distribution-free lead time model and normally distributed lead time. The cost function derived for the distribution-free model is unimodal and quasi-convex. Irrespective of the distribution function, an optimal solution for the lead time was shown to exist.

Gallego and Özer (2001) present a model that quantifies the value of receiving demand information further in advance of the delivery date, showing that the performance of the system improves as order information is received earlier. Thus, the value of lead time reduction decreases when firms have other alternatives to obtain demand information. Wang and Tomlin (2009) captured the impact of forecast updating on lead time policy, assuming a multiplicative Markovian forecast-update process. These authors consider lead time stochasticity as a type of supply risk, showing that as lead time reliability decreases, firms facing demand volatility either order earlier (increasing the full lead period) or pay a premium to increase lead time reliability.

2.5 Critique of Existing Literature

Although Albarune and Habib (2015) demonstrated the essence of demand forecasting systems, they have not demonstrated a clear link with performance, especially in the manufacturing sector. They focused on the supply chain in fast moving and consumer goods sector. Kot et al. (2011) exploring demand forecasting in a supply chain noted that the character of data flow and the type of cooperation between the links is essential. They too did not provide empirical evidence to link demand forecasting and performance. It was also not clear on which sector or discipline that their study focused on.

Liu *et al.* (2005) show the importance of information technology in the supply chain. However, their inclination is the use of technology in monitoring information flow and performance as opposed to demonstrating how the use of information communication technology has contributed to performance. Nyabwanga and Ojera (2012) similarly conducted an exploratory study that does not go beyond highlighting the use of electronic commerce in the marketplace.

Fin (2006) has shown that the use of EDI led to reduced lead time. Their study wrongly assumes reduced lead time alone can be used to demonstrate operational, financial and strategic. Devaraj *et al.* (2007) claimed that supplier and customer integration using technologies could enhance the production information integration intensity, which in turn improves the supply chain performance. However, they did not provide empirical evidence to substantiate this claim.

Skipper *et al.* (2008) saw the information technology as moderating the interdependence among supply chain members and performance. Their focus, however, was in showing the nature of supply chain today as information intensive and demonstrating the role of technology in information exchange. The link to performance is however frail.

Li *et al.* (2009) claimed that supply chain mediates in the relationship between supply chain integration and performance. However, they failed to recognise the importance of taking into account the justification of IT in changing business environment. It must take into account the appropriate usage, investment justification and align with the business environment to achieve competitive advantage.

Gadde *et al.* (2010) explored the tangible and intangible benefits of a supply chain system. However, the study has not shown how these benefits individually contribute to performance. Doggett (2005) explored the impact of implementation of distribution systems. He did not go further to establish whether the changes brought by implementation of a new distribution system had any influence on performance. Amiri (2006) similarly used SWOT analysis to establish the impact of implementation of distribution systems in Hong Kong textile industry. However, he did not link the impact to performance may be because he assumed the impact itself could pass as performance.

Bowersox and Closs (2002) demonstrated the benefits of reduced lead time. However, they did not show how these benefits influence performance. Sirias and Mehra (2005) compared quantity-dependent discounts and lead time dependent discounts. Although they concluded that lead time dependent discounts are more promising especially in the manufacturing sector, they have not shown how and its influence on performance. Kun-Shan Wu (2001) differentiated two kinds of lead times which are a normally distributed lead time and a distribution-free lead time.

Although he concluded that distribution-free model is unimodal and quasi-convex, and that an optimal solution for the lead time was shown to exist, its influence on performance has not been shown empirically.

Gallego and Özer (2001) looked into a model that quantifies the value of receiving demand information further in advance of the delivery date, showing that the performance of the system improves as order information is received earlier. They emphasised on lead time but did not contextualise their study to include other elements that influence performance such as demand forecasting, ICT integration and distribution control systems.

de Treville et al. (2014) model to optimise sourcing decisions focused on reducing time with little regard to product differentiation and costs. It, therefore, concentrated on specific aspects of lead time but was not exhaustive in its approach. Three dimensions of lead time namely delivery time, product differentiation and pricing would have made their model exhaustive.

Monthatipkul and Yenradee (2005) proposed a new inventory control system known as optimal inventory/distribution plan (IDP) control system for a one-warehouse/multi-retailer supply chain. However, they did not conduct an empirical study to test their model. This would have been useful in testing the efficiency of IDP control system as compared to traditional stock s, Q system. In comparing two common distribution planning and control systems, Enns and Suwanruji (2007) observed that centralised planning and control, as implemented under Distribution Requirements Planning (DRP) is beneficial under realistic situations of time-varying demand and replenishment time uncertainty. They, however, did not show how it is beneficial using empirical evidence.

2.6 Summary of Literature

Though performance has been touted as a revolutionary tool in management, public organisations in Kenya are still slow in embracing it. This is despite the advantages that its systems adoption would confer to the organisations and its suppliers alike. Key benefits identified include cost savings, improved efficiency and better relations with suppliers. Many past studies examining this phenomenon have advanced several factors that constitute significant hindrances to the adoption of distribution systems. These factors include the perceived complexity of management, resistance to change, culture, lack of proper regulatory mechanisms, cost and unavailability of IT infrastructure and absence of clear management strategies. Among these hindrances, organisational culture has been found to be the greatest challenge to management. Relationship with suppliers can be encouraged by the introduction of management tools. These make visible the management of information needed to enable a more effective relationship. As more data becomes visible and can be shared, makes management identify for relative initiative and shared framework contracts.

The popularity of the internet has significantly influenced organisations to use new inter-organisational systems (IOS) technologies such as distribution systems. This is because it is an information technology-based purchase system which is at the input end of the procurement processes (Kumar, Kumar, Rao & Veeramalla, 2019). It has been commonly accepted that information structures such as distribution systems become increasingly connected and embedded with other infrastructures to initiate the growth of enterprises. In line with this notion, the use of information technology systems is considered to be an innovative strategy action. In recent years, management has been advocated as a new strategic view of management. The innovation implementing EDI systems can create value for the enterprises through utilising IT-enabled resources on management.

Previous studies have focused on the implementation and adoption of management on performance (Kumar *et al,* 2019). Thus, the current study influences to literature by proposing and empirically tests a theoretical nature of performance and also can capture fundamental role as applied through technological functions. In line with this notion, the characteristics of intellectual exchange, information enrichment and joint strategies can be reflected in the domains of partner relationships, information sharing and procurement integration, respectively. In particular, relational exchange strategy stresses the focus of the committed on-going relationship between enterprises (Amiri, 2006). Therefore, distribution systems can improve the effectiveness of operational processes and the transparency of the procurement processes and procedures and could be implied that a performance enhances procurement performance and acts as a central system than other e-business applications when studying its performance.

According to Sari (2008), demand forecasting is a critical factor in supply chain management. This is elaborated by De Gooijer and Hyndman (2005) who advocates for numerous forecasting models. These are necessary to provide the decision-makers with the requisite information for decision making. The appropriate forecasting models are the ones with the least forecast errors as expounded by Pisal Yenradee and Anulark Pinnoi (2001). Panneerselvam (2010) argued that the Weighted Moving Average is a better method than Simple Moving Average. This was collaborated by Chase (2009) who pointed weaknesses of simple moving average.

Nadeem, Alvi and Iqbal (2018) have shown the importance of ICT in the supply chain as it helps in a review of past performance, monitor current performance and predict when and how much of certain products need to be produced and to manage workflow system. Nyabwanga and Ojera (2012) also emphasised the role of ICT integration by showing the importance of collaborative mechanisms to enhance integration.

Khan and Wisner (2019) observed that supplier and customer integration were positively correlated to supply chain performance. This could be explained by high interdependence for the efficient supply chain as explained by Wu and Jia (2018) who indicated that different types of IT technologies are needed to achieve different levels of coordination. Wolf (2011) observed that IT could be a good enabler to integrate supply chain. This was collaborated by Jacques, Michael and James (2013) who noted that searching for information, reading and responding to e-mails, and collaborating with colleagues take up to about 60% of typical knowledge worker's time. In line with this, therefore, it can be seen that ICT is a strategic tool to a firm for helping it to gain a competitive advantage.

Kollberg and Dreyer (2006) observed that information and communications technology is now widespread as companies seek to improve supply chain efficiency through increased integration. This was in agreement with observations by Georgise, Thoben and Seifert (2014) who indicated that with the advancement of information and communication technologies, supply chain integration had become a strategic tool for firms to improve their competitiveness.

Previous studies have shown that export failure was substantially contributed by the ineffective processing activities, particularly the distribution channel (Ogbeuhi & Long, 1994), instead of some other factors. Many aspects of distribution channel studied in the past were members afliation (Anderson, 1997; Rose et al., 2004; Frazier et al., 1989; Brett, 1995; Morrisey, 2006; Jennifer, 2008), coordination management, conflict avoidance, sales and Gadde, Håkansson and Persson (2010) identified tangible (quantifiable) and intangible (difficult to quantify) benefits. Tangible benefits included the cost of supply reduction, tender costs reduction and lead time savings. Intangible benefits included process improvement and organisational benefits.

Previous studies have shown that export failure was substantially contributed by the ineffective processing activities, particularly the distribution channel (Pillai, Putrus, Pearsall & Georgitsioti, 2017). instead of some other factors. Many aspects of distribution channel studied in the past were members affiliation Estebsari, Pons, Patti, Mengistu, Bompard, Bahmanyar and Jamali (2016), coordination management, conflict avoidance, sales and profits performance, information exchange, trust and commitment, all of which was regarded to improve the performance of channel members. In addition, studies on governance of distribution channel, the applications of non-formal channels, the position of channel members, the establishments of multiple distribution channels, the establishment of importers' networks, and decentralization of channel distribution were narrowed down the performance issues, too (Bedford, 2015; Abeyratne & Monfared, 2016; Ghobakhloo, 2018).

A study by Mfwaya (2013) found out that most of the companies had multiple suppliers of various products and services, trying as much as possible to reduce variability, always having a smooth workflow in the organization, having proper queue control to avoid delays, expediting some processes to avoid delays, using multi modal transportation to avoid delays and offering warranty of the products/services for at least 12 months significantly affects customer satisfaction positively. (Bosire, 2013) noted that outsourcing influenced queue time to a very large extent whilst set-up time, problem solving time, run time, waiting time and synchronic-time were influenced to a large extend. The study also established that outsourced services were positively correlated to lead time components on average the correlation co-efficient. Studies done on lead time management by Christensen *et al* (2007) and Germain, Claycomb and Dröge (2008) observed that variability in lead time performance leads to excess inventories, inventory shortages, or both, impacting the bottom line significantly in either case.

2.7 Research Gaps

Stevenson (2006) focused on the importance of demand forecasting in decision making. However, he has not shown its link with a multi-echelon system. Abanis, Sunday & Eliabu (2012) emphasised on the fulfillment of the customer requirements, reducing risk and in the measurement of process improvement. Although these elements are essential, it is imperative to examine them in the context of multi-echelon distribution systems.

Gallego and O'zer (2001) show the need for optimal ICT integration policies in a multi-stage distribution system. Focusing on ICT integration, Cheng and Wu (2005) emphasised its role in reducing distribution costs while Dejonckheere *et al.* (2004) saw ICT integration as important in reducing bullwhip. The authors discussed the same issue but focused on different roles that it plays in the supply chain. Nyabwanga and Ojera (2012) argued against high levels of inventories due to costs involved. Ray and Jewkes (2004) show the association between lead time and costs. Christopher (2011) details strategies to reduce lead time systems to save on costs. However, lead time can also be tied to the distribution system. This study sought to address this issue.

The review of the relevant research in the field shows that scholars focus either on one e-business tool and conduct their analysis from a single perspective or investigate them adopting only one of the aspects of their application – namely information management or market mechanism (Nan, 2011). Additionally, a discernible pattern emerges in the research, as scientists reasonably endeavour to look into the interconnection between e-business tools and business relationships. Nevertheless, every author explicates relationships in a different way, adopting terms like coordination, collaboration and cooperation. The purpose of this study is using a literature survey to categorise e-business tools according to two criteria – process and relationships (Donaldson, 2007).

As more emphasis was put on the latter for answering the presented research questions, a clear and water-tight typology of relationships was employed. Since the idea behind this study is to do a comprehensive review, both information management and market mechanism aspects of e-business tools were included in the analysis (Bergman et al., 2010). Future research, therefore, should address the issue of the viability of multi-echelon distribution systems in flexible supply chains.

Disney, Holmström, Kaipia and Towill (2001) focused on the implementation of Vendor Managed Inventory but did not include other equally important distribution control systems technologies. They also established that it is possible to design production planning and distribution control systems that are robust to many real-life uncertainties. They did not show empirically how this could be achieved.

Amiri (2006) impacts of distribution systems in the procurement process in Hong Kong. He used SWOT analysis to describe impacts in each stage of the procurement process instead of carrying out an empirical study to provide evidence. The study by Amiri (2006) therefore cannot be generalised. In addition, it did not address performance in a specific sector. This current study sought to address this gap.

A case study by Gadde *et al.* (2010) focused on analysing the Greek government procurement systems. It established tangible benefits that included the cost of supply reduction, tender costs reduction and lead time savings. Intangible benefits included process improvement and organisational benefits. Their study, however, did not take into consideration the aspect of performance. It was also concentrated in a single institution; General Secretariat of Procurement, and therefore narrow. This current study addressed performance and focused on many institutions in the manufacturing sector.

Albarune and Habib (2015) conducted a study to demonstrate forecasting practices in supply chain management in FMCG. They only focused on limitation and few practical solutions on forecasting to be useful in the business organisation. Their study was not exhaustive as it did not link forecasting practices to the performance of FMCG firms. The current study addressed this gap by investigating how distribution control systems influenced the performance of manufacturing firms.

Kot, Grondys and Szopa (2011) focused on the role of efficient management of supply chains in customer service. They concluded that aspect of demand forecasting, the character of data flow and the type of cooperation between the links is essential. However, their study did not show how demand forecasting and data flow are essential for the performance of firms in a specific industry. It is this gap that this current study addressed as it focused on the influence of distribution control systems on performance in the manufacturing firms in Kenya.

Vitri (2014) only concentrated on the design of demand forecasting processes and management of demand. However, she did not go further to show the applicability of such a design in different sectors. Agigi, Niemann and Kotze (2016) were more worried about supply chain disruptions which they assumed will affect the operational performance of firms. They concluded that strategic stock and supply chain mapping is of the most useful design approaches to enhance supply chain resilience. They, however, failed to link this resilience to performance in the FMCG industry in South Africa where they carried out the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methods and procedures that were used to achieve the set research objectives. It entails the research design, population of the study, sampling frame, sample and sampling technique, data collection instruments, data collection procedure, pilot testing, data analysis methods and presentation.

3.2 Research Philosophy

Research philosophy is an important part of research methodology (May & Williams, 2002). Research philosophy is classified as ontology, epistemology and axiology. These philosophical approaches enable to decide which approach should be adopted by the study and why, which is derived from research questions (Saunders, Lewis & Thornhill, 2009).The important assumptions are present in research philosophy which explains about the study's' view regarding the world. According to Saunders (2012) research philosophy is an approach of evaluating social phenomena and trying to explain the understandings realized.

The main research philosophies are; Positivism philosophy, Realism philosophy and interpretivist philosophy. According to Positivism philosophy, research strategy is approached on the basis of data collection and hypothesis development (Von, Bernstein & Newton, 1951). The positivist researcher follows highly structured methodology in order to facilitate the hypothesis. Furthermore, positivism works on quantifiable observations and accordingly statistical analysis is obtained. The core feature of realism is pertained to disclose the truth of reality and the existence of the objects are prevalent independently in the human mind (Dean, Joseph, Roberts & Wight, 2006). Realism is classified as direct realism and critical realism. Direct realism explains what is experienced by our senses and that are attained by the study. On the other hand, the critical realism expresses that what is experienced by our sensations those are images of the real world, not the reality. Finally, according to

Willis (1995) Interpretivist is a branch of epistemology which is focused to the assessment the differences between humans as social actors.

Positivistic philosophy approach was adopted for this study, which can rely on its relevant theories to setup the research hypothesis. These hypotheses can be tested and confirmed or disapproved by quantitative and statistical methods in order to answer the research objectives and accomplish the research purposes. Positivism research philosophy was preferred for this research study because it takes a stance that knowledge developed in this research is based on attentive observation and measurement of objective reality and the problem under investigation is perceived as independent and separate (Cooper & Schindler, 2014). Because of its deductive and objective nature, it enables the use of both qualitative and quantitative data to test hypothesis drawn from the theoretical conceptual framework.

By using positivism, the study monitors a step by step method starting with deductive reasoning, formulating hypothesis and operationalizing of the study variables based on existing theory then deducing the observations to determine the truth or falsify the hypothesis (Albert & Yue, 2011). In addition, positivism was used to judge the research in terms of its validity, that is, the extent to which the research tools actually do measure the underlying concept that they are supposed to measure. Positivism also helps to test hypothesis and examines the relationship between two or more variables (Sekeran & Bougie, 2010).

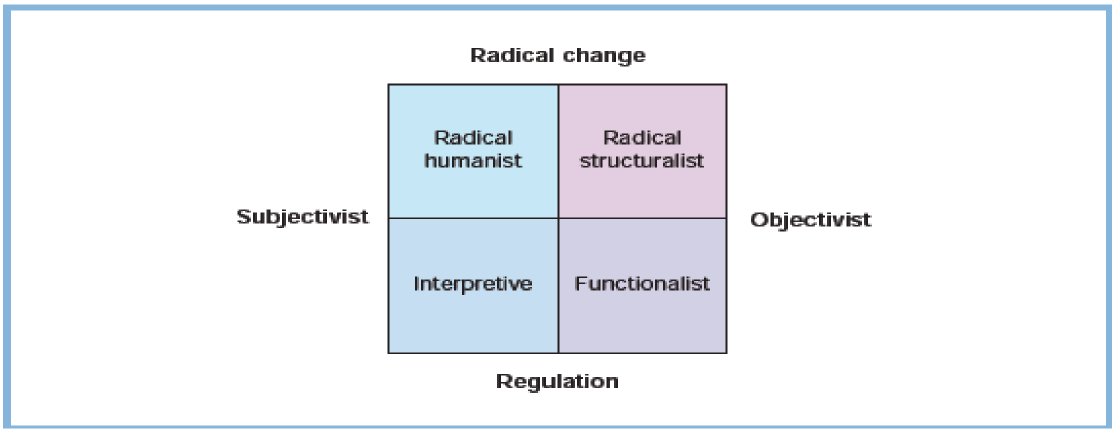

Figure 3.1: Research Paradigms, Source: (Flowers, 2009)

In the bottom right corner of the quadrant is the functionalist paradigm. This is located on the objectivist and regulatory dimensions. Objectivism is the ontological position that this study adopted. It is regulatory in that this study was more concerned with a rational explanation of whether and how multi-echelon distribution systems affect a firm's performance in the manufacturing industry. It also developed a set of recommendations. This is the paradigm within which most business and management research operates. As observed by Flowers (2009) it is often problem-oriented in approach, concerned to provide practical solutions to practical problems. The critical assumption here is that organisations are rational entities, in which rational explanations offer solutions to logical problems.

3.3 Research Design

This study employed a descriptive survey design. Creswell (2013) recommends that this research design is suitable when information involved define people, organisations, surroundings or occurrences. Descriptive survey design has adequate capability for safeguard against biasness and maximised dependability (Kothari, 2004). The research design was suitable for this study because it permitted collection of data for independent and dependent variables using questionnaires (Orodho, 2003).

Research design is the blue print upon which a study is based. It refers to the preparation and planning for data collection and analysis in a way that purposes to pool together relevance and economy in the process (Babbie, 2002). According to Kothari (2004), research design enables a study to be expedited efficiently. This not only yields desired information but also utilises minimal resources in form of time and funds.

The descriptive survey design was suitable for this study not only in validating findings but also in the generation of information and giving answers to specific problems. The study utilised this research design since it encompasses data collection, classification, measurement, comparison, analysis, and explanation to deliver reports on relationship between variables. The descriptive survey design also facilitated the study to utilise quantitative research methods in establishing the role of multi-echelon distribution systems in performance of manufacturing firms in Kenya.

3.4 Target Population

The population is defined as the entire group of people, items or things of interest that the study wishes to investigate. The study population was 903 manufacturing firms. A list that contains the number of all 903 manufacturing firms (Appendix III) was sourced from the Kenya Association of Manufacturers (KAM, 2017).

