MODERATING EFFECT OF INFORMATION COMMUNICATION TECHNOLOGY ON SUPPLY CHAIN RISKS AND FIRM PERFORMANCE AMONG MANUFACTURING FIRMS IN KENYA

MIRIAM THOGORI NYAMBURA

DOCTOR OF PHILOSOPHY

(Supply Chain Management)

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

2018

Moderating Effect of Information Communication Technology on Supply Chain Risks and Firm Performance among Manufacturing Firms in Kenya

Miriam Thogori Nyambura

A Thesis Submitted in Partial fulfillment for the Degree of Doctor of Philosophy in Supply Chain Management at Jomo Kenyatta University of Agriculture and Technology

2018

DECLARATION

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

Signature…….. Date ……..

Miriam Thogori Nyambura

This thesis has been submitted for examination with our approval as University supervisors.

Signature …….. Date …….

Dr. Jane.W.Gathenya, PhD

JKUAT, Kenya

Signature …….. Date …….

Prof. John M. Kihoro, PhD

Co-Operative University of Kenya (CUK)

DEDICATION

To my mum Lucy Nyambura Mbugua for her support. May God bless her.

ACKNOWLEDGEMENT

I wish to acknowledge my supervisors Dr.Jane.W. Gathenya and Prof.John. M. Kihoro for their endless commitment in providing the guidance and support throughout the entire period of the development to the completion of this thesis. I would like to extend my gratitude to Jomo Kenyatta University of Agriculture and Technology for giving me an opportunity to undertake my PhD degree.

Special thanks to Dr. Wycliffe Arani who assisted in the data collection among the manufacturing firms in Kiambu County. I am also grateful to colleagues in my group: Dr. Samuel Okanda, Francis Gatobu, and Dr. Julius Wambua who peer reviewed the work and made suggestions that helped to improve the quality of the thesis. I am truly grateful to the respondents (manufacturing firms) who without their participation this research would not have been possible.

I am deeply indebted to my lecturers Prof. Gregory Namusonge, Prof. Elegwa Mukulu, Prof. Henry Bwisa, Dr. Kabare Karanja, Dr. Esther Waiganjo, Dr. Shadrack Mbithi, Dr. Samuel Odari, Dr. Ismail Noor and colleagues at Jomo Kenyatta University of Agriculture main campus staff for their advice and assistance they extended in finally contributing to the general production of the final thesis. Finally, it would not have been possible to devote such time and energy without the patience, understanding and dedicated love of all members of my family, for the support they gave me during the entire period of my study. May the almighty GOD bless them all.

TABLE OF CONTENTS

LIST OF TABLE

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

AGOA	African Growth Opportunity Act
COMESA	Common Markets for East and Southern Africa
EAC	East African Community
ECR	Efficient Customer Response
EDI	Electronic Data Interchange
EIPP	Electronic Invoice Presentation and payment
EIXES	Extended Enterprise Solutions
EU	European Union
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IT	Information Technology
KAM	Kenya Association of Manufacturers
RFID	Radio Frequency Identification
SCM	Supply Chain Management
SCRM	Supply Chain Risk Management
SMS	Short Messaging Service
VIF	Variance Inflation Factor
VMCM	Vendor Managed Category Management

OPERATIONAL DEFINITION OF TERMS

ERP	Enterprise Resource Planning is a system that integrates all the departments of a firm into a single computer system (Sweeney, 2006)
Firm size	This refers to the number of employees employed by a firm. The use of ICT among the firms increases as the number of employees increases (Sinha, 2015; Kumar, Rajan & Zingales, 2001).
Financial flow risk	Inability to settle payments due to improper investments and failure of customers to pay their debts (Musa, 2012).
Firm performance	According to Hervani, Helms and Sarkis, (2005) includes both quantitative (Return on Investments (ROI), profitability, market share and revenue growth) and qualitative measures (customer satisfaction and the performance of the inventory) which mostly depend on the goals of the business.
ICT	This is a term that emphasizes on collaborative communication as well as the integration of telecommunication (wireless signals and telephone lines) and the enterprise software such as audio visual and storage software that enables (deleated)various users to access, transmit, store and manipulate information (Campton, 2004)
Information flow risk	Refers to disruptions in supply chain in an information for example the status of orders, delivery of the orders, and status of the inventory, security of data, intellectual capital which may affect the supply chain

	and firm performance (Musa, 2012; Hahn et al.,2000).
Manufacturing firms	They are concerned with the processing of raw materials, repairing of products that are manufactured and assembling of product parts (Agus, 2000)
Material flow risk	The physical flow of goods and services between and within the elements of a supply chain. Certain risk factors of materials flow such as rare raw materials, mistakes in production and logistics barriers in trade routes as well as language and cultural difficulties may affect the smooth flow of materials through the chain (Ruriani,2013).
Risk	Probability that undesired consequence will occur; it is a chance of danger, loss or damage. Risk is said to exist where there is a high probability that an event will occur and that event will lead to a significant impact or costs to an organization (Zsidisin et al, 2004; Harland, Brenchley & walker, 2003)
Supplier closure	Supplier closure .The risk of supplier shutdown due to (deleated) bankruptcy and lack of credit to finance working capital thereby putting a break to the orderly flow of raw materials and goods to an organization (Banham, 2009)
Supply Chain	is a network of organizations that are involved through upstream and downstream linkages, in the different processes and activities that produce value inform of products and services in the hands of the ultimate customer (Lysons & Farrington, 2007)

Supply Chain Risk Management	The process of preventing and mitigating risks along the supply chain through the application of tools for managing risks and collaborating with the supply chain partners to ensure continuity of a firm as well as profitability (Kimanzi, 2013).
Organizational Characteristic Risks	Refers to the specific traits exhibited by the manufacturing firms that increases their uncertainties in achieving supply chain and the firms objectives (Harvie, Narjoko & Oum, 2010)
EDI	An accurate way through which information and documents are shared between computers of the buyer and the supplier (True Commerce, 2018)

ABSTRACT

Manufacturing firms in Kenya contribute greatly to the economic development of the country. Developments in Information Communication Technology (ICT) are creating possibilities for moderating risks along the supply chain by creating platforms for effective decision support tools. However, the performance of the manufacturing firms has been decreasing in the past few years due to numerous risks whose outcome affect their supply chain, thereby undermining the sectors ability to contribute to the Gross Domestic Product (GDP) and attainment of Kenya's vision 2030. This study sought to investigate the moderating effect of ICT on supply chain risks and performance among manufacturing firms in Kenya. Cross-sectional survey design was adopted as the research design for this study using both qualitative and quantitative approaches. The target population was 94 firms in Kiambu County who were both members and potential members of the Kenya Association of Manufacturers (KAM). The study used stratified random sampling to pick a sample size of 76 manufacturing firms which represented 12 industrial sectors in manufacturing firms. Data was collected using questionnaires. Descriptive statistics was used aided by Statistical Packages for Social Sciences version 21 to compute percentages of respondents' answers. Inferential statistics using linear regression and correlation analysis was applied to assist examining relationship between the research variables. It was established that statistically, there was no significant relationship between information flow risk and performance among the manufacturing firms in Kenya. ICT use as a moderator of the relationship between financial flow risk and performance among the manufacturing firms in Kenya was also not significant. Financial flow risk did not significantly predict the performance of manufacturing firms in Kenya. ICT use was also not a significant moderator of the relationship between financial flow risk and performance of the manufacturing firms in Kenya. Material flow risk did not significantly affect the performance of the manufacturing firms in Kenya. ICT use was also not a significant moderator of the relationship between material flow risk and performance of the manufacturing firms in Kenya. On organization characteristic risks, organizational characteristic risks significantly influenced the performance of the manufacturing firms in Kenya. ICT use also moderated the relationship between organization characteristic risks

although the moderation was not statistically significant. All the independent variables (information flow risk, financial flow risk, material flow risk and organization characteristic risk) were not significant predictors of the performance of the manufacturing firms in Kenya except organizational characteristic. However, the model on the joint moderation effect of ICT use on the relationship between supply chain risks and firm performance was found to be significant, this could have been due to organizational characteristic risk. Therefore, the study recommends that manufacturing firms should leverage on ICT use to enhance performance of their firms.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Managers, consultants and academicians are increasingly recognizing the importance of the supply chain performance to the success of their business. Efficiency along the supply chain requires detailed knowledge on every minute mechanics that involve each step along the journey of a product and also understanding how these detailed mechanics support the whole process effectively (Peterson, 2016). According to Hendricks and Singhal (2005), companies are now relying on their supply chain networks to provide value. Most industries are now viewing the supply chain from a strategic angle due to its ability to generate revenue, reduce costs, improve the productivity of assets as well as increase customer satisfaction levels.

However,in recent years the vulnerability of the supply chain to risks has increased (venkatesh, Rathi & Patwa, 2015). Today, the success of supply chains largely depends on managing supply chain risks effectively and efficiently. Jian (2010) point out that the revolution of information and globalization have made supply chains to be at the centre of research. He further explains that, many firms are now involved in very complex enterprises and may engage in more than one extended enterprises to improve the bottom line. Though, such a network of extended enterprises is vulnerable to disruptions. These disturbances may either be internal or external turbulences and are often referred to as risks (Jian, 2010). Supply chain risk management implies that companies should adopt proactive approaches to effectively manage vulnerabilities along the supply chain. Strategic measures should be implemented to mitigate risk and enhance the resilience of the supply chains (venkatesh, Rathi & Patwa, 2015).

1.1.2 Global Perspective on Supply Chain Risk

Globally, supply chain risk is not a unique phenomenon, according to Juttner et al, (2002), foot and mouth disease in the UK in 2002 had a more diverse effect on the

agricultural industry than was the case during the last outbreak which had taken place 25 years back. This was due to increase in global sourcing and consolidation of the industry. This also affected Volvo which is a luxury car manufacturer which had to stop deliveries due to lack of quality leather. In February 1999, Toyotta was forced to close down 18 plants for about two weeks due to fire that led to a loss of $ 195 million and a decline in sales of $325million (70, 000 vehicles) (Converium, 2001). The global recession according to a study carried out by Accenture (2010) made companies more aware of the need for supply chain risk management. 50% of all the companies that responded gave more attention to procurement risk in 2009 than was the case in the previous years. The global competitive environment, sharing of information freely, developing long-term supply relationships, planning for the future as well as joint problem solving directly contributes to effective supply chain management and firm performance (Christopher, 2005).

Global dangers such as terrorist attacks, financial crises, shut down of factories, supplier insolvency, labor disputes, quality problems, fire, contract failure, contract security, off shoring, outsourcing risks, Co-operate Social Responsibility (CSR), sustainability risks and crop diseases have exposed supply chains to numerous risks and increase the chains vulnerability (Wagner & Neshat, 2012). Vulnerability increases further when companies outsource, that is, become dependent on other companies; increased market globalization, shorter product and technology life cycle. Panicker, Govindan and Diabat (2012) assert that companies are also increasingly using manufacturing, distribution as well as logistical partners, further resulting in complex supply relationships internationally leading to increased supply chain risk exposures. However, these risks can be mitigated through proper contingent planning (Wu et al, 2006).

1.1.3 African Perspective on Supply Chain Risks

A study carried out in a manufacturing firm in Ghana called Kasaspreko Company Limited (KCL) by Mensah, Diyuoh and Oppong (2014) pointed out that the aim of every supply chain is to minimize on costs while achieving customer satisfaction. The study also indicated that supply chain risk management has a significant effect

on firm performance as evidenced by the increased sales performance at KCL between 2004 -2010. Naude and Badenhorst-Weiss (2011) also studied on problems facing the supply chains among the automotive component manufacturers in South Africa. According to the study problems along the supply chain may lead to inefficiencies which impact on the competitive advantage of the Automotive Component Manufacturers.

South African manufacturing firms experienced a decline in performance by 1.5 % in 2015 which was a 0.5% fall from the previous year (2014) (STANLIB, 2015). The weakness in South Africa industrial sector was highly attributed to the disruptions in the labor market, bottlenecks in infrastructure especially electricity as well as depreciation in the South African Rand against the dollar. African countries such as Uganda, Botswana and Zambia often incur high transportation costs, their manufacturing sector often experience delays in the flow of materials due to their natural geographical barriers (landlocked countries). These make the countries less attractive in terms of sources of supply to the United States (US) and the European Union (EU) markets (U.S Trade and Investment annual Report, 2005).

1.1.4 Supply chain risks and performance of manufacturing firms in Kenya

In Kenya, supply chain risk is not a new phenomenon among the manufacturing firms. For example, results of a study carried out by Loice and Ronald (2011) on the manufacturing firms in Kenya (Nairobi County) shows that supply chain risk has a positive effect on profitability and productivity of a firm. The study further states that supply chain risks cannot be ignored because of their enormous contribution to the firm performance (Loice & Ronald, 2011). Supply chains in Kenya have faced myriad of disruptions since 2007 (Omondi, 2011). Results of a study carried out by Kangogo, Guyo, Bowen and Ragui (2013) on supply Chain Disruption in Kenya Floriculture Industry, ranks natural disaster as the most severe followed by logistical process design, actions of the labor union and finally the mechanics of the production function.

In today's competitive environment, companies are striving to get a competitive advantage over their competitors (Waqas, Yasir, Nauman & Hassan, 2010). Companies have also realized that the supply chain is one of the areas that they can leverage on to secure a competitive advantage and gain higher profits (Waqas et al, 2010; Elahi, 2010). A supply chain is said to be superior if it provides on time deliveries, low cost products and manufacturing flexibility compared to that of the competitors (Waqas, et al, 2010).

Competition is taking place between the company's supply chain and not between the single companies. To enhance value creation to the customers, supply chains are now focusing on increasing efficiency (Lamber & Cooper, 2000). The focus on efficiency makes the supply chains vulnerable especially when they engage in modern supply chain trends such as global sourcing, outsourcing and Just in Time strategies (Kalawsky, 2013). These trends have led to an increase in the areas which expose the supply chain to vulnerabilities. To identify these disruptions along the supply chain, Dani, Chester and Kalawsky, (2013) explains that there is need for organizations to adopt proactive approaches to manage risks on both the upstream and downstream sides of the supply chain. Complexity of supply chains and potential vulnerability is continuously increasing due to increase in globalization (Rajesh & Ravi, 2015). These vulnerabilities lead to uncertainties in the organizations operations and jeopardize the creation of value to the customer (Klibi, Martel & Guitoni, 2007).

Supply chains that are dynamic believe in continuous performance improvements. This is particularly critical for the suppliers, manufacturers and retailers who are focused on achieving and sustaining competitiveness. The volatile supply chain environment requires a deep understanding of the supply chain ecosystem and the resilience of the organizations to respond to such risks (Global Finance, 2012). Therefore, there is need to formulate support systems that will allow the adoption of measure to mitigate risks along the supply chain (Allen, 2011). As supply chains are increasingly exposed to vulnerabilities, it is important to manage these risks proactively (Kalawsky, 2013). The process of acquiring raw materials passes through political and geographical regions, ownership of the goods also changes and various

modes of transports are also used before the goods reach the end customer in the form of finished goods. The various processes involved as the raw materials are transformed into finished goods expose various stages where the supply chains may be vulnerable to disruptions (Handfield & Earnest, 2002).

Supply chain risk management is driven by the need to reduce risks not only at the organization level but the entire supply chain. According to Chaudhuri, Mohanty and Singh (2013), supply chain risk management should begin from new product development because of the increasing uncertainty in the supply chains. A study carried out by Price Water House and Coopers (2008), reports that risk assessment in an industry setting is primarily based on past experience and forward thinking which results in effective strategies in mitigating risks. Proactive risk assessment and execution is paramount for a robust supply chain management (Sodhi & Tang, 2012).

Supply chain risks exists when the behavior of the supply market and an organizations dealings with its suppliers results in outcomes that harm the reputation of the company, capability, integrity of its operations as well as financial viability (Russill, 2008). These supply chain risks are identified by Accenture (2010) as materials flow risk, financial flow risk and information flow risks

1.1.5 ICT, Supply chain risk and Firm performance

Adopting information system along the supply chain leads to improved financial performance through increased turnover and reduction in the sales expenditure (Dehning, Richardson, & Zmud, 2007). Despite the fact that companies have invested heavily in ICT over the years, these systems often struggle to achieve the much needed competitive advantage (Garson, 2009). There is also the absence of a method to measure the real business value that companies derive by implementing information systems (Elbashir, Collier & Davern, 2008). Due to complexity of supply chains, companies often turn to software to streamline their operations. Implementing decision support systems provide firms with competitive advantage (Shang et al, 2008)

ICT encompasses components that are integrated to assist in the collection, storage, processing and information communication. Supply chain risks management requires a large database of information as a basis for analysis and decision making on the strategies to mitigate the said risks (Elbashir, Collier & Davern, 2008; Shang et al, 2008). Therefore, ICT information system plays an important role in allowing the organizations to develop new capabilities and skills that would not be possible to accomplish (Borges, Hoppen & Luce, 2009). Information systems can help in increasing the overall capability of a firm to process information. Firms whose information systems capabilities are superior are better positioned to collect process and assimilate external information which is complex and hence formulate responses that are effective (Cadez, 2008; Stoel & Muhanna, 2009). Information systems are important because they affect the capabilities of the organizations to process information (Bardhan, Krishnan & Lin, 2005). Contrary to these findings, firms that utilize the most recent ICT inputs have market returns that are significantly below the mean (35) and therefore, the Information systems do not bring competitive advantage (Carr, 2003; Chae, Yen & Sheu 2005).

IT impacts greatly on the agility of the supply chain in terms of enabling the supply chain to better respond to the fluctuations in the market place. It does this by providing timely, accurate and adequate flow of information among the supply chain partners which in turn makes positive impacts on the firm's sales, market share, customer satisfaction and profitability (DeGroote & Marx, 2013). In their research on drivers and outcomes of high technology supply chain works on internet based inter and intra organizational systems, Soderoa, Robinovich and Sinha (2013) found out that these technologies makes business more able to improve their organizations due to timely provision of the information needed to make decisions.

ICT solutions enhance the flow of information along the supply chain. For example, supply chain management solutions such as Electronic Data Interchange and internet allow partners in the supply chain to use common data. Enterprise Resource Planning (ERP) helps in the integration of all the departments and functions in the entire company into a single computer system that is able to serve all the needs of different departments. Extended Enterprise solutions (XES) allows the collaborative

sharing of information and processes among the supply chain partners using the technology that underpins ERP (Sweeney, 2006).

Trackwise supplier quality management software enhances material flow by enhancing supplier quality assurance through managing the process of supplier qualification, selection as well monitoring of suppliers and supply chain partners. This software also offers features such as supplier scorecards, supplier qualification workflows, supplier audits, management of the approved suppliers list as well as the tracking of systems for non-conformances of suppliers (McBeath, 2013).

Purchasing cards (p-cards), Distribution Cards, Electronic Invoice Presentation and Payments (EIPP) systems are the new automation solutions that an organization can use to improve the financial flow. These systems create numerous opportunities in areas such as increased speed of payment, cost savings and more predictable and reliable financial flows (Hausman, 2004).

1.1.6 Manufacturing firms in Kenya

The manufacturing sector in Kenya is composed of those establishments that engage in the transformation of raw materials into finished goods. Reports by Price Water House Coopers (2013); Kenya Investment Authority (2013) detail that Kenya has a large manufacturing sector that serves both the local and the export markets in East Africa and across the globe. Regional markets such as the East African Community (EAC) and the Common Market for East and Southern Africa (COMESA) makes Kenya's manufactured goods accessible to these markets as well as importation of raw materials from the markets. Kenya is also one of the countries in Sub Saharan Africa which is eligible to export textiles products to the USA under the African Growth Opportunity Act (AGOA).

The Kenyan Embassy in Japan (2013) indicated further that manufacturing sectors in Kenya have increased in production between 2003 and 2004. In addition, manufacturing sector is a major source of growth in the Kenyan economy with its share in the Gross Domestic Product (GDP) having increased from 13% in 2002 to 14.2% in 2003 and 15.7% in 2007. Despite the potential of the manufacturing firms

to contribute to the economic growth of this country, they have been faced with myriad of challenges among them risks along the supply chain.

The Kenyan government recognizes the contribution of the manufacturing sector to the industrization of the nation and therefore contributing to economic development. In line with this, the government provides incentives (for example the remission of the value added tax) so as to attract more investors into the manufacturing sector and exploit the top markets such as the EAC (Kenya Investment Authority 2013). Kenya is also the leading country in the East African region in terms of growth in the manufacturing sector (UK AID, 2016)

1.2 Statement of the Problem

A report by the African Economic Outlook, (2015) indicates that manufacturing sector in Kenya is the third leading contributor in terms of the Gross Domestic Product (GDP) after agriculture and horticultural industry. According to the Kenya association of Manufacturers' (KAM, 2013), the manufacturing sector in Kenya growth declined to 4.4% in 2011 as compared to a growth of 5.8% in 2010 and it has been experiencing mixed performance over the last five years, that is, 5.8% in 2010, 4.4% in 2011, 3.1% in 2012, 5.6% in 2013, 3.4% in 2014 (Omondi, 2011; Loice and Ronald, 2011; KAM, 2013; Waiguru, 2015; East African Community Fact and Figures, 2010). The sector recorded a growth 3.4% in 2014 compared to a 5.6 per cent growth in 2013 (Waiguru, 2015). The decline in growth was highly attributed to an increase in inflation (5.7% in 2013 compared to 6.9% in 2014) and high fuel cost in 2014 compared to 2013. The sectors contribution to the total wage employment has worsened from 13.8% in 2008 to 12.9% in 2012 (Kenya economic Report 2013).

Chief Executive Office (CEO) of KAM in an interview conducted by Mulupi (2015) confirmed that the growth in the manufacturing sector has been stagnant at 10% although the sector has the potential to perform better. This means that the Kenyan manufacturing sector is far from achieving the 20% GDP contribution as entrenched in the vision 2030 (Economic News Update, 2014). The weak performance has been attributed to high production costs, influx of counterfeits, drought incidences and

volatility in international oil prices. This slow growth in the manufacturing sector can be explained by supply chain risks such as financial risks, that is, the depreciation in the Kenyan shilling against the dollar which is the widely used form of currency in the export markets. This has greatly reduced the demand for manufactured products (Soft Kenya, 2013).

ICT is recognized by Kenya Vision 2030 as a major player in enhancing the competitiveness of Kenyan Manufacturing firms (Kenya-Vision2030, 2007). ICT developments according to Rasmussen et al (2000) are creating possibilities in the management of risks along the supply chain by creating platforms for effective decision support tools. The trend today is on the increasingly complexity of the supply chains which makes them vulnerable to risks. To moderate this, firms have introduced ICT and supply chain management ICT tools to maintain profits and competitiveness. Technology, particularly information technology (IT), is also an important issue which is considered by The World Economic Forum (2013) as one of the ways to create supply chain resilience.

Recent studies have focused on outsourcing as a risk in supply chain management (Kinyanjui, 2013), supply chain risk management (Kimanzi, 2013), risks in supply networks (Harland, Brenchley & walker, 2003). Juttner, Peck and Christopher, 2003) in their study supply chain risk management outlining an agenda for future research indicates the need to further research on the supply risks implications of the business. However, there is scanty research on the effects of supply chain risks on the performance of manufacturing firms especially with the adoption of ICT to moderate the said risks. Therefore, to address this gap, this study seeks to investigate; what is the moderating effect of ICT on supply chain risks and firm performance among the manufacturing firms in Kenya?

1.3 Objectives of the Study

1.3.1 General Objective

The main objective of this study was to examine the moderating effect of ICT on supply chain risks and firm performance among the manufacturing firms in Kenya

1.3.2 Specific Objectives

The specific objectives of this study are:

1. To determine the moderating effect of ICT on information flow risk and firm performance among the manufacturing firms in Kenya.
2. To establish the moderating effect of ICT on financial flow risk and firm performance among the manufacturing firms in Kenya.
3. To explore the moderating effect of ICT on material flow risk and firm performance among the manufacturing firms in Kenya.
4. To establish the moderating effect of ICT on organization characteristic risk and firm performance among the manufacturing firms in Kenya.
5. To determine moderating effect of ICT on the relationship between information flow risks, financial flow risk, material flow risk, organizational characteristic risks and firm performance among the manufacturing firms in Kenya.

1.4 Research Questions

1. What is the moderating effect of ICT on information flow risk and firm performance among the manufacturing firms in Kenya?
2. What is the moderating effect of ICT on financial flow risk and firm performance among the manufacturing firms in Kenya?
3. What is the moderating effect of ICT on material flow risk and firm performance among the manufacturing firms in Kenya?
4. What is the moderating effect of ICT on organization characteristic risk and firm performance among the manufacturing firms in Kenya?
5. Is there a moderating effect of ICT on the relationship between information flow risk, financial flow risk, material flow risk, organizational characteristic risks and firm performance among the manufacturing firms in Kenya?

1.5 Research Hypothesis

1. H_{01}: ICT use does not moderate the relationship between information flow risk and firm performance among the manufacturing firms in Kenya.

2. H_{02}: ICT use does not moderate the relationship between financial flow risk and firm performance among the manufacturing firms in Kenya.

3. H_{03}: ICT use does not moderate the relationship between material flow risk and firm performance among the manufacturing firms in Kenya.

4. H_{04}: ICT use does not moderate the relationship between organization characteristic risk and firm performance among the manufacturing firms in Kenya.

5. H_{05}: ICT use does not moderate the relationship between information flow risk, financial flow risk, material flow risk, organizational characteristic risks and firm performance among the manufacturing firms in Kenya.

1.5 Significance of the study

Manufacturing organizations are the most vulnerable to supply chain risks due to their large size and complexity of operations (Lariviere, 2011). Kiganane (2013) also points out that excellence of the manufacturing firms forms a strong basis for competitive advantage.

Policy Holders

This study will assist the policy holders to formulate policies that will assist the manufacturing sector in managing supply chain risk and therefore help to prevent loses that affect the performance of these firms and ultimately the economy at large.

Research Institutions

The findings of this research are of great importance to research institutions such as the Kenya Bureau of Standards (KBS), Kenya National Bureau of Statistics (KNBS) and the Kenya Institute of Supplies Management (KISM). The research findings will

assist these institutions in maintaining quality as well as assisting the manufacturing sectors in mitigating the supply chain risks that have a direct impact on the performance of these firms. The findings of this research are of great importance to those practicing in the area of supply chain management as they will assist them in designing mechanisms that will enable better risk mitigation mechanisms for information flow risk, financial flow risk, materials flow risk and organization characteristic risk. The findings will also add to the current literature that exists on ICT, supply chain risks and firm performance among the manufacturing firms. The findings of this research are expected to also provide information that will be useful to academicians in the field of supply chain.

Stakeholders

The stakeholders, practitioners, and industries will benefit from this research as they will be able to evaluate the strategies that the managers are implementing to mitigate supply chain risks and the extent to which these managerial strategies are affecting the performance of their firms.

1.6 Scope of the Study

This research focused on the moderating effects of ICT on supply chain risk and firm performance among the manufacturing firms in Kenya. The scope of this study included a total of 94 manufacturing firms in Kiambu County who have been in at least three years of operation. The researcher undertook the study in Kiambu County on the grounds that Kiambu County is one of the richest counties in Kenya with a GDP of $1,785, followed by Nyeri ($1, 503) , kajiado ($ 1,466), Nakuru ($ 1,413) and Kwale ($1,406) (Business Daily, 2016). Kiambu County is also one of the leading innovative commercial hub that boarders Nakuru and Kajiado County to the West, Murang'a and Nyandarua to the North and Nairobi to the South (Kenya Information Guide, 2015). Kiambu county government is one of the 47 Counties in Kenya and one of the four counties which neighbors' Nairobi County (The most populous city in Kenya which contributes 60% of Kenya's wealth) and the leading county in terms of ICT (kuria, 2015; Mutegi, 2015). The choice of manufacturing

firms was based on the fact that most firms in the sector had a long experience in the use of technology. There was need to find out whether this effect (ICT) was being trickled down to the manufacturing firms in the county. The study was carried out between August and December 2016

1.7 Limitations of the study

The study had some limitations. First, securing time with the supply chain managers who were the respondents in this research was quite a challenge. However, the researcher allowed ample time for the managers to respond to the questionnaires and also encouraged them on the strategic benefits of the study to the firms and also ensured follow ups were made to ensure timely filling of the questionnaires.

Second, due to the strategic nature of the research, some managers had a negative view about filling the questionnaires. However, the researcher engaged the top management and the CEO who encouraged them to participate in the research. Third, the respondents, were hesitant to fill the questionnaire as they feared that the information would be revealed to the competing supply chains in the same industry. These fears were however countered by assuring the respondents that the information collected was purely for academic purpose only , a letter from the university was also availed to them to back up the same (See Appendices). Finally, the study was limited by supply chain risks in the study although other significant supply chain risk which were not investigated were also significant.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discussed the literature review of the study. The main aim of the literature review was to explore the available and existing information which had been covered by various researchers. The literature was reviewed from, journals, the internet, reference books, working papers, reports and periodicals.

The literature reviewed the following areas: the conceptual framework, review of variables research gaps and a summary of the chapter.

2.2 Theoretical Review

2.2.1 Normal Accident Theory (NAT)

The Normal accident Theory (NAT) was propagated by Charles Perrow whose objective was to explain the reasons that lead to the failure of social-technical systems based on the nuclear power plant near-disaster analysis of the US (Perrow, 1984). The theory suggested that the probability of systems accident occurrence and the severity of the systems accidents are determined by two characteristics of the system:

Interactive complexity of the system is the first characteristic, a supply chain is a system which is social-technical, that is, it is a complex system since there are many elements that interact in a non-simple way as explained by Simon (1962), this makes it more difficult to control and manage. The complexity according to NAT becomes more dangerous when the components in the system interact in a nonlinear. This is because nonlinear interactions lead to event consequences that are unpredictable. When many small failures interact, they produce unfamiliar and unexpected events.

Tight coupling of the elements in the system is the second characteristic; the system is a tightly coupled system and as Galbraith (1973) and Perrow (1984) puts it, the system contains interrelated components that have processes that are time dependent,

have possible substitutions and minimal slack or buffer. While systems that have tight coupling are able to have high efficiency and performance levels, supply chains that are loosely coupled are also able to absorb changes in the environment, failures or unexpected behaviors in the system. A system that is tightly coupled, a change in one component may trigger a strong and fact change in the other components in a domino kind of an effect. Therefore disruptions along the supply chain can rapidly spread through the system.

Based on these characteristics a system that has high levels of interactive complexity and high levels of tight coupling is vulnerable to accidents. This is because the combination of the two characteristics makes the prediction and the protection of the ways in which the system would fail impossible. The accidents in the system are therefore inevitable; one concludes that in such systems, accidents are normal.

According to the NAT supply chains whose degree of interactive complexity is complex, and have tight coupling, the frequency of supply chain disruption is higher. Hopkins (1999) and Wolf (2001) as cited by Sammarco (2003) argue that it is difficult to subject the level of tight coupling to empirical test.

Vachon and Klassen (2002) view information processing and technology as the two dimensions of supply chain complexity. Supply chain has three drivers according to Choi and Krause (2006): the quantity of suppliers, the diversity among the suppliers and the interrelationships among the suppliers. Daft (2006) on the other hand view complexity from the dimensions of vertical complexity, spatial and horizontal complexity. In the supply chain context, the vertical complexity can refer to the number of tiers in the upstream supply chain.

Spatial complexity can be seen as the geographical dispersion of various supply base, while the horizontal complexity as Choi, Dooley and Rungtusanatham, (2001); Choi and Hong, (2002) and Vachon and Klassen, (2002) point out, refers to the number of suppliers that an organization has. In summary , the three dimensions increase the supply chain complexity, reduce transparency, increases uncertainty and this in turns leads to increased exposure to disruptions along the supply chain (Choi & Krause, 2006).

In the Kenyan manufacturing sector, this theory is very relevant. This is because the interactive complexity and tight coupling (inventory buffering) leads to disruptions along the supply chains which also is the case in safety accidents. According to Perrow (1999), an accident refers to a failure in a subsystem or the system as a whole that causes damage to more than one unit and in the process causes a disruption (missed shipment, drought, depreciation of the Kenyan shilling against the dollar) on the ongoing or even the future output of the supply chain (system). The manufacturing sector in Kenya however, with the right information are able to detect when the disruptions are occurring or when they are about to occur (lack of information which succepts organizations to risk, un timely flow of materials leading to material flow risk). Manufacturing firms in Kenya have also experienced tight coupling (higher inventory levels) that has affected customer satisfaction.

2.2.2 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) was presented by Davis (1989). The model main aim is to explain the behavior of ICT usage, that is, what are the main causes of potential adopters of ICT to accept or reject information technology usage. TAM predicts the acceptance of the information system and designs as the problems before users experience with the system (Davis 1989). The TAM prediction of the user acceptance and of any technology is based on perceived usefulness and perceived ease of use. Within the TAM, the perceived usefulness (U) is defined as the extent to which a given user believes that using a system will enhance his/her performance (Davis, 1989).

Perceived Ease of Use (EOU) on the other hand is defined as the extent to which a given user believes that by using a given system, his/her efforts will be reduced (Davis, 1989). Both the perceived usefulness and the perceived ease of use are based on the perceptions of the users' belief about the system. According to the TAM, U and EOU impacts significantly on a user's attitude towards the use of a system (Davis, 1989).

This theory is relevant to the Kenyan manufacturing sector since technology is seen as the key driver to enhance supply chain competitive advantage. Adoption of supply chain information technology increases firms performances through provision of timely information hence mitigating supply chain risks (Dehning, Richardson & Zmud, 2007). The perceived ease of use is highly related to the training and skills that the employees possess. The Kenyan manufacturing firms should train their staffs on the implementation of the systems to enable them apply the technology effectively and efficiently. Implementation of ICT enables the supply chain managers to avoid the narrow focus of the relationship between suppliers, customers and logistical providers by establishing long term relationships and strategic alliances and therefore viewing the customers as partners other than rivals (Williams, 2006).

In order to effectively manage supply chain risks, Kenyan manufacturing firms require a large data base of information which it can analyze and make decisions on how to mitigate supply chain risks. Adoption of ICT systems that will enhance the competitiveness of the supply chains helps in the development of the capabilities and skills that would have otherwise not been achieved (Borges, Hoppen & Luce, 2009). However, adopting technology alone may not be a source of competitive advantage, since they are readily available in the market, only when the technology is embedded into the organizational supply chain risk management strategies is likely to achieve sustainable benefits expected (Barney, 2012). Firms should therefore use their existing ICT infrastructure and skills to manage supply chain risks and therefore improve the performance of the firm.

2.2.3 Resource Based View of the Firm (RBV)

The RBV postulates that the firms can be seen as a collection of resources. Some of these resources can be said to be strategic resources (Wernerfelt, 1984). RBV is also referred to as the Resource Based Theory of the firm by some researchers (Barratt & Oke, 2007). The theory was developed to complement the Industrial Organization (IO) which focused on the determinants of the performance of a firm, outside the firm itself, specifically within the structure of its industry. In contrast to the IO view, the RBV focuses on the internal sources of sustainable competitive advantage and

seeks to explain the reason why firms which are in the same industry differ in terms of performance (Kraaijenbrink et al., 2010).

In his work, Barney (1991) argues that sustainable competitive advantage can be derived from what the firm controls in terms of resources and capabilities. These resources have unique traits in that, they are rare, they are valuable, they cannot be substituted and also difficult to imitate. Additionally, such resources and capabilities can also be viewed as both tangible and intangible assets that include; the management skills of a firm, its organizational processes and routines as well as the information and the knowledge that it controls (Barney et al., 2001).

This theory is useful to this study because managers play a vital role in enhancing the performance of their firms. Managers in the Kenyan manufacturing sector must demonstrate a continuous commitment to invest in ICT as a resource to moderate the risks along their supply chains and therefore enhance their sales, market share and profitability of their firms. Investing in ICT will enable the managers to have the capabilities for decision making. Managers of the Kenyan manufacturing firms should have the necessary ICT supply chain management soft wares that will enable them to foster good relationships with other partners along the supply chain since risk mitigation requires a joint consultative effort for successful risk mitigation.

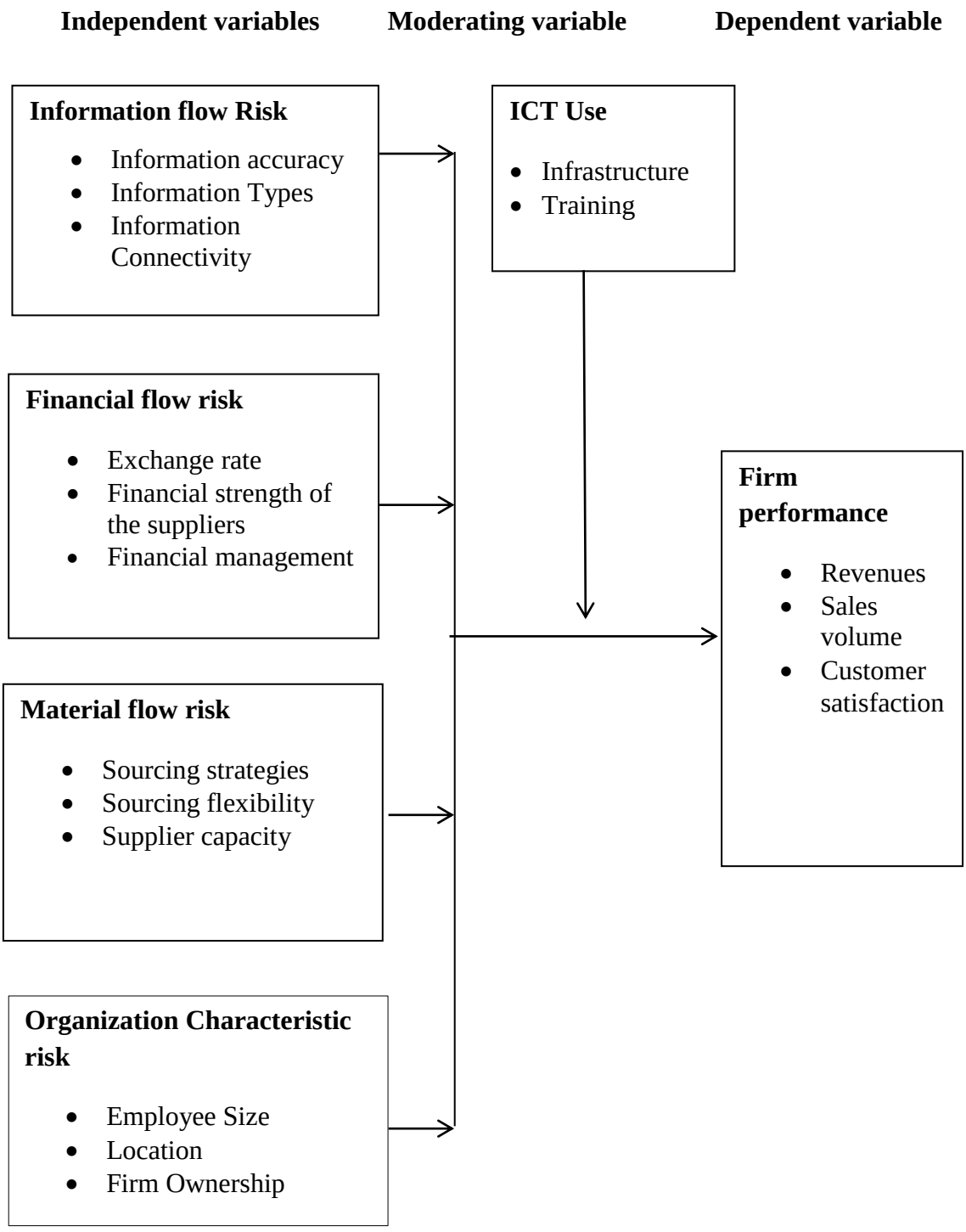
Lastly, supply chain risk management can be seen as a strategic internal resource that can lead to competitive advantage and improved performance of a firm (Barney, 2012). Risk management along the supply chains has a positive effect on the profitability of a firm (Loice & Ronald 2011). Kenyan manufacturing firms need to realize that supply chains are one of the areas that they can leverage on to achieve competitive advantage and therefore improve performance. They need to adopt proactive approaches that will enable them to manage risks from both the upstream and the downstream sides of the supply chains. Risk management will be an important resource in eliminating uncertainties along their supply chains thereby creating value to the customers.

2.3 Conceptual Framework

A conceptual framework is a presentation model where the researcher represents or conceptualizes the relationship between the variables being studied and shows the relationship diagrammatically or graphically (Orodho, 2008). This author also points out that a conceptual framework is a model which is hypothesized and identifies the variables or concepts that are being studied showing the relationship between them. A variable according to Kothari (2009) is a concept whose quantitative values can differ such as weight, height or income. A variable on the other hand according to Mugenda (2008) is a measurable characteristic that assumes different values among units of a specific population.

In this study, the key variables are categorized as the dependent, independent and moderating variables. The independent variables according to Mugenda (2008) are also called the predictor variable since they predict the amount of variation that occurs in another variable. The dependent variable on the other hand which is also known as the criterion variable, is a variable that is influenced or changed by another variable, it is the variable which the researcher wishes to explain. The moderator variable is a variable that alters the strength of the causal relationship (Frazier, Tix & Barron, 2004).

This study is seeking to explain how information flow risk, financial flow risk, material flow risk and organizational characteristic risks influence the performance of the manufacturing firms. The relationship is moderated by ICT use. The variables in the conceptual framework were identified from the theories identified in the study and from the different scholars in the study.



Adapted from Musa (2012); Omwenga (2015) and Rasmussen et al (2000)

Figure 2. 1: Conceptual framework

2.4 Empirical review

2.4.1 Information Flow risk

As explained by Musa (2012), information flow helps in updating all the supply chain elements and therefore provides resources for supply chain decision making. Information that may flow along the supply chain may for example include the status of orders, delivery of the orders, and status of the inventory just to mention a few (Musa, 2012; Hahn et al., 2000).

As Hahn et al (2000) puts it, efficient coordination along the supply chain as well as effective communication is vital for all the participants. Chopra and Sodhi (2004) and point out that increase in visibility on demand information reduces supply chain risk. A study by Lee et al (1997) also describe that sharing of information reduces the causes of the bullwhip effect. Lee and Whang, (2000) further add that information keeps coordination in a supply chain tight. Faisal et al (2000) also assert that cooperation among various participants in a supply chain leads to competitive advantage. Since each supply chain focuses on compatible objectives, duplication of efforts and redundancy of activities along the chain can be eliminated. In addition, partners in a supply chain share information openly and this provides them with a platform to jointly meet the needs of the end customer and consequently performance (lewis, 2003).

According to Musa (2012), value adding activities in a supply chain are often triggered by the flow of information which may include: information on demand, the status of the inventory, product and process design changes, status of the available capacity as well as order fulfillment. The flow of information also brings together the flow of the materials and finances within an organization. For example, when a material is delivered, the recipient is informed using the delivery order and the amount of payment that is due is also communicated by using the invoice. The information contained in the invoice triggers the recipient to make payment appropriate to the sender. Therefore funds flow in the opposite direction of the materials flow (Lewis, 2003).

According to Choy et al (2004), when information is not effectively and efficiently communicated externally with the customers and internally with the suppliers, high transaction costs are involved. Supply chain value is enhanced when costs of sourcing are reduced as well as increasing the service levels. The bullwhip effect is usually a product of poor information flow and management along the supply chain and often leads to increased inventory levels (Sweeney, 2006). Good information flow according to Christopher (2005) is normally a substitute for high levels of inventory.

According to Clements and Munoz (2007), minor disruptions along the supply chain lead to significant impacts on the performance of a firm. Decrease in the supply chain performance can be attributed to sources related to decisions that are made by individuals (Hendricks & Singhal, 2003). Each decision made lead to a disruption in the flow of materials or information along the supply chain. This can lead to undesirable stock levels, tying up of an organization resources and ultimately contributing to opportunity costs (Clements & Munoz, 2007).

Additionally, the information should be accurate, comprehensive and should be provided in a timely manner. The efficiency, accuracy, comprehensiveness and reliability of information flow are associated directly with the entities handling this information. This as explained by Tyrinopoulos (2004) leads to faster flow of information as well as effectiveness in decision making. Information along the supply chain is vital for the coordination of the daily activities relating to production, inventory, location and transportation as well as planning and forecasting for the purpose of anticipating and meeting future demand (Maurer, 2011). Information as explained by Hugos (2006), gathered at various points of the supply chain has to be transferred or has to efficiently flow between the members of the organization and the various functions of a firm in order to provide the information to the relevant parties (Maurer, 2011).

Jain (2004) argues that information is one of the most important assets of an organization. Therefore, strategic management of information is not an option for an organization that seeks to gain a competitive advantage and win in the market place.

Information is particularly important if the correct information is available for decision making, problem solving and investigation at the right time. According to Jain (2004), undistorted information should be available to an organization and therefore the importance of using information technology to manage the said information.

Failure of supply chain wide data exchange among the supply chain partners may lead to increasing errors in forecasting and diminishing quality of data (Maurer, 2011). This in turns leads to the bullwhip effect. Bullwhip effect according to Derrick (2003); Trikman and Groznik (2006) refers to the ripples in the demand forecasts that travel through the supply chain and which is as a result of discrepancies between the demand forecasts of the individual company and the real demand. Derrick (2003) believes that company share information, however, this information is limited in nature and scope therefore leading to the bullwhip effect. Simchi-Leviet et al. (2009) on the other hand maintains that the bullwhip effect results due to lack of information on demand at each stage of the supply chain. According to them (Simchi-Leviet et al., 2009), when a company takes long in responding to the demands of the customer by failing to pass the correct information to the next tier on time on the forecast order, variability in the forecast orders increase in that tier. Bullwhip effect therefore arises due to lack of real time information sharing and efficient flow of information along the supply chain (Maurer, 2011).

Inter-organizational information systems such as EDI enables an organization to share information which is accurate, assists in integrating the information (Lee & Lim, 2005) and enables the integrity, product quality and responsiveness as well as reducing the distortion of information. EDI therefore enables an organization to increase response time, increases value to an organization and allows it to provide services that are unique. EDI also adds the capabilities of delivering products and services to the customers. Supply chain players are also adopting the Radio Frequency Identification (RFID) in their ICT logistics system. Radio Frequency Identification (RFID) is an information system that allows the reduction of time required in the distribution of a product.

According to Mercado (2008), RFID is a data capturing system and an automatic identification which combines three components; a tag which is formed by a chip and which is connected to an antenna; a reader that is responsible for the emission of the radio signal and the middleware which is connected to the hardware and other application devices. RFID provides data communication in real time through the radio waves to several objects or data at the same time and at a distance without touch. This helps in the improvement of the traceability and visibility of the products between the partners in the supply chain. RFID has also the advantage of increasing efficiency, processing speed, reduction of losses associated with inventory as well improved accuracy of information (Mercado, 2008; Son et al., 2005). RFID can also decrease the costs of handling, storage and distribution as well as help in the reduction of out of stock products (Leung et al., 2007).

Vendor Managed Category Management (VMCM) is an innovative system that helps in the reduction of problems that are associated with replenishment, especially managing out-of-stock (Lee & Lim, 2005). VMCM is a combination of VMI, Efficient Customer Response (ECR) and outsourcing in the manufacturing industry. Implementation of VMI system in the supply chain helps in the reduction of inventory shortages and rationing gaming. The system helps in the signaling of demand and also anticipates the number of product sales as well as management of inventory (Gavirneni, 2006).

Results of a study conducted by Zibra (2010) however found out that when firms fail to leverage on modern technology such as Short Message Service (SMS) to communicate with supply chain partners.

Information accuracy

Accurate information should be error free, that is, the information shared according to Kaipia, (2009) should be based on objective data and should be complete to enable effective sharing by firms. According to Butcher, Lalwani and Mangan (2008), accurately matching supply and demand information is important in ensuring that products are delivered at the right time, in the right place, at the right price, from the right source and in the right quality and quantity to meet the specification of the end

customer. Butchers, Lalwani and Mangan, (2008) further assert that the demand side information helps the suppliers in knowing what products are required, quantities and the right specifications by the customer. Bidgoli (2010) asserts that information bureaucracy, where many levels are involved before the information reaches the intended destination increases uncertainty along the supply chain, further increasing lead times which impacts on costs.

Information inaccuracy can be prevented by the adoption of information sharing and transparency which can be achieved through the appreciation of the advancements in the internet technology. Taking the wrong actions and policies regarding inventory data can trigger information inaccuracy according to Raman et al. (2001) and Lee (2004) assert that top supply chains have triple A characteristics which include: Agility to changes, Adaptable top evolvement and Aligned to the interests of all the firms in the supply network.

According to Chopra and Sodhi (2004), failure to accurately match demand and supply has led to loss of sales for many companies. For example, lack of accurate information on an increase in demand leads to under stocking and consequently loss of sales and profits for a business. Information flow according to Bradley (2001) should be faster and should be able to allow for compressing cycle times in order to avoid loss in sales. Geary et al. (2002) argue that implementation of flawless materials and information system among the supply chain participants should be used to prevent uncertainty and improve the performance of a firm.

Inaccurate information on inventory levels may lead to dissatisfied customers since organizations may sell stocks that do not actually exist since they may be misled that they have more inventory than they actually have (Partida, 2012). On the other hand, accurate information on the levels of inventory may lead to improved performance in the logistical processes. An increase in information accuracy on the inventory levels is associated with an increase in the suppliers' orders that are delivered on time, faster dock to stock cycle times as well as increased sales orders that are delivered on time.

Supply side information on the other hand helps the customers to know when the products will be delivered by the suppliers, the quantities that the products will arrive in and the specifications of the products (Butcher, Lalwani & Mangan, 2008). Today, with the proliferation of the global supply chain networks, customers on the demand side require increased volumes and varieties of items in shortened time frames. This creates the need for high speed and accurate information on the market (Butcher, Lalwani & Mangan, 2008).

Information types

Type refers to the different variety of information that can be shared along the supply chain. These may include information on demand forecast, the sales data, the levels of inventory, the order status, planning of products, and logistics of the company as well as production schedules (Helo & Szekely, 2005). When information on the inventory levels and sales data is shared, it helps in the reduction of the bullwhip effect (Sweeney, 2006). Companies which share information on the performance metrics such as the required product quality and the lead times can help in the identification and reduction of bottlenecks within the entire supply chain and therefore improve the performance of the company (lee & Whang, 2000). Sharing information on capacity with the downstream partners can also help the supply chain partners to coordinate their production on demand and therefore prevent any shortages from occurring in the organization (Lee & Whang, 2000).

Information on demand levels can helps to provide forecasts, acts as a source of promotional campaigns and also informs the future business of an organization (Gavirneni et al, 2006). Information on inventory includes the levels of stocks held by an organization which affect the orders placed with partners along the supply chain (Lee et al., 2004). Information on production provides information concerning the lead times, resources, production capacity, production routing and duration which helps in the implementation of production plans (benz & Hoflinger, 2011). Production resources and capacity assist the organization in optimizing the flow of the materials hence efficiency (Lee & Whang, 2000). Logistics information include information on delivery schedules, the track loads and tracing of orders which in turn

increases visibility along the supply chain and increase the processes of distribution (Helo & Szekely, 2005). The performance metrics are the Key Performance Indicators (KPI) that support the decisions made by an organization in order to improve the processes. The KPI can assess for example the rate of inventory turnover, the performance of the suppliers and the transport costs incurred by an organization thereby helping in keeping the supply chain risks on check (Gunasekaran & Kobu, 2007).

Information connectivity

Information connectivity refers to the way the information along the supply chain is shared among the chain partners (Goswami, Engel & Krcmar, 2013). Information connectivity can occur both internally and externally. When information is shared among the different functions of an organization but within the boundaries of a firm, this is referred to as internal connectivity. External connectivity on the other hand occurs when information is exchanged outside the boundaries of a firm, for example with the customers, suppliers and third party service providers outsourced by an organization (Closs et al., 1997). Connectivity allows process coordination both within the firm as well as outside the firm. Various supply chain concepts such as Vendor Management Inventory (VMI), Collaborative Planning Forecasting and Replenishment which enhance collaboration and coordination within an organization can be supported through connectivity (Nambisan, 2000)

2.4.2 Financial Flow Risk

Financial flow refers to the cash that is received and spent by an organization (Musa, 2012). The financial position of an enterprise is disrupted when a company is unable to settle debts as well as when it engages in investments that are improper. Issues such as credit uncertainties caused ,mainly by clients who default their debts in an organization can lead to variations in the incomes of a firm (Rao & Goldsby, 2009).These can lead to delays in the payment of the suppliers and other partners along the supply chain (Musa, 2012; Rao & Goldsby, 2009).

Exchange rate risks

Njaaga (2013) defines exchange rate as the risk that the operations of a business will be affected by the changes in the rates of exchange. Musa (2013) defines exchange rate volatility as the movement of exchange rate that stems from fluctuations in currency. Rao (2006) explains that most firms manage the risk of exchange rate through hedging. Hedging involves taking a contract that will either rise or fall in value and then offsetting the fall or rise in value of an existing position (Eiteman, 2007). Hedging therefore helps in the reduction of the position risks that are caused by the movements of the exchange rates. A study by Musa (2013) shows that manufacturing firms in Kenya are more likely to be affected by the volatility in exchange rate risks since it is an import oriented country. He further explains that the fact that most manufacturing firms import raw materials, consumer goods and capital goods, there is need to manage the foreign exchange market.

The exchange rates in an economy plays a very vital role since it affects the domestic price levels, the allocation of resources and investment decisions as well as the profitability of the goods and services that are traded by a company (Musa, 2013; Njaaga, 2013). The volatility of the exchange rates affects the prices of the finished goods that are exported and also the cost of the inputs that are procured from a global perspective (Musa, 2013; Irene, 2011). The concept of globalization has encouraged international purchasing as firms seek to increase their competitive advantage and also leverage on economies of scale. Although global sourcing has significantly reduced the cost of buying, thereby contributing to profitability, it has also led to variability in the cash flows of firms due to fluctuations in foreign exchange risks (Afza & Alam, 2014). Results of a study carried out by Irene (2011) shows that there is negative relationship between foreign exchange risk and the financial performance of a firm. Exchange rate risk affects the outsourcing decisions of a firm as volatile currency affects the budget allocation for offshore initiatives (Zonnov, 2006)

Financial strength of the suppliers

Kleinddorfer and Saad, (2005) argue that a company that deals with suppliers who have financial hardships may results to inefficiencies along the supply chain. Supplier relationships such as partnerships with suppliers who are financially unsound increases risk of the procuring entities that enter in such relationships (Finch, 2004). When the financial strength of a supplier is vulnerable, it affects the entire supply chain participants (Tang, 2006). Suppliers who suffer from unsettled debts of their raw materials often affect the buying firms as they experience inadequate orders. A study by Achilles (2014) also shows that when suppliers suffer from financial failure, the average cost incurred by the procuring entity participating in the supply chain amounts to 73,000 pounds. Therefore, managing the financial failure risks of the suppliers should be a top priority for an organizations, sourcing, procurement and contract management (Achilles, 2014). An Article by Supply Chain Digest (2014) posits that procuring organizations can rely on the financial accounts of a company and carefully analyze them to determine their financial strength.

Procurement managers should also liaise with the other members of a supply chain to ensure that suppliers' issues that manifest themselves in delivery or quality problems are communicated to the management so as to allow follow up activity (Achilles, 2014). A study by Carter and Giunipero (2010) explains that it is important for companies to manage the risks that are associated with their suppliers. They further assert that firms should make a decision on whether such management should be carried out in-house or outsourced to a 3rd party. The establishment of supplier management programs helps in avoiding costs that may be difficult to measure or even put into a cost benefit analysis such as ROI (Return on Investment). Management should understand how the lack of key components or services in an organization impacts on the whole business and especially if the supplier goes into bankruptcy without the knowledge of the organization (Carter & Giunipero, 2010). Therefore management of the strengths of the suppliers is vital and should be priotized by organizations regardless of a crystal clear return of such a program.

There is need for proactiveness in supply risk management as opposed to reacting to problems once they arise (Carter & Giunipero, 2010).

Financial management

ACCA (2014) defines supply chain finance as the use of financial instruments, technologies and practices that are aimed at enabling optimal management of the working capital and the liquidity that is tied up in the processes of the supply chain. When purchasing goods and services, the supply chain participants should be concerned about the total cost of buying and not just the price of a product (ACCA, 2014). The findings of a research carried out by Hausman, (2004) shows that financial flows in a supply chain have not been matched with the improvements that have been made in supply chain management. The new innovative solutions are intended to increase the financial flows, make them faster, more predictable, reliable and less costly (ACCA, 2014).

Today, more companies are adopting innovative technologies and payment solutions that are geared towards ensuring that the supply chains are faster and cost efficient (Bottom Line Technologies, 2011). Hausman (2004) further points out that automated supply chain payment systems have especially improved the performance of the supply chain. Poor management of finances along the supply chain can impact on the performance of the firm in terms of lost sales due to product unavailability (Hausman, 2004). Today, financial flows are manifested in terms of delays in processing and reconciling invoices and holding up capital in terms of inventory to dealing with uncertainties of being out of stock (Mertinez, 2014).

Purchasing employees should also be empowered to avoid inappropriate spending in goods and services that the organization does not require thereby undermining the initiatives of companies to control expenses and engage in strategic sourcing (Mertinez, 2014). Strategic sourcing requires the organizations to know how much they are purchasing from the various suppliers for the specific categories of items used in the company (Bottom Line Technologies, 2004). These can best be done using automated systems since periodically analyzing purchasing spends and negotiating with suppliers can be time consuming and costly (Hausman, 2014).

Proper supply chain financial management improves the performance of an enterprise through reduction of supply chain risks such as improved cycle times, reduced carrying costs, predictability of cash flow improvements, reduced risk of non supply (through reduced safety stocks) and reduced currency risks (through hedging) (ACCA, 2014).

2.4.3 Material Flow Risk

Musa, (2012) defines materials flow as the physical flow of goods and services between and within the elements of a supply chain. Certain risk factors of materials flow such as rare raw materials, mistakes in production and logistics barriers in trade routes as well as language and cultural difficulties may affect the smooth flow of materials through the chain (Ruriani, 2013). According to Kerstern and Blecker (2006), these risk factors can disrupt the flow of the materials and cause significant delays and customers' orders will not be finished on time. Risks in information flow, financial flow and materials flow have some reciprocity in the sense that lack of efficient information may lead to delays in the materials and consequently affect the financial position of an organization due to lost sales. It is therefore important to link the flow of the materials risk to the performance of an enterprise (Kerstern & Blecker, 2006). Supply chains are aimed at realizing a win-win situation for all the participants. The supply chain is viewed as a simple pipe line where risks can affect the smooth flow of materials in an enterprise according to Waters (2011). There risks can be managed through increasing visibility which increases efficient flow of materials and allows better controls (waters, 2011). Li and wang (2011) are of the view that fluctuations in demand and disruptions in supply are the two primary uncertainties in a supply chain materials flow, for example, the uncertainties of the purchasing costs, selling prices and the purchasing parameters. They further classify materials flow risk into demand risk and supply risk. However, Jamil et al (2016) notes that firms can only leverage on ICT to reduce material flow risk when the management appreciates the use of automated system for agile decision making and also fuse ICT to allow agile changes in the production systems to meet the customer requirements.

Sourcing

Sourcing risks signify the probability of loss to an organization that results from events that originate from the upstream side of the supply chain (Harland, Brenchley, & Walker, 2003). These loses may be caused by natural disasters, supplier bankruptcy, supplier flexibility, lack of capacity and exchange rate risks. One of the key issues of Supply Chain Management (SCM) according to Goffin, Lemke and Szwejczewski (2006) is the management of the suppliers because the cost of the raw materials and components procured constitute the highest percentage of the costs of a products and most firms spend a considerable amount of the revenues that they obtain from sales in purchasing, therefore, selecting the suppliers is one of the most important problem when making decisions. Dey and Lockstrom (2011) also agree that selection of the right supplier reduces the costs of purchasing and increases the competitive advantage of an enterprise. Therefore, selecting the suppliers appropriately increases the performance of the supply chain and the organization as a whole (Dey & Lockstrom, 2011). To effectively manage risks associated with the sources of a product, the organization needs to have knowledge on the events that leads to the losses, the probability of those events occurring and the effect to the organization in the event they occur (Ellegaard, 2008).

Fischl, Scherrer and Friedli (2014) agree that some of the risks that are facing manufacturing firms today as far as sourcing is concerned are the price volatility especially of critical supplies such as oil. Some of the strategies that manufacturers can adopt in order to prevent the increases in prices is through vertical integration and strategic alliances with suppliers so as to secure their sources of supply and also stability of the prices (Fischl, Scherrer & Friedli 2014). Sourcing risks can also be mitigated through undertaking category management (strategic, leverage, non-critical, bottleneck) and then implementing sourcing strategies based on each category of the items (Cox, 2014).

Global sourcing which influence the financial success of a company and is viewed as a low cost strategy raises major concerns for managers due to the risks involved (Ellegaard & Vedel 2013). The large distances increases the probability of severe losses in the event damages occur along the supply chain (Juttner, Peck &

Christopher, 2003). The distance also increases the information asymmetric thereby reducing the probability of creating a knowledge base for managing the risks. Other risks associated with global sourcing according to Nelson (2013) include; capacity risk (output availability and lead time variability), catastrophic risks (natural disasters, wars, and terrorism), quality risk (specification, non-compliance), contractual risk (intellectual property risk) and management risks (embezzlement, fraud). Traditionally, intermediaries such as agents and trading houses have played a vital role in mitigating risks associated with global sourcing as they improved the flow of information, physical flows and also were responsible for supply base inventories. However, intermediaries have been criticized as emphasizing more on the profits as compared to the services rendered (Ellegaard & Vedel 2013). Nelson (2013) explains that other sourcing strategies such as single sourcing strategies reduces the cost of quality to the procuring entity, it also increases the costs of supplier failure and increases the supplier power. Outsourced manufacturing initiatives are also effective in an environment that is stable but they make the supply chain more vulnerable to disruptions caused mainly by uncertain economic cycles, consumer demands as well as natural and man-made disasters (Tang, 2006).

Sourcing Flexibility

Flexibility in sourcing enables a firm to adapt to changing business requirements and allow them to respond to the new conditions in the market (Byrd & Turner, 2000). Benefits that accrue from a flexible supply chain are reflected in terms of postponement in the processing of orders, reacting to variations in demand distributions across the nodes of the supply chain, responding to forecasting errors in a rapid manner, increased efficiency in order filling and managing of the suppliers (Christopher et al., 2006). Results of a study carried out by Khan and Pillania (2008) shows that sourcing flexibility is the strongest area of strategic sourcing to consider when organizations are planning for capabilities that are geared towards making their manufacturing processes more agile. Sourcing flexibility also increases the agility of the supply chain and the performance of a firm. According to Kidd (2000), Agility is related to quickness while flexibility is refers to adaptability and versatility.

Agility is concerned with the abilities of the organization while flexibility is related to the operational abilities in the case of manufacturing processes (D'Souza & Williams, 2000). An agile supply chain increases the competitiveness of an enterprise. Supplier sources which are flexible provide the buying firms with alternatives in case of capacity constraints or when they are faced with other disruptions which are hazardous (Musa, 2012). However, switching from one source of supplier to another suscepts the organization to other hidden costs as pointed out by Kamrad and Siddique (2004). The costs incurred by a buying organization when switching from one supplier to the other may be attributed to the establishment of relationships among the various partners along the supply chain (Musa, 2012).

Supplier Capacity

Capacity constraint according to Zsidisin (2003) is the inability of the supplier organizations production systems to produce the quantity that is demanded by the customers. Fluctuations in demand tax a supplier beyond his capabilities as the equipments are depreciating and the labor is idle. Capacity constraint can be caused by poor technology, that is, if the supplier is not able to adjust to changing technologies in the long term, the supplier may not be able to meet increased rates in demand. Johnson (2001) asserts that capacity limitation is one of the major risks that disrupt the supply chain. Resilinc (2015) point out that supplier capacity risk is one of the factors that a supply chain manager should evaluate in order to ensure uninterrupted flow of products and services that are required in the events of fluctuating demands. Lack of visibility to the supplier capacity constraints can lead to loss of revenues, market share and customer dissatisfaction and especially if a firm cannot respond to shortages in supply and surges in demand (Johnson 2001; Resilinc, 2005).

Companies can reduce idle capacity risks by ensuring that each plant is flexible (Chopra & Sodhi, 2004). Market capacity risks occur when there are few available suppliers in the market (Zsidisin, 2003). Companies can implement collaborative strategies with both the suppliers and customers such as vertical and horizontal integration to mitigate supplier capacity risks (Guillaume, Thierry & Grabot, 2014).

This is because for a company to competitive, it must compete as part of the entire supply chain process as opposed to a standalone entity.