A unit of analysis is the most essential element of a scientific study. It is the subject (the who or what) of study about which generalisations can be made. It is the primary entity that is to be analysed and for which data have been collected such as countries, international alliances, schools, communities and companies (Cooper & Schindler, 2003). In this case, manufacturing firms formed the unit of analysis for this study. A unit of observation, on the other hand, is the entity that provided the information required or the object that was observed in the course of the study (Cooper & Schindler, 2003). In this case, the unit of observation was procurement managers of the selected firms.

3.5 Sampling Frame

Sampling according to Cooper and Schindler (2003) is basically selecting some of the elements in a population for study. The sampling frame describes a list of all the elements from where a sample can be drawn (Cooper & Schindler, 2003). It is arranged in a manner to describe characteristics of a population for example categorisation of institutions by sector. Sampling frame provides a set of entities that are drawn from a population with the aim of estimating a characteristic of the population (Siegel, 2003).

A sampling frame of this study comprised of 903 manufacturing firms who are members of Kenya Association of Manufacturers categorised in fourteen (14) different sub-sectors that characterise manufacturing industry in Kenya. However, consultancy services sub-sector was excluded from this study as multi-echelon distribution systems do not apply in the services sector.

3.6 Sample Size and Sampling Techniques

The term sample refers to a segment of the population selected for research to represent the population as a whole (Kotler & Armstrong, 2006). Sampling frame and sampling techniques show the population of the study, the number of respondents that are selected and the procedure of how they were selected to take part in the study. Use of the appropriate sampling techniques eliminates sampling errors hence yielding a representative sample whose findings can be generalised to represent the whole population.

Samples can either be the probability (random) or non-probability (non-random) samples. Probability samples, as noted by Srivastava, Shenoy and Sharma (1993) is a method in which the inclusion or exclusion of any individual element of the population depends upon the application of probability methods and not on personal judgment. The author noted that each sample has an equal chance of being included in the sample and also, offers the study the advantage of being able to calculate the sampling error of measurement. Bernard (2000) observed that use of random sampling methods enhance the representativeness of the study population. These include simple random sampling, systematic random sampling, stratified random sampling, cluster sampling and multi-stage sampling.

This study used stratified random sampling Technique. Stratified random sampling technique as noted by Neuman (1993) is a method applied if the population from which a sample is to be drawn does not constitute a homogeneous group, and hence requires comparisons between various sub-groups. The procedure assures the researcher that the sample will be representative of the population regarding certain critical factors that have been used as a basis for stratification. For example in a study on gender roles, it is crucial to have sufficient numbers of males and females for comparison.

The sample size is largely dependent on what the investigator needs to know, the motivation of the research, resources available, and that which can be achieved within the available time (Orodho, 2003). Mugenda and Mugenda (2003) suggest that sample sizes of between 10-30 % forms a representative sample of the target population. Kothari (2004) also indicated that 30% of a target population which is homogeneous is adequate to use as a sample for a study. Nassiuma (2000) formula was used as shown below to obtain the desired sample size for the study with the population of 903;

$$n = N (cv^2)/Cv^2 + (N-1) e^2$$

Where:

n = sample size

N = population (903)

Cv= coefficient of variation (take 0.5)

e= tolerance of desired level of confidence (take 0.05 at 95% confidence level)

$$n = 903 (0.5^2)/ \{0.5^2 + (903-1) 0.05^2\} = 225.75/ 2.505$$

= 90.11 (rounded off to 90 respondents)

The sample size was 90.

When a population from which a sample is drawn does not constitute a homogenous group, Kothari (2004) recommended that the stratified sampling technique should be used. The thirteen (13) different sub-categories of manufacturing firms formed the strata in stratified random sampling technique. Sampled firms in each of the stratum were proportionate to its population to ensure equal representation and avoid bias as shown in the sampling matrix table.

Table 3.1: Sample Size

Sector	Members	Sample
Building, Mining & Construction	49	5
Chemical & Allied Sectors	159	16
Energy, Electrical & Electronics	45	5
Food & Beverages	187	19
Leather & Footwear	9	1
Metal & Allied Sector	104	10
Motor Vehicle & Accessories	71	7
Paper & Board	54	5
Pharmaceutical & Medical Equipment	54	5
Plastics & Rubber	77	8
Fresh Produce	11	1
Textiles & Apparels	44	4
Timber, Wood & Furniture	39	4
TOTAL	**903**	**90**

Source: *KAM (2017)*

3.7 Data Collection Instruments

There are many data collection instruments for primary data include as observed by Creswell (1994). These include mailed questionnaires, structured and semi-structured questionnaires, interviews, focus group discussion, and observations. Of these primary data collection instruments, questionnaires are the most preferred. One of the major reasons is that this data collection instrument is capable of reaching out a large number of respondents.

Questionnaire design is heavily dependent on the problem that the study seeks to address and its objectives (Mugenda & Mugenda, 2003). A questionnaire can have closed ended or open ended questions. A questionnaire with close ended questions only allows specific types of responses where options are provided. A questionnaire with open ended questions, respondents are free to indicate their opinions as they wish.

Mailed questionnaires entail self-administered questionnaires. They are used where there is need to reduce interviewer and social desirability bias. The investigator and study participants do not come into physical contact with each other. The questionnaires are sent through mail to the study participants with a request to fill and return the filled questionnaire. This method is however unreliable due to its very low response rate as many of target study participants usually fail to return the filled questionnaires.

Interviews encompass collection of data by extracting information from interviewees through oral questions and recording the responses (Creswell, 1994). There are two types of interviews; telephone interviews and face to face interviews. Telephone interview encompasses collecting data by means of a telephone call. It is suitable for study participants who are geographically far apart from the investigator. However, it is not commonly used in data collection. Face to face interview involves a personal interview that seeks answers to a set of pre-conceived questions. It is commonly used especially when study participants are few and insightful information on a phenomenon is required.

Observation is a great tool for collecting data. It helps in understanding people and intricate circumstances. The data acquired recounts current happenings and is not determined by either past actions or future plans of study participants (Orodho, 2003) However, information obtained through observation is limited and the method is expensive hence not suitable for the collection of data where a large number of study participants is involved.

Focus Group Discussions (FGDs) as noted by Creswell (1994) are unstructured interviews with small groups of people who interact with each other, and a focus group leader facilitates the discussions. They make use of group dynamics to stimulate discussions, gain insights and generate ideas on a given topic of study. FGDs are utilised to explore peoples' opinion, how they process information on a specific subject and why they process such information in that particular way. It is appropriate for action research. This is a study where the participants are expected to have an active role in the research process.

This study utilised the questionnaires in collecting the primary data while secondary data was obtained from journals, textbooks, Internet and Kenya Association of Manufacturers magazines. A semi-structured questionnaire containing both open-ended and close-ended questions was used to collect primary data for this study. The questionnaires method was preferred as it is economical regarding time and cost as compared to other methods.

3.8 Pilot Study

A pilot study was carried out using the developed questionnaires to test and improve the flow and clarity of the questions before the actual data collection. A small part of the population is adequate for a pilot study. Saunders et al. (2007) recommended that a small proportion of the population can serve the purpose in pilot testing. For this study, ten (10) procurement managers from manufacturing firms who are members of Kenya Association of Manufacturers took part in the pilot study. Those who took part in the pilot study did not take part in the main study to avoid chances of biases.

Wisner *et al.* (2008) assert that a pilot study helps in refining the questions by removing some irrelevant items and adding others to engage with the study participants genuinely. A pilot study is a mini-version of a full-scale study or a trial run done in preparation of the complete study. In this study, piloting was done, and the instruments were checked to find out if they yield similar results after pre-testing. The reliability of items was based on the estimates of the variability of participants responding to the items.

The instruments were administered to the same subjects after two weeks then tested for the reliability. The questionnaire was pre-tested before the survey to determine the best possible way of administering and restructuring questionnaire to enhance consistency of responses. Pilot testing the instrument was vital as it was used to identify and change ambiguous, awkward, or offensive questions and technique as emphasised by Cooper and Schindler (2003).

3.8.1 Validity of Research Instruments

Validity can be described as the level to which a research instrument is capable of enumerating what is supposed to capture (Blumberg et al., 2005). The validity of a research instrument therefore evaluates whether an instrument is able to adequately measure constructs in the study which it was purposed measure (Robson, 2011; Pallant 2011). It covers the whole investigational idea and determines whether or not outcomes achieved satisfy all of the necessities of scientific research.

In qualitative research, validity is largely dependent on utility, trustworthiness, and dependability (Zohrabi, 2013). A study therefore must utilise specific processes to check for the correctness of the research findings (Creswell, 2014).

In the mid-20th century, Cronbach and Meehl introduced validity in quantitative research. By then, it was about the formation of benchmarks for evaluating psychological examinations (Cronbach & Meehl, 1955). There is internal validity and external validity. Internal validity deals with the legitimacy of study results emanating from sample selection, data collection and analysis. These determine whether or not a study can be replicated (Willis, 2007). To ensure internal validity therefore, the investigator has to define suitable approaches in their research. External validity is largely on transferability. It determines whether study results can apply to other groups in the population (Last, 2001). An investigator therefore can ensure external validity through adequate representation of the population under study (Kimberlin & Winterstein, 2008).

Validity test can be broadly categorised into four: content validity, face validity, construct validity, and criterion-related validity (Creswell, 2005; Pallant, 2011). Content validity refers to the level that questions and scores represent all possible constructs (Creswell, 2005). The scale items should denote the thought being assessed (Shekaran & Bougie, 2010). At the moment, there are no statistical tests to establish whether a measure sufficiently covers a concept and therefore content validity commonly relies on the verdict of specialists in a specific area of study under investigation. Criterion-related validity deals with the relationship between scale scores, and some specific, measurable criterion. It correlates test results with another criterion of interest (Burns et al., 2017). This type of validity has concurrent and predictive aspects in it. It can therefore determine current performance and predict future performance.

Construct validity is critical for hypothesis testing in construction of theories. To gain better understanding of concepts for explaining and predicting behaviour, scholars construct theories (Thatcher, 2010). This encompasses analysis of a scale concerning hypothetically resultant theories regarding the nature of fundamental variables or constructs (Pallant, 2011). It relates to a particular use of a measure, and can commonly be dependent on setting or populace (Kane, 2013). Construct validity of an instrument can be tested by factor analysis and correlation analysis (Pett et al., 2003).

Questions were organised around the specific objectives of the study to achieve construct validity. Content and criterion-related validity were 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 review and upgrade the data collection instrument. Results of pilot testing were used to ensure that the instrument used is clear and unambiguous. This also enabled the study to make modifications to the instrument based on results obtained from the pilot study. Construct validity of the research instrument was also checked using correlation analysis. For the instrument to be valid, items in the same construct were expected to show a strong correlation with values of at least 0.5 and above.

3.8.2 Reliability of Research Instruments

The reliability can be described as a scale that gives constant results with equal values (Blumberg et al., 2005). The reliability of a research instrument therefore shows its capability of producing stable results and how accurate data acquired in the study characterises a particular concept (Mugenda & Mugenda, 2008). It shows constancy, accuracy, repeatability, and dependability of research instrument (Chakrabartty, 2013).

The aim of having a reliable research instrument is to minimise the errors and biases in a study. To enhance reliability of research instument, a pilot study was conducted. The aim was to develop a good the flow in the questions and intelligibility of the questionnaire before the main study. When the author is the only individual looking at the correctness of the questionnaire, there is likely to be bias and the research instrument may not be reliable (Wilson, 2010). In a pilot study, the research instrument is subjected to a test where respondents sharing characteristics with targeted respondents are able to fill in the questionnaire. In the process, flaws in the questionnaire could be identified and addressed before the main study is conducted.

In this study, the reliability of items was based on the estimates of the variability of participants responding to the items. The instruments were administered to the same subjects after two weeks then tested for the reliability. The coefficient of reliability falls between 0 and 1, with perfect reliability equaling 1, and no reliability equaling 0. The general rule is that reliability values greater than 0.7 are considered acceptable (Downing, 2004). The author used Cronbach's Alpha to test the reliability of the constructs. Cronbach's alpha, which is known for its stability and flexibility, is a function of internal consistency or interrelatedness of items. The alpha can take any value from zero (no internal consistency) to one (complete internal consistency). The Cronbach's Alpha value for a research instrument showing strong internal consistency among measures of variable items should be 0.7 and above.

3.9 Data Collection Procedures

The study obtained necessary authorisation and clearance from relevant authority before commencing the study. The study also obtained an authorisation letter from NACOSTI and an introduction letter from the University. A cover letter was attached to each questionnaire to assure the participants that the information given was anonymous and confidential.

The questionnaires were distributed using the drop-and-pick-later method to the respondents. This enabled the respondents to have ample time to fill the questionnaires and at the same time ensure high response rate. According to Kothari

(2004), a self-administered questionnaire elicits self-report on people's opinion, attitudes, beliefs and values.

After collecting data from the respondents through the questionnaire, data was then checked for completeness, consistency and reliability. The next step involved coding the responses in the coding sheets by transcribing the data from the questionnaire by assigning characters the numerical symbols. This was followed by screening and cleaning of data to make sure there are no errors. After this, data was transferred to SPSS for analysis.

3.10 Data Analysis and Presentation

The collected data was analysed using SPSS (Statistical Package for Social Science) version 20 as an aid. The data was analysed using both descriptive statistics and inferential statistics. The specific descriptive statistics included mean, standard deviation, frequency and percentage; while the particular inferential statistics included correlation and regression analyses. Descriptive statistics were used to examine the characteristics of the population. It enabled the study to meaningfully describe a distribution of scores using statistics that depend on the type of variables in the study and the scale of measurement. Mugenda and Mugenda (2003) assert that descriptive statistics enable the study to describe the distribution of scores. Variable aggregation was undertaken in the facilitation of further statistical analysis. The study used custom tables in analysing responses from a Likert scale measurement. This was done by adding the 'strongly agree' responses with the 'agree' responses and also adding the 'disagree' responses with 'strongly disagree' (Gwavuya, 2011).

Correlation analysis was also used for analysis. Correlation is the degree of the relationship existing between variables. Both correlation and regression analysis can be used to examine the presence of a linear relationship between two variables. The correlation analysis was carried out using the Pearson correlation coefficient. This was used to test whether independent variables are interdependent and also to examine if there exists a significant relationship between the independent variables demand forecasting, ICT integration, distribution control and lead time and the dependent variable that is the performance of manufacturing firms in Kenya.

The following regression model was used:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \acute{\varepsilon}}$$

Where:

Y = Performance of Manufacturing Firms

β_0 = Constant (Coefficient of intercept)

β_1 = Regression coefficient of X_1.

X_1 = Demand forecasting

β_2 = Regression coefficient of X_2.

X_2 = ICT Integration

β_3= Regression coefficient of X_3.

X_3 = Distribution Control Systems

β_4 = Regression coefficient of X_4

X_4 = Lead Time Systems

$\acute{\varepsilon}$ = Error Term

3.10.1 Testing for the Intervening Effect of Organisatioal Policy

The Baron and Kenny approach in testing for mediation was employed for the purpose of this study. According to Hayes (2009), for intervening effect to be considered positive, four conditions should be fulfilled:

One, the independent variable is significantly related to the dependent variable in the absence of the intervening variable

$Y = \beta_0 + \beta_1 X + \varepsilon$……………………………………………………………Equation 1

Two, the independent variable is significantly related to the intervening variable.

$I= \beta_0+ \beta_1 X+\varepsilon$……………………………………………………………..Equation 2

Three, intervening variable is significantly related to the dependent variable.

$Y= \beta_0+ \beta_1 I+\varepsilon$……………………………………………………………..Equation 3

Four, when controlling for the effect of the intervening variable on the dependent variable, the effect of the independent variable on the dependent variable is insignificant in the presence of the intervening variable.

$Y= \beta_0+ \beta_1 X_i+ \beta_1 I\varepsilon$……………….…………………………………………. Equation 4

Where;

Y=Performance of Manufacturing Firms

X_i= Independent Variables

I=Organisational Policy

3.10.2 Hypothesis Testing

The analysis tested the hypothesis of the study as shown in table 3.2.

Table 3.2: Hypothesis Testing

Hypotheses	Hypothesis Test	Regression Model
Hypothesis 1: H_{01}: Demand Forecasting systems has no significant influence on the performance of manufacturing firms in Kenya	$H_0{:}\beta_1 = 0$ vs $H_1{:}\beta_1 \neq 0$ Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0	$Y = \beta_0 + \beta_1 X_1 + \acute{\varepsilon}$ Where: Y = performance of manufacturing firms β_0 = Constant (Co-efficient of intercept) β_1 = Regression co-efficient of X_1. X_1 = Demand forecasting systems, $\acute{\varepsilon}$ = Error Term
Hypothesis 2: H_{02}: ICT Integration has no significant influence on the performance of manufacturing firms in Kenya	$H_0{:}\beta_2 = 0$ vs $H_a{:}\beta_2 \neq 0$ Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0	$Y = \beta_0 + \beta_2 X_2 + \acute{\varepsilon}$ Where: Y = performance of manufacturing firms β_0 = Constant (Co-efficient of intercept) β_2 = Regression co-efficient of X_2. X_2 = ICT Integration, $\acute{\varepsilon}$ = Error Term
Hypothesis 3: H_{03}: Distribution Control Systems have no significant influence on the performance of manufacturing firms in Kenya.	$H_0{:}\beta_3 = 0$ vs $H_a{:}\beta_3 \neq 0$ Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0	$Y = \beta_0 + \beta_3 X_3 + \acute{\varepsilon}$ Where: Y = performance of manufacturing firms β_0 = Constant (Co-efficient of intercept) β_3= Regression co-efficient of X_3. X_3 = Distribution Control Systems $\acute{\varepsilon}$ = Error Term
Hypothesis 4: H_{04}: Lead Time systems have no significant influence on the performance of manufacturing firms in Kenya.	$H_0{:}\beta_4 = 0$ vs $H_a{:}\beta_4 \neq 0$ Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0	$Y = \beta_0 + \beta_4 X_4 + \acute{\varepsilon}$ Where: Y = performance of manufacturing firms β_0 = Constant (Co-efficient of intercept) β_4= Regression co-efficient of X_4 X_4 = Lead Time Systems $\acute{\varepsilon}$ = Error Term
Hypothesis 5: H_{05}: Organisational policy has no significant intervening effect on performance and multi-echelon distribution systems in manufacturing firms in Kenya		$PER = \beta_0 + \beta_1 MDS + \varepsilon$ (i) $MDS = \beta_0 + \beta_2 OP + \varepsilon$ (ii) $PER = \beta_0 + \beta_3 OP + \varepsilon$ (iii) $PER = \beta_0 + \beta_4 MDS + \beta_5 OP + \varepsilon$ (iv) Where: PER = performance MDS = multi-echelon distribution systems OP= organisational policy

3.11 Diagnostic Tests

Three diagnostic tests were conducted before regression analysis. They include normality, homoscedasticity and multicollinearity tests. These tests and their results are discussed in the subsequent sections.

3.11.1 Normality Test

The residuals of the regression should follow a normal distribution in order to make valid inferences from a regression analysis. The residuals are simply the error terms or the differences between the observed value of the dependent variable and the predicted value. If we examine a normal Predicted Probability (P-P) plot, we can determine if the residuals are normally distributed or not. If they are, they will conform to the diagonal normality line indicated in the plot. If the residuals are seen not to conform to the diagonal normality line the dataset is not normally distributed. The normality of data was tested using the normal P-P Plot test of regression standardized residual using the IBM SPSS software. When the residuals are conforming to the diagonal normality line, it can then be concluded that the dataset is normally distributed (Saunders &Thornhill, 2012).

3.11.2 Homoscedasticity Test

This is a test of whether the residuals are equally distributed, or whether they tend to bunch together at some values, and at other values, spread far apart. The opposite of homoscedasticity is heteroscedasticity, where a cone or fan shape is found in the data. For thus study, Homoscedasticity was tested using scatter plots where predicted were plotted against the values and residuals on a scatter plot. If the residuals are equally distributed, there is no heteroscedasticity. If the residuals tend to bunch together at some values, and at other values, spread far apart, there is heteroscedasticity.