2.4.4 Organization Characteristic Risk

Organization characteristic risks are defined as the specific traits exhibited by the manufacturing firms that increase their uncertainties in achieving supply chain and the firms' objectives (Harvie, Narjoko & Oum, 2010). They also refer to the specific traits that distinguishes one firm form another and therefore determine probability of supply chain risks (Summer, 2014)

Employee Size

Employee size (number of employees) that a company employs depends on the resources (financial and technological resources). Therefore, firms with these resources tend to employ more people than those which do not (Kumar, Rajan & Zingales, 2001). Many large companies that tend to have a larger control over their supply chains tends to manage supply chain risks effectively since they act as the 'channel captain' (Juttner & Ziegenbein, 2009). Firms with a high number of employees are also able to attract a large pool of labor force which is skilled in risk management and have high technological skills (Sinha, 2015). This is because these firms have experience in supply chain risk management and implementation of supply risk management. These firms also have the financial resources to mitigate to put in structures to mitigate supply chain risks (Norman & Janson, 2004). For Small and Medium sized Enterprises (SMEs) which also are engaged in global sourcing and therefore are exposed to similar risks as the large firms, managing risks tends to be more difficult since they lack the necessary structures, processes and resources (Summer, 2014).SMEs are affected disproportionally to supply chain risk since in most cases, they are either second or third tier suppliers along the supply chains and therefore have to shoulder significant burden of risks which are pushed upstream by other partners in the supply chains (Juttner & Ziegenbein, 2009).

Organization Location

It's important to locate a firm in areas that are not prone to risks such as floods, earthquakes and natural disasters (Davis, 2016). This increases the firm's vulnerabilities to such risks. Challenges and risks of poor utilities, poor infrastructure, unstable political and economic environment should be critically analyzed (Amimo, 2013). The choice of the location chosen should also allow access by the customers, workers, transportation and the materials into the organization (Supply Chain Risk Leadership Council, 2011).

Firms whose supply chains are global are more likely to face additional risks as compared to firms which source locally. This is because the size of the supply networks increases risks of the supply chain due to currency exchanges risks, legal risks, communication risks and increased led times (Summer, 2014).Today, many firms are shifting from local suppliers to low cost distant suppliers without putting into consideration the full cost associated with this changes (Culp, 2012).

Organization Ownership

Results of a study carried out by Hillary and Hui (2007) on the influence of ownership religion on corporate decision making shows that religion highly influences the decision that a firm makes. Firms that have been in operation for a long period of time also have experience in managing supply chain risks as compared to those that have been operating for a short period of time (Juttner & Ziegenbein, 2009). A study by Jiang et al (2015) carried out on Family-firm risk taking: Does religion matter? Also shows that family firms whose founders were religious have less risk than other family firms. The study also found out that firms that were founded by entrepreneurs who were religious had lower leverages and had invested less in fixed and intangible assets compared to firms that had been founded by entrepreneurs who were non-religious.

2.4.5 Information Communication Technology (ICT)

Information and communication Technology (ICT) is an umbrella term that involves communication device or application such as radios, cellular phones, televisions, computer software and hardware, software satellite systems and their various applications such as wireless communication and video conferencing (Campton, 2007). ICT are all those electronic technologies that accept data in text form, graphics, videos or voice for purposes of processing information to be used in decision making (Baily, 2007). ICT provides new solutions that enable the developments in businesses thus supporting their growth and competitiveness. ICT and e-business applications improve information sharing and knowledge management within and outside the business processes, reduce transactional costs while increasing the speed and reliability of businesses (Osodo, 2012).

Proper ICT adoption along the supply chain enables accuracy of data that is shared along the chain due to the reliability management information system which in turn promotes confidence of the procurement business relationships (Hernandez, Galindo & Colin, 2015). Proper inventory control through the use of ICT, good forecast systems and better computer material control status improves the competitive advantage of business and enhances better performance (Calantone et al, 2003). Results of a study carried out by Hernandez, Galindo & Colin, (2015) shows that the use of ICT in the operation of a business does not guarantee performance since it depends on the type of technology used and the degree of adoption of the said technology as well as the ability to use the technology correctly. ICT today is a key enabler in the management of supply chains (Sweeney, 2005). ICT improves the performance of the supply chain through improved information sharing and collaboration by using specific computer to computer linkages (Zhang, Donk & Vaart, 2011). ICT facilitates the delay avoidance, handling of information resources which reduces costs and increases the customer reliance thereby improving the competitiveness of the organization (Hernandez, Galindo & Colin, 2015)

ICT Infrastructure

According to Porter (2005), ICT comprises of the hardware, software and communication that captures, transforms, stores, transfers and applies information. Organizations which deploy ICT according to Christiansen and Bryan (2015), experience a reduction in costs, have high productivity and have a competitive advantage. ICT is a major component of supply chain management as it leads to growth in revenues, reduces costs and promotes the utilization of assets in an organization (Cooper & Lambert, 1997). ICT in supply chain acts as a mechanism for sharing and exchange of information, integrates the supply chain members business activities (inter -and intra-organizations) and also connects the supply chains. This in turn leads to better collaboration, integration of processes and connectivity.

ICT infrastructures that are used to enable integration of processes along the supply chain are referred to as software (Christianse & Bryan, 2015). Process driven applications have planning systems that facilitate in forecasting thereby enabling the firm to be more profitable through better inventory and revenue management (Christianse & Bryan, 2015). Procurement systems support the buying processes of a firm from the identification of a need to payment (Council of Supply Chain Management Professionals, 2013). Supply Chain Relationship (SRM) systems on the hand help in the management of the interaction between the firm and the numerous suppliers in an effort to improve the processes of buying as well as reduce costs.

Manufacturing Information Systems such as Materials Requirement Planning (MRP 1) and Manufacturing Resource Planning (MRP 11) helps the manufacturing and production functions to meet stock demands, specialized orders as well as decisions on product and quality (Council of Supply Chain Management Professionals, 2013). Global Positioning Systems (GPS) enhance the efficiency of deliveries to the customers by navigating and routing of deliveries along the supply chain. Distribution solutions such as inventory management systems monitors the life cycle of inventories from purchase-production-sales. Warehouse management systems (WMS) support warehouse activities such as goods receipt, storage and picking.

Transportation Management Systems (TMS) on the other hand optimize transport activities such as shipping management, shipment scheduling, third party logistics as well as documentation (Council of Supply Chain Management Professionals, 2013).

ICT Training

ICT solutions along the supply chain require adequate training to enable the users to view the e-supply chain platforms as the most preferred means to buy goods and services in an organization (KPMG, 2001). Beth et al. (2003) point out that the competence of employees is a challenge in the adoption of technology in the procurement process. In their study, they affirm that procurement staffs must be competent to use application software that enables the organization to manage activities such as distribution and value chain activities. Findings of a research carried out by Christianse and Bryan (2015) shows that highly trained employees in ICT have deeper understanding and are able to evaluate ICT platforms that are suitable for their firms. According to Sharma and Yetton (2007), training is one of the interventions that lead to system success and acceptance by the users.

2.4.6 Firm performance

According to Florian and Constangioara (2014), firms that are exposed to supply chain risk experience lower performance as opposed to those whose level of supply chain risk is lower. The higher the levels of risks, the higher the consequences which are manifested in terms of customer complaints, quality problems, mismatch of supply and demand as well as delays (Silanpaa, 2010). Today's volatile business environment requires firms to reduce the negative effects of risk by developing appropriate supply chain management strategies and communication of the priorities of the company so as to enhance organizational performance (Wagner and Bode, 2008). According to Solakivi (2014), cost reduction is the key driver of financial performance. Grosse-Ruyken, (2012) as cited by Solakivi (2014) point out that Return on Investment (ROI) is a measure the effectiveness of a firm in utilizing its assets to generate profits.

Measuring performance helps to determine the effectiveness of the strategies that are adopted by the management and helps in directing the attention of the managers, revising the goals of a company and re-engineering business processes (Silanpaa, 2010). Measuring performance is vital in supply chain improvement (Chan, 2003).

The performance of the corporate continues to grow according to Hervani, Helms and Sarkis, (2005) includes both qualitative and quantitative measures which mostly depend of the goals of the business. Firms should consider financial measures on a more competitive and strategic levels such as: Return on Investments (ROI), profitability, market share and revenue growth. Other financial measures such as customer satisfaction and the performance of the inventory are more focused on the operations of the organization but also require to be linked to the measures and issues at the strategic level (Hervani, Helms & Sarkis, 2005). Financial measures of performance are available after some period of time when production has been carried out. The problem of using financial measures is that they are not relevant to the day to day operations of an organization and therefore, they are more useful at the top management level where strategic decisions are made (Silanpaa, 2010). Operational measures such as customer satisfaction are more useful to the managers at the lower level since they are involved in the day to day running of an organization (Morgan, 2004). It is important to develop more non-financial metrics as they present more information than the basic financial metrics (Sillanpaa, 2010). Increased risks along the supply chain affect the performance of the firm in terms of inventory costs, responsiveness and lead times (Florian & Constangioara, (2014). Leaders in supply chain performance are also leaders in financial performance (Johnson & Templer, 2007). Disruptions along the supply chain decrease the value of the shareholders both in the short run and in the long run (Hendricks & Singhal, 2003).

Revenues

Supply chain risks have a severe effect on performance as firms need to operate for at least two years experiencing low performance levels after a disruption, that is, they do not recover quickly once a disruption occur according to (Hendricks & Singhal, 2003). A study carried out by Hendricks and Singhal (2003) shows that once a firm

experiences a disruption along the supply chain, operating incomes drop by 107%, sales growth drop by 7% and costs increase by 11%. Managers and executives should put in place significant measures to mitigate risks along the supply chain since disruptions can destroy organizations value that has been created over many years. Managers must therefore be proactive in ensuring that their supply chains operate without failures (Zsidisin, Melnyk & Gragatz, 2005). Results of a research carried out by Hendricks and Singhal (2005) shows that supply chain risks negatively affects the income of a given company. According to Womack et al. (2003), firms are demanded to operate with a high degree of Excellency and the supply chain has an increased responsibility in achieving this excellence. These includes the concept of risk management throughout the supply chain (Womack et al., 2003)

Companies need to undertake investments not on the basis of cost reduction but on the premise that they make the supply chain more responsive and reliable. Such investments should be undertaken on the basis of insuring the company against potential disruptions and not on the basis of cost savings. According to Porter (1980), cost advantage and differentiation are the two generic strategies that enhance the competitive advantage of an enterprise. Reducing costs helps an organization to achieve cost advantage while differentiation provides increased levels of customization and service thereby increasing the profits of a company (Hillman & keltz, 2007). Higher levels of service can be achieved through efficient ordering, product availability improved responsiveness, on time delivery and information transparency (HCL technologies, 2013).

Differentiation along the supply chain is created through the provision of superior value that creates customer value (Peck & Christopher, 2003). Reducing the total costs of sourcing materials reduces the costs of goods sold and subsequently contributes to profitability (Zsidisin, 2003). Reduction of inventory holding costs through proper inventory management also contributes to the profitability of a firm (Stapleton et al., 2002). Reduction of current assets such as inventory helps a firm to improve the utilization of assets and thereby increases the profits of a firm (Peterson, 2015). In addition, reduction of inventory reduces the operational costs that are

associated with holding inventory. This reduces the amount of capital tied up in stock which in turn increases the liquidity of a firm

Sales volume

A research carried out by McKinsey and Company (2011) showed that 31-40% of the respondents indicated that the company executives rarely meet with the sales representatives to discuss supply chain tensions. The study also indicated that the sales and marketing department has difficulties collaborating with other functions such as manufacturing and planning. Supply chains constantly struggle with volatile demand because a rise in order volumes increases labor and distribution costs. Inaccurately forecasting sales can similarly lead to stock outs, loss of sales or increased inventories which are sold at a discount to move it off the shelf. There is need therefore to develop proper planning and forecasting processes in order to enable and predict volatility in demand (McKinsey & Company, 2011). Results of a study carried out by Ray et al. (2004) shows that there is a positive relationship between increased levels of service, customer retention and sales volume. Improvements along the supply chain therefore must be focused on reducing costs without negatively impacting on customer service, or improving services without disproportionately increasing costs

Customer satisfaction

Success of a company depends on the ability of the supply chain partners to focus on the customer (Lee, 2004). According to Wharton (2011) manufacturers today are more focused on timely delivery of complete, damage free and correctly invoiced products to the customers. This is because the number one asset to the company is the customer and therefore delivery the right product on time is key to maintaining a strong relationship with the customer (lee, 2004). Manufacturing firms are now focused on reducing risks that affect their relationship with the customers by implementing automated processes that allow visibility of the orders and the status of the shipment. Reliance on manual processes for customer and supply chain collaboration hinders the ability of the firms to manage the volatile demand, obtain demand signals in real time and this increases the risk of damaging the relationship

between the firm and the customers (Wharton, 2011). Customer satisfaction according to (Zerbini et al., 1007) is one of a firm's major milestones to profitability. Companies are now focusing on satisfying the customer with the sole aim of improving their competitive position in the industry (Rad, 2008)

2.5 Critique of existing literature

Choy et al. (2004); (Sweeney, 2006) agree that lack of information sharing along the supply chain can be costly to the organization as a whole. They however fail to mention the specific costs that a firm would incur by failure to share the said information. Clement and Munoz (2007) also point out that poor performance of a firm is normally attributed to the decisions that are made by individuals. He however fails to mention at what levels of the organization strategy should the decisions be made so as to prevent disruptions along the chain and the types of supply chain decisions that should be made at each level, that is, strategic level, business level an operational level. Tyrinopoulos (2004) also asserts that information along the supply chain should be faster and reliable but fails to show us how the organizations can ensure that information flowing along the chain should be made faster and timely for decision making.

Rao (2006); Eiteman (2007) point out that exchange rate risks can affect the financial flow of a firm as it increases the price of the raw materials and the ultimately the price of the finished goods. While this is the case, they fail to mention the strategies that a firm can implement to mitigate this risk and only mention hedging of the risks. However, other strategies such as forwards and futures of the currency can also be used by firms to reduce risks that are associated with the currency exchange. Carter and Giunipero (2010); Achilles (2014), agree that management of the suppliers can help to monitor their financial strengths and thereby reduce supply chain risks of failure to supply. However, they fail to point out the types of the proactive measures that firms should implement to manage the financial; strengths of the suppliers.

Hausman (2004); Mertinez (2014) explain that implementation of financial management systems can help in faster processing of suppliers invoices and thereby

reduce the risk of non-supply due to late payments. They however fail to pin point the specific types of the financial management systems that firms can implement to enhance their relationship with suppliers especially as far as payment is concerned thereby reducing risks along the supply chain.

According to Ellegaard and Vedel (2013); Cox (2014); Fischl, Scherrer and Friedli (2014), sourcing risks can be mitigated by classifying the materials procured by an organization on the bases of total spent. While this is true because it allows companies to put in strategies based on the strategic impact of the materials to the organization, it is not practical in firms with a small scale of operation. Firms with large portfolios are able to implement the purchase classification model but those with fewer portfolios would not enjoy the economies of scale and therefore it would be costly for them.

2.6 Summary

Supply chain risk is one of the major issues affecting supply chain management today. Firms need to understand the various sources of risks along the supply chain and put in place strategies to mitigate the same. Management of risks along the supply chain requires a joint collaborative effort among all the supply chain partners. Information sharing is key so as to identify potential areas along the supply chain that are especially vulnerable. Accurate information should be enhanced to allow firms to implement the right strategies to mitigate the supply chain risk. The organizations should also be concerned about the type of the information that flows along the chain. Forecast information, lead time information and demand information is particularly important to avoid customer dissatisfaction at the end of the supply chain. Information should also be shared between the various departments in a firm with other supply chain partners outside the organization to enhance performance.

Exchange rate risks particularly increases risks of highly priced raw materials thereby reducing the competitiveness of a firm. The bankruptcies of a supplier can also suspect an organization to risks of stock outs which can have a negative impact on profitability. Poor management of finances can also affect the liquidity of a firm

especially if money is spent in the procurement of raw materials that are not required by an organization. Poor selection and evaluation of the suppliers can also lead to risks of poor quality goods in an organization. The sources of supply should also be flexible to reduce the costs of switching from one supplier to another. Suppliers should also have adequate capacity to cater for their requirements of the procuring entity since inadequate capacity leads to risks of stock outs and lost sales which affect the profitability of an enterprise. Use of ICT can help mitigate and reduce the risks of supply chain. Proper use and implementation of ICT supply chain soft wares can provide real time information on demand, forecasts, sales and customer preferences which can help to substantially reduce risks along the supply chain. This can in turn contribute to the performance of an enterprise in terms of profitability, return on investment and customer satisfaction.

2.7 Research gaps

The existing literature was deficient in explaining the effect of supply chain risk on the performance of a firm especially in a country like Kenya which is ranked among the countries that are still developing. The studies have mainly focused on the aspects of managing the risks along the supply chain. Most of the researches have not provided a good perspective on how, supply chain information flow risk, financial flow risk and material flow risks along the supply chain specifically affect the performance of a firm. The relationship between the said risks and the firm performance in terms of revenues, return on investment and customer satisfaction is not properly correlated in the studies.

Research on the role of supply chain risk on the performance of a firm, and especially when ICT is used in moderating this risk is lacking. Most studies have focused on ICT as risk in terms of viruses and technological advancement. However, studies on using ICT to moderate the supply chain risk and especially with globalization where ICT has been seen as a catalyst to development and a solution to mitigating risks have not been extensively been explored. Other research gaps are tabulated in Table 2.1 below;

Table 2.1 Research Gaps Summary

Gaps	Authors
The Normal Accident Theory postulates that supply chain is a system that is social technical and therefore difficult to control because when the elements of the supply chain interact, they can cause accidents that may not be provided. This theory however fails to show the relationship or the impact of such interactions to the performance of a firm.	Simon (1962); Perrow, (1984)
The Technology Acceptance Model (TAM) explains that the main reason why people adopt or leverage on ICT is because it is easier to use (perceived ease of use) or because he/she believes that using ICT will improve performance (perceived usefulness). However, there are other reasons why people may adopt ICT in their supply chains such as mitigating risk of information flow by having and gathering enough information to make decisions that will prevent risks along the supply chain.	Davis, (1989)
The Resource Based View (RBV) focusses on the competitive advantage of the firm that results from the firms resources and capabilities and that the resources are rare, valuable and cannot be substituted. He points out these resources as skills, processes, information and knowledge. However, other resources such as financial resources are also significant I enhancing the capability of terh firms	Wernefelt, (1984); Barney (1991)
The researchers also point out that information sharing along the supply chain reduces the supply chain risks that are brought about by the bullwhip effect. However, these researcher however, fail to indicate how such risk can be mitigated along the supply chain.	Whang, (2000); Lee et al, (1997)
The researchers also point out that information leads to faster decision making in an organization and that information gathered along the supply chain can be provided to various participants of the chain. However, the scholars do not mention the role that this information will play once it is shared because sharing information can also negatively affect the firm if it is not carried out selectively	Tyrinopoulos (2004); Hugos (2006)
Scholars have also argued that financial flow risk is cause by the exchange rates when they fluctuate. However, external factors such as politics can also depreciate the currency in turn leads to high costs of goods and services. The scholars also point out that hedging is the strategy that firms use to mitigate against the risk of foreign exchange, however, other strategies such as forwards and futures as well as diversification are also applied by firms across the world	Musa (2013); Afza & Alam, (2014)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the methodology that was used to carry out the study. It described the research design, the population of the study, the sampling frame, the determination of the sample size and the sampling techniques that were used, the instruments that were used to collect the data and the pilot testing. The chapter outlined the type of data that was collected, the techniques that were used to collect the data and the methods that were used to analyze the data. The statistical measurement model that were used to analyze data and the tests for hypothesis were provided in this chapter.

Research philosophy

The study was guided by epistemological research philosophy. Research philosophy is concerned with the nature and development of knowledge (Saunders, Lewi & Thornhill, 2009). Epistemological positions are three: realism, interpretivism and Positivisim (Saunders, Lewis & Thornhill, 2009). This study adopted a positivist research paradigm which is an epistemological position. This is because the entire research was based on objectivity and therefore the researcher was only confined to collect and interpret data thereby ensuring that the findings were quantifiable and observable. According to Koul (2008), epistemological research in the positivist paradigm deals with how to investigate the social world as a natural science.

3.2 Research design

This study adopted the cross sectional survey design using both quantitative (focused on the measurement of weights of the opinions given by the respondents) and qualitative (information focused on opinion of the respondents) approaches. The cross sectional survey design was adopted due to the fact that data was collected

between August to December 2016. Existing data among the manufacturing firms was collected retrospectively.

In their study; an assessment of effect of risk identification management strategy on supply chain performance in manufacturing companies in Kenya; Mburu, Ngugi and Ogollah (2015) used a cross sectional research design. Ellegaard and Vedel (2013) also used a cross sectional research. Scholars cited in the literature such as Khan and Pillania (2008) also used cross sectional research design in their study.

3.3 Population

The target population was the 94 manufacturing firms in Kiambu County which involved large, medium and small manufacturing firms which are both members of the Kenya Association of Manufacturers (KAM) and potential members (KAM, 2015; KAM, 2014). This assisted the researcher in deducing the firms highly affected by supply chain risk. This firms were the small and medium due to their inability to employ more competent staffs to manage risks in their supply chain.

3.4 Sampling frame

A sampling frame consists of a list of all the items where a representative sample will be drawn for the purpose of a given study. In this study, the sampling frame was a list of all the manufacturing organizations in Kiambu county in the 12 key sectors which include: building, Mining and Construction, Fresh Produce, Food and Beverage, leather and footwear, Metal and allied Sector, Motor Vehicle and Accessories, paper and Board, pharmaceutical and Medical equipment, Plastic and Rubber, Services and Consultancy; Textiles and Apparels. The sampling frame drawn from the Kenya Association of Manufacturers (KAM) directory (2015) and KAM report (2014). KAM is an organization which represents the manufacturers of value added sectors in Kenya. KAM provides a link between the manufacturing sectors and the government by presenting the views of the sector to the government through dialogue and mutual understanding. KAM seeks to promote the competitiveness of the manufacturing firms in the liberalized markets.

The population was sampled to enable the researcher to make inferences on the data; a census would have made the study more descriptive. Inferences allow generalization of the study results which is not possible with a census study population. Sampling was also done because the research design was cross sectional and not a case study (Lavraka, 2008). Census would mean the results are just observations from the firms. The sampling was also within Kiambu County because the firms are influenced by the same social economic influences and therefore made it easier for the researcher to generalize the study results.

The researcher sampled from the manufacturing firms in Kiambu County who were both members and potential members of KAM (those who are registrable but have not paid the relevant fees). The study was restricted to KAM members because KAM is actively involved in sensitizing its members on supply chain risk management and ways of mitigating the risk through investments of ICT platforms (KAM, 2016). Manufacturing firms was also chosen as the sample size because KAM trains the members on ICT use in their firms. Kam does this by ensuring that ICT experts are part of the KAM management board to advise the members on ICT processes, systems, procedures, structures and skills (KITOS, 2017)

3.5 Sample and sampling technique

A sample is a portion of the population which the researcher is interested in. Sampling is appropriate when it is not feasible to engage the entire population under study (Cooper & Schindler, 2004). Sampling is done in order to provide a deeper understanding of the characteristics of the entire population. Sampling technique helps in selecting respondents who are rich in the information that will assist in the in depth analysis of the issues that are being discussed in the study (Kombo & Tromp, 2006). Stratified random sampling was used in this study (Mugenda & Mugenda, 2003), where the subjects were selected in a way that the subgroups in the population would be more or less reproduced in the sample. From the sampling frame, there were 12 key industrial sectors of the 94 manufacturing sectors in Kiambu County, in addition to the industries that are in the service sector and the affiliated organizations. The manufacturing firms were divided into 12 groups/strata (Table

3.1), each key sub sector forming a stratum. Stratified random sampling guarantees that every strata is well represented in the sample, it also more accurate in representing the population characteristics. Division of the population into stratum is based on the different features of the population and a random sample is picked from each stratum (Kothari, 2004). Sampling error is reduced considerably using this method. The study involved a sample size of 76 (see Appendix).

The following formula was used to determine the sample size for the survey based on simple random sampling.

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}$$ **.....Equation 1** *(Pagano* &Gauvreau, *2000)*

$$n = \frac{1.96^2 * 0.5 * 0.5 * 94}{0.05^2(94-1) + 1.96^2 * 0.5 * 0.5}$$

$$n = \frac{90.2776}{1.1929} = 76$$

P=0.5, q=0.5, $Z_{0.025}$=1.96 , e=0.05

Where

n = sample size

N= Entire Population

Z= Z score Corresponding to α =0.05 level of Significance.

E= Expected Error

p = Probability of ICT use

q = Probability of Non ICT use

Table 3. 1: Sample size

Firm Listing by Sector	No. of firms	Formula	Strata Sample	Stratum Percentage
Building, Mining and Construction	5	76*(5/94)	4	5%
Chemical and Allied Sector	2	76*(2/94)	1	2%
Fresh Produce	4	76*(4/94)	3	4%
Foods and Beverage	44	76*(44/94)	36	43%
Leather and Footwear	5	76*(5/94)	4	5%
Metal and Allied Sector	5	76*(5/94)	4	5%
Motor Vehicle and Accessories	2	76*(2/94)	1	2%
Paper and Board	5	76*(5/94)	4	5%
Pharmaceutical and Medical Equipments	7	76*(7/94)	6	7%
Plastic and Rubber	10	76*(10/94	8	11%
Services and Consultancy	2	76*(2/94)	1	2%
Textiles and Apparels	7	76*(7/94)	6	7%
Total	**94**		**76**	**100%**

3.6 Instruments

A questionnaire is an instrument that is used to gather data over large samples and aims to translate the objectives of a study into questions and the answers provided for each question provides the data that is required to test the hypothesis. A questionnaire is preferred over other instruments because information from very large samples can be adequately collected, it does not provide an opportunity for the respondents to be biased since the information is presented in hard copy or soft copy form and confidentiality is enhanced. A questionnaire was used in this study in order to capture the dependent (information flow risk, financial flow risk, material flow risk and organization characteristic risk), moderating (ICT use) and the independent variables (firm performance) (see Appendix 1). The questionnaire had both closed

ended and open ended questions. The closed ended questions were used to provide precise information, minimized biasness and enabled proper analysis of the data. The open ended questions on the other hand enabled the respondents to express themselves freely. Secondary data was collected through evaluation, reports, publication, information from websites and organizational journals as far as they provided up to date and relevant information.

3.7 Measurement of Variables

The following rating scales were used in this study: open ended questions to enable the respondents to include information that had not been captured in the closed ended questions. Likert scale which was developed by Rensis Likert to examine how subjects strongly agree or disagree with a given statement was also used in this study (Cooper & Schindler, 2011). The likert scale dominated the questionnaire in this research. According to Chimi and Russel (2009) likert scale is used nearly in all scholarly and business research and is used in circumstances such as: when the value being sought is a belief, opinion or effect; when the value being sought cannot be asked or answered definitely with precision and when the value being sought is considered to be of a sensitive nature that the respondents are likely not to answer except stated categorically in large ranges. The nature of the data that was collected in this study exhibited most of these characteristics and therefore the likert scale was most appropriate. It is easy to evaluate a likert scale through standard techniques such as factor analysis and logistic regression analysis (Montgomery, Peck & Vining, 2001). All the hypothesis to test the relationship between supply chain risk and firm performance was measured by a linear regression model.

Information flow risk helps in updating all the supply chain elements and therefore provides resources for supply chain decision making, distortion of the information poses a risk to the supply chain (Musa, 2012). In this study, information flow risk was measured with information accuracy, information type and connectivity. These measures are modified and adopted from Musa (2012).

Financial flow risk; Financial flow refers to the cash that is received and spent by an organization (Musa, 2012). The financial position of an enterprise is disrupted when a company is unable to settle debts as well as when it engages in investments that are improper. In this study, the financial flow risk was measured by exchange rates risks, financial strength of the suppliers and financial management (Njaaga, 2003; Musa, 2012; Achilles, 2014; ACCA, 2014).

Material flow risk; Musa, (2012) defines materials flow as the physical flow of goods and services between and within the elements of a supply chain. Certain risk factors of materials flow such as rare raw materials, mistakes in production and logistics barriers in trade routes as well as language and cultural difficulties may affect the smooth flow of materials through the chain (Ruriani, 2013). In this study material flow risk was measured by sourcing, sourcing flexibility and supplier capacity (Harland, Brenchley, & Walker, 2003; Byrd & Turner, 2000; Zsidisin 2003)

Organization Characteristic risk; Refers to the specific traits that distinguishes one firm from another and therefore determine probability of supply chain risks (Summer, 2014). In this study, organizational characteristic risks was measured by the employee size, the firm location and the firm ownership.

Information and communication Technology (ICT) is an umbrella term that involves communication device or application such as radios, cellular phones, televisions, computer software and hardware, software satellite systems and their various applications such as wireless communication and video conferencing (Campton, 2007). In this study, ICT was measured by the hardware and software devices used by the manufacturing firms.

Firm performance according to Hervani, Helms and Sarkis, (2005) includes both qualitative and quantitative measures which mostly depend on the goals of the business. In this study, the performance of the firm was measured using revenues, return on investment (ROI) and customer satisfaction.

3.8 Data Collection procedure

Two sets of questionnaires were administered. The questionnaires were self-administered. The target participants were the supply chain managers and the operational managers who deal with the day to day activities of the organization who filled in the questionnaires. These target population had adequate knowledge on the supply chain risks that face the firms because they are highly involved in the supply chain decisions. The organizations were first contacted to inform them of the intention to drop the questions and the request to drop the questionnaires form the supply chain managers. The total number of questionnaires that were issued were 76.

3.9 Pilot test

Pilot test as explained by Cooper and Schindler (2011) is conducted in order to detect weaknesses in instrumentation and also it provides proxy data for the selection of probability sample. The procedures which was applied in pre-testing the questionnaire was similar to those that were applied during the actual study and also during the collection of data. According to Mugenda and Mugenda (2003), the number that is used in the pre-test should be small, about 1% to 10% of the entire sample size which will translate to nine respondents. The questionnaire that was used in this study was pilot tested on eight manufacturing firms that were part of the target population; the questionnaires were filled by the supply chain managers of the firms which were part of the sample size.

3.9.1 Reliability of Data Collection Instruments

This study adopted the internal consistency method. According to Bollen (1989), reliability is the consistency of measurement or the stability of measurement over a variety of conditions in which the same results should be obtained. Reliability is the extent to which a given measuring instrument will produce the same result every time it is used (Abbott & McKinney, 2013). In behavioral science, the methods that can be used to test reliability are: test-retest reliability, alternative forms, split-halves, inter-rater reliability and internal consistency (Drost, 2011). In this study, the internal consistency method was adopted because it is more stable compared to all the other

methods (Cooper & Schindler, 2011; Bryman, 2012). Internal consistency was tested using the Cronbach's alpha statistics (see Table 4.3). Cronbach statistics measures consistency within the instrument and was popularized by Cronbach (1951). Cronbach's alpha (α) is a coefficient (a number between 0 and 1) that is used to rate the internal consistency or homogeneity or the correlation of items in a test (Sushil & Verma, 2010). It also assesses how well a set of item measures a given behavior or characteristics within the test. According to Drost, (2011), for a test to be consistent internally, the estimates of reliability should be purely based on the average intercorrelations among all the single items in a test. Where Cronbach's alpha coefficient is used for reliability test, the value should be between 0.6 and 0.7 (Cronbach, 2004). In this study, the Cronbach alpha value was above 0.6 which indicated adequate convergence and internal consistency.

3.9.2 Validity of Data Collection Instruments

Construct validity was adopted in this study. According to Mugenda nd Mugenda (2003), validity refers to the degree to which results which are obtained from the data analysis represent the phenomenon being studied. Validity also refers to the degree to which a research instrument measures what it is actually supposed to measure (Bryman, 2012; Mugenda, 2008). Therefore, validity is concerned with the meaningfulness of the research components. Construct validity on the other hand refers to how well one translated or transformed a concept, idea or behavior (a construct) into a functioning and operating reality, that is, operationalization (Trochim, 2006).

Content validity was adopted in this study. Content validity is a qualitative type of validity where the domain of the concept is made clear according to Bollen (1989), the analyst judges opine whether the measures represent the domain fully. According to Drost (2012), there are two ways of assessing the content validity, that is, ask several questions about the instrument or test and/or ask the opinion of expert judges in the field.