3.11.3 Multicollinearity Test

This test is conducted to determine whether predictor variables are highly correlated with each other. This becomes an issue as the regression model will not be able to accurately associate variance in the outcome variable with the correct predictor variable, leading to muddled results and incorrect inferences. This assumption is only relevant for a multiple linear regression which has multiple predictor variables.

Two ways can be used to check multicollinearity: correlation coefficients and variance inflation factor (VIF) values. A correlation matrix of predictor variables is used to check multicollinearity using correlation coefficients. Coefficients with magnitudes of .80 or higher show that predictors are multicollinear as they are strongly correlated. However, a more natural way to check multicollinearity is using VIF values. When there is no multicollinearity, the VIF values are below 10.00, and best case would be if these values were below 5.00. If VIF values of predictor variables are above 10, we can conclude that there is multicollinearity. For thus study, Tolerance and Variance Inflation Factor (VIF) was used to check for multicollinearity. Tolerance value less than 0.2 and VIF value above 10 indicates problem of multicollinearity. If VIF for any variable is around or greater than 10, there is collinearity associated with that variable.

3.12 Measurement of Variables

This study has four dependent variables which operationalise multi-echelon distribution systems. Demand forecasting was measured by the methods or combination of methods used by a firm to forecast customer demand. The methods include quantitative methods, qualitative methods, casual methods and time series. ICT integration was measured by optimal policies of ordering, availability of demand information, integration and coordination of actions. Distribution control systems as a variable was measured by distribution system technology used by firms, collaborative models used and level of stock outs. Lead time was measured by order delivery time, supplier selection and interest of supplier. The dependent variable which is performance was measured by quality, flexibility and supplier reliability.

Table 3.3: Measurement of Variables

Variable	Indicators	Adopted from
Demand forecasting Systems	• Quantitative Systems • Qualitative Systems • Casual methods & time series	Stevenson (2006), Asmus, Cauley & Maroney (2006), Datta *et al.* (2007), Cheng and Wu (2005) and Xu *et al.* (2009)
ICT integration	• Optimal policies • Availability of demand information • Integration & coordination of actions	Lotfi, Mukhtar, Sahran & Zadeh (2013), Gallego and O'zer (2001) and Dejonckheere et al. (2004)
Distribution control systems	• Technology • Collaborative models • Level of stock-outs	Sila, Ebrahimpour and Birkholz (2006), Fawcett & Magnan (2002), Mustaffa and Potter (2009), Hardgrave, Langford and Waller (2008) and Van der Vaart and Donk (2008)
Lead time Systems	• Elapsed Time • Process Cycle Time • Length of Process	Christopher (2011), Daaboul, Da Cunha, & Bernard (2011), Pahl, Voss, & Woodruff (2005), Vernimmen *et al.* (2008) and Gadde, Hakansson, & Persson (2010)
Performance	• Quality • Flexibility • Supplier reliability	Hugo *et al.* (2004), Wisner *et al.* (2008) and Bolstorff & Rosenbaum (2003)

3.13 Ethical Consideration

Ethical considerations relate to the moral standards that the study should consider in all stages of the research process. Research deals with people, therefore, the researcher has the responsibility of protecting the participants, develop trust with them, and guard against misconduct in order to promote integrity of the research. Bordens and Abbott (2008) caution of the need for a researcher to obtain official permission from their affiliated institutions before doing research for purposes of regulation. After the permission from the supervisors, the study sought for a research permit from JKUAT.

Furthermore, it is highly recommended in research that informed consent from participants be sought before they are involved in the study. This is because, “ethical research requires balancing the value of advancing knowledge against the value of non-interference in the lives of others” (Neuman, 2013). For this reason, the study sought permission from the universities before contacting the managers of the manufacturing firms. Participants were requested to participate in the study by obtaining their informed consent either verbally or by signing consent forms (Bordens & Abbott, 2008). Also the study ensured that the purpose of the study was fully explained to the participants before involving them in the research. To ensure confidentiality and anonymity of the participants, participants were requested by the study not to indicate their names on the questionnaires.

During data collection, the participants were given freedom to respond or not to respond to the questions. The participants were also free to withdraw from research if they felt they could not continue due to personal reasons. The author explained this to the participants before the administration of the research instruments to them. Also the researcher did not coarse any participant against their wish to participate in the research.

Throughout the administration of all the research instruments, the researcher took precaution not to use any sensitive words or gestures that may disturb a participant physically or psychologically. In addition, during data analysis and reporting, the researcher remained truthful and reported the findings as they appeared. More so, the researcher endeavoured not to falsify any information or conclusions in order to ensure accuracy of the finding as recommended by Creswell (2014).

As a strategy of guarding against plagiarism (Mugenda, 2011), the researcher acknowledged all sources of information as used in the research report. Equally important, the researcher took personal responsibility for his own work, his contribution to the whole study, the conduct of the research and the consequences of the research report. The raw data would be kept securely for two months after the research report has been submitted, and thereafter all raw data documents would be disposed by burning them. This procedure would safe guard the identity of the participants and ensure that no harm is caused to the participants as a result of this study.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents the findings and discussions. Factor analysis was conducted to determine items to be included in making research constructs. This was followed by a descriptive analysis, correlation analysis; regression analysis, diagnostic tests. These tests included normality, homoscedasticity and multicollinearity tests. This was then followed by hypotheses testing.

4.2 Response Rate

The study targeted 90 manufacturing firms in Kenya across 13 sectors (consultancy services sector excluded). The response rate results are shown in table 4.1.

Table 4.1: Response Rate

Sector	Target	Response	Response Rate (%)
Building, Mining and Construction	5	4	80.0
Chemicals and allied	16	15	93.8
Energy, electricals and electronics	5	5	100.0
Food and beverage	19	18	94.7
Metal and allied	10	10	100.0
Motor and accessories	7	6	85.7
Paper and board	5	5	100.0
Pharmaceuticals and medical equipment	5	4	80.0
Plastics and rubber	8	7	87.5
Textiles and apparels	4	3	75.0
Timber, wood and furniture	4	4	100.0
Fresh Produce	1	0	0.0
Leather and Footwear	1	0	0.0
Total/Aggregate	**90**	**81**	**90.0**

The response rate results show that ninety (90) questionnaires were distributed and 81 were filled and returned for analysis. This translates into an overall response rate of 90%. Sectors in which 100% response rate was achieved include energy, electricals and electronics, metal and allied, paper and board, timber, wood and furniture. Fresh produce, as well as leather and footwear sectors did not have any response. The chemical and allied sector had a response rate of 93.8% while food and beverage sector had 94.7%. Building mining and construction had a response rate of 80% while motor and accessories had a response rate of 85.7%. The pharmaceuticals and medical equipment had a response rate of 80% while plastics and rubber had 87.5%. Textiles and apparels had a response rate of 75%. The response rate was considered adequate for analysis and making conclusions as observed by Babbie (2002) that a response rate of above 50% can be appropriate for making conclusions.

4.3 Pilot Study Results

Before using a questionnaire for any study, it is recommended that a pilot study should be conducted (Kothari, 2004). A pilot study was conducted to test the validity and reliability of the questionnaire. Furthermore, a pilot study brings to the light the weaknesses of the questionnaires and the survey techniques. Through pilot study, the questionnaires can be adjusted, typing errors identified and corrected as well as addressing questions that are ambiguous by restating them using simple language that is easily understood.

The study used Cronbach’s Alpha to test the reliability of the study constructs. Cronbach’s alpha is a function of internal consistency or interrelatedness of items. The alpha can take any value from zero (no internal consistency) to one (complete internal consistency). The Cronbach’s Alpha value for a research instrument showing strong internal consistency among measures of variable items should be 0.7 and above.

A Cronbach's alpha value that is at least 0.7 suffices for a reliable research instrument. In this pilot study, a threshold of 0.7 was used to establish the reliability of the data collection instrument. According to Eisinga, Grotenhuis, Pelzer (2013), a commonly accepted rule of thumb for describing reliability is as follows; Cronbach's alpha $\alpha \geq 0.9$ is considered excellent while $0.9 > \alpha \geq 0.8$ is considered good. Cronbach's alpha $0.8 > \alpha \geq 0.7$ is considered acceptable while $0.7 < \alpha \geq 0.6$ is questionable. Cronbach's alpha of $0.6 < \alpha \geq 0.5$ is considered poor while Cronbach's alpha of $0.5 < \alpha$ is considered unacceptable.

4.3.1 Reliability Analysis

Table 4.2 presents the overall reliability statistics for all the items analysed in the study. The research instrument had 60 items.

Table 4.2: Overall Reliability Statistics

Cronbach's Alpha	No. of Items
0.768	60

Reliability for all the six variables was tested using Cronbach's Alpha. The results show overall reliability of 0.768. Table 4.3 shows that the number of items tested for reliability was 60 distributed across the six variables of the study. The variables included demand forecasting, ICT integration, distribution control systems, lead time, organisational policy and performance. The results are presented according to variables and items comprising these variables.

Table 4.3: Reliability Statistics for each Variable

Constructs Reliability	No. of Items	Cronbach's Alpha
Reliability for Demand Forecasting Systems	13	0.756
Reliability For ICT Integration	11	0.764
Reliability For Distribution Control Systems	10	0.763
Reliability for Lead Time Systems	9	0.776
Reliability for Organisational Policy	6	0.765
Reliability for Performance	11	0.760

Thirteen items on demand forecasting were tested for reliability. Reliability test results show that overall reliability for demand forecasting was 0.756. This figure is above the minimum threshold of 0.7 based on which we can conclude that items on demand forecasting were reliable.

Eleven items were tested for reliability on ICT integration. Reliability test results show that overall reliability for ICT integration was 0.764. This is within the recommended threshold of 0.7 based on which a research instrument is considered reliable. The items on ICT integration are therefore reliable.

Ten items on distribution control systems were tested for reliability. Results show that overall reliability for distribution control systems was 0.763. Cronbach's Alpha value for distribution control systems is within the recommended threshold of 0.7, and therefore we can conclude that items on distribution control systems in the research instrument were reliable.

Nine items on lead time were tested for reliability. The results show that overall reliability for lead time was 0.776. The Cronbach's Alpha value shows that items on lead time in the research questionnaire are reliable. Six items on organisational policy were tested for reliability. Results show that overall reliability for the organisational policy was 0.765. The Cronbach's Alpha value is within the recommended threshold of 0.7 for a reliable research instrument. We can, therefore, conclude that items on organisational policy in the questionnaire were reliable.

Eleven items on performance were tested for reliability. The results show that overall reliability for performance was 0.760. The Cronbach's Alpha value shows that items on performance in the research questionnaire were reliable.

4.4 Respondents Background Information

4.4.1 Manufacturing Firms by Sector

The study categorised the manufacturing firms studied by sector. Table 4.4 presents this categorisation.

Table 4.4: Manufacturing Firms by Sector

Sector	Frequency	Percentage (%)
Building, Mining and Construction	4	4.9
Chemicals and allied	15	18.5
Energy, electricals and electronics	5	6.2
Food and beverage	18	22.2
Metal and allied	10	12.3
Motor and accessories	6	7.4
Paper and board	5	6.2
Pharmaceuticals and medical equipment	4	4.9
Plastics and rubber	7	8.6
Textiles and apparels	3	3.7
Timber, wood and furniture	4	4.9
Total	**81**	**100.0**

The results in table 4.4 show that 22.2% of firms were in the food and beverage category while 18.5% were in chemicals and allied sector. The results also show that 12.3% and 8.6% of the firms were in metal and allied and plastics and rubber sectors respectively. Firms in energy, electricals and electronics as well as paper and board sectors were 6.2% each while firms in motor and accessories were 7.4%. Firms in the building, mining and construction, pharmaceuticals and medical equipment, as well as timber, wood and furniture sectors, were 4.9% each. Firms in textiles and apparels sector were 3.7%.

4.4.2 Manufacturing Firms by Type of Product Manufactured

The respondents were asked to indicate the type of product their firms manufacture. The results are shown in figure 4.1

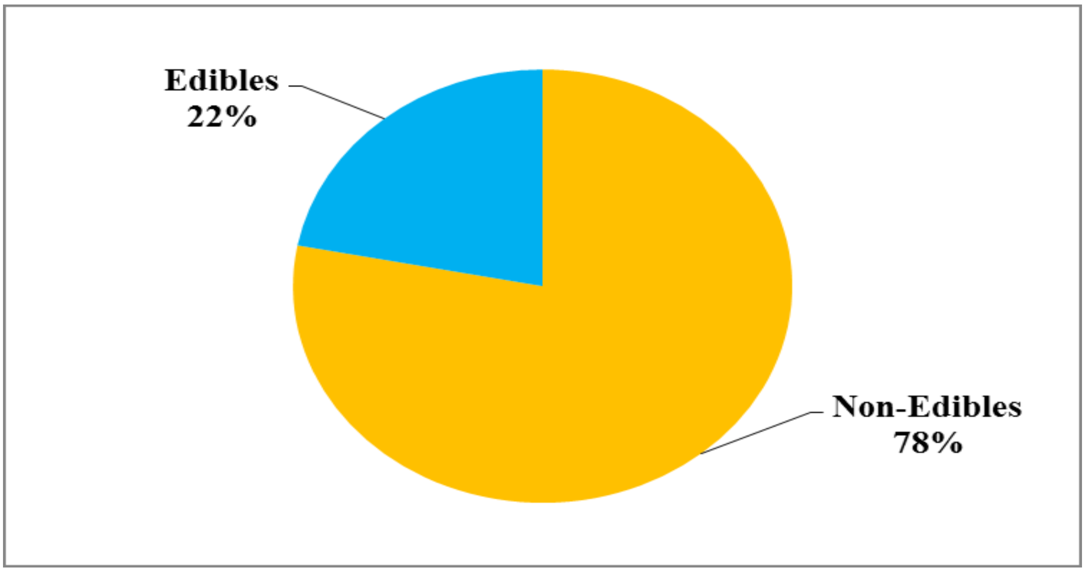

Figure 4.1: Manufacturing Firms by Type of Product Manufactured

The results if figure 4.1 show that the majority of firms manufactured non-edibles (78%) while 22% manufactured edibles.

4.4.3 Manufacturing Firms by Ownership

The respondents were asked to indicate the ownership of their firms. The findings are summarised in table 4.5.

Table 4.5: Manufacturing Firms by Ownership

Type of Ownership	Frequency	Percentage (%)
Local	43	53.1
Foreign	13	16.0
Both local and foreign	25	30.9
Total	**81**	**100.0**

The results in table 4.5 show that the majority of firms (53.1%) are locally owned while 30.9% have both local and foreign ownership. Sixteen (16%) of the manufacturing firms have foreign ownership.

4.4.4 Markets for Manufacturing Firms

The study sought to know the markets for manufacturing firms. The findings are shown in table 4.6.

Table 4.6: Markets for Manufacturing Firms

Markets	Frequency	Percentage (%)
Domestic market	4	4.9
Foreign market	1	1.2
Both Domestic and Foreign	76	93.8
Total	**81**	**100.0**

The results in table 4.6 have shown that the majority of firms market their products in both domestic and foreign markets. The results also show that 4.9% of the firms sell their products in the domestic market only while 1.2% exclusively manufactured for the foreign market.

4.5 Factor Analysis

Factor analysis is the name given to a group of statistical techniques that can be used to analyse interrelationships among a large number of variables and to explain these variables regarding their common underlying dimensions (factors). The approach involves condensing the information contained in some original variables into a smaller set of dimensions (factors) with a minimum loss of information. It addresses the problem of analysing the structure of the interrelationships (correlations) among a large number of variables by defining a set of common underlying dimensions, known as factors. Factor analysis is an interdependence technique in which all variables are simultaneously considered, each related to all others. Factor loading values of 0.4 and above are acceptable while those below 0.4 are not (Basheka, 2008; Mabert *et al*., 2003).

4.5.1 Factor Loadings for Demand Forecasting

Table 4.7 presents the results of factor analysis of items comprising demand forecasting construct. Demand forecasting had ten items.

Table 4.7: Factor Loadings for Demand Forecasting Systems

Items	Factor Loading
Last period demand	.953
Multiplicative seasonal indexes	.970
Simple and weighted moving averages	.914
Delphi method	.930
Historical life cycles of similar products	.705
Market research	.963
Holidays	.889
Seasons	.760
Frequency domain method	.962
Time-domain method	.903

The results show that the highest factor loading being 0.97 (multiplicative seasonal indexes) and the lowest being 0.705 (past life cycles of similar products). According to Basheka (2008), factor loading values of 0.4 and above are acceptable while those below 0.4 are not. In this case, the factor loadings are within the recommended values as shown in table 4.7 and therefore all the items were retained for demand forecasting construct.

4.5.2 Factor Loadings for ICT Integration

Table 4.8 presents results of factor analysis of items comprising ICT integration construct. ICT integration had four items.

Table 4.8: Factor Loadings for ICT Integration

Items	Factor Loading
There are optimal information access and communication policies	.854
There is sufficient availability of demand information	.442
Activities in the supply chain are integrated	.852
There is coordination of actions through ICT	.963

According to Mabert *et al.* (2003), factor loading values of 0.4 and above are acceptable while those below 0.4 are not. The results show that ICT integration items have values within the recommended factor loadings. The item with the lowest factor loading value (there is sufficient availability of demand information) has 0.442 while the item with the highest factor loading value (there is coordination of actions through ICT) has 0.963 as shown in table 4.8. This means that there was no item dropped for the ICT integration construct.

4.5.3 Factor Loadings for Distribution Control Systems

Table 4.9 presents results of factor analysis of items comprising distribution control systems construct. Distribution control systems as a construct has ten items.

Table 4.9: Factor Loadings for Distribution Control Systems

Items	Factor Loading
Maintenance of an optimum level of investment in distribution	**.972**
Achieved required operational performance	**.836**
Meeting customer demand	**.972**
Stock-outs are avoided	**.983**
Distribution costs have been lowered	**.921**
There is optimal ordering in each echelon	**.507**
Vendor managed distribution system is used	**.992**
Forecasting is used	**.950**
Replenishment is used	**.950**
There is an integration of the suppliers, factories and customers	**.839**

The results show that distribution control systems construct has high factor loadings. The item with the lowest factor loading (there is optimal ordering in each echelon) has 0.507 while that with the highest factor loading has 0.992 (vendor managed distribution system is used) as shown in table 4.9. Factor loading values of 0.4 and above are acceptable while those below 0.4 are not (Basheka, 2008). None of the items was found to be below the recommended factor loading value hence no item was dropped for this construct.

4.5.4 Factor Loadings for Lead Time Systems

Table 4.10 presents results of factor analysis of items comprising lead time systems. Lead time systems had nine items

Table 4.10: Factor Loadings for Lead Time Systems

Items	Factor Loading
There is responsiveness to customers' demands regarding product differentiation	.801
There is responsiveness to customers' demands regarding pricing	.847
There is responsiveness to customers' demands regarding short delivery time	.956
There is a high order processing rate	.982
There is a high order fulfilment rate	.801
Inventory replenishment	.935
Sufficient delivery speed	.973
Adequate delivery to location (on-time in-full)	.708
Delivery planning is adequate	.840

The results show that lead time construct factor loadings are within the recommended values of above 0.4. The item with the lowest factor loading value (adequate delivery to location) has 0.708 while that with the highest factor loading value (there is high order processing rate) has 0.982 as shown in table 4.10. Factor loading values of 0.4 and above are acceptable while those below 0.4 are not (Mabert *et al*., 2003). None of the items was dropped for lead time construct as all of them met the required threshold.

4.5.5 Factor Loadings for Organisational Policy

Table 4.11 presents results of factor analysis of items comprising organisational policy. The organisational policy was comprised of 6 items

Table 4.11: Factor Loadings for Organisational Policy

Items	Factor Loading
The company has a centralised organisational structure	.810
The company has a decentralised organisational structure	.489
There is seamless communication across all cadres of employees in the company	.965
Communication within the company is structured	.965
There are human resource development programs in the company	.662
There is adequate training on new technology and tools used in the company	.892

The results show that organisational policy construct item with the lowest factor loading (the company has a decentralised organisational structure) is 0.489. The item with the highest factor loading (there is seamless communication across all cadres of employees in the company) is 0.965. Basheka (2008) recommends that factor loading values be 0.4 and above to be acceptable. All the items have a factor loading above 0.4 as shown in table 4.11 hence none of the items was dropped for the organisational policy construct.

4.5.6 Factor Loadings for Performance

Table 4.12 presents results of factor analysis of items comprising performance. Performance comprised of 11 items.

Table 4.12: Factor Loadings for Performance

Items	Factor Loading
There is a formal quality assurance system	.858
There is continuous improvement	.867
There is a statistical process control for quality	.868
Six sigma limits are used	.873
There is fail-safe lot traceability	.898
Incoming quality is assured	.851
Flexibility allows low supply chain response time (number of days it takes to respond to marketplace changes)	.892
Suppliers have adequate billing accuracy	.914
Suppliers have adequate order accuracy	.942
On-time completion by suppliers	.875
Suppliers keep promises	.508

The results show that most of the items of performance construct had high factor loadings. The item with the lowest factor loading (suppliers keep promises) has 0.508 while that with the highest factor loading (suppliers have adequate order accuracy) has 0.942. Mabert *et al*. (2003) recommended that factor loading values should be 0.4 and above to be acceptable. Since all the items met the required threshold of factor loading values as shown in table 4.11, none of them was dropped for performance construct.

4.6 Descriptive Analysis

4.6.1 Demand Forecasting Systems

Respondents were asked to indicate the extent to which they used quantitative methods for demand forecasting in their company. These results are shown in table 4.13.

Table 4.13: Quantitative Systems

Quantitative Systems	Mean	Std. Dev
Last period demand	4.37	.782
Multiplicative seasonal indexes	3.94	.242
Simple and weighted moving averages	3.73	.822

The results show that the quantitative method used to a large extent by manufacturing firms for demand forecasting is last period demand (M=4.37, SD=.782). Multiplicative seasonal indexes (M=3.94, SD=.242) and simple and weighted moving averages (M=3.73, SD=.822) were also moderately used by manufacturing firms for demand forecasting. Quantitative method is among the four main methods of demand forecasting as outlined by Datta *et al.* (2007).

Respondents were asked to indicate the extent to which they used qualitative systems for demand forecasting in their company. The results are shown in table 4.14.

Table 4.14: Qualitative Systems

Qualitative Systems	Mean	Std. Dev
Delphi method	2.83	1.292
Historical life cycles of similar products	4.57	.498
Market research	3.99	.783

The results show that the qualitative systems used to a large extent by manufacturing firms for demand forecasting was past life cycles of similar products (M=4.57, SD=.498). Manufacturing firms moderately used market research (M=3.99, SD=.783) for demand forecasting while Delphi method was only used to a little extent (M=2.83, SD=1.292). As expected, when used, the qualitative method the second of the four primary methods in demand forecasting show its influence on the performance of manufacturing firms (Stevenson, 2006; Asmus, Cauley & Maroney, 2006; Datta *et al.*, 2007).

Respondents were asked to indicate the extent to which they used causal methods for demand forecasting in their company. The findings are shown in table 4.15.

Table 4.15: Causal Methods

Causal Systems	**Mean**	**Std. Dev**
Holidays	3.43	1.589
Seasons	3.93	.667

The findings show that manufacturing firms moderately used causal systems for demand forecasting. The results show that manufacturing firms moderately used holidays (M=3.43, SD=1.589) and seasons (M=3.93, SD=.667) for demand forecasting. The causal method is the third of the four main methods of demand forecasting as outlined by Datta *et al.* (2007).

Respondents were asked to indicate the extent to which they used time series for demand forecasting in their company. The findings are shown in table 4.16.

Table 4.16: Time Series

Time series	**Mean**	**Std. Dev**
Frequency domain method	4.25	.751
Time domain method	3.89	1.012

The results show that time series method used to a large extent by manufacturing firms for demand forecasting was frequency domain method (M=4.25, SD=.751) while time domain method was moderately used (M=3.89, SD=1.012). Time series is the last of the four main methods of demand forecasting as outlined by Datta *et al.* (2007).

The study sought to establish achievements of demand forecasting. Respondents were asked to indicate the extent to which demand forecasting achieved customer satisfaction, fulfilment of the customer requirements, reducing risk and process improvement goals. The results are shown in table 4.17.

Table 4.17: Achievements of Demand Forecasting Systems

Achievements of demand forecasting	Mean	Std. Dev
Customer satisfaction	4.89	.316
Fulfilment of the customer requirements	4.49	.503
Reducing risk	4.20	.401
Process improvement	4.70	.459

The results show that demand forecasting to a large extent achieved the four goals. The findings show that demand forecasting to a large extent achieved customer satisfaction goals (M=4.89, SD=.316) while it equally to a large extent achieved the goals of the fulfillment of the customer requirements (M=4.49, SD=.503). The findings also show that to a large extent demand forecasting achieved goals of reducing risk (M=4.20, SD=.401) and process improvement (M=4.70, SD=.459). These findings are in line with Asmus, Cauley and Maroney (2006) who expected a company to align its production capacity with estimated customer demand to not only ensure that the company meets customer requirements effectively but also optimise its customer satisfaction.

4.6.2 ICT Integration

The respondents were asked to indicate the extent to which attributes of ICT integration are exhibited by their company. These results are presented in table 4.18.

Table 4.18: Attributes of ICT Integration

Attributes of ICT integration	Mean	Std. Dev
There are optimal information access and communication policies	3.70	.901
There is sufficient availability of demand information	3.69	.465
Activities in the supply chain are integrated	4.20	.401
There is coordination of actions through ICT	4.69	.645

The results show that to a large extent, activities in the supply chain are integrated (M=4.20, SD=.401), and there is coordination of actions through ICT (M=4.69, SD=.645) in manufacturing firms. The results also show that to a moderate extent there are optimal information access and communication policies (M=3.70, SD=.901) and there is sufficient availability of demand information (M=3.69, SD=.465). The findings are in agreement with Lotfi, Mukhtar, Sahran and Zadeh (2013) who saw information and communication technology playing a significant role in improving coordination of business activities and cooperation among different stakeholders resulting into efficiency in operations.

Respondents were asked to indicate the extent to which ICT Integration has enabled reliability in their company. The results are shown in table 4.19.

Table 4.19: Achievements of ICT Integration in Reliability

Achievements of ICT Integration in reliability	Mean	Std. Dev
Timeliness	4.68	.668
Consistency	4.90	.300
Accuracy	4.69	.465

The results show that to a large extent ICT integration has achieved reliability in manufacturing firms. The findings show that ICT integration to a large extent achieved aspects of reliability such as timeliness (M=4.68, SD=.668), consistency (M=4.90, SD=.300) and accuracy (M=4.69, SD=.465). The results reflect observations by Gallego and O'zer, 2001 as well as Cheng and Wu (2005) who indicated that ICT integration creates a suitable environment for demand and distribution information sharing and reduce distribution costs.

Respondents were asked to indicate the extent to which ICT Integration has enabled responsiveness in their company. The findings are shown in table 4.20.

Table 4.20: Achievements of ICT Integration in Responsiveness

Achievements of ICT Integration in responsiveness	Mean	Std. Dev
Willingness to help	4.10	.539
Prompt attention to requests	4.59	.494
Problem resolution	4.30	.459
Complaint handling	4.59	.494

The results show that to a large extent ICT integration has achieved responsiveness in manufacturing firms. The findings show that ICT integration to a large extent achieved aspects of responsiveness such as willingness to help (M=4.10, SD=.539), prompt attention to requests (M=4.59, SD=.494), problem resolution (M=4.30, SD=.459) and complaint handling (M=4.59, SD=.494). The observations are in agreement with Lotfi, Mukhtar, Sahran and Zadeh (2013) that ICT plays a central role in the integration of business processes.

4.6.3 Distribution Control Systems

Respondents were asked to indicate the extent to which aspects of distribution control systems are employed in their respective companies. The findings are shown in table 4.21.

Table 4.21: Aspects of Distribution Control Systems

Aspects of distribution control systems	Mean	Std. Dev
Maintenance of an optimum level of investment in distribution	4.20	.401
Achieved required operational performance	3.99	.783
Meeting customer demand	4.80	.401
Stock-outs are avoided	4.70	.459
Distribution costs have been lowered	4.38	.681
There is optimal ordering in each echelon	4.31	.645
Vendor managed distribution system is used	4.47	.963
Forecasting is used	4.59	.494
Replenishment is used	4.59	.494
There is integration of the suppliers, factories and customers	4.49	.503

The results show that to a large extent many aspects of distribution control systems are employed in manufacturing firms. The findings show that to a large extent maintenance of an optimum level of investment in distribution (M=4.20, SD=.401), meeting customer demand (M=4.80, SD=.401) and avoiding stock-outs (M=4.70, SD=.459) are employed in manufacturing firms. The results also show that distribution costs have been lowered (M=4.38, SD=.681), there is optimal ordering in each echelon (M=4.31, SD=.645), vendor managed distribution system is used (M=4.47, SD=.963), and forecasting is used (M=4.59, SD=.494). Other distribution control systems aspects used include replenishment (M=4.59, SD=.494) and there is an integration of the suppliers, factories and customers (M=4.49, SD=.503). The results also show that to a moderate extent required operational performance was achieved (M=3.99, SD=.783). The results address the cost implications of stock-outs as expressed by Amiri (2006). They also emphasise aim of distribution control systems as it is to attain an optimum level in distribution for optimum level of operational performance through integration of suppliers, factories and customers (Mathuva, 2013; Sila, Ebrahimpour & Birkholz, 2006).

4.6.4 Lead-Time Systems

The respondents were asked to indicate the extent to which some lead time activities apply to their respective companies. These findings are presented in table 4.22.

Table 4.22: Lead Time Systems

Lead time activities	Mean	Std. Dev
There is responsiveness to customers' demands in regard to product differentiation	3.90	.539
There is responsiveness to customers' demands in regard to pricing	4.70	.459
There is responsiveness to customers' demands in regard to short delivery time	3.49	1.361
There is high order processing rate	4.41	.667
There is high order fulfilment rate	3.90	.539
Inventory replenishment	3.80	1.470
Sufficient delivery speed	3.80	1.470
Adequate delivery to location (on-time in-full)	4.11	.837
Delivery planning is adequate	4.11	.707

The results show that to a large extent there is responsiveness to customers' demands in regard to pricing (M=4.70, SD=.459), there is high order processing rate (M=4.41, SD=.667), adequate delivery to location (on-time in-full) (M=4.11, SD=.837) and delivery planning is adequate (M=4.11, SD=.707). The results also show that to a moderate extent there is responsiveness to customers' demands in regard to product differentiation (M=3.90, SD=.539), there is responsiveness to customers' demands in regard to short delivery time (M=3.49, SD=1.361), there is a high order fulfilment rate (M=3.90, SD=.539), inventory replenishment (M=3.80, SD=1.470) and sufficient delivery speed (M=3.80, SD=1.470). The results show three competitive dimensions that lead time addresses. They include price, product and delivery time. Lead time has an impact on pricing as longer lead time increases costs while shorter lead time diminishes costs (Ray & Jewkes, 2004; Pahl, Voss, & Woodruff, 2005; Vernimmen *et al.*, 2008).

4.6.5 Organisational Policy

The respondents were asked to indicate the extent to which organisational policy activities such as governance, communication and human resource apply to their respective companies. The findings are shown in table 4.23.

Table 4.23: Organisational Policy Activities

Organisational policy activities	Mean	Std. Dev
The company has a centralized organisational structure	3.57	1.457
The company has a decentralized organisational structure	3.59	1.116
There is seamless communication across all cadres of employees in the company	3.78	1.000
Communication within the company is structured	3.67	1.449
There are human resource development programs in the company	4.00	1.000
There is adequate training on new technology and tools used in the company	4.49	.503

The results show that to a large extent, human resource aspects of organisational policy activities apply to manufacturing firms. The findings show that to a large extent there are human resource development programs in the company (M=4.00, SD=1.000) and there is adequate training on new technology and tools used in the company (M=4.49, SD=.503). Manufacturing firms moderately apply governance and communication aspects of organisational policy activities. The results show that to a moderate extent the company has a centralised organisational structure (M=3.57, SD=1.457) and the company has a decentralised organisational structure (M=3.59, SD=1.116). The results also show that to a moderate extent there is seamless communication across all cadres of employees in the company (M=3.78, SD=1.000) and that communication within the company is structured (M=3.67, SD=1.449). The results agree with Mathis and Jackson, 2005) on the critical role of human resource management in any organisation to ensure that competent employees are recruited and retained.

4.6.6 Performance

The respondents were asked to rate the performance of their respective companies regarding some indicators. The results are presented in table 4.24.

Table 4.24: Performance of Manufacturing Firms

Performance	Mean	Std. Dev
There is a formal quality assurance system	3.69	1.554
There is continuous improvement	4.80	.600
There is a statistical process control for quality	4.40	.492
Six sigma limits are used	2.89	1.581
There is fail-safe lot traceability	3.79	.754
Incoming quality is assured	4.30	.782
Flexibility allows low supply chain	4.70	.459

response time (number of days it takes to respond to marketplace changes)		
Suppliers have adequate billing accuracy	3.80	.980
Suppliers have adequate order accuracy	4.31	.465
On-time completion by suppliers	4.00	.632
Suppliers keep promises	3.20	.600

The results show that to a large extent there is a continuous improvement (M=4.80, SD=.600) and there is a statistical process control for quality (M=4.40, SD=.492) in manufacturing firms. The results also show that to a large extent incoming quality is assured (M=4.30, SD=.782) and flexibility allows low supply chain response time (number of days it takes to respond to marketplace changes) (M=4.70, SD=.459). The findings also show that suppliers have adequate order accuracy (M=4.31, SD=.465) and there is on-time completion by suppliers (M=4.00, SD=.632). Respondents indicated that to a moderate extent there is a formal quality assurance system (M=3.69, SD=1.554) and a fail-safe lot traceability (M=3.79, SD=.754). They also indicated that to a moderate extent suppliers have adequate billing accuracy (M=3.80, SD=.980) and suppliers keep promises (M=3.20, SD=.600). Respondents indicated that six sigma limits are used only to a small extent (M=2.89, SD=1.581) in manufacturing firms. The findings reflect the importance of product quality, flexibility and supplier accuracy in determining performance in manufacturing firms as observed by Jacobs, Chase and Aquilano (2009), (Jonsson, 2008) and (Wisner *et al.*, 2008).

4.7 Diagnostic Tests

Three diagnostic tests were conducted before regression analysis. They include normality, homoscedasticity and multicollinearity tests. These tests and their results are discussed in the subsequent sections.

4.7.1 Normality Test

In order to make valid inferences from a regression analysis, the residuals of the regression should follow a normal distribution. The normality of data was tested using the normal P-P Plot test of regression standardized residual using the IBM SPSS software. When the residuals are conforming to the diagonal normality line, it can then be concluded that the dataset is normally distributed (Saunders &Thornhill, 2012).

The residuals are simply the error terms or the differences between the observed value of the dependent variable and the predicted value. If we examine a normal Predicted Probability (P-P) test, we can determine if the residuals are normally distributed or not. If they are, they will conform to the diagonal normality line indicated in the plot.

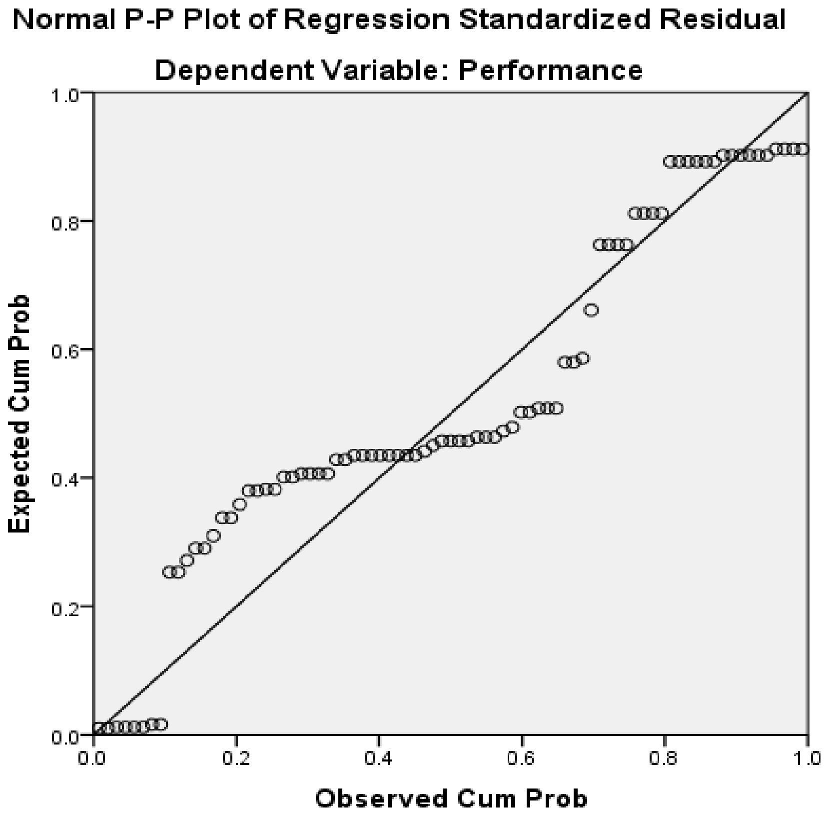

Figure 4.2: Normality Test

In figure 4.2, the residuals are seen to conform to the diagonal normality line hence we can conclude that the dataset is normally distributed.

4.7.2 Homoscedasticity Test

Homoscedasticity refers to whether the residuals are equally distributed, or whether they tend to bunch together at some values, and at other values, spread far apart. The opposite of homoscedasticity is heteroscedasticity, where a cone or fan shape is found in the data. This assumption is checked by plotting the predicted values and residuals on a scatter plot.

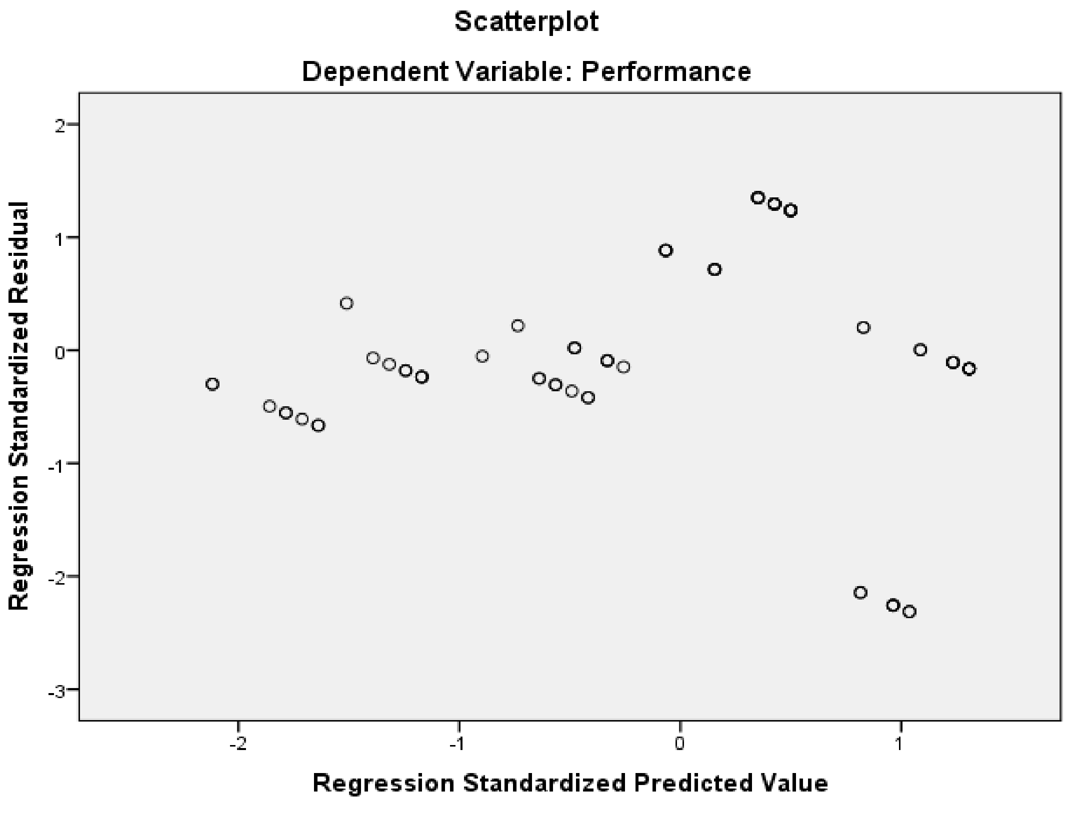

Figure 4.3: Homoscedasticity Test

From the scatter plot in figure 4.3, it was noted that the residuals are equally distributed hence there is no heteroscedasticity.