3.10 Data processing and Analysis

Data analysis as explained by Zikmund et al. (2012) involves applying reasoning for the purpose of understanding the gathered data with the purpose of determining patterns that are consistent and summarizing details that are relevant and that have been revealed in the investigation. Data processing on the other hand involves editing, classifying and tabulating data which has been collected so that it is agreeable (Kothari, 2009). Entry of data converts the information gathered through the primary or the secondary methods to a medium for viewing and manipulation. Quantitative data was collected and analyzed in this study by calculating the response rate with descriptive statistics such as mean, standard deviation, median and proportions using the Statistical Package for Social Sciences (SPSS) version 21 and Microsoft Excel. Correlation analysis was used to carry out inferential data analysis to determine the direction and strength of the relationship between the independent and the dependent variables. Regression models were also fitted. Testing of the hypothesis was done using multiple regression analysis and standard F tests. This enabled all variables to be compared with each other in a simultaneous manner as opposed to individually.

This study also tested for normality, heteroscedasticity and autocorrelation. To test for normality, Shaphiro-Wilk test was used and the p values were < 0.05 which implied that the variables were normally distributed. Normality played a vital role in predicting the scores of the dependent variable and also in knowing the shape of the distribution (Paul & Zhang, 2009). Heteroscedasticity refers to a situation where the variance of the dependent variable varies across the data as opposed to a situation whereby Ordinary Least Squares (OLS) assumes that $V(\varepsilon_j)=\sigma^2$ for all j, which means that the variance of the error term is constant (homoscedasticity). Park (2008) posits that heteroscedasticity makes analysis more complicated because in regression analysis, many methods are based on the assumption of equal variance.

Autocorrelation according to Box and Jenkins (1976) refers to the correlation of a times series with its own past and future values. The function of autocorrelation can be used in the detection of non-randomness in data and also in the identification of an

appropriate model for time series if the data are not random. Autocorrelation is basically a correlation coefficient but instead of correlation being between two different variables, the correlation is between two values that are of the same variable at times (X_i and X_{i+k}).

Multicollinearity was also tested in this study. The problem of multicollinearity was ruled out in this study (see Table 4.5) Multicollinearity is the undesirable situation whereby the correlations among the variables that are independent are strong (Martz, 2013). Variance Inflation Factor (VIF) was used to test for multicolinearity. If there will be no two independent variables that are correlated, then all the VIF will be 1. There will be multicolinearity associated with a variable if VIF for that variable is around or greater than 5. One of the variables must be removed from the regression model if this will be the case (Cohen, Cohen, West & Aiken, 2003).

In order to test the effect of the moderating role of ICT on supply chain risk and firm performance, the study employed a hierarchical regression analysis with moderation. In hierarchical multiple regression analysis, the researcher was able to determine the order that the variables were entered into the regression equation (Tobachnick & Fidell, 1989)

3.10.1 Statistical measurement models

According to Mugenda and Mugenda (2003), linear regression analysis attempts to determine whether a group of variables together predict a given dependent variable and in this way, attempt to increase the accuracy of the estimate. The general linear regression model for this study was:

$$Y= \beta_0 + \boldsymbol{\beta}_1 X_1 + \beta_2 X_2 + \boldsymbol{\beta}_3 X_3 + \boldsymbol{\beta}_4 X_4 + \varepsilon$$

For testing the moderating effect, the following model will be used:

$$Y= \beta_0 + \beta_i X_i + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (i=1, 2,3,4)$$

$$Y= \beta_0 + \beta_i X_i + \beta_m M + \varepsilon$$

$$Y= \beta_0 + \beta_i X_i + \beta_m M \beta_{mi} M X_i + \varepsilon$$

Where; Y=firm performance

β_0=constant

β_i is the coefficient for X_i (i=1, 2,3,4) $_i$

X_1=information flow risk

X_2=financial flow risk

X_3=Material flow risk

X_4=organization characteristic risk

M=ICT (Moderating variable)

ε = error term

The multiple regression model was:

$$Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta iMXiM + \beta_{2M}X_2M + \beta_{3M}X_3M + \beta_{4M}X_4M + \varepsilon,$$

(i= 1, 2, 3, 4)

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the key findings of the study and the results of data analysis. The data was collected between August and December 2016. The general objective of this research was to determine the moderating effect of ICT on supply chain risks and firm performance among the manufacturing firms in Kenya. The specific objectives were to determine the moderating effect of ICT on information flow risk and firm performance; to determine the moderating effect of ICT on financial flow risk and firm performance; to determine the moderating effect of ICT on material flow risk and firm performance and to determine the moderating effect of ICT on organization characteristics risk and firm performance among the manufacturing firms in Kenya.

The primary data was collected from 67 out of the 76 manufacturing firms which were targeted as some firms declined to respond to the questionnaires. The manufacturing firms were categorized based on their sub sectors (Building, mining and construction; chemical and allied sector; fresh produce; foods and beverage; leather and footwear; metal and allied sector; motor vehicle and accessories; paper and board, pharmaceutical and medical equipments; plastic and rubber; services and consultancy; textiles and apparels). The reviewed literature was linked with the findings of the study to enable data interpretation, drawing of implications and the recommendations for the study. Descriptive statistics, correlations and regression analysis were used to analyze the empirical findings. This chapter is outlined as follows: response rate, sample characteristics, data management, reliability testing and multicollinearity testing, Normality Test and then descriptive, correlation and regression analysis under each of the study objectives

4.1.1 Response Rate

Response rate refers to the number of questionnaires sent to the field divided by the number of questionnaires completed and returned. A total of 76 questionnaires were distributed and delivered to the respondents but only 67 questionnaires were filled and returned. This represented 88% response rate which is quite suitable to make a finale for the study. According to Mugenda and Mugenda (2003), a response rate of 50% and above is considered adequate for reporting and analysis, 60% good and 70% and above response rate is very good for data analysis and reporting. Table 4.1 provides an illustration of the response rate by subsector.

Table 4. 1: Subsector Response Rate

Subsector	**Number Sampled**	**Percentage**
Building, Mining and Construction	8	11.94%
Chemical and Allied Sector	2	2.98%
Fresh Produce	3	4.48%
Foods and Beverage	21	31.34%
Leather and Footwear	4	7.46%
Metal and Allied Sector	5	5.97%
Motor Vehicle and Accessories	1	1.49%
Paper and Board	7	10.45%
Pharmaceutical and Medical Equipments	3	4.48%
Plastic and Rubber	6	8.96%
Services and Consultancy	4	5.97%
Textiles and Apparels	3	4.47%
Total	**67**	**100%**

As shown in table 4.1, data for this study was collected from 67 organizations which were distributed across the manufacturing sector in Kenya which had 12 key subsector (see table 4.1). The majority of the organizations which participated in the study were in the food and beverage sector (31.4%); metal and allied sector,

pharmaceuticals and medical equipment, textiles and apparels, building, mining and construction (28.5%); chemical and allied sector, plastic and rubber, leather and footwear, motor vehicle and accessories (19.5%) while paper and board, fresh produce, service and consultancy had a response of (21%).

4.1.2 Sample Characteristics

a) Manufacturing firm demographics

Data was collected on the demographic characteristics of the firms which were registered by KAM during the year 2015 which was collected, reviewed and analyzed. Data analysis was based on the information provided by the respondents in the questionnaire. The ownership of the company, markets served, number of years the organization has been in operation, distance of the company from Kiambu County, the number of people employed in the organization, part of Kiambu County where the firm is located and the average age of employees in the company. The results were shown in the Table 4.2.

Table 4. 2: Manufacturing Firms Demographics

Main Factor	Factor Level	Frequency	%
Ownership	Locally owned by individual	25	35
	Locally owned by group	19	27
	Foreign	8	11
	Foreign and local	19	27
Markets served	Domestic markets only	26	41
	Foreign markets only	1	2
	Domestic and foreign	37	57
Years in operation	1-20 years	44	68
	21-30 years	9	14
	31-40 years	6	9
	41-50 years	1	2
	51-60	2	3
	60 and above	3	4
Distance from Kiambu town	10 KM	2	29
	14 KM	1	14
	20 KM	3	43
	220KM	1	14
Number of people employed in the organization	1-1000	56	88
	1001-3000	5	8
	3000 and above	2	3
Firm location in Kiambu county	Juja	4	7
	Limuru	10	16
	Kiambu town	2	3
	Thika	36	59
	Ruiru	9	15
Average age of employees in the company	20-30	21	36
	31-40	32	55
	41-50	5	9
Total		**72**	**100**

The majority of these organizations (35%) were locally owned by individual, 27% were locally owned by group, 27% were owned by both local and foreign and 11% were owned by foreigners. Their frequencies were 25, 19, 19 and 8 respectively.

Majority of the firms (57%) served both domestic and foreign markets, 41% served domestic markets only while 2% of the firms served foreign markets only. This represented a frequency of 37, 26 and 1 respectively.

In terms of the number of years that the firms in Kiambu County had been in operation, majority of the firms (68%) had been in operation for a period of 1-20 years, 14% between 21-30 years, 9% between 41-50 years, 4% 60 years and above, 3% 51-60 yeras and few firms (2%) had operated for a period between 41-50 years. In terms of the distance from Kiambu town, majority of the firms (43%) were located 20 KM from Kiambu town. 29% were located 10KM from Kiambu town, 14% were located 14KM and 220KM respectively.

The number of people who were employed in the organization, 88% who were the majority employed between 1-1000 employees. 8% of the firms employed between 1001-3000 and the other 3% employed 3000 and above employee. In terms of specific location in Kiambu County, majority of the firms were located in Thika (59%). 16% were located in Limuru, 15% in Ruiru, 7% in Juja and 3% in Kiambu town. The average age of employees was between 31-50 years which was recorded in the majority of the firms sampled (55%). 36% of the firms had an average age of the employees between 20-30% while 9% of the firms had employees who were between the age of 41-50 years.

4.1. 3 Diagnosis

a) Aggregation of variables, Reliability and Validity measurement results

In order to measure the internal consistency of the study variables, Cronbach's Alpha was used. Reliability should be (0.60) or higher to indicate adequate convergence or internal consistency (Sekaran & Bougie, 2010). The results of the reliability test for the study variables used are indicated in Table 4.3.

Table 4. 3: Aggregation of variables, Reliability and validity of the study variables

Construct	Number of items	Cronbach's Alpha
Information flow risk	9	0.707
Financial flow risk	7	0.630
Material flow risk	7	0.766
Organization characteristic risk	6	0.769

The Cronbach's Alpha for information flow risk which had 9 items was 0.707. The 9 items were aggregated by taking their average to come out with information flow risk having dropped items (c, j, I, m, n and o). Financial flow risk which had 7 items indicated a Cronbach's Alpha of 0.630. The 7 items were aggregated by taking their average to come out with financial flow risk having dropped items (a, d, e, j, k, m, n, o, p and q). The Cronbach's Alpha for material flow risk that comprised of 7 items was 0.766 (after aggregation) having dropped items (e and i). Lastly the Cronbach's Alpha for the organization characteristic risk that had 6 items (after aggregation by taking their average) was 0.769 having dropped item (g). All the constructs had a Cronbach's Alpha value above 0.6 which indicated adequate convergence or internal consistency.

b) Normality Test using Shapiro-Wilk

Kolmogorov-Smirnov and Shapiro-Wilk test are used to test for normality. For large sample sizes, Kolmogorov-Smirnov is used while for small sample sizes Shaphiro-Wilk test is used (Thode, 2002). Shaphiro-Wilk test was used in this study. The tests results show that the p-values for the variables were >0.05. This implies that the variables were normally distributed as shown in Table 4.4. However, the p value for performance was <0.05 implying that the variable was not normal as shown in table 4.30.

Table 4. 4: Normality Test using Shapiro-Wilk

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Performance	.257	65	.000	.883	65	.000
Information flow risk index	.139	65	.003	.970	65	.113
Financial flow risk	.074	65	.200*	.984	65	.550
Material flow risk	.077	65	.200*	.980	65	.389
Organization Characteristics	.108	65	.057	.981	65	.416

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

However, looking at the following Q-Q plot, we note that the departure form normality is not big. We can therefore conclude that performance is also normally distributed as shown in the figure 4.1.

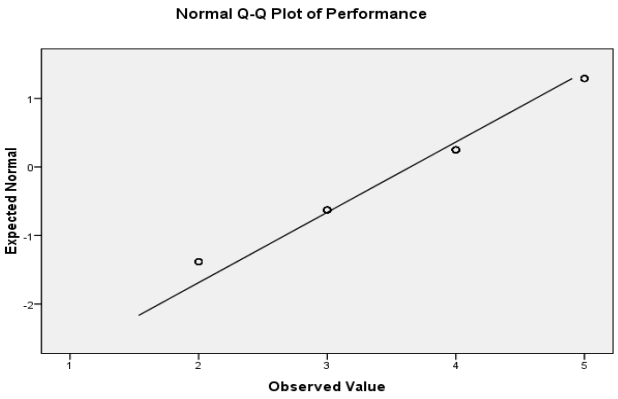


Figure 4. 1: Normality test for performance

c) Test of Multicollinearity

Multicollinearity is the undesirable situation where the correlations among the independent variables are strong. That is, multicollinearity misleading bloats the standard errors. Therefore, they make some variables insignificant statistically where else they should be significant (Martz, 2013). Tolerance of a respective independent variable is calculated from 1 - R^2.

Regression analysis was conducted to generate the Variance Inflation Factor (VIF) value and tolerance levels in order to determine if multicollinearity would pose a challenge to the study. The values in table 4.6 show that the VIF for information flow risk was 1.419, financial flow risk was 1.599, material flow risk 1.409 and organization characteristic 1.300. The results indicate that all the variables had a VIF of less than 10 and a tolerance of more than 0.1 ruling out the problem of multicollinearity. According to Bryman (2012), a VIF of above 10 indicates a multicollinearity problem (see table 4.45 on multiple regression).

d) Correlation Analysis Results for the Study Variables

According to Pallant (2010), Correlation is used when exploring the relationship among a group of variables, which in turn helps in testing of multicollinearity. When the values of the correlation are not close to 1 or -1, it is an indication that the factors involved sufficiently measure different variables (Farndale, Hope-Hailey & Kelliher, 2010). It also indicates that the variables involved are not multicollinear. When multicollinearity is absent, the study can then utilize all the independent variables as shown in table 4.5.

Table 4. 5: Correlation results of the Study Variables

		Performance	Information flow risk index	Financial flow risk	Material flow risk	Organization Characteristics
Performance	Pearson Correlation	1	-.168	-.130	-.031	-.386
	Sig. (2-tailed)		.174	.286	.804	.001
	N	70	67	69	68	70
Information flow risk index	Pearson Correlation	-.168	1	.498**	.076	.142
	Sig. (2-tailed)	.174		.000	.541	.249
	N	67	69	68	67	68
Financial flow risk	Pearson Correlation	-.130	.498**	1	.420	.283**
	Sig. (2-tailed)	.286	.000		.000	.018
	N	69	68	70	69	70
Material flow risk	Pearson Correlation	-.031	.076	.420**	1	.489
	Sig. (2-tailed)	.804	.541	.000		.000
	N	68	67	69	69	69
Organization Characteristic risk	Pearson Correlation	-.386**	.142	.283*	.489**	1
	Sig. (2-tailed)	.001	.249	.018	.000	
	N	70	68	70	69	71

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

From the results, it is clear that information flow risk is positively correlated with financial flow risk (0.498). This is in agreement with Musa (2012) that the flow of information brings about the flow of finances. This is because for finances to be transferred from the firm to the supplier, there must be information on the amount due to the supplier which is communicated through the invoice raised by the

supplier. Financial flow risk is also highly correlated with the material flow risk (0.420). This is also in tandem with the findings of Musa (2012) that when materials are delivered the procuring entity is informed through a delivery order which is attached to the invoice to allow the procuring entity to process the supplier's payment (Musa, 2012). Financial flow risk correlates very highly with organization characteristic risk also (0.489). This is in agreement with the findings of Kumar, Rajan and Zingales (2001) who found that firms that have more financial resources have the capacity to employ human resource with the skills necessary to manage risks along the supply chain.

Of all the variables on supply chain risk (information flow risk, financial flow risk, material flow risk, organization characteristic risk) only organization characteristic risk had a high negative correlation with performance (-0.386). This means that a high organization characteristic risk reduces the performance a firms in Kenya. This is true as it conforms the study of Summer (2014) that firms with smaller employee size are more exposed to supply chain risks as they lack the structures and resources to manage the risks. These risks are then pushed up the upstream of the supply chain affecting the performance of the firms. Firms whose supply chains are located globally may also be at a high risk of exchange rate (Summer, 2014). This can also be explained by the results from the manufacturing firms demographics which clearly show that majority (68%) of the manufacturing firms in Kenya have been in operation for a short period of time (1-20 years). This means they have less experience in managing the supply chain risk which explains why performance is reduced. The descriptive analysis on organizational characteristic (firm ownership) also confirms this findings (low performance affected by organization characteristic risk) where the majority of the respondents (43.5%) indicated that supply chain decisions made by manufacturing firms in Kenya are not consultative.

4.1.4 Descriptive analysis of ICT Use

A majority of the respondents (48.4%) agreed that use of ICT to share supply chain information had increased their sales volume, 31.3% strongly agreed, 14.1% were neutral, 4.7 disagreed while 1.6% strongly disagreed (Mean = 4.03, SD =0.890) . When asked to respond on whether ICT use in supply chain decision making often

increases profit, 44.6% agreed, 29.2% strongly agreed, 16.9% were neutral, 7.7% disagreed while 1.5% strongly disagreed (Mean = 3.92, SD =0.957) . A large number (47.7%) disagreed that ICT use in information sharing reduces sales volume, 27.7% strongly agreed, 12.3% agreed, 9.2% were neutral while a small number (3.1%) agreed (Mean = 2.15, SD =1.064) as shown in table 4.6.

Table 4. 6: Measurement of ICT

	SD %	D	N %	A %	SA %	M	SD
a) ICT use to share supply chain information has increased our sales volume	1.6	4.7	14.1	48.4	31.3	4.03	.890
b) ICT use in supply chain decision making often increases profit	1.5	7.7	16.9	44.6	29.2	3.92	.957
c) ICT use in information sharing reduces sales volume	27.7	47.7	9.2	12.3	3.1	2.15	1.064

These study findings agree with Hernandez, Galindo & Colin, (2015) that proper ICT adoption along the supply chain enables accuracy of data that is shared along the chain due to the reliability management information system which in turn promotes confidence of the procurement business relationships. DeGroote & Marx, (2013) also agree by stating that IT impacts greatly on the agility of the supply chain in terms of enabling the supply chain to better respond to the fluctuations in the market place. It does this by providing timely, accurate and adequate flow of information among the supply chain partners which in turn makes positive impacts on the firm's sales, market share, customer satisfaction and profitability.

The study findings are also in tandem with the findings of a research carried out by Soderoa, Robinovich and Sinha (2013) on drivers and outcomes of high technology supply chain works on internet based inter and intra organizational systems, which found out that these technologies makes business more able to improve their organizations due to timely provision of the information needed to make decisions. Manufacturing firms in Kenya should therefore leverage on IT for improved supply chain and firm performance.

a) ICT infrastructure

The study showed that 50.0% of the respondents disagreed that the computers in the supply chain department are not adequate to monitor sales volume, 19.4% were neutral, 17.7% strongly disagreed, 8.1% agreed and 4.8% strongly agreed (Mean = 2.32, SD =1.021) . When asked if their firms use ICT in tendering to reduce costs, majority, and 49.2% agreed, 20.6% strongly agreed, 19.0% were neutral, 7.9% disagreed while 3.2% strongly disagreed (Mean = 3.76, SD =0.979). Also, 60.7% agreed that the use ICT in planning aids in inventory forecasting which increases customer satisfaction, 21.3% strongly agreed, 11.5% were neutral while 6.6% disagreed (Mean = 3.97, SD =0.774) as shown in table 4.7.

Table 4. 7: Measurement of ICT infrastructure

	SD %	D %	N %	A %	SA %	M	SD
d) The computers in the supply chain department are not adequate to monitor sales volume	17.7	50.0	19.4	8.1	4.8	2.32	1.021
e) We use ICT in our tendering to reduce the cost	3.2	7.9	19.0	49.2	20.6	3.76	.979
f) Use of ICT in planning systems aids in inventory forecasting which increases customer satisfaction		6.6	11.5	60.7	21.3	3.97	.774

From the study findings, it was observed that manufacturing firms in Kenya have adequate computers to monitor sales volume and ICT is also used in the tendering process to reduce costs. The study also noted that the use of ICT by the manufacturing firms in Kenya aids in inventory forecasting which increases customer satisfaction. These study finding agree with Christiansen and Bryan (2015 that organizations which deploy ICT experience a reduction in costs, have high productivity and have a competitive advantage. ICT is a major component of supply chain management as it leads to growth in revenues, reduces costs and promotes the utilization of assets in an organization (Cooper & Lambert, 1997).

b) ICT training

The researcher observed that 32.3% agreed that they have received training in supply chain management system in the last 6 months to monitor sales volume, 27.7% disagreed, 24.6% were neutral, 9.2% strongly agreed while 6.2% strongly disagreed (Mean = 3.11, SD =1.106). The study also revealed that majority 59.7% of the respondents (Mean = 3.95, SD =0.838) agreed that their ICT skills have enabled them to manage distributions and value chain activities. When asked whether everyone appreciates the use of ICT to manage supply chain risk due to the trainings that they have received, 50.0% agreed, 19.4% were neutral, 17.7% strongly agreed, 9.7% disagreed while 3.2% strongly disagreed (Mean = 3.69, SD =0.985). Majority of the respondents, 41.0% of the respondents agreed that their ICT data is always encrypted when being transmitted to suppliers and customers, 21.3% were neutral, 18.0% disagreed, 13.1% strongly agreed while 6.6% strongly disagreed (Mean = 3.36, SD =1.126) . Majority of the respondents (27.0%) disagreed and also agreed that they use text messages to post information on Annual General Meetings, 22.2% were neutral, 19.0% strongly disagreed while the minority (4.8%) strongly agreed (Mean = 2.71, SD =1.197) .

A large number of the respondents (60.9%) indicated that they use the internet to communicate to their suppliers, 25.0% strongly agreed, 6.3% disagreed, 4.7% were neutral while the minority (3.1%) strongly disagreed (Mean = 3.98, SD =0.917). A large number of the respondents (31.7%) disagreed that WhatsApp is the communication method of sending quotations to suppliers, 26.7% strongly disagreed, 21.7% agreed, 16.7% were neutral while a small number (3.3%) strongly agreed (Mean = 2.43, SD =1.198) . When the respondents were asked if their firms always place tenders in their website, 28.3% disagreed, 25.0% agreed, 20.0% were neutral and also strongly agreed while 6.7% strongly disagreed (Mean = 3.23, SD =1.254) . Further, 41.7% disagreed that they post the winners of the tenders and the amounts allocated in their website, 30.0% were neutral, 15.0% agreed, 8.3% strongly disagreed while 5.0% strongly agreed (Mean = 2.67, SD =1.003) as shown in table 4.8.

Table 4. 8: Measurement of ICT training

	SD %	D %	N %	A %	SA %	M	SD
g) We have received training in supply chain management system in the last 6 months to monitor the sales volume	6.2	27.7	24.6	32.3	9.2	3.11	1.106
h) Our ICT skills have enabled us to manage distributions and value chain activities		9.7	8.1	59.7	22.6	3.95	.838
i) Everyone appreciates the use of ICT to manage supply chain risks due to the trainings that we have received	3.2	9.7	19.4	50.0	17.7	3.69	.985
j) Our ICT data is always encrypted when being transmitted to suppliers and customers	6.6	18.0	21.3	41.0	13.1	3.36	1.126
k) We use text messages to post information on Annual General Meetings	19.0	27.0	22.2	27.0	4.8	2.71	1.197
l) We use internet to communicate to our suppliers	3.1	6.3	4.7	60.9	25.0	3.98	.917
m) What Sapp is the communication method of sending quotations to suppliers	26.7	31.7	16.7	21.7	3.3	2.43	1.198
n) Our tenders are always placed in our website	6.7	28.3	20.0	25.0	20.0	3.23	1.254
o) We post the winners of the tenders and the amounts allocated in our website	8.3	41.7	30.0	15.0	5.0	2.67	1.003

From the study findings, it was found that manufacturing firms in Kenya train their employees on supply chain management system. This is in agreement with the findings of a research carried out by Christianse and Bryan (2015) that highly trained employees in ICT have deeper understanding and are able to evaluate ICT platforms that are suitable for their firms. The study also revealed that the ICT skills of the manufacturing firms in Kenya enable them to manage distribution and value chain activities. This is important as it agrees with the findings of a research carried out by

Beth et al (2003) that procurement staffs must be competent to use application software that enables the organization to manage activities such as distribution and value chain activities. The manufacturing firms also appreciate the use of ICT in managing risks because of the training they have received. Equally, the study found out that manufacturing firms in Kenya encrypt their ICT data when it is being transmitted to suppliers from the customers.

The internet is also used by the manufacturing firms to communicate to their suppliers. This is in agreement with the findings of a research carried out by Soderoa, Robinovich and Sinha (2013) on drivers and outcomes of high technology supply chain works on internet based inter and intra organizational systems, found out that these technologies makes business more able to improve their organizations due to timely provision of the information needed to make decisions.

However, manufacturing firms in Kenya do not use text messages to post information on Annual General Meetings (AGM). Manufacturing firms in Kenya also do not use WhatsApp as a communication method of sending quotations to suppliers. The firms also do not place tenders on the website. The firms also do not post the winners of the tenders and the amounts allocated in their website.

4.1.5 Descriptive Analysis of Firm Performance

The study sought to determine the rating of performance of manufacturing firms in Kenya using the following indicators revenues, sales volume and customer satisfaction. Respondents were asked to indicate the extent to which they agreed with the opinion statements given in regard to the rating of firm performance in their manufacturing firms. This was on a likert scale of strongly disagree, disagree, neutral, agree and strongly agree. In this study the scale of strongly disagree and disagree meant disagree while agree and strongly agree meant agreed.

a) Revenues

The study observed that 35.7% of the respondents agreed that their profits had steadily increased over the last 3 years, 30.0% were neutral, 24.3% strongly agreed while 10.0% disagreed (Mean = 3.74, SD =0.943) . With regard to a 50% increase in

their market share in the last 5 years, 30.4% agreed that their market share had increased, 27.5% strongly agreed, 21.7% were neutral, 17.4% disagreed while 2.9% strongly disagreed (Mean = 3.62, SD =1.152). Majority of the firms (44.1%) also indicated that the number of products that they sold had increased during the past 3 years, 23.5% were neutral, 19.1% strongly agreed, 11.8% disagreed while the minority (1.5%) strongly disagreed (Mean = 3.68, SD =0.969) as shown in table 4.9.

Table 4. 9: Measurement of Revenues

	SD %	D %	N %	A %	SA %	M	SD
h) Our profits has steadily increased over the last 3 years		10.0	30.0	35.7	24.3	3.74	.943
i)Our market share has increased by 50% in the last 5 years	2.9	17.4	21.7	30.4	27.5	3.62	1.152
j)The number of products that we sell has also increased during the past 3 years	1.5	11.8	23.5	44.1	19.1	3.68	.969

From the study findings, it was clear that manufacturing firms in Kenya have experienced a steady increase in profits over the last 3 years, the market share has increased by 50% over the last 5 years and also the number of products sold over the last 3 years. This is in agreement with Hillman and keltz, (2007) that reducing costs helps an organization to achieve cost advantage while differentiation provides increased levels of customization and service thereby increasing the profits of a company.

b) Sales volume

Majority of the respondents (46.4%) indicated that they are constantly monitoring the exchange rates of the currency that they use, 27.5% were neutral, 11.6% strongly agreed, 11.6% strongly disagreed while the minority (2.9%) strongly disagreed (Mean = 3.52, SD =0.49) . Most firms (36.4%) of the firms agreed that their expenditure on procured items had greatly reduced, 34.8% were neutral, 16.7%

disagreed while few firms (4.5%) strongly disagreed (Mean = 3.26, SD =0.982). A large number of firms were neutral on whether they had opened more branches in the last 5 years, 24.6% disagreed, 23.1% agreed, 18.5% strongly disagreed while a small number (7.7%) strongly agreed (Mean = 2.77, SD =1.222). Most firms (30.0%) also agreed that 60% of their employees had been employed in the last 2 years, 27.1% were neutral, 25.7% disagreed, 7.1% strongly disagreed while few firms (10.0%) strongly agreed as (Mean = 3.10, SD =1.118) shown in table 4.10.

Table 4. 10: Measurement of sales volume

	SD %	D %	N %	A %	SA %	M	SD
k) We are constantly monitoring the exchange rates of the currency that we use	2.9	11.6	27.5	46.4	11.6	3.52	.949
l) Our expenditure on procured items has greatly reduced	4.5	16.7	34.8	36.4	7.6	3.26	.982
m) We have opened more branches in the last 5 years	18.5	24.6	26.2	23.1	7.7	2.77	1.222
n) 60% of our employees have been employed in the last 2 years	7.1	25.7	27.1	30.0	10.0	3.10	1.118

The study findings indicated that manufacturing firms in Kenya had representatives that constantly monitored the exchange rates of the currency that they used, their expenditure on procured items had greatly reduced and 60% of the employees had been employed in the last 2 years and expenditure on procured items. Therefore, manufacturing firms in Kenya which are able to manage their exchange rates and expenditure on procured items are regarded to be performing well. This is in agreement with Zsidisin, (2003) that reducing the total costs of sourcing materials reduces the costs of goods sold and subsequently contributes to profitability. Improvements along the supply chain therefore must be focused on reducing costs without negatively impacting on customer service, or improving services without disproportionately increasing costs

However, the manufacturing firms had not opened more branches in the last 5 years. This is an indication of a decrease in the demand of the goods manufactured. There is need for the sales and marketing department to collaborate with other functions such

as manufacturing and planning. Supply chains constantly struggle with volatile demand because a rise in order volumes increases labor and distribution costs. Inaccurately forecasting sales can similarly lead to stock outs, loss of sales or increased inventories which are sold at a discount to move it off the shelf. There is need therefore to develop proper planning and forecasting processes in order to enable and predict volatility in demand (McKinsey & Company, 2011).

c) Customer satisfaction

A large number of the respondents (37.7%) indicated that a large number of customers who were referred to their products had increased by 50% in the last 3 years, 34.8% were neutral, 14.5% strongly agreed, 10.1% disagreed while a small number (2.9%) strongly disagreed (Mean = 3.51, SD =0.964) . When asked whether the number of complaints by customers had reduced by 70% in the last 3 years, 59.7% agreed, 19.4% were neutral, 10.4% disagreed, 9.0% strongly agreed while 1.5% strongly disagreed (Mean = 3.64, SD =0.847) . Also, 55.6% of the respondents agreed that the level of customer satisfaction has been on the rise in the last 5 years, 22.2% were neutral, 19.0% strongly agreed, while 3.2% disagreed (Mean = 3.90, SD =0.734) as shown in table 4.11.

Table 4. 11: Measurement of customer satisfaction

	SD %	D %	N %	A %	SA %	M	SD
o) The number of customers refereed to our products has increased by 50% in the last 3 years	2.9	10.1	34.8	37.7	14.5	3.51	.964
p) The number of complaints by customers has reduced by 70% in the last 3 years	1.5	10.4	19.4	59.7	9.0	3.64	.847
q) The level of customer satisfaction has been on the rise in the last 5 years		3.2	22.2	55.6	19.0	3.90	.734

From the study, it was evident that manufacturing firms in Kenya had witnessed increased numbers of customers who were referred to others, the number of complaints by customers had decreased and the level of customer satisfaction had

been on the rise. This is in agreement with Lee, (2004) that the success of a company depends on the ability of the supply chain partners to focus on the customer. In addition, Wharton (2011) asserts that manufacturers today are more focused on timely delivery of complete, damage free and correctly invoiced products to the customers. Customer satisfaction is one of a firm's major milestones to profitability (Zerbini et al., 1007). Companies are now focusing on satisfying the customer with the sole aim of improving their competitive position in the industry (Rad, 2008). This positive performance could be explained by the fact that the managers do not put much attention on supply chain risks. Therefore, the performance in terms of increased customer satisfaction (55.6%), reduced complains and increased customer referrals were not linked to supply chain risks.

4.2 Objective 1: To determine the moderating effect of ICT on information flow risk and firm performance among manufacturing firms in Kenya

4.2.1 Descriptive analysis of Information flow risk

The study sought to determine the moderating effect of ICT on information flow risk and firm performance. The following indicators were used to measure this objective: information accuracy, information types and information connectivity. The respondents were asked to indicate the extent to which they agreed with the flow of information along the supply chain for performance in the manufacturing firms. This was on a likert scale strongly agree, agree, neutral, disagree or strongly disagree.

Majority of the respondents (44.9%) strongly disagreed that their firms frequently shared information with their supply chain partners, such as information on the status of the orders, delivery of orders and inventory status, 40.6% of the respondents disagreed, 11.6% were neutral while 2.9% agreed that information is shared among the supply chain partners (Mean = 1.72, SD =0.784). Majority (47.8%) also disagreed with the presence of appropriate technology that helps in information sharing among the supply chain partners, 34.8% strongly disagreed, 10.1% were neutral while the minority 5.8% agreed there was presence of appropriate technology in the firms that helped in sharing information along the supply chain (Mean = 1.91, SD =0.903). On the other hand, majority of the respondents (36.9%) disagreed that

information is not shared at every stage of the supply chain, 24.6% of the respondents were neutral, 20% of the respondents agreed that information is not shared at every stage of the supply chain the minority (9.2%) strongly disagreed and also (9.2%) strongly agreed (Mean = 2.83, SD =1.140). In addition, a large number of the respondents (39.7%) disagreed with the fact that their firms rarely share information with their supply chain partners. 27.9% also strongly disagreed, 13.2% were neutral, 13.2% agreed while a small number 5.9% strongly agreed (Mean = 2.29, SD =1.185).

The highest mean was 2.29 with the lowest being 1.72. This showed that the respondents took a negative position about the presence of information flow risk in their supply chains (below 3.0). All the items had a mean below 3.0. This showed that the general position was that information flow risk was not present among the manufacturing firms in Kenya as shown in table 4.12.

Table 4. 12: Information flow Risk

	SD%	D%	N%	A%	SA%	M	SD
a) We frequently share information with our supply chain partners (status of orders, delivery of orders, status of inventory e.t.c)	44.9	40.6	11.6	2.9		1.72	.784
b) We have appropriate technology that helps in information sharing	34.8	47.8	10.1	5.8	1.4	1.91	.903
c) Information is not shared in every stage of the supply chain	9.2	36.9	24.6	20.0	9.2	2.83	1.140
d) We rarely share information with our supply chain partners	27.9	39.7	13.2	13.2	5.9	2.29	1.185

Key: SD (Strongly Disagree), D (Disagree), N (Neutral), A (Agree), SA (Strongly Agree), SD (Strongly Disagree)

In general, the study found out that manufacturing firm in Kenya share information with their supply chain partners (information is shared on every stage of the supply chain and also shared with the supply chain partners). This is in tandem with Musa (2012) who explains that information flow updates all the elements in the supply

chain and therefore critical in supply chain decision making. These findings also concur with the study carried out by Hahn et al (2000) that information sharing can enhance efficient coordination along the supply chain and effective communication is important for the supply chain participants. These findings also agree with Lee and Whang (2000) and Faisal et al (2000) who further add that information keeps coordination along the supply chain tight and increases the competitive advantage of an enterprise.

However, the study found out that manufacturing firms in Kenya do not frequently share information such as order status, order deliveries and inventory status with their supply chain partners. Also, manufacturing firms in Kenya lack appropriate technology to enable them share information along the supply chain. A study by Musa (2012) suggests that value along the supply chain is triggered by the flow of information which may include; information on demand, status of the inventory, process and design changes, status of the available capacity as well as order fulfillment. Jain (2004) also asserts that information technology avails undistorted information along the supply chain which further reduces the bullwhip effect. Therefore, manufacturing firms in Kenya should frequently share information with their supply chain partners and have the appropriate technology for supply chain information sharing which will reduce the risk of information flow and further improve the performance of their firms.

a) Information accuracy

The majority of the respondents (48.5%) disagreed that they shared objective information along the supply chain that was free of error. 23.5% of the respondents strongly disagreed, 13.2% of the respondents were neutral, 13.2% agreed while the minority (5.9%) strongly agreed (Mean = 2.21, SD =1.001). A large number of respondents (33.8%) disagreed that their firms have many levels through which the documents are passed before the actual implementation is done (bureaucracy), 30.9% of the respondents agreed with bureaucracy in their firms, 20.6% of the firms strongly disagreed, 8.8% were neutral while a small number (5.9%) strongly agreed with presence of bureaucracy in their firms (Mean = 2.68, SD =1.275). Majority of

the respondents (35.3%) strongly disagreed that their firms had adopted information technology to enable accurate information sharing along the supply chain, 35.3% of the respondents disagreed, 10.3% were neutral, 13.2% agreed while the minority (5.9%) strongly agreed (Mean = 2.19, SD =1.225). A large number of the respondents (41.2%) disagreed that they were not aware of the exact quantities and timings of the deliveries from suppliers, 33.8% strongly disagreed, 13.2% strongly agreed, while the minority 5.9% strongly agreed and 5.9% were neutral (Mean = 2.16, SD =1.205). A large number of respondents (33.8%) disagreed that they had minimum technology for information sharing, 23.5% strongly disagreed, 23.5% agreed, 13.2% were neutral while a small number 5.9% strongly agreed (Mean = 2.54, SD =1.251). the highest mean for information accuracy was 2.68 while the lowest mean was 2.21. This showed that the majority of the respondents took a positive position that information that was flowing along the supply chain was accurate (mean less than 3.0) shown in Table 4.13.

Table 4. 13: Measurement of Information accuracy

	S D%	D%	N%	A%	S A%	M	SD.
e) We share objective information along the supply chain free of error	23.5	48.5	13.2	13.2	1.5	2.21	1.001
f) We have very many levels through which documents are passed through before the actual implementation bureaucracy)	20.6	33.8	8.8	30.9	5.9	2.68	1.275
g) We have adopted information technology to enable accurate information sharing along the supply chain	35.3	35.3	10.3	13.2	5.9	2.19	1.225
h) We are not aware of the exact quantities and timings of the deliveries from suppliers	33.8	41.2	5.9	13.2	5.9	2.16	1.205
i) We have minimum technology for information sharing	23.5	33.8	13.2	23.5	5.9	2.54	1.251

From the findings, it was clear that manufacturing firms in Kenya avoided many levels when passing documents (bureaucracy) prior to their implementation. This ensures that information is not distorted as it passes along the supply chain. This agrees with Bidgoli (2010) who asserts that bureaucracy along the supply chain increases uncertainty, further increasing lead times which have cost implications to the firm. The firms are also aware of the exact timings of the exact timing and deliveries from the suppliers. This findings concur with Chopra and Sodhi (2004) that lack of accurate information on timings and deliveries of supplies can lead to under stocking which can lead to loss of sales and consequently profits of the business. The firms have adequate technology for information sharing which is in tandem with the findings of Hernandez, Galindo & Colin (2015) that proper technology increases the accuracy of data shared along the supply chain.

There is need however for the manufacturing firms to share more objective, error free information along the supply chain. Information shared along the supply chain should be free of error and objective to enable effective sharing by firms (Kaipia, 2009). This helps in accurately matching supply and demand and ensuring that products are delivered at the right time, at the right place, from the right source, in the right quality and quantity to meet specifications of the customers (Butchers, Lalwani and Mangan, 2008). The firms also need to adopt information technology to enable information sharing along the supply chain. This is in line with Raman et al (2001) and Lee (2004) who explain that lack of information technology adoption can lead to information inaccuracy which can lead to adoption on wrong policies regarding inventory data and lack of agility to changes in the business environment.

b) Information types

Majority of the respondents (37.3%) disagreed that they share information such as sales data, product planning and logistical schedules, 25.4% agreed, 19.4% were neutral, 11.9% strongly disagreed while the minority (6%) strongly agreed (Mean = 2.76, SD =1.143). A large number of the respondents (32.3%) disagreed that minimum information on inventory levels and lead times is availed to supply chain partners, 21.5% of the respondents were neutral (Mean = 2.86, SD =1.273). Majority

of the respondents (57.6%) disagreed that they shared information on production capacity, 16.7% strongly disagreed, 12.1% were neutral, 10.6% of the respondents agreed that they shared information on production capacity while the minority (3%) strongly agreed that they shared information on production capacity (Mean = 2.26, SD =0.966). The highest mean was 2.86 while the lowest was 2.26 indicating that the respondents agreed that the correct type of information was flowing along their supply chains as shown in table 4.14.

Table 4. 14: Measurement of Information Types

	SD %	D %	N %	A %	SA %	M	SD
j) We share information such as sales data, product planning, logistical schedules etc.	11.9	37.3	19.4	25.4	6.0	2.76	1.143
k) Minimal information on inventory levels and lead times is availed to supply chain partners	13.8	32.3	21.5	18.5	13.8	2.86	1.273
l) We share information on production capacity	16.7	57.6	12.1	10.6	3.0	2.26	.966

This study found out that majority of the manufacturing firms in Kenya shared information on inventory levels and lead times among their supply chain partners to enable them manage their inventories and satisfy their customers. These findings are in harmony with Sweeney (2006) that when information on inventory levels is shared, it helps in reducing the bullwhip effect. The study also agrees with Lee and Whang (2000) that sharing information on lead times also helps in reducing bottlenecks along the supply chain and therefore improve the performance of the company. However contrary to the findings of Benz and Hoflinger (2011), it was clear that manufacturing firms in Kenya do not share information on production capacity. This can increase risks along the supply chain due to lack of coordination of both production and demand and therefore results to inventory shortages and hinder implementation of production plans within the organizations.

c) Information Connectivity

A large number of respondents (36.9%) agreed that they shared information only within the company, 32.3% disagreed, 12.3% strongly disagreed while a small number (6.2%) strongly agreed (Mean = 2.92, SD =1.203). Majority of the respondents (37.5%) disagreed that supply chain information is only communicated with the suppliers, customers and 3rd party service providers, 21.9% agreed, 15.6% strongly agreed, while the minority 12.5% agreed, 12.5% were also neutral (Mean = 2.91, SD =1.318). Majority of the respondents (43.5%) agreed that all the company personal information is available in the website, 23,2% strongly agreed, 14.5% disagreed while the minority (5.8%) strongly disagreed (Mean = 3.64, SD =1.163). A large number of respondents (44.1%) agreed that the firm does not have centralized information sharing system and that all the departments share information freely, 19.1% strongly agreed, 16.2% disagreed, 13.2% were neutral while a small number (7.4%) strongly disagreed (Mean = 3.51, SD =1.191) as shown in Table 4.15.

Table 4. 15: Measurement of Information connectivity

	SD %	D %	N %	A %	SA %	M	SD.
m) We share supply chain information only within the company	12.3	32.3	12.3	36.9	6.2	2.92	1.203
n) Supply chain information is only communicated with the suppliers, customers and 3rd party service provider	12.5	37.5	12.5	21.9	15.6	2.91	1.318
o) All the company personal information is available in the website	5.8	14.5	13.0	43.5	23.2	3.64	1.163
p) We do not have a centralized information sharing system and all the departments share information freely	7.4	16.2	13.2	44.1	19.1	3.51	1.191

Based on the findings, the firms share information with the suppliers, customers and 3rd party providers. This is in agreement with the findings of a study by Nambisan (2000) that when information is exchanged with customers, suppliers and 3rd parties

who are outside the geographical boundaries of a firm, it allows coordination of processes such as Vendor Management Inventory (VMI). However, much of the information was only shared within the company and companies also lacked centralized information sharing system since information was shared freely. This can be risky for the firms since it hinders collaboration and coordination which is supported through connectivity therefore affecting the firms' performance (Closs et al, 1997; Nambisan, 2000).

The Cronbach's Alpha for information flow risk which had 9 items was 0.707. The 9 items were aggregated by taking their average to come out with information flow risk having dropped items (c, j, I, m, n and o). Normality tests results show that the p-values for the variables were >0.05. This implies that the variables were normally distributed (see Table 4.4). Regression analysis was conducted to generate the Variance Inflation Factor (VIF) value and tolerance levels in order to determine if multicollinearity would pose a challenge to the study. The values (see Table 4.6) show that the VIF for information flow risk was 1.419. The results indicate that the variables had a VIF of less than 10 and a tolerance of more than 0.1 ruling out the problem of multicollinearity. From the correlation results, (see Table 4.5) it is clear that information flow risk is positively correlated with financial flow risk (0.498)

d) **ICT use on Information flow risk**

The study sought to establish how the manufacturing firms in Kenya use ICT to enable the flow of information along the supply chain. Majority of the firms (75.0%) indicated that they use ICT to gather sales data, 62.5% use ICT to analyze demand forecast data, 65.3% to post inventory level data, 61.1% to gather order status data, 63.9% to analyze production schedule information, 61.1% to store plans of the order, 58.3% to gather logistical data and minority 34.7% for Corporate Social Responsibility (CSR) as depicted in Table 4.16

Table 4. 16: ICT use on Information flow risk

	Frequency	%
Gather sales data		
No	16	25
Yes	54	75
Analyze demand forecast		
No	25	37.5
Yes	45	62.5
Post inventory data		
No	23	34.7
Yes	47	65.3
Gather order status		
No	26	38.9
Yes	44	61.1
Analyze production schedule		
No	24	36.1
Yes	26	63.9
Store plans of the order		
No	26	38.9
Yes	44	61.1
Gather logistical data		
No	27	41.7
Yes	42	58.3
Corporate Social Responsibility (CSR)		
No	43	65.3
Yes	25	34.7

This study findings are in agreement with Elbashir, Collier and Davern, (2008) ; Shang et al, (2008) who argue that supply chain risk management requires a large data base of information (sales data, demand forecast, inventory levels) which helps in decision making on the strategies to mitigate the risks. These findings also agree with the findings of a research carried out by Cadez, (2008); Stoel and Muhanna, (2009) that information increases the performance of the firm as they are able to formulate responses that are effective.

The study observed that majority of the manufacturing firms in Kenya (75%) use ICT to gather sales data, 62.5% to analyze demand forecast data, 65.3% to post inventory level data, 61.1% to gather order status data, 63.9% to analyze production schedule information, 61.1% to store plans of the order, 58.3% to gather logistical

data and minority (34.7%) use ICT for Corporate Social Responsibility (CSR). Other uses of ICT are shown in Table 4.17below;

Table 4. 17: Measurement of other uses of ICT

	Frequency	Percentage
Demand Forecast	2	2.8
Timely sharing information	1	1.4
It improves performance	3	4.2

4.2.2 Inferential of information flow risk

a) Information flow risk and firm performance

The regression analysis for information flow risk was conducted to determine the proportion of firm performance (dependent variable) which would be predicted by information flow risk (independent variable). The linear regression model for information flow risk was found to be statistically insignificant {F (1, 65= 1.889, p= 0.174)}. Therefore, information flow risk is not a significant predictor of performance because p is larger than 5% that is, it is 17% as shown in table 4.18.

Table 4. 18: Regression results on information flow risk and firm performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.168[a]	.028	.013	.537		
ANOVA						
Model	Sum of Squares	Df	Mean Square	F	Sig.	
	Regression	.544	1	.544	1.889	.174[b]
	Residual	18.729	65	.288		
	Total	19.273	66			
Coefficient						
Model	Unstandardized Coefficients	Standardized Coefficients	T			
	B	Std. Error	Beta			
	(Constant)	3.805	.254		14.96	
	Information flow risk index	-.152	.110	-.168	1.375	

a. Dependent Variable: Performance
b.Predictors: (Constant) Information flow risk index

b) Moderating effect of ICT on information flow risk and firm performance

A moderator variable influences the relationship between the dependent variable and the independent variable. The magnitude and the direction of the relationship depends on the value of the moderator (Sekaran, 2006). This study identified ICT use as the moderator variable affecting the relationship between information flow risk (independent variable) and firm performance (dependent variable) among the manufacturing firms in Kenya. Using the moderated multiple regression (MMR) analysis in this study, the moderating effect of the variable (interaction term) was analyzed by interpreting the R^2 change in the models obtained from the model

summaries and by interpreting the regression coefficients for the interaction term obtained from the coefficient tables. Regression analysis was performed in this study to test the moderating effect of ICT use on the relationship between information flow risk and firm performance among the manufacturing firms in Kenya.

The hypothesis to test for this specific objective was:

H_{01} – ICT use does not moderate the relationship between information flow risk and firm performance among the manufacturing firms in Kenya

To determine if ICT use moderates the relationship between information flow risk and firm performance among the manufacturing firms in Kenya, three models were fitted hierarchically with;

1) Model 1 having X_1 as the predictor (see Figure, 4.18).
2) Model 2 having X_1 and the moderation variable as a predictor (see Figure, 4.19).
3) Model 3 is model 2 with interaction term between X_1 and the moderating variable (see Figure, 4.19).

In model 1, the F change for X was insignificant (F change = 1.889, P – value 0.174), implying that X_1 did not significantly influence Y as discussed earlier in Table 4.18.

In model 2, when M (ICT use) was added as a predictor to the model containing X_1 the model was still insignificant (F change = 2.895, p=0.094)

In model 3, when the interaction term was introduced, the model remained the same (insignificant) (F change = 1.595, P-value = 0.211). This means that M (ICT use) is not a significant moderator of the relationship between information flow risk and performance of the manufacturing firms in Kenya.

Table 4. 19: Moderating effect of ICT on information flow risk and firm performance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		Change Statistics		
					R Square Change	F Change	df1	df2	Sig. F Change
1	.168[a]	0.28	0.013	0.537	0.028	1.889	1[a]	65	0.174
2	.265[b]	0.070	0.041	0.529	0.042	2.895	1[b]	64	0.094
3	.305[c]	0.093	0.050	0.527	0.023	1.595	1[c]	63	0.211

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.544	1	.544	1.889	.174[b]
	Residual	18.729	65	.288		
	Total	19.273	66			
2	Regression	1.355	2	.677	2.420	.097[c]
	Residual	17.918	64	.280		
	Total	19.273	66			
3	Regression	1.797	3	.599	2.160	.102[d]
	Residual	17.476	63	.277		
	Total	19.273	66			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.468	.066		52.879	.000		
	Information flow risk	-.152	.110	-.168	-1.375	.174	1.000	
2	(Constant)	3.305	.115		28.625	.000		1.000
	Information flow risk	-.081	.116	-.090	-.699	.487	.874	
	ICT use	.248	.146	.219	1.701	.094	.874	1.145
3	(Constant)	3.362	.123		27.233	.000		1.145
	Information flow risk	-.276	.193	-.306	-1.432	.157	.315	
	ICT use	.208	.148	.184	1.399	.167	.834	3.172
	Information flow risk*ICT use	.305	.241	.256	1.263	.211	.352	1.200

However, looking at the reduction in p values (from 0.174 to 0.094 to 0.211), that is, the significant F change, one would suspect some form of moderation, maybe with a larger sample size. ICT use as a moderator on the relationship between information flow risk and firm performance is further depicted by the scatter plot. As shown in the Figure 4.6 the crossover point for the two regression lines occurs on the right side of predictor and therefore the moderator narrowly influenced the relationship between information flow risk and firm performance. The green regression line is horizontal. This means that information flow risk does not influence performance. However, without ICT use, performance is worse.

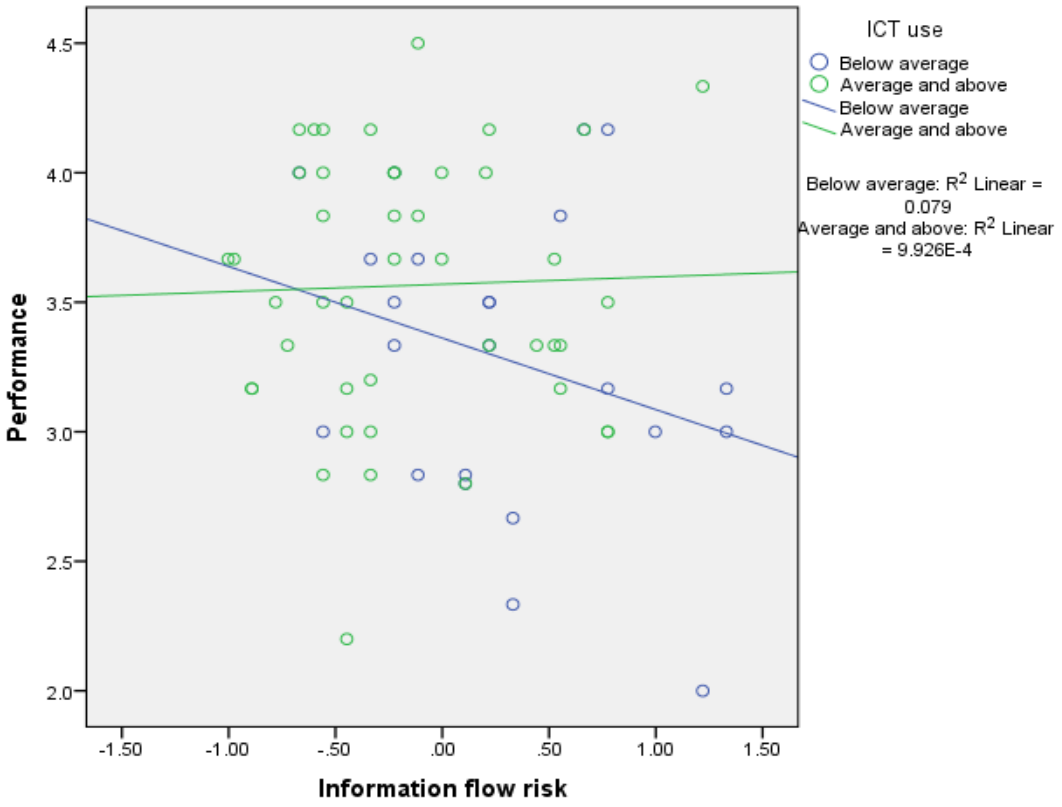


Figure 4. 2: Slope of moderated information flow risk

The scatter plot suggests some form of moderation though not statistically significant (p-value is less than 0.05). The findings from the scatterplot roughly suggested some form of moderation effect of ICT use on the relationship between information flow risk and firm performance. ICT use affects slightly positive the performance of

manufacturing firms in Kenya. This means that for manufacturing firms below average (blue line) in ICT use, the higher the information flow risk and therefore worse in terms of performance. Manufacturing firms in Kenya that have challenges in ICT use (lack training and ICT infrastructure) are affected by information flow risk and this inhibits their performance. Manufacturing firms in Kenya who are above average in terms of ICT use (green line), their performance is not affected. This means that even if information flow risk increases, the performance remains the same (it is not affected).

This is in agreement with the study by Lee and Lim (2005) that ICT enables firms to share information, integrate information thereby improving responsiveness and reducing information distortion. This is especially the case when firms have the necessary infrastructure and a well trained workforce to leverage on the ICT in managing information flow risk.

An open ended question was asked on how information flow affects the performance of the firm. The respondents indicated information flow helps in setting the production schedules of a firm.

4.2.3 Discussion

It is clear from the qualitative results that information flow risk does not affect the performance of the manufacturing firms in Kenya. These results disagree with the findings of Choy *et al* (2004) and Musa (2012). Musa (2012) argue that information flow (information on demand, status of inventory, available capacity, process design changes) prevents stock holding costs that directly reduce the profits of firms. Lack of information especially on the available capacity could also lead to lost sales thereby reducing the profits of a firm. Choy *et al* (2004) is also of the view when manufacturing firms fail to share supply chain information both within the firm and with the outside supply chain partners, transactional costs arise that are caused by lack of coordination which ultimately reduces the profits of the frim.

This is supported by the descriptive results where the majority of the manufacturing firms (44.9%) failed to share information on sales orders, inventory status and order deliveries. Lack of such information according to Clement and Munoz, (2007);

Hendricks and Singhal, (2003) would disrupt the supply chains and therefore significantly impact the performance of the firm in terms of stock levels of tying of organizations resources. This means that important supply chain information that would have had a bearing on the firm performance was not shared among the supply chain partners. The respondents also indicated that information flow also helps in setting the production schedules of a firm which increases customer satisfaction.

On moderation, results from the scatter plot showed that ICT moderated the relationship between information flow risk and the performance of the manufacturing firms in Kenya. In fact, manufacturing firms which failed to leverage in ICT recorded a poor performance compared to those that did. This is in agreement with the findings of Lee and Lim (2005) that information sharing reduces distortion therefore availing the right supply chain information for decision making which improves the firm performance. This sharing of information can well be facilitated by an adequate ICT infrastructure coupled with training to equip the participants with the relevant skills on information flow. This reduces the risk of lack of information which could hamper real time decision making of the firm and ultimately customer satisfaction.

4.3 Objective 2: To establish the moderating effect of ICT on financial flow risk and firm performance among manufacturing firms in Kenya

4.3.1 Descriptive Analysis of Financial Flow Risk

The study sought to determine the moderating effect of ICT on Financial flow risk and firm performance among the manufacturing firms in Kenya. Exchange rate risks, financial strength of the suppliers and financial management were the parameters that were used to measure this objective in the opinion statements that were given by the respondents. The respondents were asked to indicate the extent to which they agreed with reduced performance as a result of better financial flow risk in their manufacturing firms. This was based on a likert scale of strongly disagree, disagree, neutral, agree and strongly agree as shown in table 4.20.

Table 4. 20: Measurement of Financial flow risk

	SD %	D %	N %	A %	SA %	M	SD
a) We only buy goods and services that are important to the firm	1.4	5.7	1.4	34.3	57.1	4.40	.891
b) We are not able to timely pay our suppliers	33.3	27.5	13.0	17.4	8.7	2.41	1.343

The research observed that majority of the respondents (57.1%) strongly agreed that their firms only buy goods and services that are important to the firm, 34.3% agreed, 5.7% disagreed while the minority1.4% strongly disagreed and also neutral. (Mean = 4.40, SD =0.891). A large number of the firms (33.3%) strongly disagreed that they were not able to pay their suppliers on time, 27.5% disagreed, 17.4% agreed, 13.0% were neutral while a small number 8.7% strongly agreed (Mean = 2.41, SD =1.343).

This means that manufacturing firms in Kenya are able to pay their suppliers on time. These research findings are in agreement with the findings of a research carried out by Musa (2012) that the financial position of a firm is disrupted when a firm is unable to settle its debts. The findings also add that buying goods and services that are not required by the firm also affects the firm performance.

a) Exchange Rate Risk

Majority of the respondents (35.4%) were neutral about the effectiveness of the strategies that their firms had put in place to prevent the effect of currency volatility, 29.2% disagreed that the strategies they had to prevent the effect of currency volatility were rarely effective, 18.5% agreed, 9.2% strongly disagreed while the minority 7.7% strongly agreed (Mean = 2.86, SD =1.074). A large number (37.7) agreed that their firms buy goods from outside the country, 21.7% strongly agreed, 15.9% were neutral, 14.5% disagreed while a small number 10.1% strongly disagreed (Mean = 3.46, SD =1.267). Most firms (30.4%) also disagreed that they frequently change their sources of supply when the currency exchange rate increases, 30.4% of the firms were neutral, 18.8% strongly disagreed, 17.4% agreed while few firms (2.9%) strongly agreed (Mean = 2.55, SD =1.078). In terms of local sourcing,

31.9% strongly agreed that they source locally, 33.3% agreed, 14.5% disagreed, 13.0% were neutral while 7.2% strongly disagreed (Mean = 3.68, SD =1.266) as shown in table 4.21.

Table 4. 21: Measurement of exchange rate risk

	SD %	D %	N %	A %	SA %	M	SD
c) The strategies we have to prevent the effect of currency volatility are rarely effective	9.2	29.2	35.4	18.5	7.7	2.86	1.074
d) We buy most of our materials from outside the country	10.1	14.5	15.9	37.7	21.7	3.46	1.267
e) We frequently change our sources of supply when the currency exchange rate increases	18.8	30.4	30.4	17.4	2.9	2.55	1.078
f) Most of our firms materials are sourced locally	7.2	14.5	13.0	33.3	31.9	3.68	1.266

From the findings, it was clear that most strategies that the firms implemented to prevent the effect of currency volatility were effective. This is consistent with the research carried out by Eiteman (2007) that strategies such as hedging of currency helps in the prevention of position risks that are caused by the movement of the currency. The findings also indicate that most of the materials used by the manufacturing firms are sourced locally. This is in line with the findings of Musa (2013) and Jaaga (2013) that local sourcing helps to shield the firms from the volatility of the exchange rate which affects the prices of the finished goods if they were imported and therefore affect the profitability and performance of the firm.

On the flipside, it is evident from the study findings that a significant amount of the firms' material is also bought from outside the country. These results can concur with a study carried out by Musa (2013) that manufacturing firms in Kenya are likely to be affected by the volatility of the exchange rate since it is an import oriented country. He further explains that, the fact that most manufacturing firms in Kenya import their raw materials, consumer goods and capital goods there is need to manage the exchange rate market. It also confirms the findings of Afza & Alam,

(2014) that although international sourcing significantly reduces the cost of buying, thereby increasing profitability, it also leads to variability in the cash flows of the firm due to variations in the foreign exchange risks.

Manufacturing firms in Kenya also fail to change their sources of supply when the exchange rate increases in their current source market. This is likely to expose the firms to high risk of exchange rate and consequently increase the prices of the goods and services bought. These study findings also agreed with Irene (2011) that there a negative relationship between exchange rate risks and the financial position of a firm. This as evidenced by Zannov (2006) could also affect the budget allocation by the firms especially for offshore initiatives especially outsourcing decisions since outsourcing from outside the country could prove costly for the firm.

b) Financial Strength of Suppliers

A large number of the firms (21.7%) strongly disagreed and also disagreed that their firms do not evaluate their suppliers financially to determine their financial status before engaging them in their organization, 22.9% agreed, 12.9% were neutral while a small number (10.0%) strongly agreed (Mean = 2.61, SD =1.365). In terms of monitoring the financial status of their suppliers throughout the contract, the majority (24.3%) disagreed that they rarely monitor, 21.4% strongly agreed, 21.4% also agreed, 18.6% were neutral while the minority (14.3%) strongly agreed (Mean = 2.83, SD =1.372). A large number of the firms (34.8%) disagreed that they engage 3rd parties to manage the financial status of the suppliers regularly, 20.3% strongly disagreed, 17.4% agreed, 15.9% were neutral while a small number (11.6%) strongly agreed(Mean = 2.65, SD =1.304). A large number (38.8%) of the respondents agreed that they were monitoring the strength of their suppliers, 25.4 strongly agreed, 19.4% were neutral, 9.0% disagreed while a small number (7.5%) strongly disagreed (Mean = 2.78, SD =1.291) as shown in table 4.22.

Table 4. 22: Measurement of financial strength of suppliers

	SD %	D %	N %	A %	S A %	M	SD
g) We do not evaluate our suppliers financially to determine their financial status before engaging them in the organization	27.1	27.1	12.9	22.9	10.0	2.61	1.365
h) We rarely monitor the financial status of the suppliers throughout the contract	21.4	24.3	18.6	21.4	14.3	2.83	1.372
i) We engage 3rd parties to manage the financial status of our supplier regularly	20.3	34.8	15.9	17.4	11.6	2.65	1.304
j) We are monitoring the strength of our suppliers	7.5	9.0	19.4	38.8	25.4	3.66	1.175
k) We have consistently performed well at the NSE	23.4	15.6	29.7	21.9	9.4	2.78	1.291

Based on the study findings, it is clear that the manufacturing firms in Kenya evaluate their suppliers financially to determine their financial status before engaging them in their organization. These findings are consistent with Kleindddorfer and Saad (2005) who argue that a company that deals with suppliers who have financial hardships may result to inefficiencies along the supply chain. Supplier relationships such as partnerships with suppliers who are financially unsound increase the risks of firms which enter into such relationships (finch, 2004). Also, when the financial strength of a supplier is vulnerable, it affects the entire supply chain participants (tang, 2006)**.**

Manufacturing firms in Kenya also monitored the financial status of their suppliers throughout the contract. These findings are in agreement with Achilles, (2004) that managing financial failure risk of the suppliers should be a top priority for an organization, sourcing, procurement and contract management. The study also concurs with the results of a study by Achilles (2014) that when suppliers suffer from financial failure, the average cost incurred by the procuring entity participating in the supply chain amounts to 73, 000 pounds. Manufacturing firms in Kenya also monitor the financial status of their suppliers.

c) Financial Management

A large number of the respondents (29.4%) agreed that their firms are concerned with the price and not the total cost when buying products from the suppliers, 26.5% agreed, 23.5% strongly agreed, 11.5% were neutral while a small number (8.8%) strongly agreed (Mean = 2.74, SD =1.345). Majority of the respondents (47.1%) also agreed that they used technology to enhance the firms' cash flow, 20.6% were neutral, 19.1% strongly agreed, 7.4% disagreed, while the minority 5.9% strongly disagreed (Mean = 3.66, SD =1.060). Most firms (49.2%) also agreed that the finances of the firm are managed through strategic sourcing, 22.2% were neutral, 19.0% strongly agreed, 6.3% disagreed while few firms (3.2%) strongly disagreed (Mean = 3.75, SD =0.950). Majority of the manufacturing firms in Kenya (39.7%) disagreed that there are many complaints about nonpayment of suppliers, 32.4% strongly disagreed, 14.7% agreed, 10.3% were neutral while the minority (2.9%) strongly agreed (Mean = 2.16, SD =1.128). A large number of manufacturing firms in Kenya (39.7%) agreed that they had a procurement schedule that is strictly adhered to, 23.5% were neutral, 19.1% strongly agreed, 11.8% disagreed while a small number (5.9%) strongly disagreed (Mean = 3.54, SD =1.112). When they were asked whether they have a procurement schedule that frequently overlap, majority of the manufacturing firms (35.8%) disagreed, 23.9% agreed, 20.9% were neutral, 16.4% while the minority (3.0%) strongly agreed (Mean = 2.61, SD =1.114) as shown in table 4.23.