4.7.3 Multicollinearity Test

Multicollinearity refers to when predictor variables are highly correlated with each other. This is an issue, as the regression model will not be able to accurately associate variance in the outcome variable with the correct predictor variable, leading to muddled results and incorrect inferences. This assumption is only relevant for a multiple linear regression, which has multiple predictor variables.

Multicollinearity can be checked in two ways: correlation coefficients and variance inflation factor (VIF) values. A correlation matrix of predictor variables was used to check for multicollinearity. Coefficients with magnitudes of 0.80 or higher show that predictors are multicollinear as they are strongly correlated. However, a more natural way to check is using VIF values. When there is no multicollinearity, the VIF values are below 10.00, and best case would be if these values were below 5.00. Tolerance and Variance Inflation Factor (VIF) was used to check for multicollinearity. Tolerance value less than 0.2 and VIF value above 10 indicates problem of multicollinearity. If VIF for any variable is around or greater than 10, there is collinearity associated with that variable.

Table 4.25: Multicollinearity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	5.714	7.862		.727	.470		
Demand forecasting Systems	.072	.083	.084	.858	.394	.857	1.166
ICT Integration	.680	.146	.780	4.663	.000	.291	3.434
Distribution Control Systems	-.068	.148	-.067	-.462	.645	.384	2.606
Lead Time Systems	.121	.062	.250	1.969	.053	.508	1.969

a. Dependent Variable: Performance

In this case, table 4.25 shows that VIF values of predictor variables are between one and three hence we can conclude that no multicollinearity was detected.

4.8 Correlation Analysis

A correlation analysis was conducted to establish the relationship among study variables. The results are presented in table 4.26.

Table 4.26: Correlations Analysis Results

		Demand forecasting Systems	ICT Integration	Distribution Control Systems	Lead Time Systems	Organisational Policy	Performance
Demand	r	1	.347	.359	-.214	-.124	.276
forecasting	p		.002	.001	.055	.272	.012
ICT	r	.347	1	.778	-.700	-.551	.582
Integration	p	.002		.000	.000	.000	.000
Distribution	r	.359	.778	1	-.567	-.324	.429
Control Systems	p	.001	.000		.000	.003	.000
Lead Time	r	-.214	-.700	-.567	1	.913	-.276
	p	.055	.000	.000		.000	.013
Organisational	r	-.124	-.551	-.324	.913	1	-.226
Policy	p	.272	.000	.003	.000		.043
Performance	r	.276	.582	.429	-.276	-.226	1
	p	.012	.000	.000	.013	.043	

a. Listwise N=81

The results show that demand forecasting had a weak positive correlation with the performance of manufacturing firms in Kenya. This relationship was statistically significant (r=0.276, p=0.012) as shown in table 4.26. ICT integration had a moderate positive relationship with the performance of manufacturing firms in Kenya. This relationship was also statistically significant (r=0.582, p=0.000).

Distribution control systems were found to have a moderate positive relationship with performance in manufacturing firms. This relationship was statistically significant (r=4.429, p=0.000). Lead time systems were found to have a weak negative relationship with demand forecasting. This relationship was statistically significant (r=0.276, p=0.013). Organisational policy was found to have a weak negative relationship with performance in manufacturing firms. This relationship was statistically significant (r=0.226, p=0.043).

4.9 Hypothesis Test Results

4.9.1 Hypothesis 1 Testing Results

The first hypothesis sought to test the influence of demand forecasting on the performance of manufacturing firms. Hypothesis 1: H_{01}: Demand forecasting systems have no significant influence on the performance of manufacturing firms in Kenya. Simple linear regression was conducted using the following model;

$$Y= \beta_0 + \beta_1X_1 + \acute{\varepsilon}$$

Where:

Y = performance of manufacturing firms

β_0 = Constant (Coefficient of intercept)

β_1 = Regression coefficient of X_1.

X_1 = Demand forecasting Systems,

$\acute{\varepsilon}$ = Error Term

H_0: $\beta_1 = 0$ vs H_1:$\beta_1 \neq 0$

Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0

Demand forecasting was regressed against performance. The results of the regression analysis results are presented in table 4.27.

Table 4.27: Model Summary for Hypothesis 1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.276[a]	.076	.065	3.04815

a. Predictors: (Constant), Demand forecasting

The results of the regression analysis show that demand forecasting contributed to change in performance by 7.6% as indicated by the value of R^2 (.076).

ANOVA test results for the regression analysis of demand forecasting against performance shows whether the model used was fit for the analysis or not. The results are presented in table 4.28.

Table 4.28: ANOVA Test for Hypothesis 1

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	60.760	1	60.760	6.540	.012[b]
Residual	734.005	80	9.291		
Total	794.765	81			

a. Dependent Variable: Performance
b. Predictors: (Constant), Demand forecasting Systems

The results of the ANOVA test in table 4.28 show that the model was fit for the regression analysis (F=6.540, p=0.012) and therefore results are valid as they did not occur by chance.

Coefficients table shows the contribution of demand forecasting to the change in performance and its significance. Table 4.29 shows the coefficients results.

Table 4.29: Coefficients for Hypothesis 1

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	30.353	5.299		5.728	.000
	Demand forecasting Systems	.236	.092	.276	2.557	.012

a. Dependent Variable: Performance

$Y= 30.353 + 0.236X_1$

X_1= Demand Forecasting Systems

Results of coefficients table show that the contribution of demand forecasting to the change in performance was 0.236 and it was statistically significant (p=0.012).

According to the regression results as shown in tables 4.27, 4.28 and 4.29, $H_1:\beta_1 \neq 0$ ($\beta=0.236$) and $p < 0.05$ (p=0.012). The null hypothesis was hence rejected that; demand forecasting system has no significant influence on the performance of manufacturing firms in Kenya. The study therefore adopted the alternative hypothesis that demand forecasting system has significant influence on the performance of manufacturing firms in Kenya.

4.9.2 Hypothesis 2 Testing Results

The second hypothesis sought to test the influence of ICT Integration on the performance of manufacturing firms. Hypothesis 2: H_{02}: ICT Integration has no significant influence on the performance of manufacturing firms in Kenya. A simple linear regression analysis was conducted using the following model;

$Y= \beta_0 + \beta_2X_2 + \acute{\varepsilon}$

Where:

Y = performance of manufacturing firms

β_0 = Constant (Coefficient of intercept)

β_2 = Regression coefficient of X_2.

X_2 = ICT Integration,

$\acute{\varepsilon}$ = Error Term

H_0: $\beta_2 = 0$ Vs H_2: $\beta_2 \neq 0$

Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0

ICT Integration was regressed against performance. Table 4.30 shows the results of the regression analysis.

Table 4.30: Model Summary for Hypothesis 2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.582[a]	.339	.331	2.57846

a. Predictors: (Constant), ICT Integration

Regression analysis results of ICT Integration against performance show that ICT integration can explain 33.9% change in performance in manufacturing firms as indicated by the value of R^2 (0.339).

The ANOVA test was done to establish whether the model used for the analysis was fit. The results are presented in table 4.31.

Table 4.31: ANOVA Test for Hypothesis 2

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	269.537	1	269.537	40.541	.000[b]
	Residual	525.229	80	6.648		
	Total	794.765	81			

a. Dependent Variable: Performance

b. Predictors: (Constant), ICT Integration

The ANOVA test results in table 4.31 show that the model used in the regression of ICT integration against performance was fit for the analysis (F=40.541, p=0.000). The results did not occur by chance hence are valid and suitable for making conclusions.

Coefficients table is used to show the independent variable contribution to the change in the dependent variable and its significance. The coefficients in the regression of ICT integration against performance are presented in table 4.32.

Table 4.32: Coefficients for Hypothesis 2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	19.459	3.846		5.060	.000
	ICT Integration	.507	.080	.582	6.367	.000

a. Dependent Variable: Performance

$Y= 19.459 + 0.507X_2$

X_2= ICT Integration

The coefficients in the regression of ICT integration against performance show that ICT integration contributed 0.507 for every unit change in the performance of manufacturing firms in Kenya.

The regression results in tables 4.30, 4.31 and 4.32 show that H_2: $\beta_2 \neq 0$ (β=.507) and $p < 0.05$ (p=0.000). The null hypothesis which indicated that ICT integration has no significant influence on the performance of manufacturing firms in Kenya was therefore rejected. The study hence adopted the alternative hypothesis that; ICT integration has significant influence on the performance of manufacturing firms in Kenya.

4.9.3 Hypothesis 3 Testing Results

The third hypothesis sought to test the influence of distribution control systems on the performance of manufacturing firms. Hypothesis 3: H_{03}: Distribution Control Systems have no significant influence on the performance of manufacturing firms in Kenya. A simple linear regression analysis was conducted using the following model;

$Y= \beta_0 + \beta_3 X_3 + έ$

Where:

Y = performance of manufacturing firms

β_0 = Constant (Coefficient of intercept)

β_3= Regression co-efficient of X_3.

X_3 = Distribution Control Systems

έ = Error Term

H_0: $\beta_3 = 0$ Vs H_3: $\beta_3 \neq 0$

Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0

Distribution control systems were regressed against performance. The regression analysis results are shown in table 4.33.

Table 4.33: Model Summary for Hypothesis 3

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.429[a]	.184	.173	2.86574

a. Predictors: (Constant), Distribution Control Systems

The regression analysis results for distribution control systems against performance show that distribution control systems can explain 18.4% of the change in manufacturing firms in Kenya as indicated by the value of R^2 (0.184).

The ANOVA test was done to determine whether the model used for analysis was fit. The ANOVA test results are presented in table 4.34.

Table 4.34: ANOVA Test for Hypothesis 3

Model		Sum Squares	ofdf	Mean Square	F	Sig.
1	Regression	145.983	1	145.983	17.776	.000[b]
	Residual	648.783	80	8.212		
	Total	794.765	81			

a. Dependent Variable: Performance
b. Predictors: (Constant), Distribution Control Systems

The ANOVA test results in table 4.34 show that the model used was fit for the regression analysis (F=17.776, p=0.000). The results obtained from the regression analysis can, therefore, be used as they are valid and did not occur by chance.

Coefficients table shows the contribution of distribution control systems as an independent variable to performance, the dependent variable. The results are shown in table 4.35.

Table 4.35: Coefficients for Hypothesis 3

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	24.489	4.609		5.313	.000
1	Distribution Control Systems	.435	.103	.429	4.216	.000

a. Dependent Variable: Performance

$Y = 24.489 + 0.435X_3$

X_3=Distribution Control Systems

The results of the coefficients table show that the contribution of distribution control systems was 0.435 for every unit change in the performance of manufacturing firms in Kenya.

According to regression results shown in tables 4.33, 4.34 and 4.35, H_3: $\beta_3 \neq 0$ (β=0.435) and $p < 0.05$ (p=0.000). The null hypothesis which stated that distribution control systems have no significant influence on the performance of manufacturing firms in Kenya was therefore rejected and alternative hypothesis adopted that distribution control systems have significant influence on the performance of manufacturing firms in Kenya.

4.9.4 Hypothesis 4 Testing Results

The third hypothesis sought to test the influence of lead time systems on the performance of manufacturing firms. Hypothesis 4: H_{04}: Lead Time has no significant influence on the performance of manufacturing firms in Kenya. A simple linear regression analysis was conducted using the following model;

$Y = \beta_0 + \beta_4 X_4 + έ$

Where:

Y = performance of manufacturing firms

β_0 = Constant (Coefficient of intercept)

β_4= Regression coefficient of X_4

X_4 = Lead Time Systems

έ = Error Term

H_0: $\beta_4 = 0$ vs H_4: $\beta_4 \neq 0$

Reject H_0 if $p < 0.05$, otherwise fail to reject the H_0

Lead time was regressed against performance. The regression results are shown in table 4.36.

Table 4.36: Model Summary for Hypothesis 4

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.276[a]	.076	.065	3.04842

a. Predictors: (Constant), Lead Time Systems

The results of the regression analysis of lead time systems against performance show that lead time systems can explain 7.6% of the change in the performance of manufacturing firms in Kenya as indicated by the value of R^2 (0.076).

The ANOVA test was done to determine whether the model used for analysis was fit. The ANOVA test results are presented in table 4.37.

Table 4.37: ANOVA Test for Hypothesis 4

Model		Sum Squares	ofdf	Mean Square	F	Sig.
1	Regression	60.630	1	60.630	6.524	.013[b]
	Residual	734.136	80	9.293		
	Total	794.765	81			

a. Dependent Variable: Performance

b. Predictors: (Constant), Lead Time

The ANOVA test results in table 4.37 show that the model used was fit for the regression analysis (F=6.524, p=0.013). The results are therefore valid and can be used to make conclusions.

Coefficients show the contribution of lead time to performance in the regression analysis and its significance. The results are presented in table 4.38.

Table 4.38: Coefficients for Hypothesis 4

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	48.741	1.934		25.200	.000
	Lead Time	-.134	.053	-.276	-2.554	.013

a. Dependent Variable: Performance

$Y= 48.741 + -0.134X_4$

X_4=Lead Time Systems

Results in coefficients table have shown that the contribution of lead time was -0.134 for every unit change in the performance of manufacturing firms in Kenya.

The regression analysis results in tables 4.36, 4.37 and 4.38 show that H_4: $\beta_4 \neq 0$ (β=-.134) and $p < 0.05$ (p=0.013). The null hypothesis which stated that lead time has no significant influence on the performance of manufacturing firms in Kenya was therefore rejected and alternative hypothesis adopted that; lead time has significant influence on the performance of manufacturing firms in Kenya.

4.9.5 Hypothesis 5 Testing Results

Four major conditions should be met for a variable to be classified to have an intervening effect. That is; first, the predictor variable should demonstrate a high level of significant relationship with the response variable holding the mediating variable constant. Secondly, the predictor variable should show a statistically significant connection with the mediator variable while holding the response variable constant. Thirdly, the mediator variable should portray a significant link to the response variable assuming that predictor variable is not changing. Lastly, on regressing the predictor variable against the response variable in the presence of the intermediating variable, the results are that the predictor has insignificant influence on the response variable as compared to the effect caused by the mediating variable on the response variable.

The first step for testing the intermediation effect in the current study entailed regression of multi-echelon distribution systems (MDS-predictor variable) and performance of manufacturing firms (PER-response or dependent variable). At this time the mediating variable (organisational policy) is held constant.

$PER = \beta_0 + \beta_1 MDS + \varepsilon$……………………………………………………… (i)

Where: PER is the performance of manufacturing firms which is a composite value; MDS is multi-echelon distribution systems (made up of demand forecasting, ICT integration, distribution systems, and lead time); β_0 is regression coefficient or the y-intercept, β_1 is regression coefficient of MDS and ε is the random error term.

Multi-echelon distribution systems were regressed against performance. The results are shown in table 4.39.

Table 4.39: Model Summary for Hypothesis 5a

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.387[a]	.150	.139	2.92448

a. Predictors: (Constant), MDS

Results of regressing multi-echelon distribution systems against performance have shown that multi-echelon distribution systems can explain 15% change in the performance of manufacturing firms in Kenya. This is indicated by the value of R^2 (0.150).

The ANOVA test was done to determine whether the model used for analysis was fit. The ANOVA test results are presented in table 4.40.

Table 4.40: ANOVA Test for Hypothesis 5a

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	119.109	1	119.109	13.927	.000[b]
1	Residual	675.656	80	8.553		
	Total	794.765	81			

a. Dependent Variable: Performance

b. Predictors: (Constant), MDS

The ANOVA test results shown in Table 4.40 show that the model used was fit for the regression analysis (F=13.927, p=0.000).

Coefficients table shows the contribution of multi-echelon distribution systems to change in performance. The results are presented in table 4.41.

Table 4.41: Coefficients for Hypothesis 5a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.891	8.845		1.231	.222
	MDS	.177	.047	.387	3.732	.000

a. Dependent Variable: Performance

The results in the coefficients table show that the contribution of multi-echelon distribution systems was 0.177 for every unit change in the performance of manufacturing firms in Kenya.

The regression analysis results of performance against multi-echelon distribution systems shown in tables 4.39, 4.40 and 4.4 indicate that multi-echelon distribution systems explain 15% change in the performance of manufacturing firms (R^2=.150). The model used is fit as shown by a significant F statistic (F=13.927, p=0.000). For every unit change in MDS, there will be 0.177 change in performance (β=.177).

The second step for the testing of intermediation effect involved performance of linear regression between MDS which is the predictor variable and organisational policy (OP) which was the proposed mediating variable (Performance of manufacturing firms is not changing; it is constant);

$MDS = \beta_0 + \beta_2 OP + \varepsilon$.. (ii)

Where: MDS is multi-echelon distribution systems; OP is organisational policy; β_0 is regression coefficient; β_2 is regression coefficient of OP and ε is the random error term.

Multi-echelon distribution systems were regressed against organisational policy. The results of the regression analysis are shown in table 4.42.

Table 4.42: Model Summary for Hypothesis 5b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.358[a]	.128	.117	6.46796

a. Predictors: (Constant), Organisational Policy

The regression analysis results of multi-echelon distribution systems against organisational policy show that organisational policy explains 12.8% of the change in multi-echelon distribution systems (R^2=.128).

The ANOVA test was conducted to determine the suitability of the model used. The results of the ANOVA test are presented in table 4.43.

Table 4.43: ANOVA Test for Hypothesis 5b

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	486.280	1	486.280	11.624	.001[b]
	Residual	3304.930	80	41.835		
	Total	3791.210	81			

a. Dependent Variable: MDS

b. Predictors: (Constant), Organisational Policy

The fitness of the model used in the regression analysis is confirmed by a significant F statistic (F=11.624, p=0.001).

Coefficients table shows the contribution of multi-echelon distribution systems to change in performance of manufacturing firms in Kenya. The results are presented in table 4.44.

Table 4.44: Coefficients for Hypothesis 5b

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	173.785	3.682		47.193	.000
	Organisational Policy	.533	.156	.358	3.409	.001

a. Dependent Variable: MDS

The results show that for every unit change in organisational policy, there is 0.533 change in multi-echelon distribution systems (β=.533).

The third level of testing for intermediation effect is to regress the mediating variable which in this case is an organisational policy against response variable which is the performance of manufacturing firms, holding the predictor variable constant (MDS);

$PER= \beta_0 + \beta_3 OP + \varepsilon$….. (iii)

Where: PER is the performance of manufacturing firms; β_0 is regression constant; β_3 is regression coefficient of OP (organisational policy), and ε is the random error term.

The organisational policy was regressed against the performance of manufacturing firms. The results are shown in table 4.45.

Table 4.45: Model Summary for Hypothesis 5c

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.226[a]	.051	.039	3.09008

a. Predictors: (Constant), Organisational Policy

The regression analysis results of performance and organisational policy in tables 4.45 show that organisational policy can explain 5.1% of the performance of manufacturing firms (R^2=.051).

The ANOVA test was conducted to establish the fitness of regression model used. The results are shown in table 4.46.

Table 4.46: ANOVA Test for Hypothesis 5c

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.425	1	40.425	4.234	.043[b]
	Residual	754.341	80	9.549		
	Total	794.765	81			

a. Dependent Variable: Performance

b. Predictors: (Constant), Organisational Policy

A significant F statistic (F=4.234, p=0.043) shows that the model used was fit for the regression analysis hence results are valid and can be used for making conclusions.

Coefficients table show the contribution of organisational policy to performance. The results are shown in table 4.47.

Table 4.47: Coefficients for Hypothesis 5c

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	47.427	1.759		26.958	.000
	Organisational Policy	-.154	.075	-.226	-2.058	.043

a. Dependent Variable: Performance

The results show that for every unit change in organisational policy, there will be -0.154 change in performance (β=-.154).

The final stage of intermediation testing process is step four whereby regression of the predictor variable (MDS) against response variable (PER) is performed in the presence of mediating variable (organisational policy-OP) as follows;

$PER = \beta_0 + \beta_4 MDS + \beta_5 OP + \varepsilon$…………………………...……………..…… (iv)

Where; PER = Performance of manufacturing firms, β_0 is y-intercept or regression constant, β_4 and β_5 are regression coefficients of multi-echelon distribution systems and organisational policy, and ε is the random error term. Intervening effect is assumed to have taken place if predictor variable (MDS) shows a significant prediction of both responses variable (where in this case it is performance of manufacturing firms and mediating variable (organisational policy) and on the other hand portray no significant prediction of the response variable in the presence of the mediating variable.