Table 4. 23: Measurement of financial management

	SD %	D %	N %	A %	SA %	M	SD
l) We are concerned with the price and not the total cost when buying products from suppliers	23.5	26.5	11.8	29.4	8.8	2.74	1.345
m) We always use technology to enhance the firm cash flow	5.9	7.4	20.6	47.1	19.1	3.66	1.060
n) We manage the finances of the firm through strategic sourcing	3.2	6.3	22.2	49.2	19.0	3.75	.950
o) There are many complaint about nonpayment of suppliers	32.4	39.7	10.3	14.7	2.9	2.16	1.128
p) We have a procurement schedule that is strictly adhered to	5.9	11.8	23.5	39.7	19.1	3.54	1.112
q) We have procurement schedule that frequently overlap	16.4	35.8	20.9	23.9	3.0	2.61	1.114

From the study findings, it is clear that manufacturing firms in Kenya use technology to enhance their firms' cash flow. This is in agreement with bottom Line Technologies (2011) who argue that when companies adopt information technology, they ensure that their supply chains are faster and cost efficient. Hausman (2004) also agrees by arguing that when supply chain payment systems are automated, the performance of the firm is improved. Manufacturing firms in Kenya also manage their finances through strategic sources. This is in line with a study carried out by Mertinez (2014) that firms can reduce their financial flow risk by avoiding inappropriate spending in goods and services that the company does not require. This improves the performance of the firm through the reduction of supply chain risks such as reduced risk of non-supply and reduced currency risk (ACCEA, 2014). Manufacturing firms in Kenya also have few complaints about nonpayment from the suppliers. This is in tandem with Mertinez (2014) that financial flows are manifested terms of delays in processing and reconciling of invoices. Manufacturing firms in Kenya also have a procurement schedule that is strictly adhered to and that does not

frequently overlap. This helps in preventing the firms from spending on purchases that are not required by the firm (Mertinez, 2014).

However, manufacturing firms in Kenya are concerned about the price and not the total cost when buying goods from the suppliers. This is in agreement with a research carried out by ACCA (2014) which argues that when purchasing goods and services, the supply chain participants should be concerned with the total cost of buying and not just the price of the product. Therefore, to improve performance of their firms, manufacturing firms should first analyze the total cost from purchase price, maintainace, to disposal in order to better manage the finances of the firms and avoid financial flow risks.

On the Cronbach test, Financial flow risk which had 7 items indicated a Cronbach's Alpha of 0.630. The 7 items were aggregated by taking their average to come out with financial flow risk having dropped items (a, d, e, j, k, m, n, o, p and q). Shaphiro-Wilk test was used in this study to test for normality. Normality tests results show that the p-values for the variables were >0.05. This implies that the variables were normally distributed (see Table 4.4). Regression analysis was conducted to generate the Variance Inflation Factor (VIF) value and tolerance levels in order to determine if multicollinearity would pose a challenge to the study. The values (see table 4.6) show that the VIF for information flow risk was 1.419, The results indicate that the variables had a VIF of less than 10 and a tolerance of more than 0.1 ruling out the problem of multicollinearity. On multiple regression Correlation results (see Table 4.5) show that financial flow risk is highly correlated with the material flow risk (0.420).

ICT use on financial flow risk

The respondents were asked to indicate how they use ICT to improve financial flow. Most of the respondents (89.4%) agreed that they used ICT in payment of the suppliers, 83.5% used ICT in analyzing purchasing spend, 68.2% in supplier relationship management, 78.8% in sourcing for goods while 53% used intranet to send payment information to suppliers.

However, majority of the respondents did not use ICT in; Exchange rates management (51.5%), analyzing the suppliers' financial performance (51.5%), use text messages to post notices of supplier payment (64.6%), use of whats app to post payment documents to suppliers (70.8%) while (66.7%) of the respondents did not use wi-fi to send payment information to suppliers. The results were shown in the table 4.24.

Table 4. 24: ICT use on information flow risk

	Frequency	%
Payment to suppliers		
No	7	10.6
Yes	59	89.4
Analyzing purchasing spend		
No	11	16.7
Yes	55	83.5
Exchange rates management		
No	34	51.5
Yes	32	48.5
Supplier relationship management		
No	21	31.8
Yes	45	68.2
Sourcing goods		
No	14	21.2
Yes	52	78.8
Analysis of supplier financial performance		
No	34	51.5
Yes	32	48.5
We use text messages to post notices of supplier payment		
No	42	64.6
Yes	23	35.4
We use whatsApp to post payment documents to suppliers		
No	46	70.8
Yes	19	29.2
We use intranet to send payment information to suppliers		
No	31	47.0
Yes	35	53.0
Wifi is used to transmit payment information		
No	44	66.7
Yes	22	33.3

4.3.2 Inferential of financial flow risk

a) Relationship between financial flow risk and firm performance

Regression analysis was conducted to determine the extent to which firm performance (dependent variable) can be influenced by financial flow risk (independent variable). The linear regression model for financial flow risk was found to be statistically insignificant (F=1, 67= 1.159, p= 0.286). Therefore, financial flow risk is not a significant predictor of the performance of the manufacturing firms in Kenya as shown in table 4.25.

Table 4. 25: Regression results on financial flow risk and firm performance

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.130[a]	.017	.002	.538

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.335	1	.335	1.159	.286[b]
	Residual	19.377	67	.289		
	Total	19.712	68			

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	3.733	.261		14.328	.000
Financial flow risk	-.095	.089	-.130	-1.077	.286

a. Dependent Variable: Performance of the manufacturing firms in Kenya

Although the regression model indicated that there was no relationship between information flow risk and firm performance, the researcher did a triangulation to support the regression model. The researcher had asked the firm to give their perceived effect of financial flow risk on the performance of manufacturing firms in Kenya. Table 4.37 illustrates their perceived effect of financial flow risk and performance of manufacturing firms in Kenya.

b) Moderating effect of ICT use on the relationship between financial flow risk and firm performance

The second specific objective of this study was to establish the moderating effect of ICT on information flow risk and firm performance among the manufacturing firms in Kenya

The hypothesis to test for this specific objective was:

H_{02} – ICT use does not moderate the relationship between financial flow risk and firm performance among the manufacturing firms in Kenya

To determine if ICT use moderates the relationship between financial flow risk and firm performance among the manufacturing firms in Kenya, three models were fitted hierarchically with;

1) Model 1 having X_2 as the predictor (the linear relationship, see Figure 4.25).
2) Model 2 having X_2 and the moderation variable as a predictor (see Figure, 4.26).
3) Model 3 is model 2 with interaction term between X_2 and the moderating variable (see Figure 4.26).

In model 1, having X2 as the predictor, the model was insignificant (F change = 1.376, P value = 0.245).

In model 2, when the moderating value was used as a predictor, the model was still insignificant (F change = 3.031, P-value = 0.086).

In model 3, when the interaction term was introduced, the model remained the same (insignificant) (F change = 3.288, P-value = 0.074)

The 3 models were found to be statistically insignificant, that is, in all cases p was bigger than 0.05 (see table 4.26). This implies that M (ICT use) does not significantly moderate the relationship between financial flow risk and performance of manufacturing firms in Kenya.

Table 4. 26: Moderated Multiple Regression for financial flow risk

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		Change Statistics		
					R Square Change	F Change	df1	df2	Sig. F Change
1	.143[a]	.020	.006	.535	.020	1.376	1	66	.245
2	.253[b]	.064	.035	.527	.044	3.031	1	65	.086
3	.331[c]	.110	.068	.518	.046	3.288	1	64	.074

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.394	1	.394	1.376	.245[b]
	Residual	18.918	66	.287		
	Total	19.312	67			
2	Regression	1.237	2	.619	2.224	.116[c]
	Residual	18.075	65	.278		
	Total	19.312	67			
3	Regression	2.120	3	.707	2.631	.058[d]
	Residual	17.192	64	.269		
	Total	19.312	67			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.474	.065		53.460	.000		
	Financial flow risk	-.104	.088	-.143	-1.173	.245	1.000	1.000
2	(Constant)	3.315	.111		29.840	.000		
	Financial flow risk	-.060	.091	-.083	-.663	.510	.924	1.083
	ICT use	.242	.139	.217	1.741	.086	.924	1.083
3	(Constant)	3.368	.113		29.800	.000		
	Financial flow risk	-.234	.131	-.323	-1.788	.078	.427	2.342
	ICT use	.208	.138	.186	1.502	.138	.906	1.104
	Financial flow risk*ICT use	.324	.179	.316	1.813	.074	.457	2.190

However, looking at the reduction (from 0.245 to 0.086 to 0.074) in p-values (sig. F change), one can conclude moderation maybe detected with a larger sample size. This means there is a significant reduction in financial flow risk when ICT use is present though not statistically significant since it is not below 5%. The potential moderation of ICT use on the relationship between financial flow risk and firm performance is further depicted in the scatter plot shown in Figure 4.8.

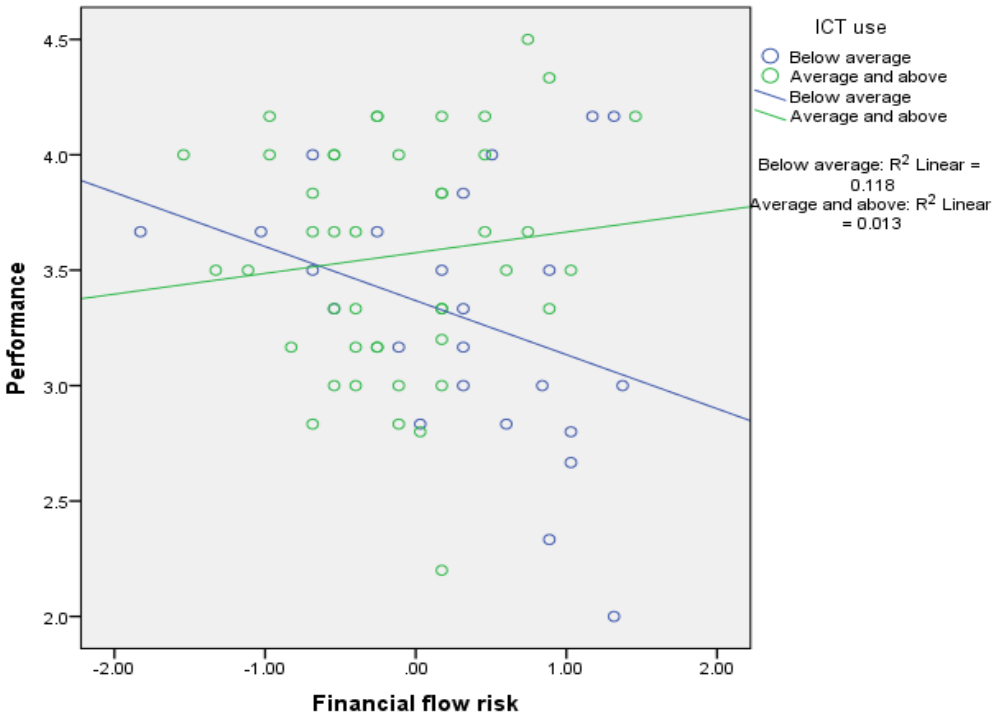


Figure 4. 3: Slope of moderated financial flow risk

The scatter plot above suggests some form of moderating effect that was not statistically significant because the p value was not less than 5%. This means that as financial flow risk increases, manufacturing firms in Kenya that have leveraged on ICT use have increased firm performance. This is because ICT use hedges them against the negative effect of the financial flow risk on their performance. On the other hand, the manufacturing firms which have not leveraged on the usage of ICT, when financial flow risk increases, their performance is affected negatively (decreases). This is in agreement with a study carried out by Hausman (2014) which revealed that firms that failed to leverage on ICT to improve their financial

management and analyze the purchasing spend were more prone to financial flow risks due to high carrying costs and non-predictability of cash flow improvements.

When an open ended question was asked on how the firms can manage finances in order to improve the performance of their firms, the respondents indicated; budgeting and strictly sticking to the budget, ensuring value for money is achieved in all stages of procurement, managing skills and terms of payment.

4.3.3 Discussion

Findings form the qualitative results indicate that financial flow risk does not affect the performance of the manufacturing firms in Kenya. This is contrary to the findings of Musa, 2012; Rao and Goldsby (2009) that financial flow risk affects the performance of a firm as failure by debtors to settle their debts may affect the ability of the manufacturing firms to pay their suppliers therefore disrupting the supply chain. The lack of relationship between financial flow risk and firm performance among the manufacturing firms in Kenya could be explained by the fact that majority (37.7%) of the manufacturing firms in Kenya buy goods and services from outside the country.

The manufacturing firms are also not aware that there is need to change their sources of supply when the source countries are affected by the threat of exchange rates. It is therefore evident that most of these firms are not aware of the potential financial flow risks that may greatly affect their supply chain such as exchange rate risks. Exchange rate risk according to Njaaga, (2013) and Irene, (2011) increases the cost of raw materials and these may affect the financial performance and customer service due to increased prices of the final products. Total costing is an important supply chain determinant of the price of the product. However, manufacturing firms in Kenya only consider the price of the products only. These firms are also not aware that the lack of the total costing can significantly affect the performance of their firms. A study carried out by ACCA (2014) advises manufacturing firms to consider the total cost of a product as this may have an impact on the performance of the firms in terms of high maintenance and disposal costs during the life cycle of products.

ICT was seen to moderate the relationship between financial flow risk and performance of the manufacturing firms in Kenya based on the results from the scatter plot. Manufacturing firms that had leveraged on ICT use had a higher performance compared to those which had not. This means that ICT use reduces the impact of financial flow risk on the performance of the firm. These study findings are in agreement with the study carried out by Hausman (2014) that ICT use helps in the management of finances and analyses the firms purchasing spend thereby reducing carrying costs and enabling firms to predict cash flows more effectively. Reduction of carrying costs directly contributes to the profits of the firm. On the other hand, increased visibility in the financial flows of an organization exposes non value adding activities which the firm can address in real time to avoid far reaching implications on the performance of a firm.

4.4 Objective 3: To explore the moderating effect of IT on material flow risk and firm performance among the manufacturing firms in Kenya

4.4.1 Descriptive Analysis of Material Flow Risk

The researcher observed that 37.9% of the respondents disagreed that they frequently experience logistical barriers in trade routes, language and cultural difficulties as materials flow along the supply chain, 22.7% agreed, 19.7% strongly agreed, 15.2% were neutral while 4.5% strongly agreed (Mean = 2.55, SD =1.179). A large number (34.8%) also disagreed that the flow of materials is often disrupted due to lack of information and finances (Mean = 2.39, SD =1.051) as shown in table 4.27.

Table 4. 27: Measurement of material flow risk

	SD %	D %	N %l	A %	SA %	M	SD
a) We frequently experience logistical, barriers in trade routes, language and cultural difficulties as materials flow along the supply chain	19.7	37.9	15.2	22.7	4.5	2.55	1.179
b) The flow of materials is often disrupted due to lack of information and finances	22.7	34.8	22.7	19.7		2.39	1.051

From the results of the study, it was found that manufacturing firms in Kenya do not frequently experience logistical barriers in trade routes, language and cultural difficulties as materials flow along the supply chain. These findings are in agreement with Ruriani (2013); Kerstern and Blecker (2006) that certain risk factors of material flow such as rare raw materials, mistakes in production and logistical barriers in trade routes as well as language and cultural difficulties may affect the smooth flow of materials throughout the chain, may cause delays and disrupt customer orders. The study also found out that the flow of materials is also not disrupted due to lack of information and finances. This is in line with Kerstern and Blecker (2006) that risk in information flow; financial flow and material flow have some reciprocity in that lack of efficient information may lead to delays in materials and consequently affect the financial position of an organization due to lost sales. Therefore, manufacturing firms in Kenya should mitigate risks that may hinder the smooth flow of materials as these may affect the financial flow of the firm and consequently performance.

a) Sourcing strategies

The study showed 42.0% of the respondents agreed and also strongly agreed that they always select their supplier competitively, 2.9% strongly disagreed and also disagreed while 10.1% were neutral (Mean = 4.17, SD =0.939). Also, 35.4% of the respondents were neutral on whether their firms experience disruptions in material

flows due to long lead times, terrorism, quality risk (noncompliance) when sourcing goods internationally, 26.2% disagreed, 16.9% strongly disagreed, 13.8% agreed while 7.7% strongly agreed (Mean = 2.69, SD =1.145) as shown in table 4.28.

Table 4. 28: Measurement of sourcing strategies

	SD %	D %	N %l	A %	SA %	M	SD
c) We always select our suppliers competitively	2.9	2.9	10.1	42.0	42.0	4.17	.939
d) When sourcing internationally, we experience disruptions in material flows due to long lead times, terrorism, quality risk (noncompliance)	16.9	26.2	35.4	13.8	7.7	2.69	1.145

In terms of sourcing, it was clear from the study that the manufacturing firms in Kenya select their suppliers competitively. This is in agreement with Dey and Lockstrom (2011) that the selection of the right suppliers reduces the cost of purchasing and increases the competitive advantage and the performance of a firm. In addition one of the key issues of supply chain management according to Goffin, Lemke and Szwejezewski (2006) is the cost of the raw materials and components procured as they constitute the highest percentage of the total spend of the revenues that the firm obtains from sales. Likewise, manufacturing firms in Kenya do not experience disruptions in material flows due to long lead times, terrorism, quality risk (noncompliance) when sourcing goods internationally. This is in line with Juttner, Peck and Christopher (2003) that large distances associated with international sourcing increases the risks along the supply chain and the probability of severe losses incase damages occur. Large distances also create information asymmetric thereby reducing the probability of creating a knowledge base for managing the risks. Therefore, selecting the right suppliers is key to the performance of the manufacturing firms in Kenya as it reduces the risks associated with the sources of the products, high prices and prevents the firms from incurring losses (Ellegaard, 2008).

a) Sourcing flexibility

The study showed that 32.8% of the respondents agreed that their suppliers postpone processing of orders in case of changes in demand, 28.4% disagreed, 23.9% were neutral, 11.9% strongly disagreed while3.0% strongly agreed (Mean = 2.87, SD =1.100) . On the other hand, 63.2% of the respondents disagreed that their firms consider flexibility of the suppliers when selecting them to ensure that the manufacturing processes are agile (Mean = 1.94, SD =0.710) as shown in table 4.29.

Table 4. 29: Measurement of sourcing flexibility

	SD %	D %	N %l	A %	SA %	M	SD
f) Our suppliers postpone processing of our orders in case of changes in demand	11.9	28.4	23.9	32.8	3.0	2.87	1.100
g) We consider the flexibility of the suppliers when selecting them to ensure that the manufacturing processes are agile	23.5	63.2	8.8	4.4		1.94	.710

In terms of sourcing flexibility, the study found out that suppliers of the manufacturing firms are flexible and postpone the processing of orders in case of changes in demand. This is in agreement with Byrd and Turner (2000) that flexibility in sourcing enables a firm to adapt to the changing business environment and also allows them to respond to the new conditions in the market. However, manufacturing firms in Kenya do not consider the flexibility of the suppliers when selecting them to ensure that their manufacturing processes are agile. A study carried out by Khan and Pillania (2008) showed that sourcing flexibility is the strongest area of strategic sourcing to consider when organizations are planning for capabilities that are geared towards the agility of their manufacturing firms. Therefore, manufacturing firms in Kenya should consider the flexibility of the suppliers prior to awarding them a supplies contract in order to increase the supply chain and firm performance.

b) Supplier capacity

The study showed that majority of the respondents 34.8% (Mean = 2.58, SD =1.151) disagreed that they are not able to keep pace with new products in the market because their suppliers do not adjust easily. Likewise, a large number of the respondents 42.2% (Mean = 3.58, SD =1.081) agreed that they maintain economic Order Quantities (EOQ) monitored by their system. The results are shown in table 4.30.

Table 4. 30: Measurement of supplier capacity

	SD %	D %	N %	A %	SA %	M	SD
h)We rarely are not able to keep pace with new products in the markets because our suppliers do not adjust easily	18.2	34.8	24.2	16.7	6.1	2.58	1.151
i) We maintain Economic Order Quantities (EOQ) monitored by our system	4.7	12.5	21.9	42.2	18.8	3.58	1.081

From the study, it was found out that manufacturing firms in Kenya are able to keep pace with new products in the market because suppliers are able to adjust easily. Manufacturing firms in Kenya should deal with suppliers who are not constrained in terms of capacity because if the suppliers are not able to adjust easily, the firms may not be in a position to meet the increased demand (Johnson, 2001). Supplier capacity risk is one of the factors that manufacturing firms should evaluate in order to ensure uninterrupted flow of products and services that are required in the event of fluctuating demand (Resilinc, 2005).

The Cronbach's Alpha for material flow risk that comprised of 7 items was 0.766 (after aggregation) having dropped items (e and i) (see Table 4.3). Normality tests results show that the p-values for the variables were >0.05. This implies that the variables were normally distributed (see Table 4.4). Regression analysis was

conducted to generate the Variance Inflation Factor (VIF) value and tolerance levels in order to determine if multicollinearity would pose a challenge to the study. The values (see table 4.6) show that the VIF for material flow risk was 1.409. The results indicate that the variables had a VIF of less than 10 and a tolerance of more than 0.1 ruling out the problem of multicollinearity (see Table 4.5). Material flow risk (see Table 4.5) is also highly correlated with the financial flow risk (0.420).

The study also sought to find out ICT use on material flow risk. The results were shown in the table 4.31.

Table 4. 31: ICT use on material flow risk

	No %	**Yes %**
Conduct Market research	74.2	25.8
Supplier selection	36.4	63.6
Monitoring price volatility	37.9	62.1
Capacity management	36.4	63.6
Collaboration with customers or suppliers	31.3	68.2

4.4.2 Inferential of material flow risk

a) Relationship between material flow risk and firm performance of manufacturing firms in Kenya

The regression analysis was conducted to determine empirically whether material flow risk is a significant determinant of firm performance. The linear regression model for material flow risk was found to be statistically insignificant (F=1, 66= 0.062, p= 0.804). Therefore, material flow risk is not a significant predictor of performance because p is larger than 5% that is, it is 80.4% as shown in table 4.32 below.

Table 4. 32: Regression results of Material Flow risk and firm performance

Model summary Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.031[a]	.001	-.014	.542

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	.018	1	.018	.062	.804[b]
	Residual	19.400	66	.294		
	Total	19.418	67			

Coefficients

Model	Unstandardized Coefficints		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	3.511	.241		14.574	.000
Material flow risk	-.023	.092	-.031	-.249	.804

b) Moderating effect of ICT use on the relationship between material flow risk and firm performance

The third specific objective of this study was to explore the moderating effect of ICT on information flow risk and firm performance among the manufacturing firms in Kenya

The hypothesis to test for this specific objective was:

H_{03} – ICT use has no significant moderating effect the relationship between material flow risk and firm performance among the manufacturing firms in Kenya

To determine if ICT use moderates the relationship between financial flow risk and firm performance among the manufacturing firms in Kenya, three models were fitted hierarchically with;

1) Model 1 having X_3 as the predictor (see Figure, 4.32).
2) Model 2 having X_3 and the moderation variable as a predictor (see Figure, 4.33).
3) Model 3 is model 2 with interaction term between X_1 and the moderating variable (see Figure 4.33).

In model 1, having X_3 as the predictor, the model was insignificant (F change = 0.083, P-value = 0.774)

In model 2, having X_3 and the moderating variable (ICT use) as the predictor, the model was significant (F change = 4.783, P-value = 0.032). Therefore, ICT use is a significant predictor of Y (performance) among the manufacturing firms in Kenya

Model 3 with the interaction term between X_3 and the moderating variable, the model was insignificant (F change = 0.21, P-value = 0.886). Therefore, we can conclude that ICT use is not a significant moderator of the relationship between material flow risk and performance of the manufacturing firms in Kenya.

Table 4. 33: Moderated Multiple Regression for material flow risk

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		Change Statistics		
					R Square Change	F Change	df1	df2	Sig. F Change
1	.036[a]	.001	-.014	.541	.001	.083	1	65	.774
2	.266[b]	.071	.042	.526	.069	4.783	1	64	.032
3	.267[c]	.071	.027	.530	.000	.021	1	63	.886

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.024	1	.024	.083	.774[b]
	Residual	19.004	65	.292		
	Total	19.028	66			
2	Regression	1.346	2	.673	2.436	.096[c]
	Residual	17.682	64	.276		
	Total	19.028	66			
3	Regression	1.352	3	.451	1.606	.197[d]
	Residual	17.676	63	.281		
	Total	19.028	66			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.463	.066		52.405	.000		
	Material flow risk	-.026	.092	-.036	-.288	.774	1.000	1.000
2	(Constant)	3.267	.110		29.596	.000		
	Material flow risk	-.002	.090	-.002	-.019	.985	.984	1.016
	ICT use	.298	.136	.266	2.187	.032	.984	1.016
3	(Constant)	3.265	.112		29.097	.000		
	Material flow risk	.013	.135	.017	.094	.925	.441	2.268
	ICT use	.300	.138	.267	2.175	.033	.978	1.023
	Material flow risk*ICT use	-.026	.182	-.026	-.144	.886	.447	2.236

The model did not provide sufficient evidence of ICT use moderation on the relationship between material flow risk and performance of manufacturing firms in Kenya. Moreover, further investigations using scatterplot revealed no form of moderation as shown in the Figure 4.4.

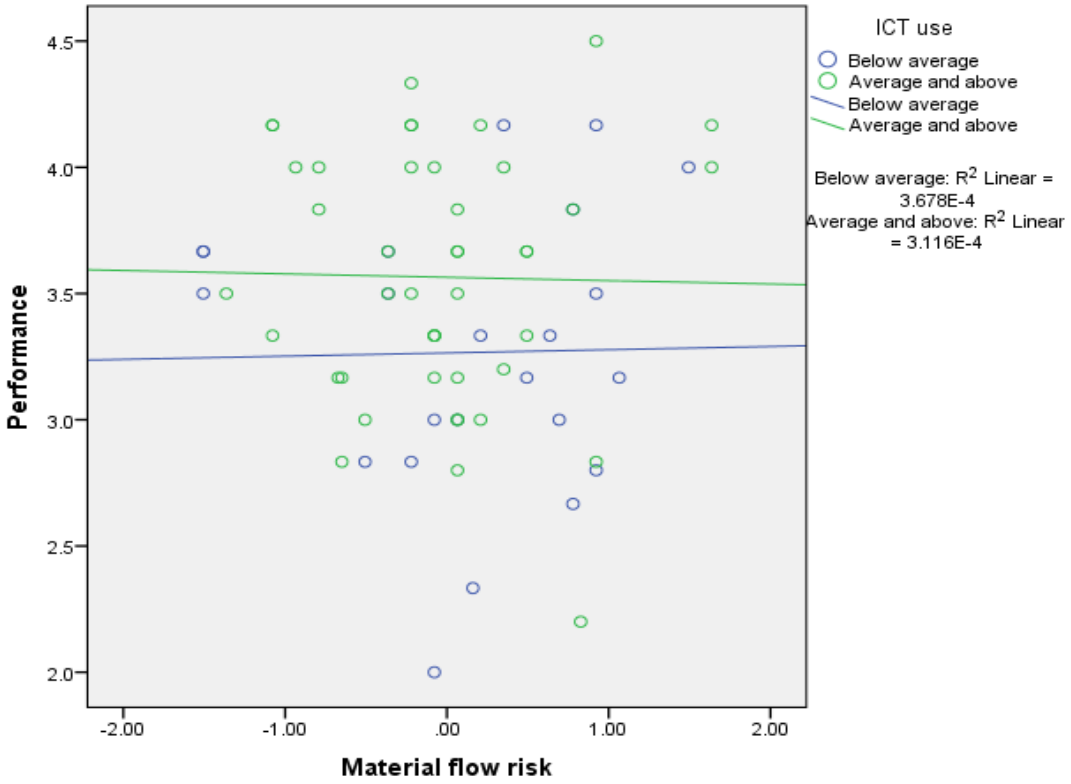


Figure 4. 4: Material flow risk

4.4.3 Discussion

From the qualitative results, it is evident that there is no presence of material flow risk among the manufacturing firms in Kenya. This means that the sourcing, the sourcing flexibility and supplier capacity do not pose a risk to the supply chains of the manufacturing firms. These findings disagrees with the studies carried out by Ruriani, (2013) that poor sourcing strategies, lack of competitive and agile suppliers as well as lack of supplier capacity disrupt the flow of materials along the supply chain. Material flow risk did not affect the performance of the manufacturing firms in Kenya.

This could be explained by the earlier results on financial flow risk. Both qualitative and quantitative analysis on financial flow risk indicated that manufacturing firms in Kenya pay their suppliers on time. This therefore means that materials also flow because suppliers do not withdraw their materials due to lack of timely payment. Financial flow risks leads to lost sales in an organization. This is because, when suppliers are not paid on time, they tend to withhold their supplies to a firm (Hausman, 2004).

Qualitative results on sourcing flexibility also indicated that majority of the manufacturing firms, do not consider the flexibility of their suppliers when selecting and prequalifying their suppliers. Although this poses a risk of material flow as no flexible suppliers may increase the supply chain costs in terms of lost sales in case of an increase in demand and stock holding costs in case of a decrease in demand (Christopher *et al*, 2006), manufacturing firms in Kenya seems not to understand this fact from the study findings. This could explain why material flow risk was not present.

On the moderating effect of ICT use on the relationship between material flow risks and the performance of the manufacturing firms in Kenya, ICT use did not moderate the relationship. This means that there was no difference in terms of performance among firms that had leveraged on ICT use and those that had not. This findings can be explained by the qualitative findings on ICT use where the majority of the manufacturing firms (74.2%) failed to leverage on ICT to conduct their market research on possible competitive material sources, flexible supplier as well as analyze supplier capacity prior to the engagement of the suppliers with the firm. Jamil *et al*, (2016) points out that having ICT infrastructure and skills is not enough, firms must leverage on the same to manage the supply chain risk in order to experience improved firm performance.

4.5 Objective 4: To establish the moderating effect of ICT on organization characteristic risk and frim performance among the manufacturing firms in Kenya

4.5.1 Descriptive Analysis of Organization Characteristic Risk

The study sought to determine the moderating effect of ICT on organizational characteristics and performance of manufacturing firms in Kenya using the following indicators Employee size, location, firm ownership. Respondents were asked to indicate the extent to which they agreed with the opinion statements given in regard to the rating of organizational characteristic in their manufacturing firms. This was on a likert scale of strongly disagree, disagree, neutral, agree and strongly agree. In this study the scale of strongly disagree and disagree meant disagree while agree and strongly agree meant agreed.

a) Employee size

Majority of the respondents (40.8%) disagreed and strongly disagreed that their companied had too many employees unnecessarily, 9.9% were neutral, 5.6% agreed while the minority 2.8% strongly agreed (Mean = 1.89, SD =0.994) . Likewise, 40.9% of the respondents strongly disagreed that their current expenditures are high due to too many employees, 36.4% disagreed, 13.6% were neutral while 9.1% agreed (Mean = 1.91, SD =0.956) . When asked if they had a lot of logistical challenges due to too many employees, 46.4% strongly disagreed, 42.9% disagreed, 7.1% were neutral and 3.6% agreed (Mean = 1.68, SD =0.765) as shown in the table 4.34.