Performance of manufacturing firms was regressed against multi-echelon distribution systems and organisational policy. The results are shown in table 4.48.

Table 4.48: Model Summary for Hypothesis 5d

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.550[a]	.302	.284	2.66685

a. Predictors: (Constant), Organisational Policy, MDS

The regression analysis results of performance against multi-echelon distribution systems and organisational policy in table 4.48 show that multi-echelon distribution systems and organisational policy explain 28.4% change in performance of manufacturing firms in Kenya (Adj. R^2=.284).

The ANOVA test was conducted to establish whether the model used for the regression analysis was fit. Results are shown in table 4.49.

Table 4.49: ANOVA Test for Hypothesis 5d

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	240.023	2	120.012	16.874	.000^{b}
	Residual	554.742	79	7.112		
	Total	794.765	81			

a. Dependent Variable: Performance

b. Predictors: (Constant), Organisational Policy, MDS

The F statistic is significant as shown in table 4.24 (F=4.234, p=0.000) hence the model used for analysis was fit.

Coefficients table shows the contribution of multi-echelon distribution systems and organisational policy to the performance of manufacturing firms in Kenya. Results are shown in table 4.50.

Table 4.50: Coefficients for Hypothesis 5d

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.719	8.203		.575	.567
	MDS	.246	.046	.537	5.298	.000
	Organisational Policy	-.285	.069	-.418	-4.123	.000

a. Dependent Variable: Performance

The results show that for every unit change in multi-echelon distribution systems there is a 0.246 positive change in performance (β=.246) while for every unit change in organisational policy, there is a 0.285 negative change in performance (β= -.285).

Taking the assumptions of intervening effect where MDS is expected to show a significant prediction of both performance and organisational policy separately and on the other hand portray no significant predictor of performance in the presence of the organisational policy, the results show that organisational policy had no intervening effect on performance and MDS. We, therefore, fail to reject the null hypothesis that organisational policy has no significant intervening effect on performance and multi-echelon distribution systems in manufacturing firms in Kenya.

4.10 Optimal/Final Model

After the diagnostic tests, all constructs in the dependent variable performance (quality, flexibility and supplier reliability) were adopted. The same case applied to the independent variables where all constructs were adopted. However, the intervening variable was dropped as the study established that organisational policy had no intervening effect on the relationship between multi-echelon distribution systems and performance of manufacturing firms in Kenya. The new optimal framework representing this change is presented in figure 4.4.

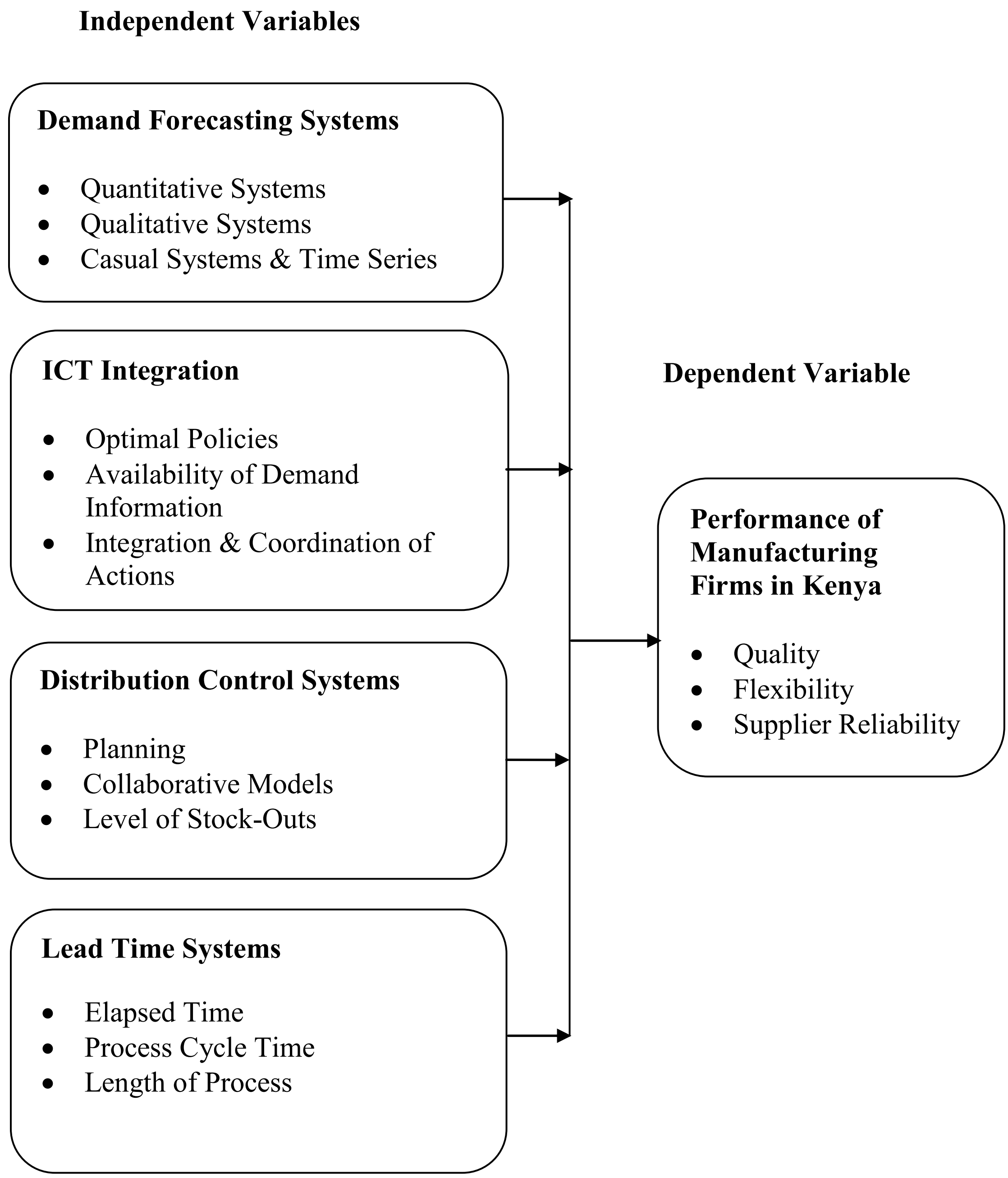

Figure 4.4: Optimal/Final Model

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter covers the summary of the key findings, conclusion and recommendations of the study. The presentation revolves around the key themes of the study namely demand forecasting, ICT integration, distribution control system, lead time, organisational policy and performance. It also presents suggestions for further research.

5.2 Summary of Major Findings

This study sought to establish the role of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. It focused on four elements of multi-echelon distribution systems which comprised of demand forecasting, ICT integration, distribution control systems, and lead time. The study also sought to determine the intervening effect of organisational policy on the relationship between multi-echelon distribution systems and the performance of manufacturing firms in Kenya. A review of literature established that demand forecasting was focused on decision making without showing a direct link a multi-echelon system and performance. It also emphasised on the fulfillment of the customer requirements, reducing risk and in the measurement of process improvement without taking into consideration the context of multi-echelon distribution systems and the influence this has on the performance of manufacturing firms. The literature reviewed revealed that ICT integration focus was on reducing bullwhip and reducing distribution costs. However, further analysis to reveal its role in multi-echelon distribution systems and its influence on the performance of manufacturing firms was lacking. The literature further established that inventories as well as lead time increases costs and were expected to reduce performance. This, however, was not shown empirically. The literature revealed scholars focus either on one element of multi-echelon distribution systems and conduct their analysis from a single perspective or investigate them adopting only one of the aspects of their application. This study sought to bridge this by combining the elements.

A pilot study was conducted with ten manufacturing firms where supply chain managers participated to provide information on the role of multi-echelon distribution systems in manufacturing firms in Kenya. This helped in testing the reliability and validity of research instruments used for the study. In the main study, data was collected from 81 respondents using a semi-structured questionnaire. Data was analysed using descriptive and inferential statistics, and results were presented using tables and charts.

5.2.1 Demand Forecasting Systems

The study sought to establish the influence of demand forecasting as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The study revealed that demand forecasting explained 7.6% of the change in the performance of manufacturing firms in Kenya. For a unit increase in demand forecasting, the performance of manufacturing firms would increase by 0.236 units. The findings are in agreement with Asmus, Cauley and Maroney (2006) who argued that forecasting is a fundamental step in demand management that optimises the customer satisfaction through capabilities of the supply chain. They further recognised its impact on the fulfillment of the customer requirements, reducing risk and in the measurement of process improvement. The findings are also in agreement with Albarune and Habib (2015) who found demand forecasting to have limitations and few practical solutions in a business organisation. The findings confirm a conclusion by Kot, Grondys and Szopa (2011) that the character of data flow and the type of cooperation between the links in the whole supply chain is essential.

5.2.2 ICT Integration

The study sought to determine the influence of ICT integration as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. ICT integration was found to explain 33.9% of the change in the performance of manufacturing firms in Kenya. The results also revealed that for every unit increase in ICT integration there is 0.507-unit increase in the performance of manufacturing firms. The findings were congruent with observations by Nyabwanga and Ojera (2012) that horizontal and vertical collaborative mechanisms and functionalities of ICT are critical to enhancing integration in a supply chain. The findings of this study also agree with those by Devaraj et al. (2007) who established that capability supporting supply chain technologies such as customer orders, purchasing and collaboration between suppliers and customer enhances the production information integration intensity, which in turn improves the supply chain performance. The findings also confirm Li et al. (2009) assertion that supply chain integration mediates the relationship between IT implementation and supply chain performance. Hence, IT can be a good enabler to integrate supply chain.

5.2.3 Distribution Control Systems

The study sought to establish the influence of distribution control systems as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The results revealed that distribution control systems account for 18.4% of the change in the performance of manufacturing firms in Kenya. It was also found that for every unit change in distribution control systems there is 0.435 units increase in the performance of manufacturing firms. The findings of this study are in agreement with observations by Gadde et al. (2010) who identified tangible (quantifiable) and intangible (difficult to quantify) benefits. Tangible benefits included the cost of supply reduction, tender costs reduction and lead time savings. Intangible benefits included process improvement and organisational benefits. Doggett (2005) in a similar manner identified five impacts of distribution control systems, namely: change in total cost of acquisitions, changes in organisational characteristics, changes in governance structure, management and implementation. The results are also congruent with an assertion by Amiri (2006) on the impacts of distribution systems in the procurement process. He identified strengths and weaknesses as internal performance measurement in the procurement process, and opportunities and threats were identified as the electronic environments that support distribution systems.

5.2.4 Lead Time Systems

The study sought to determine the influence of lead time systems as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The findings revealed that lead time accounted for 7.6% of the change in the performance of manufacturing firms in Kenya. The study also established that for every positive change in lead time, there was a negative change in the performance of manufacturing firms in Kenya by 0.134 units. The findings of this study were in agreement with Bowersox and Closs (2002) who demonstrated that improvement in continuity of supplies with reduced lead time systems, will lead to improvement in cooperation and will also enhance cooperation's and communications with reduced duplication of efforts, reduction in material costs and improvement in quality control. The results also were in tandem with the conclusion by Sirias and Mehra (2005) that the lead time systems-dependent discount systems could be more promising for the supply chains, especially for the manufacturing sector.

5.2.5 The Overall Effect of the Variables

Multi-echelon distribution systems were expected to show a significant prediction of both performance and organisational policy and on the other hand, portray no significant predictor of performance in the presence of organisational policy. However, the results showed that organisational policy had no intervening effect on performance and multi-echelon distribution systems. The findings are in disagreement with Ferguson and Terrion (2014) who viewed communication as one of the most fundamental and pervasive of all management activities.

The findings also went against the notion created by Mathis and Jackson (2005) that human resource policy when organised and disseminated in an easily used form, can serve to pre-empt many misunderstandings between employees and employers about their rights and obligations in the business place hence significantly influencing performance.

The findings are also not in tandem with observations by Gill (2002) who saw governance, one element of organisational policy, as about the structures and processes in place to facilitate and monitor the effective management of an organisation, including mechanisms to ensure legal compliance and prevent improper or unlawful behaviour for improved performance.

5.3 Conclusion

The study sought to establish the role of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. To achieve this objective, it focused on four elements of multi-echelon distribution systems which comprised of demand forecasting, ICT integration, distribution control systems, and lead time. ICT integration and distribution control systems are the two elements of multi-echelon distribution systems that have the most significance on the performance of manufacturing firms in Kenya. The intervening effect of organisational policy on the relationship between multi-echelon distribution systems and the performance of manufacturing firms in Kenya was also investigated.

The study sought to establish the influence of demand forecasting systems as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The study concluded that demand forecasting significantly influences the performance of manufacturing firms in Kenya. Demand forecasting systems are a fundamental step in demand management that optimises the customer satisfaction through capabilities of the supply chain. It has a significant impact on the fulfillment of the customer requirements, reducing risk and in the measurement of process improvement. However, it has its limitations and few practical solutions in a business organisation. The most critical aspect of demand forecasting is the character of data flow, and the type of cooperation between the links in the whole supply chain is essential.

The study sought to determine the influence of ICT integration as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The study concluded that ICT integration significantly influences the performance of manufacturing firms in Kenya. The horizontal and vertical collaborative mechanisms and functionalities of ICT are critical in enhancing integration in a supply chain. The capability of supporting supply chain technologies such as customer orders, purchasing and collaboration between suppliers and customer enhances the production information integration intensity, which in turn improves performance. ICT can, therefore, be a good enabler to integrate supply chain.

The study sought to establish the influence of distribution control systems as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. The study concluded that distribution control systems significantly influence the performance of manufacturing firms in Kenya. It has tangible and intangible benefits. Tangible benefits include the cost of supply reduction and lead time savings. Intangible benefits include process improvement and organisational benefits.

The study sought to determine the influence of lead time as an element of multi-echelon distribution systems on the performance of manufacturing firms in Kenya. It concluded that lead time systems significantly and negatively influences the performance of manufacturing firms in Kenya. Improvement in the continuity of supplies with reduced lead times systems will lead to improvement in cooperation and will also enhance cooperation and communications with reduced duplication of efforts, reduction in material costs and improvement in quality control.

Multi-echelon distribution systems were expected to show a significant prediction of both performance and organisational policy separately and on the other hand, portray no significant predictor of performance in the presence of organisational policy. However, based on failure to fulfil assumptions for intervening effect, this study concluded that organisational policy had no intervening effect on performance and multi-echelon distribution systems. Though communication, governance and human resource are essential elements of organisational policy, in this study, they were not found to significantly have an impact on the relationship between multi-echelon distribution systems and performance of manufacturing firms in Kenya.

5.4 Recommendations

The recommendations of the study are based on the objectives of the study. These objectives include to examine the influence of demand forecasting on performance of manufacturing firms, to determine influence of ICT integration on performance of manufacturing firms, to establish influence of distribution control systems on performance of manufacturing firms, and to determine influence of lead time on performance of manufacturing firms.

5.4.1 Demand Forecasting Systems

This study recommends to stakeholders of the manufacturing firms that they should adopt quantitative systems, qualitative systems, causal systems and time series for demand forecasting systems. This will not only optimise the customer satisfaction through capabilities of the supply chain have a positive impact on the fulfillment of the customer requirements, reducing risk and in the measurement of process improvement. The study also recommends to the scholars and academicians that they should carry out more studies in the same field using different variables so as to compare the findings with those of the current study. To the public and private organizations, they should strive to adopt demanding forecasting systems since it has been established that it influences the performance of an organization. The study further recommends to the managements of state corporations and government agencies that, they support the manufacturing firms in the country as they strive to achieve excellence in their performance. Finally, the government and other policy makers should come up with policies making it possible for the manufacturing firms to access grants and loans to be able to implement the strategies they seek to incorporate in their manufacturing for better performance.

5.4.2 ICT Integration

The study recommends to the stakeholders and managements of manufacturing firms in Kenya that they should strive to adopt ICT integration in their supply chain to achieve timeliness, consistency and accuracy. These can be achieved through having optimal information access and communication policies, sufficient availability of demand information, integration in the supply chain and coordination of actions through ICT. The horizontal and vertical collaborative functionalities of ICT supporting supply chain technologies such as customer orders, purchasing and collaboration between suppliers and customers enhances the production and demand information integration intensity, which in turn improves performance. In addition to this, the study recommends to the scholars and academicians that they should carry out more studies in the same field using different variable other than ICT integration so as to compare the findings with those of the current study. To the public and private organizations, they should strive to adopt ICT integration since it has been established that it influences the performance of an organization. The study further recommends to the managements of state corporations and government agencies that, they support the manufacturing firms in the country as they strive to achieve excellence in their performance through the implementation of ICT integration. Finally, the government and other policy makers should come up with policies making it possible for the manufacturing firms to access grants and loans to be able to implement ICT integration.

5.4.3 Distribution Control Systems

Based on the findings and the conclusions of this study, it is recommended to the management and stakeholders of manufacturing firms in Kenya that they should employ aspects of distribution control systems as, according to this study, is one of the most critical elements of multi-echelon distribution systems. It will enable them not only to reap tangible benefits such as the cost of supply reduction and lead time savings but also intangible benefits such as process improvement and other organisational benefits. This can be achieved through the maintenance of an optimum level of investment in distribution and attaining required operational performance. Meeting customer demand and avoiding stock-outs are avoided as well as lowering distribution costs are critical towards this goal. Manufacturing firms should also ensure that there is optimal ordering in each echelon, vendor managed distribution systems, and forecasting and replenishment are used. The integration of the suppliers, factories and customers are also critical in employing distribution control systems. In addition, it is recommended to the scholars and academicians that they should carry out more studies in the same field using an appropriate alternative of distribution control systems so as to compare the findings with those of the current study. To the public and private organizations, they should strive to adopt distribution control systems since it has been established that it influences the performance of an organization. The study further recommends to the managements of state corporations and government agencies that, they support the manufacturing firms in the country as they strive to achieve excellence in their performance through adoption of distribution control systems. Finally, the government and other policy makers should come up with policies making it possible for the manufacturing firms to access grants and loans to be able to implement distribution control systems.

5.4.4 Lead Time Systems

Based on the findings and conclusions, the study recommends to the managements and stakeholders of manufacturing firms in Kenya that they should ensure that they are proactive in activities that reduces lead time systems as revealed in the study. This can be achieved through ensuring that there is responsiveness to customers' demands regarding pricing, there is high order processing rate and adequate delivery to location (on-time in-full). Manufacturing firms should also ensure that delivery planning is adequate and there is responsiveness to customers' demands regarding product differentiation as well as responsiveness to customers' demands regarding short delivery time. In addition, manufacturing firms should facilitate high order fulfilment rate, inventory replenishment and sufficient delivery speed. In addition, it is recommended to the scholars and academicians that they should conduct further research to determine other ways in which lead time is capable of influencing performance of other organizations other than manufacturing firms.

5.4.5 Multi-echelon Distribution Systems, Organisational Policy and Performance

This study recommends to the managements and thee stakeholders of manufacturing firms in Kenya that they should have human resource development programs and adequate training on new technology and tools used in their respective companies.

This is because the human resource is a critical component of organisational policy in manufacturing firms.

5.5 Suggestions for Further Research

This study has covered four dimensions of multi-echelon distribution systems namely demand forecasting, ICT integration, distribution control systems and lead time and their influence on the performance of manufacturing firms. Future research should increase this scope by including other variables and expanding measures of performance. Further research should also cover a larger geographical region and compare the manufacturing sector with other sectors. This will help in establishing whether findings on a link between multi-echelon distribution systems and the performance of manufacturing firms can be generalised to other industries.

Future research should also seek to establish the role of human resource in the relationship between multi-echelon distribution systems and the performance of manufacturing firms. Organisational policy as a whole was not found to have an intervening effect. Future scholars could test other prospective intervening variables such as work environment, motivation and productivity of employees. Further research should also seek to uncover the specific elements of demand forecasting, ICT integration, distribution control systems and lead time that are crucial for other industries outside the manufacturing sector.

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APPENDICES

Appendix I: Questionnaire

This questionnaire is aimed at collecting data required for a study entitled "Influence of outsourcing third-party logistics providers on the performance of food and beverages manufacturing companies in Kenya" in partial fulfillment of the requirements for the award of PhD in supply chain Management of Jomo Kenyatta University of Agriculture and Technology. The questionnaire forms an integral part of the study and respondents are kindly requested to complete it and to give any additional information they may feel is necessary for the study. The data required is needed for academic purpose only and will be treated with strict confidentiality.

PART A

ORGANISATIONAL DATA

Please provide the following information regarding your organisation.

1. Company name (optional) ____________________

2. What type of products are manufactured in your firm? (Tick as appropriate)

a) Edibles [ ]
b) Non-Edibles [ ]

3. What is the ownership of the company? (Tick one)

a) Local [ ]
b) Foreign [ ]
c) Both [ ]

4. What markets are served by your products? (Tick One)

a) Domestic markets only [ ]
b) Foreign markets only [ ]
c) Both Domestic and Foreign [ ]

PART B

Demand Forecasting Systems

1. Please indicate the extent to which you use the following methods for Demand Forecasting in your company. Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent)

Statement	1	2	3	4	5
Quantitative Systems a) Last period demand					
b) Multiplicative seasonal indexes					
c) Simple and weighted moving averages					
Qualitative Systems a) Delphi method					
b) Historical life cycles of similar products					
c) Market research					
Causal Systems a) Holidays					
b) Seasons					
Time series a) Frequency domain method					
b) Time domain method					

1. What other demand forecasting activities are conducted in your company?..
   ....

2. To what extent does demand forecasting achieve the following in your company? Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent)

Statement	1	2	3	4	5
a) Customer satisfaction					
b) Fulfilment of the customer requirements					
c) Reducing risk					
d) Process improvement					

ICT Integration

3. Please indicate the extent to which the following attributes of ICT Integration are exhibited by your company. Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent).

Statement	1	2	3	4	5
a) There are optimal information access and communication policies					
b) There is sufficient availability of demand information					
c) Activities in the supply chain are integrated					
d) There is coordination of actions through ICT					

4. Please indicate any other ICT Integration activities that are conducted in your company.

……………………………………………………………………………………...

5. Please indicate the extent to which ICT Integration has enabled the following your company. Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent).

Statement	**1**	**2**	**3**	**4**	**5**
Reliability a) Timeliness					
b) Consistency					
c) Accuracy					
Responsiveness d) Willingness to help					
e) Prompt attention to requests					
f) Problem resolution					
g) Complaint handling					

Distribution Control Systems

6. Please indicate the extent to which the following are employed in Distribution Control Systems of your company. Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent).

Statement	1	2	3	4	5
a) Maintenance of an optimum level of investment in distribution					
b) Achieved required operational performance					
c) Meeting customer demand					
d) Stock-outs are avoided					
e) Distribution costs have been lowered					
f) There is optimal ordering in each echelon					
g) Vendor managed distribution system is used					
h) Forecasting is used					
i) Replenishment is used					
j) There is integration of the suppliers, factories and customers					

7. Please indicate any other Distribution Control activities that are done in your company

…………………………………………………………………………………………...

Lead Time Systems

8. Please indicate the extent to which the following lead time activities apply to your company. Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent).

Statement	1	2	3	4	5
a) There is responsiveness to customers' demands in regard to product differentiation					
b) There is responsiveness to customers' demands in regard to pricing					
c) There is responsiveness to customers' demands in regard to short delivery time					
d) There is high order processing rate					
e) There is high order fulfilment rate					
f) Inventory replenishment					
g) Sufficient delivery speed					
h) Adequate delivery to location (on-time in-full)					
i) Delivery planning is adequate					

9. Please indicate any other lead-time activities that affect the performance of your company

…………………………………………………………………………………………...

Organisational Policy

10. Please indicate the extent to which the following organisational policy activities apply to your company. Please record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent).

Statement	1	2	3	4	5
Governance a) The company has a centralized organisational structure					
b) The company has a decentralized organisational structure					
Communication c) There is seemless communication across all cadres of employees in the company					
d) Communication within the company is structured					
Human resource e) There are human resource development programs in the company					
f) There is adequate training on new technology and tools used in the company					

11. Please indicate any other organisational policy activities that are done in your company

…………………………………………………………………………………………
…………………………………………………………………………………………
…………

Performance of Manufacturing Firms in Kenya

12. Please rate the performance of your company regarding the following indicators. Record your answer by ticking in the spaces provided, by the scale indicator (1=not at all, 2=small extent, 3=moderate, 4=large extent, 5=very large extent).

Performance	**1**	**2**	**3**	**4**	**5**
a) There is a formal quality assurance system					
b) There is continuous improvement					
c) There is a statistical process control for quality					
d) Six sigma limits are used					
e) There is fail-safe lot traceability					
f) Incoming quality is assured					
g) Flexibility allows low supply chain response time (number of days it takes to respond to marketplace changes)					
h) Suppliers have adequate billing accuracy					
i) Suppliers have adequate order accuracy					
j) On-time completion by suppliers					
k) Suppliers keep promises					

13. Please indicate other ways which you can rate the performance of your company

…………………………………………………………………………………………………
……

THANK YOU FOR YOUR TIME!!!

Appendix II: Membership Composition of KAM as of 2017

Sector	Members	Sample
Building, Mining & Construction	49	5
Chemical & Allied Sectors	159	16
Energy, Electrical & Electronics	45	5
Food & Beverages	187	19
Leather & Footwear	9	1
Metal & Allied Sector	104	10
Motor Vehicle & Accessories	71	7
Paper & Board	54	5
Pharmaceutical & Medical Equipment	54	5
Plastics & Rubber	77	8
Fresh Produce	11	1
Textiles & Apparels	44	4
Timber, Wood & Furniture	39	4
TOTAL	**903**	**90**

Appendix III: Manufacturing Firms by Sector

Building, Mining & Construction Sector

1. African Diatomite Industries
2. Athi River Mining Ltd
3. Bamburi Cement Ltd
4. Bamburi Special Products Ltd
5. Boyama Building Materials
6. East African Portland Cement Company Ltd
7. Erdemann Gypsum Ltd
8. Flamingo Tiles (Kenya)Ltd
9. Glenn Investments Ltd C/O The Mehta Group Ltd
10. Homa Lime Co. Ltd
11. International Green Structures Manufacturing Kenya Ltd
12. Kay Salt Ltd
13. Kemu Salt Packers Productions Ltd
14. Kenbro Industries Ltd
15. Kenya Builders & Concrete Ltd
16. Kisumu Concrete Products
17. Koto Housing Kenya Ltd
18. Krystalline Salt Ltd
19. Kurawa Industries Ltd
20. Lexcon Enterprises Ltd
21. Malindi Saltworks Ltd
22. Mombasa Cement Ltd
23. National Cement Ltd
24. Orbit Enterprises Ltd
25. Pride Enterprises Ltd
26. Reliable Concrete Works Ltd

27. Rexe Roofing Products
28. Saj Ceramics Ltd
29. Sandblasting & Coating (K) Ltd
30. Savannah Cement Ltd
31. Skylark Construction Ltd
32. Space and Style Ltd
33. Tana River Quarrying Ltd
34. Tile & Carpet Centre
35. Twyford Ceramics LtdPlenser Ltd
36. Pentagon Agencies
37. Marshall Fowler (Engineers) Ltd
38. Holman Brothers (E.A) Ltd
39. Baumann Engineering Ltd
40. Aquila Development Co. Ltd
41. Asano International Ltd
42. Assa Abloy East Africa Ltd
43. Roka Industries Ltd
44. Muhoroni Briquette Co. Ltd
45. IMCD Kenya Ltd
46. Kanku Kenya Ltd
47. Sanergy Ltd
48. Sanvoks Industries Ltd
49. Rumorth EA Ltd

Chemical & Allied Sector

1. Anffi Kenya Ltd
2. Basco Products (K) Ltd

3. Basf East Africa Ltd
4. Bayer East Africa Ltd
5. Beiersdorf East Africa Ltd
6. Blue Ring Products Ltd
7. BOC Kenya Ltd
8. Buyline Industries Ltd
9. Canon Chemicals Ltd (former United Chemicals Ltd)
10. Carbacid (CO2) Ltd
11. Central Glass Industries Ltd
12. Chrysal Africa Ltd
13. Chryso Eastern Africa Ltd
14. Cooper K- Brands Ltd
15. Coral Paints Ltd
16. Crop Nutrition Laboratory Services Ltd
17. Crown Paints (Kenya) Ltd
18. Darfords Enterprises Ltd
19. Decase Chemicals (Ltd)
20. Deluxe Inks Ltd
21. Desbro Kenya Ltd
22. Diversey Eastern and Central Africa Ltd
23. Dow Chemicals East Africa Ltd
24. Eastern Chemicals Industries Ltd
25. Elex Products Ltd
26. Enviro Hub Holdings Ltd
27. Evonik East Africa
28. Flame Tree Africa Ltd
29. Galaxy Paints & Coating Co. Ltd
30. H.B. Fuller Kenya Ltd
31. Haco Tigerbrands East Africa Ltd

32. Henkel Kenya Ltd
33. Henkel Polymer Company Ltd
34. Hi-Tech Inks & Coatings Ltd
35. Highchem East Africa Ltd
36. Impact Chemicals Ltd
37. Instant Pest Control Services Ltd
38. Interconsumer Products Ltd
39. Jumbo Matress Industries Ltd
40. Kaolin Crowners Company Ltd
41. Kapi Ltd
42. Kel Chemicals Ltd
43. Kemia International Ltd
44. Ken Nat Ink & Chemicals Ltd
45. Kip Melamine Co. Ltd
46. L'Oreal East AfricaLtd
47. Maroo Polymers Ltd
48. MEA Ltd
49. Mekan (Kenya) Ltd
50. Metoxide Africa Ltd
51. Milly Glass Works Ltd
52. Murphy Chemicals (E.A)(Ltd
53. Norbrook Kenya Ltd
54. Odex Chemicals Ltd
55. Orbit Products Africa Ltd (Formerlt Orbit Chemicals)
56. Osho Chemicals Industries Ltd
57. Pan Africa Chemicals Ltd
58. PolyChem East Africa Ltd
59. Procter & Gamble East Africa Ltd
60. Protea Chemicals Kenya Ltd

61. Pyrethrum Board of Kenya
62. PZ Cussons EA Ltd
63. Reckitt Benckiser (E.A.) Ltd
64. Revolution Stores Ltd
65. Rok Industries Ltd
66. Rutuba Bio Agric and Organic Fertilizers company Ltd
67. Sadolin Paints (E.A.) Ltd
68. SC Johnson and Son Kenya
69. Seweco Paints Ltd
70. Shreeji Chemicals Ltd
71. Style Industries ltd (Previously Strategic)
72. Super Foam Ltd
73. Tropical Heat Ltd (Formerly Deepa Industries)
74. Spectre International Ltd
75. Spice World Ltd
76. Sigma Supplies Ltd
77. Shree Sai Industries
78. SBC Kenya Ltd
79. RAZCO Ltd
80. Re-Suns Spices Ltd
81. Promasidor (Kenya) Ltd
82. Propack Kenya Ltd
83. Pernod Ricard Kenya Ltd
84. Pearly LLP
85. Monwalk Investment Ltd
86. Morani Ltd
87. Selecta Kenya Gmbh & Co. .KG
88. Pearl Industries Ltd
89. Menengai Oil Refineries Ltd

90. DPL Festive Ltd
91. East African Seed Co. Ltd
92. Kenafric Industries Ltd
93. Mayfeeds Kenya Ltd
94. Nestle Kenya Ltd
95. Norda Industries Ltd
96. Pristine International Ltd
97. Agricultural & Veterinary Supplies Ltd (Agrivet)
98. Capwell Industries Ltd
99. CoffTea Agencies
100. Diamond Industries Ltd
101. Elekea Ltd
102. FRM EA Packers Ltd
103. Jungle Group
104. Kentaste Proucts Ltd
105. Landeco Ltd
106. Proctor & Allan (E.A.) Ltd
107. Cook 'N Lite Ltd
108. Khetshi Dharamshi & Co. Ltd
109. Kitchen King Ltd
110. Chandaria Industries Ltd
111. Questa Care Ltd
112. Dilpack Kenya Ltd
113. Techpak Industries Ltd
114. Sproxil East Africa
115. Sameer Agriculture & Livestock (Kenya) LTD
116. Megatech Ltd
117. Melvin Marsh International
118. MDI Ltd

119. Kenya Seed Company Ltd
120. Kenya Highland Seed Co. Ltd
121. Kedsta Investment Ltd
122. Gonas Best Ltd
123. Golden Africa Kenya Ltd
124. Frutarom Kenya (Ltd)
125. Frigoken Ltd
126. Giloil Company Ltd
127. Excel Chemicals Ltd
128. Erdemann Co. (K) Ltd
129. Europack Industries Ltd
130. Elle Kenya Ltd
131. Agro Chemical & Food Company Ltd
132. Synergy Gases (K) Ltd
133. Syngenta East Africa Ltd
134. Synresins Ltd
135. Tata Chemicals Magadi Ltd
136. Tri-Clover Industries (K) Ltd
137. Tropikal Brand (Afrika) Ltd
138. Match Masters Ltd
139. Skylight Chemicals Ltd
140. Oss.Chemie (K) Ltd
141. Elys Chemicals Industries Ltd
142. Biodeal Laboratories Ltd
143. Laboratory & Allied Ltd
144. Polyblend Ltd
145. Betatrad (K) Ltd
146. Autosterile (East Africa Ltd
147. Newline Ltd

148. Comply Industries Ltd
149. Straightline Enterprises Ltd
150. Le-Stud Ltd
151. Kema E.A. Ltd
152. Tarpo industries
153. Suman Shakti
154. Elburgit Enterprises Ltd
155. Roar Media Ltd
156. Marvel Lifestyle Ltd
157. Chalange Industries
158. Bedi Investments Ltd
159. Twiga Chemical Industries Ltd

Energy, Electrical and Electronics Sector

1. African Cables Ltd
2. Alternative Energy Systems Ltd
3. Amedo Centre Kenya Ltd
4. Aucma Digital Technology africa Ltd
5. Avery (East Africa) Ltd
6. Azuri Technologies Kenya Ltd
7. Biogas Power Holdings (EA) Ltd
8. Burn Manufacturing USA LLC
9. Centurion Systems Ltd
10. Daima Energy Services
11. East African Cables Ltd
12. Ibera Africa Power (EA) Ltd
13. Kenwest Cables Ltd
14. Kenya Petroleum Refineries Ltd
15. Kenya Power Co. Ltd

16. Libya Oil Kenya Ltd.(Formerly Mobil Oil Kenya)
17. Manufacturers & Suppliers (K) Ltd
18. Metlex International Ltd
19. Metsec Cables Ltd
20. Mustek East Africa
21. Nationwide Electrical Industries Ltd
22. Oilzone (East Africa) Ltd
23. Optimum Lubricants Ltd
24. Ourupower Ltd
25. Pan Africa Transformers & Switchgears Ltd
26. Patronics Services Ltd
27. PCTL Automation Ltd
28. Philips East Africa Ltd
29. Powerex Lubricants Ltd
30. Premier Solar Solutions Ltd
31. Protel Studios
32. Rabai Power Ltd
33. Repelectric (K) Ltd
34. Rich Enviro Fuels Ltd
35. Schneider Electric Ltd
36. Siera Cables
37. Sloimppexs Africa Ltd
38. Socabelec (EA) Ltd
39. Solimpexs Africa Ltd
40. Solinc East Africa Ltd (Formerly Ubbink East Africa)
41. Sollatek Electronics (Kenya) Ltd
42. Specialised Power Systems Ltd
43. Steam Plant Ltd
44. Synergy Lubricant Solutions Ltd

45. Synergy-Pro

Food & Beverages Sector

1. Aariva Ltd
2. Afribon (K) Ltd
3. Africa Spirits Ltd
4. African Coffee
5. Afrimac Nut Company
6. Agri Pro-Pak Ltd
7. Agricultural & Veterinary Supplies Ltd (Agrivet)
8. Agriner Agricultural Development
9. Al-Mahra Industries Ltd
10. Alliance One Tobacco Kenya Ltd
11. Almasi Beverages Ltd
12. Alpha Fine Foods Ltd
13. Alpha Grain Millers Ltd
14. Alpine Coolers Ltd
15. Aquamist Ltd
16. Arkay Industries Ltd
17. Aviano East Africa
18. Bakers Corner Ltd
19. Bakex Millers Ltd
20. Bakhresa Grain Milling (K) Ltd
21. Bdelo Ltd
22. Belat Enterprises
23. Belfast Millers Ltd
24. Bidco Africa Ltd
25. Bio Food Products Ltd
26. Brava Foods

27. Breakfast Cereal Company (K) Ltd
28. British American Tobacco Kenya Plc
29. Broadway Bakery Ltd
30. Brookside Dairy Ltd
31. Brown Biashara Ltd
32. Buffalo Millers
33. Bulto Foods Ltd
34. Bunda Cakes & Feeds Ltd
35. Bunge East Africa Ltd
36. Burton and Bamber Company Ltd
37. Butali Sugar Mills Ltd
38. Buuri Millers Enterprises
39. Buzeki Dairy Ltd
40. C. Dormans Ltd
41. C.Czarnikow Sugar(EA) ltd
42. Cadbury Kenya Ltd
43. Caffe Del Duca Ltd
44. Candy Kenya Ltd
45. Capel Food Ingredients
46. Capwell Industries Ltd
47. Centrofood Industries Ltd
48. Chai Trading Company Ltd
49. Chemelil Sugar Company Ltd
50. Chirag Kenya Ltd
51. Coastal Bottlers Ltd
52. Coca-Cola East Central and West Africa Ltd
53. Coca-Cola Juices (K) Ltd
54. Coffee Agriworks Ltd
55. CoffTea Agencies

56. Crown Beverages LTD
57. Danone Baby Nutrition Africa and Overseas
58. Del Monte Kenya Ltd
59. Diamond Industries Ltd
60. Doinyo Lessos Creameries Ltd
61. DPL Festive Ltd
62. Dutch Waters Ltd
63. East African Breweries Ltd
64. East African Sea Food Ltd
65. East African Seed Co. Ltd
66. Eastern Produce Kenya Ltd (Kakuzi)
67. Edible Oil Poducts
68. Eldoret Grains Ltd
69. Elekea Ltd
70. Equator Bottlers Ltd
71. Farmers Choice Ltd
72. FRM EA Packers Ltd
73. General Mills East Africa Ltd
74. Githunguri Dairy Farmers Co-operative Society
75. Glacier Products Ltd
76. Global Fresh Ltd
77. Global Tea & Commodities (K) Ltd
78. Gold Crown Foods (EPZ) Ltd
79. Grain Bulk Handlers
80. Green Forest Foods Ltd
81. Happy Cow Ltd
82. Heritage Foods Kenya Ltd
83. Highlands Mineral Water Co. Ltd
84. Honey Care Africa

85. Insta Products (EPZ) Ltd
86. Italian Gelati & Food Products Ltd
87. Jambo Biscuits (K) Ltd
88. James Finlay Kenya Ltd
89. Jetlak Foods Ltd
90. Jjasm Mini-Distillery
91. Juja Coffee Exporters
92. Jungle Group
93. Kabianga Dairy Ltd
94. Kambu Distillers Ltd
95. Kamili Packers Ltd
96. Kapa Oil Refineries Ltd
97. Karirana Estate Ltd
98. Kenafric Bakery
99. Kenafric Industries Ltd
100. Kenblest Ltd
101. Kenchic Ltd
102. Kentaste Proucts Ltd
103. Kenya Co-Operative Coffee Dealers Ltd (KCCD)
104. Kenya Nut Company Ltd
105. Kenya Sweets Ltd
106. Kenya Tea Development Agency
107. Kenya Tea Growers Association
108. Kenya Tea Packers Ltd (KETEPA)
109. Kenya Wine Agencies Ltd
110. Kerio Valley Development Authority
111. Keroche Industries Ltd
112. Kevian Kenya Ltd
113. Kibos Sugar and Allied Industries