Table 4. 34: Measurement of employee size

	SD %	D %	N %	A %	SA %	M	SD
a) In this company, we have too many employees unnecessarily	40.8	40.8	9.9	5.6	2.8	1.89	.994
b) Our recurrent expenditure is high due to too many employees	40.9	36.4	13.6	9.1		1.91	.956
c) We have a lot of logistical challenges due to too many employees	46.4	42.9	7.1	3.6		1.68	.765

From the study findings, it was noted that manufacturing firms in Kenya do not have unnecessary employees and the current expenditure of the firms in Kenya is not high due to too many employees. The firms also do not have logistical challenges due to too many employees. These are in agreement with Norman & Janson, (2004) that such firms are more efficient and have the financial resources to mitigate and put in structures to mitigate supply chain risks. Manufacturing firms in Kenya should therefore avoid unnecessary employees as this will affect their financial expenditures and tie up money which would have otherwise being used in supply chain risk management and improve the performance of the firms.

b) Location

Majority of the manufacturing firms in Kenya (46.2%) strongly disagreed that most of their company's' branches are located in areas that have poor road networks, 33.8% disagreed, 17.6% were neutral, 4.4% agreed while the minority (1.5%) strongly agreed (Mean = 1.88, SD =0.955) . In addition, 31.8% of the respondents, who were the majority disagreed that their firms often experience delays because some of the materials are shipped from global companies, 30.3% were neutral, 24.2% strongly disagreed, 12.1% agreed while 1.5% who were the minority strongly agreed (Mean = 2.35, SD =1.030) as shown in table 4.35.

Table 4. 35: Measurement of location

	SD %	D %	N %l	A %	SA %	M	SD
d) Most of our company branches are located in areas that have poor road networks	42.6	33.8	17.6	4.4	1.5	1.88	.955
e) We often experience delays because some of our materials are shipped from our global companies	24.2	31.8	30.3	12.1	1.5	2.35	1.030

From the study findings, it is evident that manufacturing firms in Kenya are not located in areas that have poor road networks and they also do not experience delays because some of the materials are shipped form their global companies. This confirms the findings of Davis, (2016) that It's important to locate a firm in areas

that are not prone to risks such as floods, earthquakes and natural disasters (Davis, 2016). This increases the firms' vulnerabilities to such risks. Manufacturing firms in Kenya should also critically analyze challenges and risks of poor utilities, poor infrastructure, unstable political and economic environment (Amimo, 2013). The choice of the location chosen should also allow access by the customers, workers, transportation and the materials into the organization (Supply Chain Risk Leadership Council, 2011). On the other hand, firms whose supply chains are global are more likely to face additional risks as compared to firms which source locally. This is because the size of the supply networks increases risks of the supply chain due to currency exchanges risks, legal risks, communication risks and increased led times (Summer, 2014).

c) Firm ownership

A high percentage of respondents (43.5%) disagreed that decisions in their firms are often made after consultation by the board of management, 39.1% strongly disagreed, 7.2% were neutral, 5.8% agreed while a small percentage (4.3%) strongly agreed (Mean = 1.93, SD =1.048) . When the respondents were asked whether their companies were jointly owned with foreign investors who were involved when making decisions, 35.8% strongly disagreed, 25.4% disagreed, 22.4% agreed, 10.4% strongly agreed while 6.0% were neutral (Mean = 2.46, SD =1.439) as shown in table 4.36.

Table 4. 36: Measurement of firm ownership

	SD %	D %	N %l	A %	SA %	M	SD
f) Decisions are often made after consultation by the board of the management	39.1	43.5	7.2	5.8	4.3	1.93	1.048
g) Our company is jointly owned with foreign investors who are involved when making decisions	35.8	25.4	6.0	22.4	10.4	2.46	1.439

From the study findings, it is clear that decisions made by the Kenyan manufacturing firms are not consultative especially by the board of management. This confirms the findings of a research carried out by McKinsey and Company (2011) showed that 31-40% of the respondents indicated that the company executives rarely meet with the sales representatives to discuss supply chain tensions. The study also indicated that the sales and marketing department has difficulties collaborating with other functions such as manufacturing and planning. Supply chains constantly struggle with volatile demand because a rise in order volumes increases labor and distribution costs.

Inaccurately forecasting sales can similarly lead to stock outs, loss of sales or increased inventories which are sold at a discount to move it off the shelf. There is need therefore to develop proper planning and forecasting processes in order to enable and predict volatility in demand (McKinsey & Company, 2011).

The Cronbach's Alpha (see Table 4.3) for the organization characteristic risk that had 6 items (after aggregation by taking their average) was 0.769 having dropped item (g). Normality tests results show that the p-values for the variables were >0.05. This implies that the variables were normally distributed (see Table 4.4). Regression analysis was conducted to generate the Variance Inflation Factor (VIF) value and tolerance levels in order to determine if multicollinearity would pose a challenge to the study. The values (see Table 4.6) show that the VIF for organization characteristic is 1.300. The results indicate that all the variables had a VIF of less than 10 and a tolerance of more than 0.1 ruling out the problem of multicollinearity. On correlation (see table 4.5) organization characteristic risk correlates very highly with financial flow risk (0.489).

4.5.2 Inferential analysis of organization characteristic risk

a) Relationship between Organization characteristic risk and firm performance

Regression analysis was conducted to determine the extent to which firm performance can be determined by organization characteristic risk. The linear regression model shows R^2= 0.149 which means that 14.9 percent change of performance of the manufacturing firms in Kenya, can be explained by an increase in organization characteristic risk. However, the model failed to explain 85.1% of the

variations in firm performance. This means that there are other factors associated with firm performance which are not explained by the model. The result is shown in Table 4.37.

Table 4. 37: Model Summary of organization characteristic risk

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.386[a]	.149	.137	.510

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	3.098	1	3.098	11.917	.001[b]
Residual	17.678	68	.260		
Total	20.776	69			

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	4.148	.204	.000	20.331	.000
Organization Characteristics	-.344	.100	.001	-3.452	.001

The regression results in Table 4.42 further revealed that the overall model was significant. The overall model was found to be significant {F (1, 68) = 11.917, p< 0.001)}. The study further determined the beta coefficient of organization characteristic risk. The results revealed that organization characteristic risk is statistically significant in explaining performance among the manufacturing firms in Kenya. This is supported by β = -0.344 with a t-value=-3.452 (p-value <0.001. This implies that a unit increase in organizational characteristic led to a negative change in firm performance by -0.344.

The model equation is therefore:

$Y = 4.418 – 0.344X_{4,}$ where Y is firm performance and X_4 is organization characteristic

It was therefore concluded that organizational characteristic risk had a negative and significant influence on the performance of manufacturing firms in Kenya. This implies that the more the organizational characteristic risk, the less the performance of the manufacturing firms in Kenya

This result agrees Juttner and Ziegenbein, (2009) that many large companies that tend to have a larger control over their supply chains tends to manage supply chain risks effectively since they act as the 'channel captain' as opposed to smaller firms. This makes smaller firms susceptible to supply chain risk and this reduces their performance.

The findings also agree with Amimo, (2013) that location challenges that may pose risks of poor utilities, poor infrastructure, and unstable political and economic environment should be critically analyzed as they affect the firm performance. The choice of the location chosen should also allow access by the customers, workers, transportation and the materials into the organization (Supply Chain Risk Leadership Council, 2011). These findings agree with this study that organization characteristic risks affect the firm performance.

b) Moderating effect of ICT use on organization characteristic risk and firm performance

The fourth specific objective of this study was to establish the moderating effect of ICT on organization characteristic risk and performance among manufacturing firms in Kenya.

The hypothesis tested for this specific objective was:

H_{04} – ICT use has no significant moderating effect on the relationship between organization characteristic risk and firm performance among manufacturing firms in Kenya.

The study performed regression analysis to test the moderating effect of ICT use on the relationship between organization characteristic risks. Using Moderated Multiple Regression (MMR) analysis in this study, the moderating effect of the variable (interaction term) was analysed by interpreting the R^2 change and the regression coefficient for the interaction term. The study tested the null hypothesis H_{04} – ICT use has no significant moderating effect on the relationship between organization characteristic risk and firm performance among manufacturing firms in Kenya.

To test the hypothesis, the following models were fitted;

Model 1: $Y= \beta_0 + \beta_4 X_4 + \varepsilon;$

Model 2: $Y= \beta_0 + \beta_4 X_4 + \beta_m M + \varepsilon;$

Model 3: $Y= \beta_0 + + \beta_4 X_4 + B_2M + \beta_3 X_4 M + \varepsilon;$

Where Y is service delivery, X_4 is organization characteristic risk, M is ICT use and X4*M is the interaction term between organizational characteristic risk and ICT use.

In model 1 in Table 4.43, X4 is used as a predictor {F (1, 67) = 10.778, p=0.002. The R2 for model 1 was 0.139. This means that model one was significant since p was less than 0.005. The model equation for organization characteristic risk is

$Y = 3.486-0.332X_4$

Model 2 in Table 4.43 the results present the independent variable (organization characteristic risk) and the moderator (ICT use) as predictors; the moderator as a predictor was significant in the model. The relationship between organization characteristic risk and firm performance with ICT use as a predictor was significant {F(1,66)=1.731, p= 0.193)}. The value of R^2 was 0.161 which indicates that 16.1% of the variance in firm performance can be accounted by ICT use and organization characteristic risk (see table 4.42). The results indicate that the percentage of the variation accounted for by the model increased from 14.9% to 16.1%. This implies therefore that the moderator as a predictor explained 1.2% variations in firm performance.

The results in Table 4.43 shows that Model 2 beta coefficient for organization characteristic risk was statistically significant (β= -0.315, t= -3.107, p=0.003). The result revealed that for one unit increase in organization characteristic risk, the firm performance is predicted to decrease by -0.003 given that ICT use is held constant. As shown in model 2, the beta coefficient for ICT use as a predictor was not significant (β= 0.169, t= 1.316, p=0.193), meaning that for one unit increase in ICT use, firm performance increases by about 0.169 given that organization characteristic risk is held constant. The findings confirm that ICT use is a significant variable in the

relationship between organizational characteristic risk and firm performance. The model equation for organizational characteristic and ICT use as a predictor is

$Y = 3.378-0.315X_4+0.169M$

Where Y is firm performance, X4 organization characteristic risk, M is ICT use.

Model 3 in Table 4.43 shows the results after the interaction term (organization characteristic risk* ICT use) was added into the model. The results indicated that the inclusion of the interaction term resulted into an increase of R^2 by 0.001% (F (1, 65=0.655, p=0.421) showing no significant moderating effect of ICT use on the relationship between organization characteristic risk and firm performance.

Further, the results for coefficient in Table 4.43 in model 3 confirmed that the interaction effect of ICT use on the relationship between organization characteristic risk and firm performance was not significant (β= -0.165, t= -0.809, p=0.421). This implies that the interaction term did not add any predictive power to the model (p=0.421>0.05). Therefore, the study failed to reject the null hypothesis H_{04}: ICT use has no significant moderating effect on the relationship between organization characteristic risk and firm performance among manufacturing firms in Kenya. It was concluded that there is no significant moderating effect of ICT use on the relationship between organization characteristic risk and performance among the manufacturing firms in Kenya. The findings revealed that ICT use does not moderate the relationship between organizational characteristic risk and firm performance.

The model equation for the moderating effect is:

$Y= 3.369-0.255X_4+0.174M-0.165X_4M$

Where Y is firm performance, X_4 is organization characteristic risk, M is ICT use and X_4*M is the interaction between organization characteristic and ICT use. The finding in Table 4.43 indicates that the percentage of variation accounted for by the model went up from 14.9% to 16.9%. This means that the introduction of ICT use as

a predictor, the model improved by 2%in explaining the variations in firm performance as shown in Table 4.38.

Table 4. 38: Moderated Regression for organization characteristic risk

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Change Statistics
					R Square Change	F Change	df1	df2	Sig. F Change
1	.372[a]	.139	.126	.512	.139	10.778	1	67	.002
2	.401[b]	.161	.135	.509	.022	1.731	1	66	.193
3	.411[c]	.169	.131	.510	.008	.655	1	65	.421

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.821	1	2.821	10.778	.002[b]
	Residual	17.536	67	.262		
	Total	20.357	68			
2	Regression	3.269	2	1.635	6.314	.003[c]
	Residual	17.087	66	.259		
	Total	20.357	68			
3	Regression	3.440	3	1.147	4.405	.007[d]
	Residual	16.917	65	.260		
	Total	20.357	68			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.486	.062		56.604	.000		
	Orgarnization characteristic	-.332	.101	-.372	-3.283	.002	1.000	1.000
2	(Constant)	3.378	.102		33.018	.000		
	Orgarnization characteristic	-.315	.101	-.353	-3.107	.003	.984	1.016
	ICT use	.169	.128	.150	1.316	.193	.984	1.016
3	(Constant)	3.369	.103		32.632	.000		
	Orgarnization characteristic	-.225	.150	-.253	-1.498	.139	.449	2.225
	ICT use	.174	.129	.154	1.351	.181	.981	1.019
	Org Characteristics*ICT use	-.165	.204	-.136	-.809	.421	.455	2.197

Although the models were significant, that is, there was a relationship but the change in firm performance was not significant in the relationship. This moderation was further explained by the scatter graph as shown in the Figure 4.5.

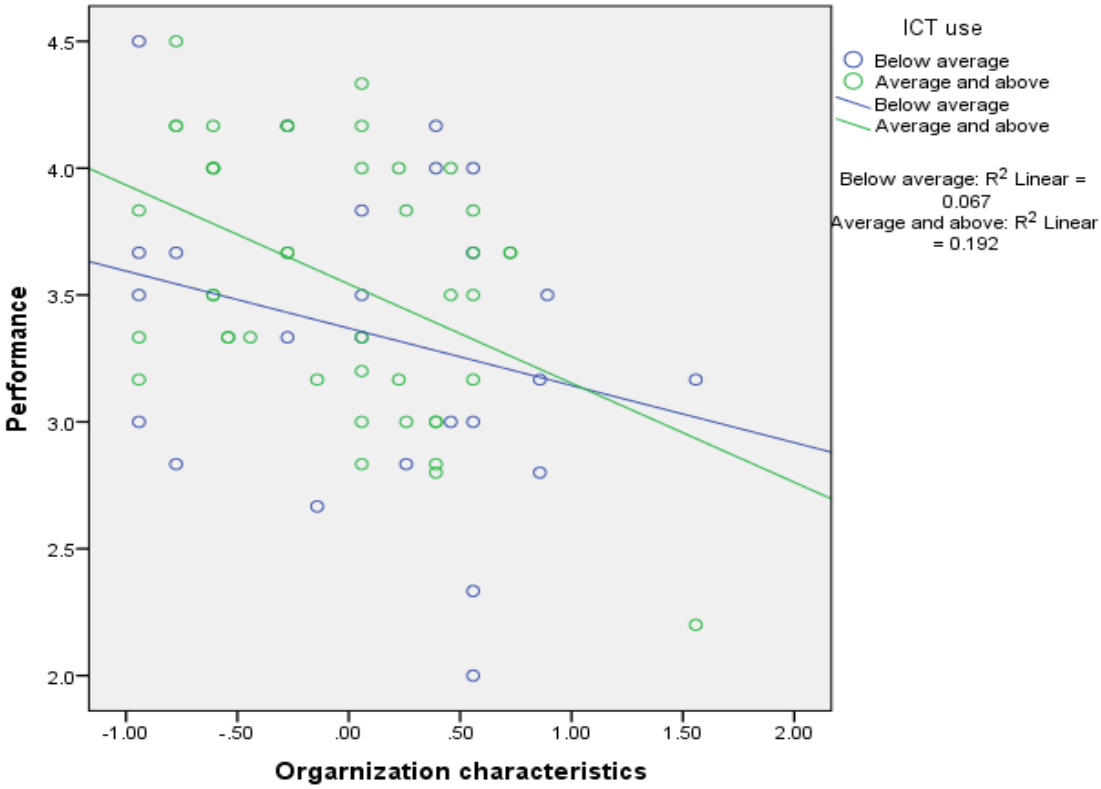


Figure 4. 5: Slope of moderated organizational characteristic

The scatter plot above suggests the moderating effect of ICT use on organizational characteristic risks and frim performance among the manufacturing firms in Kenya. Firms which have leveraged on ICT use have high performance as they are not affected by the organizational characteristic risk. On the other hand firms which have not leveraged on ICT are not able to hedge themselves against organization characteristic risk and this is reflected in terms of reduced performance of their firms.

4.5.3 Discussion

Results from the qualitative analysis shows that manufacturing firms in Kenya do not consult their board of management when making supply chain decisions. These subjects their supply chain to risks because supply chains decisions such as make or

buy require the in put of the top management to approve the commitment of resources (Hillary and Hui, 2007). Consultation is very important especially with top management because they are able to put in place strategies that can help the management of risk. Manufacturing firms that also engage the board of directors can also lobby for funds to employ competent human resource who have the skills of managing supply chain risk (Juttner & Ziegenbein 2009).

Quantitative analysis also shows a linear relationship between organizational characteristic risk and firm performance among the manufacturing firms in Kenya. These findings are in agreement with Juttner and Ziegenbien (2009); Amino (2013) that location choice challenges threatens the performance of the firms in terms of poor infrastructure which pose a risk to materials flow. Manufacturing firms whose supply chains are located globally are at a higher risk of logistical costs due to the distance involved. These logistical costs directly decrease the performance of the firms as they are expenses to the firm.

On moderation, ICT use moderated the relationship between organization characteristic and firm performance. This means that manufacturing firms that had leveraged on ICT use recorded an improved performance compared to those which had not because they were able to deal with the threat of organization characteristic risk. ICT use enables firm to deal with the risk of logistical challenges as firms can source online and also expedite their materials in real time. This enables proper planning and also increases customer satisfaction. ICT use can also increase organizational ownership as decisions can be made through online platforms such as video conferencing and skype. This increases the decision making process between the local supply chain partners and the global supply chain partners especially the top management. The effect of this increased decision making processes is reflected in the better firm performance in term of increased sales, profits and customer satisfaction.

4.6 Objective 5: To determine the moderating effect of ICT on the relationship between information flow risk, financial flow risk, material flow risk, organization characteristic risk and firm performance among the manufacturing firms in Kenya

4.6.1 Descriptive analysis for supply chain risks, ICT Use and firm performance

A descriptive analysis of all the study variables revealed that information flow risk had a mean of 2.2248 and a standard deviation of 0.59225. Financial flow risk had a mean of 2.8271 and a standard deviation of 0.75451. Material flow risk had a mean of 2.5063 and a standard deviation of 0.73139. Organization characteristic risk had a mean of 1.9420 and a standard deviation of 0.62238. Performance on the other had a mean of 3.48 and a standard deviation of 0.549. When performance and supply chain risks were analyzed, the mean was 2.3533 with a standard deviation of 0.61208. The study also sought to find out whether ICT affects performance. This revealed a mean of 3.2884 and a standard deviation of 0.60843 as shown in Table 4.39.

Table 4. 39: Descriptive analysis for supply chain risks, ICT and firm performance

Descriptive statistics	N	Minimum	Maximum	Mean	Std. Deviation
Information flow risk index	69	1.22	3.56	2.2248	.59225
Financial flow risk	70	1.00	4.29	2.8271	.75451
Material flow risk	69	1.00	4.14	2.5063	.73139
Organization Characteristics	71	1.00	3.50	1.9420	.62238
Performance vs Risks	67	1.08	3.75	2.3533	.61208
ICT vs Performance	68	1.33	4.75	3.2884	.60843
Performance	70	2	5	3.48	.549

A descriptive analysis of all the study variables revealed that information flow risk had a mean of 2.2248 and a standard deviation of 0.59225. Financial flow risk had a mean of 2.8271 and a standard deviation of 0.75451. Material flow risk had a mean of 2.5063 and a standard deviation of 0.73139. Organization characteristic risk had a

mean of 1.9420 and a standard deviation of 0.62238. Performance on the other had a mean of 3.48 and a standard deviation of 0.549. When performance and supply chain risks were analyzed, the mean was 2.3533 with a standard deviation of 0.61208. The study also sought to find out whether ICT affects performance. This revealed a mean of 3.2884 and a standard deviation of 0.60843.

From the description of the study variables, it is clear that the level of supply chain risks among the manufacturing firms in Kenya is low. This is because the mean values are below 2.5 which is low. The preference of 2.5 falls below the preference of the researcher. Therefore, we can conclude that the risks do not exist.

4.6.2 Descriptive analysis of Supply chain risk and firm performance

a) Firm performance and information flow risk

The researcher had asked the manufacturing firms to give their perceived effect of information flow risk on the performance of manufacturing firms in Kenya. Table 4.40 illustrates the perceived effect of information flow risk on performance of manufacturing firms in Kenya.

Table 4. 40: Measurement of Firm performance vs Information Flow Risk

	SD %	D %	N %	A %	SA %	M	SD
a) The high levels of inventory can be attributed to lack of information	9.2	35.4	15.4	32.3	7.7	2.94	1.171
b) Our customers are dissatisfied due to lack of accurate information	29.9	40.3	14.9	13.4	1.5	2.16	1.053
c) Our distribution system is not accurate due to lack of accurate information	23.9	43.3	16.4	14.9	1.5	2.27	1.038
d)Collaborative planning and forecasting have not been possible due to lack of information connectivity				10.6	1.5	2.15	1.026

On inventory levels, the respondents seriously disagreed (35.4%) that the high levels of inventory can be attributed to lack of information (Mean= 2.94, SD=1.171). This means that there are other factors contributing to the high levels of inventory other than information. The respondents also disagreed (40.3%) that customers are dissatisfied due to lack of accurate information. This means that the information flowing is adequate and therefore customers are not affected negatively and the mean is also low 2.16. The respondents also disagreed (43.3%) that the inaccuracy in their distribution system is not because of lack of information. On the flip side however, the respondents agreed that collaborative planning and forecasting have not been possible due to lack of information connectivity. This may hinder coordination and collaboration among the supply chain partners exposing the supply chain to risks and therefore affecting performance (Nambisan, 2000).

This could be explained by the results from the descriptive analysis which revealed that majority of the manufacturing firms in Kenya do not use ICT in Exchange rates management (51.5%), analyzing the suppliers' financial performance (51.5%), they did not use text messages to post notices of supplier payment (64.6%), and did not also use of whats app to post payment documents to suppliers (70.8%). Generally, the whole analysis is correctly depicting that information flow risk does not affect the performance of the manufacturing firms in Kenya. The model also agrees with the results of the descriptive analysis where the mean values are low (below 2,5). This is therefore the reported perceived effect that information flow risk does not affect the performance of the Kenyan manufacturing firms.

c) **Firm performance and financial flow risk**

The researcher had asked the firm to give their perceived effect of financial flow risk on the performance of manufacturing firms in Kenya. Table 4.41 illustrates their perceived effect of financial flow risk and performance of manufacturing firms in Kenya.

Table 4. 41: Measurement of Firm performance vs financial Flow Risk

	SD %	D %	N %	A %	SA %	M	SD
a) Our customers do not pay for their products on time which leads to untimely payment of suppliers	15.2	40.9	21.2	18.2	4.5	2.56	1.097
b) Exchange rates risks have not affected the way the firm sources for the materials	10.4	41.8	23.9	16.4	7.5	2.69	1.104
c) Managing the financial failure risks of the supplier is not priority for the organization	28.8	40.9	18.2	9.1	3.0	2.17	1.046
d) The cash flow of the firm has been affected due to lack of technology	22.7	50.0	18.2	7.6	1.5	2.15	.916

The above findings support the regression model that financial flow risk does not affect the performance of the manufacturing firms in Kenya. This is because based on table 4.49 above, the customers of the manufacturing firms in Kenya (40.9%) disagreed that their customers do not pay for their products on time which leads to no payment of suppliers, the mean was also low (2.56). This means that the firms have enough finances to pay their suppliers. This was also noted by Musa, (2012); Rao and Goldsby, (2009) that failure by clients to settle their debts can lead to delayed supplier payment in a firm. Manufacturing firms in Kenya also prioritize the management of the financial failure risks of their suppliers (40.9%) and a low mean of 2.17. This is in tandem with the findings of Achilles (2014) that firms incur significant costs when their suppliers are financially unsound. In addition, the presence of adequate technology among the manufacturing firms inn Kenya has enhanced the cash flow of the firms. This is in agreement with Hausman (2014) that technology reduces costs by allowing automation of the supply chain processes such as negotiations with suppliers and analysis of purchasing spend.

However, despite the risks involved with the exchange rates, this has not affected the way the firms' source for their goods. This can have a huge impact on the profitability of the firms because, exchange rate risks increases the prices of both the finished goods and the raw materials that are imported. In his study, Musa (2013)

noted that Kenyan firms import most of their raw materials and therefore affected by exchange rate risks.

a) Firm performance and material flow risk

The researcher sought the perception of the respondents on the effect on material flow risk on the performance of the manufacturing firms in Kenya. Their responses are summarized in the Table below 4.42.

Table 4. 42: Measurement of Firm performance vs material flow risk

	SD %	D %	N %	A %	SA %	M	SD
a) We delay customer orders due to material flow disruption	20.9	52.2	14.9	10.4	1.5	2.19	.941
b) We single source our supplies	19.0	46.0	14.3	20.6		2.37	1.021
c) Our suppliers are not able to adjust to changing market conditions for example, drop in demand	22.2	47.6	14.3	12.7	3.2	2.27	1.050
d) Lack of supplier capacity has led to lost sales	25.9	41.4	17.2	13.8	1.7	2.24	1.048

The study findings are in agreement with the regression results that material flow risk does not affect the performance of the manufacturing firms in Kenya. This is because majority of the respondents disagreed (52.2%) that customers' orders are delayed due to material flow disruption. The firms also disagreed (47.6%) that they single source their suppliers. This means that their material flows is not at risk that may be caused by single sourcing. The respondents also state that their suppliers are flexible enough to adjust to change in demand and therefore material flows are not affected by supplier inflexibility. The lack of suppliers capacity has also not led to loss of sales (41.4% disagreed). This means that supplier capacity does not affect the sales volume of the manufacturing firms in Kenya.

The study findings are in agreement with Nelson (2013) that single sourcing strategies increase the vulnerability of the firms to risks of supplier failure and high chances of exploitation by the suppliers in terms of prices for goods. The research findings are also in tandem with the findings of khan and Pillania (2008) that the strongest area of strategic sourcing is sourcing flexibility as it allows firms to be

more agile thereby improving their performance. Resilic (2015) also agrees with the study findings that suppliers should be properly evaluated on the basis of their capacity to supply as this can interrupt the flow of materials in an organization

All the constructs had a Cronbach's Alpha value above 0.6 (see Table 4.3) which indicated adequate convergence or internal consistency. Kolmogorov-Smirnov and Shapiro-Wilk test are used to test for normality. The tests results show that the p-values for the variables were >0.05. This implies that the variables were normally distributed as shown in (see Table 4.4). However, the p value for performance was <0.05 implying that the variable was not normal as (see Table 4.30). However, looking at the f Q-Q plot, (see figure 4.1) we note that the departure form normality is not big. We can therefore conclude that performance is also normally distributed

Regression analysis was conducted to generate the Variance Inflation Factor (VIF) value and tolerance levels in order to determine if multicollinearity would pose a challenge to the study. The values (see Table 4.6) show that the VIF for information flow risk was 1.419, financial flow risk was 1.599, material flow risk 1.409 and organization characteristic 1.300. The results indicate that all the variables had a VIF of less than 10 and a tolerance of more than 0.1 ruling out the problem of multicollinearity. On correlation, from the results, it is clear that information flow risk is positively correlated with financial flow risk (0.498). Financial flow risk is also highly correlated with the material flow risk (0.420). Financial flow risk correlates very highly with organization characteristic risk also (0.489). Of all the variables on supply chain risk (information flow risk, financial flow risk, material flow risk, organization characteristic risk) only organization characteristic risk had a high negative correlation with performance (-0.386).

4.6.3 Joint relationship of the supply chain risks on firm performance

In order to analyze the joint effect of independent variables on the dependent variable (firm performance) multiple regression was employed. The following model was employed

$$Y = \beta_{0+} \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where Y is firm performance, X_1 is information flow risk, X_2 is financial flow risk, X_3 is material flow risk and X_4 is organization characteristic risk. The regression results in table 4.31 shows the joint relationship between the supply chain risk variables and firm performance was significant (F=4, 61= 3.020, p= 0.024) with R^2 0.165). This could be explained by organization characteristic risk which was explained earlier (see table 4.43) as a significant predictor of performance although all the other variables were not. The model explains that about 16.5% in performance can be explained by variations in supply chain risks. However, the model did not explain 83.5% of the variation which means there are other factors which are not reflected in the model but affecting performance as shown in table 4.43.

Table 4. 43: Multiple Regression Results for Supply Chain Risk and Firm Performance

Model Summary								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate				
1	.407[a]	.165	.111	0.510				
ANOVA[a]								
Model		Sum of Squares	Df	Mean Square	F	Sig.		
1	Regression	3.138	4	.785	3.020	.024[b]		
	Residual	15.847	61	.260				
	Total	18.986	65					
Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
	(Constant)	4.070	.339		12.023	.000		
	Information flow risk index	-.066	.126	-.073	-.527	.600	.705	1.419
	Financial flow risk	-.033	.109	-.045	-.302	.764	.625	1.599
	Material flow risk	.148	.106	.194	1.398	.167	.710	1.409
	Organization Characteristics	-.380	.119	-.425	-3.187	.002	.769	1.300

To test the hypothesis, the following model was fitted:

Y= 4.070-0.066X1-0.033X2+0.148X3-0.380X4

In the above model, the only significant predictor is organization characteristic implying that for one unit increase in organization characteristic risk, the

performance index decreases by -0.380 units when all the other variables are held constsnt.

This model is quite weak in terms of goodness of fit (R^2) because the 4 predictors can only explain 16.5% in the performance index.

4.6.4 The Moderating Effect of ICT use on the Joint Relationship between Supply Chain Risks and Firm Performance

The fifth specific objective of this study was to determine the moderating effect of ICT on information flow risk financial flow risk, material flow risks, organization characteristic risk and firm performance among the manufacturing firms in Kenya

The hypothesis to test for this specific objective was:

H_{05} – ICT use has no significant moderating effect on the relationship between information flow risk, financial flow risk, material flow risk, organization characteristic risk and firm performance among the manufacturing firms in Kenya.

Model 2: $Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta iMXiM + \beta_{2M}X_2M + \beta_{3M}X_3M + \beta_{4M}X_4M + \varepsilon$, (i= 1, 2, 3, 4)

Where Y is firm performance, X_1 is information flow risk, X_2 is financial flow risk, X_3 is material flow risk and X_4 is organization characteristic risk, M is ICT use and $\beta_i M$ is the coefficient of X*M the interaction term between ICT use and each of the independent variable for i= 1,2,3,4.

Table 4. 44: Moderated Multiple Regression for supply chain risks

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Change Statistics
					R Square Change	F Change	df1	df2	Sig. F Change
1	.407[a]	.165	.111	.510	.165	3.020	4	61	.024
2	.460[b]	.211	.145	.500	.046	3.489	1	60	.067
3	.548[c]	.300	.187	.487	.089	1.772	4	56	.147

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3.138	4	.785	3.020	.024[b]
	Residual	15.847	61	.260		
	Total	18.986	65			
2	Regression	4.009	5	.802	3.212	.012[c]
	Residual	14.976	60	.250		
	Total	18.986	65			
3	Regression	5.692	9	.632	2.664	.012[d]
	Residual	13.294	56	.237		
	Total	18.986	65			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	3.463	.063		54.983	.000		
	Information flow risk	-.066	.126	-.073	-.527	.600	.705	1.419
	Financial flow risk	-.033	.109	-.045	-.302	.764	.625	1.599
	Material flow risk	.148	.106	.194	1.398	.167	.710	1.409
	Organization characteristics	-.380	.119	-.425	-3.187	.002	.769	1.300
2	(Constant)	3.280	.116		28.301	.000		
	Information flow risk	-.003	.128	-.004	-.025	.980	.656	1.526
	Financial flow risk	-.007	.108	-.010	-.065	.948	.615	1.626
	Material flow risk	.162	.104	.211	1.550	.126	.706	1.416
	Organization characteristics	-.368	.117	-.412	-3.146	.003	.767	1.304
	ICT use	.270	.145	.238	1.868	.067	.812	1.231
3	(Constant)	3.364	.126		26.638	.000		
	Information flow risk	-.140	.224	-.154	-.623	.536	.204	4.906
	Financial flow risk	-.226	.163	-.306	-1.387	.171	.256	3.904
	Material flow risk	.313	.176	.409	1.779	.081	.236	4.228
	Organization characteristics	-.267	.189	-.299	-1.415	.163	.281	3.562
	ICT use	.197	.148	.174	1.336	.187	.741	1.350
	Information flow risk*ICT use	.126	.274	.106	.458	.648	.233	4.294
	Financial flow risk*ICT use	.409	.215	.403	1.907	.062	.280	3.571
	Material flow risk*ICT use	-.218	.219	-.218	-.995	.324	.260	3.845
	Org Characteristics*ICT use	-.223	.238	-.190	-.937	.353	.305	3.282

Model 1 represents the independent variables (information flow risk, financial flow risk, material flow risk and organization characteristic risk) and the dependent variables (firm performance).