114. Kilimanjaro Biscuits Ltd
115. Kinangop Dairy Ltd
116. Kirinyaga Flour Mills
117. Kisii Bottlers Ltd
118. Koba Waters Ltd/ Broomhill Springs Water
119. Krish Commodities Ltd
120. Kuguru Food Complex Ltd
121. Kwale International Company Ltd
122. Kwality Candies & Sweets Ltd
123. Landeco Ltd
124. Luma Stores & Supplies Enter. Ltd
125. Mace Foods Ltd
126. Mafuko Industries Ltd
127. Malindi Natural Juice Processors Ltd
128. Mama Millers Ltd
129. Mamboleo Distillers Ltd (Formerly Kenlab Supplies Ltd
130. Manji Food Industries Ltd
131. Mastermind Tobacco (K) Ltd
132. Mayfeeds Kenya Ltd
133. Menengai Oil Refineries Ltd
134. Meru Greens Horticulture Ltd
135. Meru Water & Sewerage Services
136. Milly Fruit Processors Ltd
137. Mini Bakeries (Nbi) Ltd
138. Miritini Kenya
139. Mjengo Ltd
140. Mombasa Maize Millers Ltd
141. Mount Kenya Bottlers Ltd
142. Mumias Sugar Co. Ltd

143. Munyiri Special Honey Ltd
144. Mwanga Millers
145. Mzuri Sweets Ltd
146. Nairobi Bottlers Ltd
147. Nairobi Flour Mills Ltd
148. Nal Packaging Holdings Ltd
149. NAS Airport Services Ltd
150. NesFoods Industries Ltd
151. Nestle Kenya Ltd
152. New Kenya Co-Operative Creameries Ltd
153. Nicey Nicey Maize Millers Ltd
154. Nicola Farms Ltd
155. Njoro Canning Factory(Kenya) Ltd
156. Norda Industries Ltd
157. Nzoia Sugar
158. Olivado EPZ Ltd
159. Palmhouse Diaries Ltd
160. Patco Industries Ltd
161. Pearl Industries Ltd
162. Pembe Flour Mills Ltd
163. Platinum Distillers Ltd
164. Premier Flour Mills Ltd
165. Premier Food Industries Ltd
166. Pride Industries Ltd
167. Pristine International Ltd
168. Proctor & Allan (E.A.) Ltd
169. Pwani Oil Products Ltd
170. Rafiki Millers Ltd
171. Raka Milk Processors

172. Rift Valley Bottlers Ltd
173. Sahara Venture Capital Company Ltd
174. Salim Wazarani Kenya Company
175. Sameer Agriculture & Livestock (Kenya) LTD
176. Scepter Millers Ltd
177. Selecta Kenya Gmbh & Co. .KG
178. Simply Foods Ltd
179. Sky Foods Ltd
180. South Nyanza Sugar Company
181. Stawi Foods and Fruits Ltd
182. Sunny Processors Ltd
183. Sweet Rus Ltd
184. T.S.S. Grain Millers Ltd
185. Trufoods Ltd
186. Trust Feeds Ltd
187. Trust Flour Mills Ltd

Fresh Produce Sector

1. Big Flowers Ltd
2. Exotic Penina Fields Group Ltd
3. Flamingo Horticulture Kenya Ltd
4. Fresh Produce Exporters Association of Kenya
5. From Eden
6. Kankam Exporters Ltd
7. Kenya Horticultural Exporters (1977)
8. Mahee Flowers Ltd
9. Maridadi Flowers
10. Rainforest Farmlands Kenya
11. Sunland Roses Ltd

Leather and Footwear

1. Alpharama Ltd
2. Athi River Tanneries Ltd
3. Bata Shoe Co (K) Ltd
4. Budget Shoes Ltd
5. C & P Shoes Industries Ltd
6. Leather Industries of Kenya Ltd
7. Macquin Shoes Ltd
8. Sandstorm Africa Ltd
9. Norsam Enterprises

Metal and Allied Sector

1. African Marine & General Engineering Co. Ltd
2. Agro Irrigation & Pump Services Ltd
3. Allied East Africa Ltd
4. Alloy Steel Castings Ltd
5. Apex Steel Ltd - Rolling Mill Division
6. Arvind Engineering Ltd
7. Ashut Engineers
8. ASL Ltd
9. ASP Company Ltd
10. Athi River Steel Plant Ltd
11. Atlantic Ltd
12. Blue Nile Wire Products Ltd
13. Booth Extrusions Ltd
14. Brollo Kenya Ltd
15. Buhler Ltd
16. City Engineering Works Ltd

17. Cook 'N Lite Ltd
18. Corrugated Sheets Ltd
19. Crystal Industries Ltd
20. Davis & Shirtliff Ltd
21. Devki Steel Mills Ltd
22. Doshi & Company Hardware
23. East Africa Spectre Ltd
24. East African Foundry Works (K) Ltd
25. East African Glassware Mart (Nairobi)
26. Easy Clean Africa Ltd
27. Eco-Steel Africa
28. Eldoret Farm Machinery
29. Elite Tools Ltd
30. Farm Engineering Industries Ltd
31. Fine Engineering Works Ltd
32. Fit Tight Fasteners Ltd
33. Friendship Container Manufacturers Ltd
34. Globology Ltd
35. Greif Kenya Ltd
36. GZI Kenya Ltd
37. Heavy Engineering Ltd
38. Hebatullah Brothers Ltd(Formerly General Aluminium Fabricators))
39. Hobra Manufacturing Ltd
40. Insteel Ltd
41. Iron Art Ltd
42. Kab Kam Enterprises Ltd
43. Kaluworks Ltd
44. Kens Metal Industries Ltd
45. Kenya General Industries Ltd

46. Kenyon Pte Ltd
47. Khetshi Dharamshi & Co. Ltd
48. Kitchen King Ltd
49. Laminate Tubes Industries
50. M-Kopa Kenya Ltd
51. Mabati Rolling Mills Ltd
52. Marine Crafts & Boat Repairs
53. Mecol Ltd
54. Metal Crowns Ltd
55. Mitsubishi Corporation
56. Modulec Engineering Systems Ltd
57. Nails & Steel Products Ltd
58. Nalin Steel Works
59. Nampak Kenya Ltd
60. Napro Industries Ltd
61. Narcol Aluminium Rolling Mills Ltd
62. Ndume Ltd
63. Orbit Engineering Ltd
64. Palak International Ltd
65. Patnet Steel Makers Manufacturers Ltd
66. Prime Steel Ltd
67. pyrrex General Agencies Ltd
68. Red Oak Ltd
69. Richfield Engineering Ltd
70. Safal Building Systems Ltd
71. Sheffield Steel Systems Ltd
72. Silverspread Hardwares Ltd
73. Siya Industries (K) Ltd
74. Soni Technical Services Ltd

75. Southern Engineering Co. Ltd
76. St Theresa Industries Kenya Ltd
77. Standard Rolling Mills Ltd
78. Steel structures Ltd
79. Steelmakers Ltd
80. Steelwool (Africa) Ltd
81. Sufuria World Ltd
82. Superfit Steelcon Ltd
83. Tarmal Wire Products Ltd
84. Tensiles EA Ltd
85. Tononoka Rolling Mills Ltd
86. Tononoka Steel Ltd
87. Top Steel Kenya Ltd
88. Towertech Africa Ltd
89. Taws Ltd
90. Shri Krishana Overseas Ltd
91. Palmy Enterprises
92. L.A.B International Kenya Ltd
93. Kim-Fay East Africa Ltd
94. Kenafric Manufacturing Ltd
95. Essential Manufacturing Co. Ltd
96. Ellams Products
97. Autolitho Ltd
98. Avery Dennison Kenya Ltd
99. Continental Products Ltd
100. Steam Plant Ltd
101. Metsec Cables Ltd
102. Metlex International Ltd
103. Avery (East Africa) Ltd

104. PCTL Automation Ltd

Motor Vehicle Assemblers & Accessories Sector

1. Ace Motors
2. Alamdar Trading Company Ltd
3. Associated Battery Manufacturers (E.A.) Ltd
4. Associated Vehicle Assemblers Ltd
5. Auto Ancilliaries Ltd
6. Auto Industries Ltd
7. Auto Springs Manufacturers Ltd
8. Autofine Filters & Seals Ltd
9. Azad Automobile Trimmings Ltd
10. Banbros Ltd
11. Bhachu Industries Ltd
12. BMG Holdings Ltd
13. Choda Fabricators Ltd
14. Chui Auto Spring Industries Ltd
15. Cica Motors
16. Dalcom Kenya
17. Dodi Autotech
18. Foton East Africa Ltd
19. General Motors East Africa Ltd
20. Global Motors Centre Ltd
21. Handa (K) Ltd
22. Harveer Bus Body Builders Ltd
23. Honda Motorcycle Kenya Ltd
24. Igo Holdings Ltd
25. Impala Glass Industries Ltd
26. Kenya Coach Industries Ltd

27. Kenya Vehicle Manufacturers Ltd
28. Kibo Africa Ltd formerly Koneksie Ltd
29. King Finn Kenya Ltd
30. King-Bird (K) Ltd
31. Labh Singh Harnam Singh Ltd
32. Load Trailers
33. Makindu Motors Ltd
34. Mann Manufacturing Co. Ltd
35. Master Fabricators Ltd
36. Megh Cushion Industries Ltd
37. Mobius Motors Kenya Ltd
38. Mutsimoto Company Ltd
39. Passion Profit Ltd
40. Pipe Manufacturers Ltd
41. R.T. (East Africa) Ltd
42. Romageco Kenya Ltd
43. Ruidu (Kenya) Company Linited
44. Scania East Africa Ltd(Merged with Kenya Grange Vehicles)
45. Simba Caetano Formula Ltd
46. Skyline Holdings Ltd
47. Sohansons Ltd
48. Songyi Motocycles International Ltd
49. Soroya Motors Spares Ltd
50. Springtech (K) Ltd
51. Theevan Enterprises Ltd
52. Toyota Tshusho East africa Ltd
53. Transafrica Motors Ltd
54. Transtrailers Ltd
55. Turaco Ltd

56. Fine Wood Works Ltd
57. PG Bison Ltd
58. Renocon
59. Panah Ltd
60. Penny Galore Ltd
61. Insight Kenya
62. Kamyn Industries Ltd
63. Forces Equipment (Kenya) Ltd
64. Fantex (K) Ltd
65. Dharamshi & Co. Ltd
66. Adpack Ltd
67. Cartubox Industries (E.A.) Ltd
68. MFI Ultra Print Ltd
69. Modern Lithographic (K) Ltd
70. Cempack Solutions Ltd
71. GE East Afrika Services Ltd

Paper & Board Sector

1. Adpak International Ltd
2. Allpack Industries Ltd
3. Anvi Emporium Ltd (Formerly Andika Industries
4. ASL Packaging Ltd
5. Associated Paper & Stationery Ltd
6. Bag and Envelope Converters Ltd
7. Bags & Balers Manufacturers Ltd
8. Boxpack Ltd
9. Brand Printers
10. Capitol Printers
11. Carton Manufacturers Ltd

12. Colour Labels Ltd
13. Colour Packaging Ltd
14. Colourprint Ltd
15. Digital Hub Ltd
16. Dodhia Packaging Ltd
17. East Africa Packaging Industries Ltd
18. East African Paper Mills (Formerly Kenya Paper Mills
19. Economic Industries
20. Elegant Printing Works
21. Elite Offset Ltd
22. Euro Packaging Ltd
23. Fortunes Printers & Sationers Ltd
24. General Printers Ltd
25. Graphic Lineups Ltd
26. Green Pencils Ltd
27. Guaca Stationers Ltd
28. Highland Paper Mills Ltd
29. International Paper & Board Supplies Ltd
30. Juja Pulp & Paper Ltd
31. Kartasi Industries Ltd
32. Kenafric Diaries Manufacturers Ltd
33. Kenya Stationers Ltd
34. Manipal International Printing Press Ltd
35. Mega Pack (K) Ltd
36. Ndalex Digital Technology
37. Packaging Manufacturers (1976) Ltd
38. Paper House of Kenya Ltd
39. Paperbags Ltd
40. Prime Cartons Ltd

41. Printing Services Ltd
42. Printpak Multi Packaging Ltd
43. Printwell Industries ltd
44. Punchlines Ltd
45. Ramco Printing Works Ltd
46. Sintel Security Print Solutions Ltd
47. Skanem Interlabels Nairobi Ltd
48. Sketchers Design Promoters Ltd
49. Soloh Worldwide Inter-Enterprises Ltd
50. Statpack Industries Ltd
51. Tetra Pak Ltd
52. Chandaria Industries Ltd
53. Tissue Kenya Ltd
54. Twiga Stationers & Printers Ltd

Pharmaceutical & Medical Equipment Sector

1. African Cotton Industries Ltd
2. Alpha Medical Manufacturers Ltd
3. Autosterile (East Africa Ltd
4. Benmed Pharmaceuticals Ltd
5. Beta Healthcare International Ltd
6. Biodeal Laboratories Ltd
7. Biopharma Ltd
8. Cosmos Ltd
9. Dawa Ltd
10. Elys Chemicals Industries Ltd
11. Glaxo Smithkline Kenya Ltd
12. KAM Industries Ltd
13. Laboratory & Allied Ltd

14. Medisel Kenya Ltd
15. Medivet Products Ltd
16. Oss.Chemie (K) Ltd
17. Pharm Access Africa Ltd
18. Pharmaceutical Manufacturung Co. (K) Ltd
19. Promed Industries Ltd
20. Questa Care Ltd
21. Regal Pharmaceuticals Ltd
22. Revital Healthcare (EPZ) Ltd
23. Skylight Chemicals Ltd
24. SoSure AFRIpads Ltd
25. Toyota Kenya Ltd
26. Fontana Ltd
27. Dilpack Kenya Ltd
28. Groove Ltd
29. Techpak Industries Ltd
30. Styroplast Ltd
31. Signode Packaging Systems Ltd
32. Prosel Ltd
33. Polyblend Ltd
34. Polyflex Industries Ltd
35. Malplast Industries Ltd
36. Mega (EA) Plastics Ltd
37. L.G. Harris & Co. Ltd
38. Jamlam Industries Ltd
39. Betatrad (K) Ltd
40. Karan Biofuel
41. Power Technics Eat Africa
42. CosmoSol Ltd

43. Intersoft Ltd
44. Karcher Ltd
45. Ofgen Ltd
46. Rentco East Africa Ltd
47. Samco Holdings Ltd
48. Sproxil East Africa
49. Stanlib Kenya Ltd
50. Tally Solutions Kenya Ltd
51. The Helios Group
52. Askdoc
53. Ceven Ltd
54. ASKADOC

Plastic & Rubber

1. Hi-Tech Poly Ltd
2. Plast Packaging Industries Ltd
3. A-One Plastics Ltd
4. ACME Containers Ltd
5. Africa PVC Industries Ltd
6. Afro Plastics (K) Ltd
7. BlueSky Industries ltd
8. Bobmil Industries Ltd
9. Brush Manufacturers Ltd
10. Canaaneast Company Ltd
11. Coast Polythene
12. Cocorico Investments Ltd
13. Complast Industries Ltd
14. Coninx Industries Ltd
15. Darshan Plastic Ltd

16. Digital Packaging Innovations Holdings Ltd
17. Dune Packaging Ltd
18. Dynaplas Ltd
19. Elgitread (Kenya) Ltd
20. Elgon Kenya Ltd
21. Eslon Plastics of Kenya Ltd
22. Finlay Brushware Ltd
23. Five Star Industries Ltd
24. Flair Kenya Ltd
25. Foam Mattress Ltd
26. General Plastics Ltd
27. Hi-Plast Ltd
28. Hope Plastics
29. Jay Giriraj
30. Jumbo Chem (K) Ltd
31. Jumbo Quality Products
32. Just Plastics Ltd
33. Kamba Manufacturing (1986) Ltd
34. Kenpoly Manufacturers Ltd
35. Kenrub Ltd
36. Kenstar Plastic Industries Ltd
37. Kentainers Ltd
38. Kenya Suitcase Manufacturers Ltd
39. King Plastic Industries
40. Kinpash Enterprises Ltd
41. Kwality Packaging House Ltd
42. Lakhir Plastics Ltd
43. Laneeb Plastic Industries Ltd
44. Metro Plastics Kenya Ltd

45. Mombasa Polythene Bags Ltd
46. Nairobi Plastics Ltd
47. Nakuru Plastics
48. Ombi Rubber Rollers Ltd
49. Packaging Industries Ltd
50. Packaging Masters Ltd
51. Plastic Electricons
52. Plastics & Rubber Industries Ltd
53. Polly Propelin Bags Ltd
54. Polythene Industries Ltd
55. Premier Industries Ltd
56. Pyramid Packaging Ltd
57. Raffia Bags (K) Ltd
58. Rubber Products Ltd
59. Rushabh Industries Ltd
60. Safepak Ltd
61. Sameer Africa Ltd
62. Sanpac Africa Ltd
63. Scandic Ltd
64. Shiv Enterprises (E) Ltd
65. Silafrica Kenya Ltd
66. Silpack Industries Ltd
67. Silver Coin Imports Ltd
68. Singh Retread Ltd
69. Smartpack Ltd
70. Solvochem East Africa Ltd
71. Springbox Kenya Ltd
72. Super Manufacturers ltd
73. Supreme Poly Pack (K) Ltd

74. Techno-Plast Ltd
75. Top pak Ltd
76. Torrent East Africa Ltd
77. Treadsetters Tyres Ltd

Textile & Apparels Sector

1. Africa Apparels EPZ LTD
2. Alltex EPZ Ltd
3. Alpha Knits Ltd
4. Ashton Apparel EPZ Ltd
5. Beberavi Collections Ltd
6. Brilliant Garments EPZ Ltd
7. Ethical Fashion Artisans EPZ Ltd
8. Global Apparrels Ltd
9. Gone Fishing
10. Hanitex (EPZ) Ltd
11. Hantex Garments EPZ Ltd
12. Hela Intimates EPZ LTD
13. Kapric Apparels EPZ Ltd
14. Kavirondo Filments Ltd
15. Ken-Knit (Kenya) Ltd
16. Kenya Shirts Manufacturers Company Ltd
17. Kenya Tents Ltd
18. Kenya Trading EPZ Ltd
19. Kikoy Co. Ltd
20. Leena Apparels Ltd
21. Long-Yun (Formerly Senior Best Garments)
22. Longyun Garments Kenya EPZ Ltd
23. Manchester Outfitters Ltd

24. Mega Apparel Industries (EPZ) Ltd
25. Mega Garment Industries Kenya (EPZ)
26. Midco Textiles (EA) Ltd
27. Mombasa Apparells
28. New Wide Garments Kenya EPZ LTD
29. Omega Apparels Ltd
30. Oriental Mills Ltd
31. Rivatex (East Africa) Ltd
32. Royal Garment Industries EPZ Ltd
33. Shin-Ace Garments Kenya (EPZ) Ltd
34. Simba Apparel EPZ Ltd
35. SOKO EPZ Ltd
36. Spin Knit Ltd
37. Spinners & Spinners Ltd
38. Squaredeal Uniforms Centre Ltd
39. Sunflag Textile & Knitwear Mills Ltd
40. Supra Textiles Ltd
41. Teita Estate Ltd
42. Thika Cloth Mills Ltd
43. TSS Spinning And Weaving Ltd
44. Tulips Collections Ltd

Timber, Wood and Furniture

1. African Retail Traders
2. Budget Furniture Ltd
3. Fun Kidz Ltd
4. Furniture International Ltd
5. GreenPot Enterprises Ltd
6. House of Sahara Enterprises Ltd

7. Kenya Wood Products Ltd
8. Panesar's Kenya Ltd
9. Rai Plywoods (Kenya) Ltd
10. African Retail Traders
11. Budget Furniture Ltd
12. Comply Industries Ltd
13. Economic Housing Group Ltd
14. Elburgit Enterprises Ltd
15. Fine Wood Works Ltd
16. Fun Kidz Ltd
17. Furniture International Ltd
18. GreenPot Enterprises Ltd
19. House of Sahara Enterprises Ltd
20. Kenya Wood Products Ltd
21. Marvel Lifestyle Ltd
22. Match Masters Ltd
23. Newline Ltd
24. Panesar's Kenya Ltd
25. PG Bison Ltd
26. Rai Plywoods (Kenya) Ltd
27. Renocon
28. Summit Fibres Ltd
29. Ngecha Industries Ltd
30. Mills Industry Ltd
31. Brand Track Ltd
32. Lori Systems Ltd
33. Tally Solutions Kenya Ltd
34. Mjengo Ltd
35. Dynaplas Ltd

36. Jay Giriraj
37. Kenrub Ltd
38. Safepak Ltd
39. Scandic Ltd