Model 2 represents the regression model with the independent variables (information flow risk, financial flow risk, material flow risk and organization characteristic risk) and the moderator (ICT use) as the predictor. As shown in table 4.34, the moderator as a predictor was significant (F 1, 60= 3.489, p= 0.67) with R^2 0.046. This results indicate that the percentage of the variation accounted for in the model is decreased from 16.5% to 4.6% (see table 4.31). This means that when the moderator (ICT use) was introduced into the model as the predictor, the model lost 12.5% of its predictive power. Beta coefficient for ICT use as a predictor was significant (β= 0.270, t= 1.868, p= 0.067). Meaning that for one unit increase in ICT use, index performance increases by 0.270. The model equation is:

$$Y=3.280 - 0.003X1 - 0.007X2 + 0.163X3 – 0.368X4 + 0.270 M$$

Where Y is firm performance, X_1 is information flow risk, X_2 is financial flow risk, X_3 is material flow risk, and X_4 organization characteristic risk and Z is ICT use.

Model 3 represents the regression model with the independent variable, the moderating variable and the interaction term. The results in table 4.34 indicates that the inclusion of the interaction term resulted into an increase in R^2 by 8.9% (F 4, 56= 1.772, p= 0.147). However, the model was insignificant (P greater than 5%) showing no presence of moderating effect.

Using the results in table 4.34, the study failed to reject the null hypothesis H_{05}: ICT use has no significant moderating effect on the relationship between information flow risk, financial flow risk, material flow risk, organization characteristic risk and firm performance among the manufacturing firms in Kenya. The study found out that ICT use does not significantly moderate the relationship between supply chain risk and firm performance among the manufacturing firms in Kenya (P = 0.147 > 0.005).

The results revealed that ICT use does not moderate the relationship between supply chain risks and firm performance among the manufacturing firms in Kenya.

The equation model for model 2 is:

$Y=3.364-0.140X_1-0.226X_2-0.313X_3-0.267X_4+0.197M+0.126X_{1*}M+0.409X_{2*}M-0.218X_{3*}M-0.223X_{4*}M$

This study is consistent with the results of a study carried out by Hernandez, Galindo and Colin, (2015) which revealed that adoption of ICT to run the operations of an enterprise does not guarantee improved performance unless the appropriate technology is used and also used correctly. The findings however contradict the study carried out by Zhang, Donk and Vaart, (2011) which showed that ICT increases the performance of a firm by reducing information flow risk through enhanced information sharing and collaboration facilitated by computer to computer connectivity.

4.6.5. Discussion

All the three models were significant, that is, ICT use in the joint relationship between supply chain risks and firm performance was significant. An increase in ICT use therefore increased the performance of the manufacturing firms in Kenya. This is in agreement with a study carried out by Dehning, Richardson and Zmud, (2007) that leveraging on ICT use along the supply chain increases the financial performance of the firm due to a decrease in the sales expenditure and an increase in the in the turnover of a firm. Moreover, supply chain risk management requires a large data base of information as this provides the basis for analysis and formulating supply chain risk mitigation strategies that would lead to an increase in the performance of the firm (Shang *et al*, 2008). The findings also agree with Stoel and Muhanna, (2009) that with ICT, firms are able to develop capabilities to manage supply chain risks that would have otherwise not be possible

However, this could have been caused by the organizational characteristic risk which significantly affected performance. ICT use did not have a significant moderating effect on information flow risk and performance of the manufacturing firms in

Kenya. ICT use did not also have a moderating effect on the relationship between financial flow risk and the performance of the manufacturing firms in Kenya. This could have been explained by the small sample size. On material flow risk, ICT did not have a moderating effect on material flow risk and the performance of the manufacturing firms in Kenya. This was explained by lack of knowledge among the supply chain partners and what causes risks among the material flows, for example, sourcing flexibility among the suppliers. Manufacturing firms in Kenya also failed to understand the importance of conducting market research using the ICT platforms to reduce the risk of the material flow along the supply chain.

Model X_1 to X_4 were regressed on Y. The model was fitted and the model was found to be statistically significant. When all the 3 models were put together they did not play a predictive role on Y. Therefore the null hypothesis was not rejected. This could be explained by the previous findings, where, information flow risk, financial flow risk and material flow risk did not have a predictive role on Y. This could be because top management does not regard them as risks that can contribute to performance and therefore pay less attention on them.

CHAPTER FIVE

SUMMARY CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

This chapter provides a summary of the study major findings and also draws the conclusions, makes recommendations for practice and provides suggestion for further research based on the study findings.

5.2 Summary

The overall objective of this study was to investigate the moderating effect of ICT on supply chain risk and firm performance among the manufacturing firms in Kenya. The study particularly sought to determine the moderating effect of ICT on information flow risk and firm performance among the manufacturing firms in Kenya, to establish the moderating effect of ICT on financial flow risk and firm performance among the manufacturing firms in Kenya, to explore the moderating effect of ICT on material flow risk and firm performance among the manufacturing firms in Kenya, to establish the moderating effect of ICT on organization characteristic and firm performance among the manufacturing firms in Kenya and to determine the moderating effect of ICT on the relationship between information flow risk, financial flow risk, material flow risk and organization characteristic among the manufacturing firms in Kenya

5.2.1 Moderating effect of ICT on information flow risk and firm performance among the manufacturing firms in Kenya

Information flow risks are defined as a disruption in supply chain information therefore affecting the firm performance. Information flow risk in this study was measured using information accuracy, information types and information connectivity. The study established that that manufacturing firm in Kenya share information with their supply chain partners. However, the study found out that manufacturing firms in Kenya do not frequently share information such as order status, order deliveries and inventory status with their supply chain partners. Also,

manufacturing firms in Kenya lack appropriate technology to enable them share information along the supply chain.

Manufacturing firms in Kenya avoided many levels when passing documents (bureaucracy) prior to their implementation. This ensures that information is not distorted as it passes along the supply chain. The firms are also aware of the exact timings of the exact timing and deliveries from the suppliers. The firms also have adequate technology for information sharing. The manufacturing firms however do not share more objective, error free information along the supply chain. Also, the manufacturing firms in Kenya shared information on inventory levels and lead times among their supply chain partners to enable them manage their inventories and satisfy their customers. However, manufacturing firms in Kenya do not share information on production capacity. Likewise, manufacturing firms also shared information with the suppliers, customers and 3rd party providers. However, much of the information was only shared within the company and companies also lacked centralized information sharing system since information was shared freely.

Manufacturing firms in Kenya use ICT to gather sales data, to analyze demand forecast data, to post inventory level data, to gather order status data, to analyze production schedule information, to store plans of the order, to gather logistical data. However, few firms used ICT for Corporate Social Responsibility (CSR). Information flow helped manufacturing firms in setting the production schedules.

Moreover, there was no significant relationship between information flow risk and firm performance. This means that information flow risk does not influence the performance of manufacturing firms in Kenya.

ICT moderation on the relationship between information flow risk and firm performance was not statistically significant. However, further test using the scatter graph implied that ICT use moderates the relationship between information flow risk and performance of the manufacturing firms in Kenya. Meanings that manufacturing firms in Kiambu County which had leveraged on the use of ICT recorded a high performance while those that had not recorded a poor firm performance. These findings were in harmony Lee and Lim (2005) who asserted that ICT use improves

information flow along the supply chain improves information integration thereby improving the performance of a firm.

5.2.2 Moderating effect of ICT on financial flow risk and firm performance among the manufacturing firms in Kenya

Financial flow risk is defined as the inability by the suppliers to settle payment as a result of improper investments and the failure by customers to pay their debt. In this study, financial flow risk was operationalized using exchange rate, financial strength of the supplier and financial management. The study found out that manufacturing firms in Kenya buy goods that are only important to the firm and are also able to pay their suppliers on time. Most of the strategies that the firms implemented to prevent the effect of currency volatility were effective. Also, most of the materials used by the manufacturing firms were sourced locally but also a significant amount is sourced from outside the country. Manufacturing firms in Kenya also fail to change their sources of supply when the exchange rate increases in their current source market. From the study findings, manufacturing firms in Kenya evaluate their suppliers financially to determine their financial status before engaging them in their organization. Manufacturing firms in Kenya also monitored the financial status of their suppliers throughout the contract.

In addition, manufacturing firms in Kenya use technology to enhance their firms' cash flow. These firms also manage their finances through strategic sources. Manufacturing firms in Kenya also have few complaints about nonpayment from the suppliers. They also have a procurement schedule that is strictly adhered to and that does not frequently overlap. However, manufacturing firms in Kenya are concerned about the price and not the total cost when buying goods from the suppliers. The firms also pointed out budgeting and strictly sticking to the budget, ensuring value for money is achieved in all stages of procurement, managing skills and terms of payment as some of the strategies that firms can adopt in order to reduce financial flow risk and improve the performance of their firms.

Kenyan manufacturing firms also in order to improve their financial flow use ICT in payment of the suppliers, in analyzing purchasing spend, in supplier relationship management, in sourcing for goods and use the intranet to send payment information to suppliers. However, they do not use ICT in exchange rates management, analyzing the suppliers' financial performance, do not use text messages to post notices of supplier payment , they did not use what's app to post payment documents to suppliers and also did not use wi-fi to send payment information to suppliers.

The study also found out financial flow risk is not a significant predictor of firm performance. ICT use was also not a significant moderator of the relationship between financial flow risk and firm performance. However, further investigation using the scatter plot revealed that ICT use moderated the relationship between financial flow risk and firm performance, although the moderation was not significant. Also looking at the decrease in the p values, one would conclude that with a larger sample size, the moderation would have been evident. Therefore, manufacturing firms in Kenya that have better ICT infrastructure and training are able to hedge themselves against financial flow risk and therefore record a high performance. Firms that are not able to leverage on ICT use on the other hand are affected more by financial flow risk and this decreases their performance. This findings were in agreement with Hausman (2014 that, firms that use ICT in managing their financial flows are able to manage carrying costs which significantly reduces their revenues and also able to manage their cash flows. This enables them to only purchase products based on total spend therefore managing the finances of a firm.

5.2.3 Moderating effect of ICT on material flow risk and firm performance among the manufacturing firms in Kenya

Material flow risk is defined as disruptions that may affect the smooth flow of materials through the supply chain. In this study, material flow risk was operationalized using sourcing, sourcing flexibility and supplier capacity. The study found out that manufacturing firms in Kenya do not frequently experience logistical barriers in trade routes, language and cultural difficulties as materials flow along the

supply chain. Also, lack of information and finances does not affect the flow of materials. In addition, manufacturing firms in Kenya select their suppliers competitively. Likewise, long lead times, terrorism, quality risk (noncompliance) do not disrupt the flow of materials among the manufacturing firms in Kenya when sourcing goods internationally. In case of changes in demand, suppliers of the manufacturing firms in Kenya are flexible and are able to postpone the order processing.

However, manufacturing firms in Kenya do not consider the flexibility of the suppliers when selecting them to ensure that their manufacturing processes are agile. Suppliers are also able to adjust easily and this enables the Kenyan manufacturing firms to keep up with the technological changes. Adoption of strong materials flow management, strategically leveraging on supplier relationship as well as strategic sourcing, use of supplier collaboration to enhance security of supplies and modern vehicles that are faster in delivery are some of the strategies that the Kenyan manufacturing firms indicated would help reduce the risk of materials flow and improve the performance of the firm.

On the Use of ICT in managing material flow, manufacturing firms in Kenya used ICT to improve the flow of materials, in selecting their suppliers, in monitoring price volatility, supplier capacity management and in collaborating with the suppliers or customers. However majority of the respondents did not use ICT to conduct market research for goods and services in their firms.

In addition, material flow risk was not a significant predictor of firm performance. ICT use was also not a significant moderator of the relationship between material flow risk and performance of the manufacturing firm in Kenya. Moreover, the scatter plot supported the findings with two parallel lines. The two parallel lines were suggesting that manufacturing firms that had leveraged on ICT use and those that had not leveraged on ICT use had recorded equal performance. That is, there was no difference in term of performance among firms that used ICT in managing the material flow risk and those which did not. These findings agree with Jamil et al, (2016) that manufacturing firms can only benefit form ICT use when they leverage

on the same to make decisions faster that will enable material to flow along the supply chain. These findings are also supported by the descriptive results which revealed that manufacturing firms in Kenya do not use ICT in making supply chain decisions.

5.2.4 Moderating effect of ICT on organization characteristic risk and firm performance among the manufacturing firms in Kenya

Organization characteristic is defined as the traits that differentiates one firm from another and therefore determines the supply chain risk probability. This study operationalized the organization characteristic risk using employee size, employee location and firm ownership. The study established that manufacturing firms in Kenya do not have unnecessary employees and the current expenditure of the firms in Kenya is not high due to too many employees. The firms also do not have logistical challenges due to too many employees. The study also found out that manufacturing firms in Kenya are not located in areas that have poor road networks and they also do not experience delays because some of the materials are shipped from their global companies.

The boards of management in the Kenyan manufacturing firms do not consult when making decisions. Manufacturing firms in Kenya are also not owned jointly with foreign investors who are involved in decision making. In addition, organization characteristic risk was statistically significant in explaining the performance of manufacturing firms in Kenya. A unit increase in organizational characteristic risk, led to a decrease in performance. These results agree with Juttner and Ziegenbein, (2009) that organization characteristics such as firm size can affect the performance of a firm since smaller firms lack the financial resources to employ competent human resource to manage those risks. Also, there was no significant moderating effect of ICT use on the relationship between organization characteristic risk and performance index of the manufacturing firms in Kenya. However, further investigation using the scatter plot revealed that ICT moderates the relationship between organization characteristic risks and performance of manufacturing firms in Kenya.

5.2.5 Moderating effect of ICT use on the Joint relationship of supply chain risk and firm performance

On the combined relationship between supply chain risks (information flow risk, financial flow risk, material flow risk and organization characteristic risk) and firm performance, the descriptive statistics revealed the relationship was low. This is because the mean combine mean was low (below, 2.5). All the variables (information flow risk, financial flow risk, material flow risk and organization characteristic risk) were insignificant in predicting firm performance except organization characteristic. On moderation, ICT use was not a significant moderator of the relationship between supply chain risks and performance of manufacturing firms in Kenya. This is in agreement Juttner and Ziegenbein, (2009) that ICT use increases, information flow risk therefore increasing visibility along the supply chain which in turn increases customer satisfaction.

5.3 Conclusions

5.3.1 Moderating effect of ICT use on the relationship between information flow risk and firm performance among the manufacturing firms in Kenya

The findings confirm that there is statistically no significant relationship between information flow risk and performance among the manufacturing firms in Kenya. This can be explained by the fact that, manufacturing firms in Kenya lack information connectivity as evidenced by the descriptive statistics. These results are in line with Choy et al (2004) who explained that lack of proper information flow between an organization and its customers as well as suppliers may lead to high transactional costs. This transactional cost reduces the profits of a firm.

ICT use as a moderator of the relationship between information flow risk and performance among the manufacturing firms in Kenya was also not significant. This can be explained by the fact that, although manufacturing firms in Kenya have proper ICT infrastructure and also skills in ICT, they fail to use the same to improve their supply chains risk management. Majority of the manufacturing firms for example failed to leverage on ICT to gather more data on their logistics. Lee and Lim

(2005) agree that leveraging on ICT systems such as Radio Frequency Identification (RFID) reduces the amount of time taken by a firm to distribute a product and therefore improves customer satisfaction.

5.3.2 Moderating effect of ICT use on the relationship between financial flow risk and performance among manufacturing firms in Kenya.

The study concluded that there was an insignificant relationship between financial flow risk and performance of manufacturing firms in Kenya. Therefore, financial flow risk does not significantly predict the performance of manufacturing firms in Kenya (financial flow risk does not affect performance). This is explained by the descriptive results which revealed that manufacturing firms in Kenya are concerned about the price but not the total cost when buying goods and services. In their study, ACCA (2014) argue that manufacturing firms should be concerned with the total price (purchase price, maintenance and disposal costs) as this will help them to analyze risk over the entire life of a product prior to purchase.

ICT use was also not a significant moderator of the relationship between financial flow risk and performance of the manufacturing firms in Kenya. The study can therefore conclude that when firms leverage on proper ICT use along the supply chains, they can experience a reduction in financial flow risk. That is, they will be able manage their exchange rates, analyze the financial strength of their suppliers online and consequently manage the financial flows of a firm. These will have a significant impact in terms of hedging the firms form increased prices of imported goods and services (Eitman, 2007). Firms will also leverage on ICT to analyze the financial strengths of the suppliers and also manage their total spend to prevent spending the firms money on purchases that are not necessary. Unnecessary purchases increases storage costs which affects the performance of a firm.

5.3.3 Moderating effect of ICT use on the relationship between material flow risk and firm performance of manufacturing firms in Kenya

The study concluded that material flow risk does not significantly affect the performance of the manufacturing firms in Kenya. This is explained by the fact that manufacturing firms in Kenya are not aware of supply chain issues that may pose risks to their supply chains. For example, supplier flexibility can pose a major risk to the flows of the materials yet the majority of the manufacturing firms in Kenya do not see it as a risk (86.7%). Flexibility of the suppliers is a very strong area that contributes significantly to the competitiveness of a firm. This is because, when suppliers are flexible, they are able to respond to the increasing changes in customer demands and this improves the agility of the supply chain (Khan & Pillania, 2008). This is because ICT use also does not moderate the relationship between material flow risk and performance among manufacturing firms in Kenya.

ICT use is also not a significant moderator of the relationship between material flow risk and performance of the manufacturing firms in Kenya. The study can therefore conclude that although manufacturing firms in Kenya have adequate ICT infrastructure and training, they are not leveraging on the same to improve the flow of materials along the supply chain. This evident by because only (25.8%) of the manufacturing firms in Kenya are using ICT to conduct market research for goods and services. This means that the firms are not able to monitor the price volatility which can increase the risks of material flows because of the high risks involved (Fischl, Scherrer & Friedli, 2014). Market research also helps in identifying better quality of materials sourced by a firm. This reduces risks associated with materials returns which are also costly to a firm because a firm has to incur the costs to enhance customer satisfaction Wagner & Neshat, 2012

5.3.4 Moderating effect of ICT use on the relationship between organization characteristic risk and performance of manufacturing firms in Kenya.

The findings of this study confirm that organizational characteristic risk is significantly influences the performance of the manufacturing firms in Kenya. It was possible to infer form the study that the relationship between organizational

characteristic risk and the performance of the manufacturing firms in Kenya was negative and significant. We can therefore conclude that as organizational characteristic risk increases, the performance of the manufacturing firms in Kenya decreases. This is true because, results from the manufacturing firms demographics indicated that majority (35%) of the manufacturing firms in Kenya are owned by individuals. This increases the supply chain risks of this firm because the individuals do not consult when making strategic supply chain decisions. This affects the performance of their firms. Also, majority of the firms have been in operation for a short period of time (1-20 years). This means that the firms lack the experience in supply chain risk management and therefore are not able to adequately manage supply chain risks (Sinha, 2015).

ICT use moderates the relationship between organization characteristic risk although the moderation is not statistically significant. This can be explained by the fact that firms that have a high employee size are able to put up necessary structures and processes to manage the supply chain risks and therefore hedge themselves against the impact of the risks. Majority of the firms also located nearer Thika town (59%). This means that they have proper internet to timely mitigate risks along their supply chains.

5.3.5 Moderating effect of ICT use on the joint relationship between supply chain risks and performance of manufacturing firms in Kenya.

All the independent variables (information flow risk, financial flow risk, material flow risk and organization characteristic risk) were not significant predictors of the performance of the manufacturing firms in Kenya except organizational characteristic. This can be explained lack of proper involvement of the corporate managers in making supply chain decisions of a firm. This can result to non-strategic supply chain decisions been made which significantly impacts the performance of a firm.

Although the model on the joint moderation effect of ICT use on the relationship between supply chain risks and firm performance was found to be significant, this could have been due to organizational characteristic risk. The study can therefore

conclude that of ll the other predictors, only organizational characteristic was moderated ICT use and this was evident in the increased performance of firms that were adequately equipped in terms of ICT infrastructure and training. This is because these firms recorded an increase in the performance of their firms as opposed to those which had not.

5.4 Recommendations

5.4.1 Moderating effect of ICT use on the relationship between information flow risk and firm performance among the manufacturing firms in Kenya

Manufacturing firms should share information such as order status, delivery of orders and status of inventory with their supply chain partners. This is because sharing of the status of the order will help the manufacturing firms to improve inventory accuracy. This is because they will be able to plan their production based on the information on whether the order has been shipped and therefore increase customer satisfaction by providing sufficient lead time dates. The order status also helps to reduce information flow risk along the supply chain as the manufacturing firm swill be able to increase supply chain visibility and initiate proactive measures on the potential areas that may hinder the timely delivery of their orders. In formation on inventory levels that is required when shared appropriately with the supply chain partners will improve information accuracy along the supply chain and prevent the bull whip effect (Sweeney, 2006). Bullwhip is caused by information miss match on the correct inventory levels required by the end customer. This increases the inventory holding costs which consequently affects the performance of a firm.

Information on production capacity should also be shared by the manufacturing firms in Kenya. This is because such information as lead times, production routing and production duration will help the manufacturing firms to estimate their production plans (Benz & Hoflinger, 2011). This will also help the firms to optimize their production flow and therefore improve efficiency and reduce costs (Lee &Whang, 2005).

Manufacturing firms in Kenya should also leverage on ICT use. This is because ICT helps in reducing information flow risk and therefore improves the performance of the manufacturing firms in Kenya as evidenced in the fin dings. Therefore firms must have the appropriate ICT infrastructure such as Electronic Data Interchange (EDI) that will help in increasing response time and also adds in the firms' capability of delivering the products to the customer by providing real time information on customer requirements (Lee & Lim, 2005). Firms should also leverage on ICT platforms such as Vendor Managed Category Management (VMCM) as this will increase the flow of information on the stock levels therefore reducing risks associated with out of stock and also enable timely replenishments of materials in the firm (Gavirneni, 2006).

5.4.2 Moderating effect of ICT use on the relationship between financial flow risk and firm performance among the manufacturing firms in Kenya

When the sources of supply of the manufacturing firms in Kenya are affected by exchange rate risks, they should be able to switch to alternative sources where the risks of exchange rate are not high. This can be achieved by diversifying sources of supply. Diversification of supply sources will be informed through proactive market research which will help in identifying and monitoring the currency exchange rates in the different countries. This is because exchange rates impacts negatively to the performance of a firm as it increases the cost of the raw materials. High cost of raw materials means that the firms will pass the same to the end customers making their products less competitive and consequently affecting their performance (Musa, 2013; Njaaga, 2013).

In order to leverage on ICT use, in reducing the impact of financial flow risk, the manufacturing firms in Kenya need to take advantage of ICT in monitoring the exchange rate risks. The employees should be properly trained on ICT use. They will equip them with adequate skills and also enhance their understanding on the various ICT platforms that are suitable for the firm to reduce the risk of exchange rate.

5.4.3 Moderating effect of ICT use on the relationship between material flow risk and firm performance among the manufacturing firms in Kenya

Supplier flexibility is key to monitoring the risk of material flow along the supply chain. Lack of supplier flexibility reduces the responsiveness and agility of a supply chain. This has a negative impact on performance in terms of customer satisfaction. Therefore, in order for the manufacturing firms in Kenya to reduce the risk of material flow, they must monitor the flexibility of their suppliers. This can be done at the supplier evaluating stage where the suppliers who are not flexible will not be engaged by a firm. This is because flexible supply chains will provide the manufacturing firms with alternatives in the event their suppliers are constrained in terms of capacity or when their suppliers are faced with hazards such as fire that can lead to their closures (Musa, 2012). On ICT use, this study recommends that manufacturing firms should leverage on their ICT infrastructure and employee skills to conduct market research on sourcing strategies, supplier flexibility and supplier capacity. Manufacturing firms may not reduce the risks of material flow if the existing ICT is not properly utilized in their supply chain management practices.

5.4.4 Moderating effect of ICT use on the relationship between organization characteristic risk and firm performance among the manufacturing firms in Kenya

This study recommends that manufacturing firms in Kenya should consult prior to making supply chain decisions. This is because supply chain decisions such as make or buy have a strategic impact on the competitiveness of a firm. Consulting widely with supply chain professionals who have the relevant skills will reduce the risks associated with such decisions. Consultations should involve all the departments in a firm. Making the wrong supply chain decisions can lead to risks of poor quality products and procurement of highly priced products (Butchers, Lalwani & Mangan, 2008).

Manufacturing firms in Kenya should also adopt and invest more in ICT use. This is because from the study findings, firms that have proper ICT infrastructure and training are able to reduce the risk of organizational characteristic and this leads to

improved performance. Firm should therefore invest more human resource who are skilled in ICT use and who can use this skills to reduce the risks along their supply chains.

5.4.5 Moderating effect of ICT use on the joint relationship between supply chain risks and firm performance among the manufacturing firms in Kenya

Considering that only organization characteristic risk affect the performance of the manufacturing firms in Kenya, it is evident that manufacturing firms in Kenya re not well conversant that information flow risk, financial flow risks and material flow risk can significantly affect the performance of their firms.It is therefore recommended that manufacturing firms in Kenya need to be trained on the impact of these risks to their performance. This is because their poor performance could be traced to the supply chain risks that the firms are not taken much concern on. These firms should also be trained on how they can optimize their existing ICT platforms and systems to further reduce the impact of these risks to their performance.

5.5 Areas for Further Research

The study limited itself to the four supply chain risks, that is, information flow risk, financial flow risk, material flow risks and organization characteristic risk, from the literature that affect the performance of manufacturing firms in Kenya. This meant that the empirical review that supports information flow risk, financial flow risk, material flow risk and organization characteristic risk and the moderating effect of ICT on these risks among the manufacturing firms in Kiambu County Kenya was only limited to these four variables identified in the study. Therefore, similar study should be conducted with other variables that affect the risk of the supply chains and the performance of the firms observed. This study was also conducted in Kiambu County in Kenya and data was collected in that County only. This study recommends that a similar study should be conducted in other counties in Kenya in order to come up with a variety of outcomes.

REFERENCE

Abbott, M. L., & McKinney, J. (2013). *Understanding and applying research design*. (1st ed.). Somerset, NJ: John Wiley & Sons.

Acenture (2010). *High Performance in procurement risk Management*: research and Insights Developed in collaboration with Massachusetts Institute of Technology

Achilles (2014). *Supplier Financial Assessment: Assess the Financial Profile of Potential Suppliers*. Retrieved from: http://www.achilles.com/en/for-buyers /supply-chain-solutions-portfolio/supplier-financial-risk-assessment

Achilles (2014). *Supply Chain News: What are the Best ways to Estimate Supplier Financial Risks?* Retrieved from: http://www. scdigest.com/ assets /On _Target/09-07-28-2.php-

African Economic Outlook (2015). Principle Economic Sectors of Kenya. Retrieved from: http://focusafrica.gov.in/Sector_Profile_Kenya.html

Afza, M., & Alam, K. (2014). Managing foreign exchange risk among Ghanaian firms. *Journal of Risk Finance volume, 6*(4), 306-318.

Ahmad, S., & Schroeder, R.G. (2001). The impact of electronic data interchange on delivery performance. *Production and Operations Management Journa*l, *10* (1), 16-30.

Amimo, E. (2013). Location Decision by Food Manufacturing Firms in Kenya. Retrieved from: http://erepository.uonbi.ac.ke/bitstream /handle/ 11295 /58413/ Amimo_Location%20Decisions%20by%20Food %20Manufact uring %20Firms%20in%20Kenya.pdf?sequence=3&isAllowed=y

Anderson, A. (2009). *Automation Tools: Managing Supply Chain Risks.* Retrieved from: http://www.automationworld.com/energy-management/automation-tools-managing-supply-chain-risk

Association of Chartered Certified Accountants (ACCA), (2014). *A Study of The Business case for Supply Chain Finance*. Retrieved from: http ://www.accaglobal.com/ab111

Baily, P. (2007). *Purchasing and supplies chain Management*. (4th ed.). Washington DC: Kogan Page Publishers.

Banham, R. (2009). Reducing Disruption in Global supply chain. Retrieved from: http://online.wsj.com/ad/article/managingrisk-disruption

Bardhan, I., Krishnan, V. & Lin, S. (2005). A Model to Measure the Business Value of Information Technology: the Case of Project and Information Work, Rady School of Management.

Barney, J. B. (2012). Purchasing, supply chain management and sustained competitive advantage: The relevance of resource-based theory. *Journal of Supply Chain Management, 48*(2), 3-6

Barney, J. B., Wright, M., & Ketchen, D. J.,(2001). The resource-based view of the firm: Ten years after 1991. *Journal of Management, 27*, 625-641.

Barratt, M. & A. Oke (2007). Antecedents of Supply Chain Visibility in Retail Supply Chains: A Resource-Based Theory Perspective. *Journal of Operations Management, 25* (6), 1217-1233.

Berg, B. (2001). *Qualitative Research Methods for Social the Science* (4th ed). Boston: Pearson Education

Bidgoli, H. (2010). The Handbook of Technology Management, Supply Chain Management, Marketing and Advertising, and Global Management. U.S.A. John Wiley & Sons.

Bollen, K. A. (1989). *Structural Equations with Latent Variables*. Somerset, NJ: John Wiley & Sons.

Borges, M., Hoppen, N. & Luce F.B. (2009). Information technology impact on market orientation in e-business. *Journal of Business Research, 62* (9), 883–890

Bottom Line Technologies, (2011). *Best practice in Financial Supply Chain Automation*. Retrieved from: http://archive.bottomline.com /collateral /banking/ best_practice_financial_supply%20_chain_automation.pdf

Bradley, P. (2001). The certainty of uncertainty. *Supply Chain Management Review 5* (2) 105-106.

Bryman, A. (2012). *Social research methods* (4th ed.). New York: Oxford University Press.

Business Daily (2016). Nairobi Ranked 8th on World Bank List of Rich, Poor Counties. Retrieved from: http://www .businessdailyafrica.com/Nairobi-ranked-8th-on-World-Bank-list-of-rich--poor-counties--/-/539546/2951310/-/l07jfl/-/index.h

Butcher, T., Lawani, C., & Mangan, J. (2008). *Global Logistics and Supply Chain Management.* USA: John Wiley & Sons

Byrd, A. & Turner, D.E. (2000). Measuring the flexibility of information technology infrastructure: exploratory analysis of a construct. *Journal of Management Information Systems, 17* (1), 167-208.

Cadez, C. S. (2008). Guilding, An exploratory investigation of an integrated contingency model of strategic management accounting, *Accounting, Organizations and Society, 33* (7–8), 836 –863

Carr, N. (2003). IT doesn't matter, *Harvard Business Review, 81*(5), 41–49

Carter, P.L., & Giunipero, L.C. (2010). *Supplier Financial and Operational Risk Management*. Retrieved from: http://www.mypurchasingcenter .com/ files/ 8913/9524/5629/Caps-Research-Financial-Risk-paper-Dec-2010.pdf

Chae, B., Yen, H.R. & Sheu, C. (2005). Information technology and supply chain collaboration: moderating effects of existing relationships between partners. *IEEE Transactions on Engineering Management,52* (4), 440 – 448

Chan, F.T.S. (2003). Performance measurement in a supply chain. *International Journal o Advanced Manufacturing Technology, 21*(7), 534–548.

Chaudhuri, A., Mohanty, B., & Singh, K. (2013). Supply Chain Risk assessment During New Product Development: A Group Decision Making Approach using Numeric and Linguistic Data. *International Journal of production Research, 51*(10), 2790-2804

Chimi, C. J., & Russell, D. L. (2009). The Likert Scale: A Proposal for Improvement Using Quasi-Continuous Variables: T*he Proceedings of the Information Systems Education Conference.* Washington DC: 1542-7382.

Choi, T. Y., & Hong, Y. (2002). Unveiling the structure of supply networks: Case studies in Honda, Acura, and DaimlerChrysler. *Journal of Operations Management, 20* (5), 469.

Choi, T. Y., Dooley, K. J., & Rungtusanatham, M. (2001). Supply networks and complex adaptive systems: Control versus emergence. *Journal of Operations Management, 19*, 351–366.

Choi, T.Y., & Krause, D.R. (2006). The supply base and its complexity: Implications for transaction costs, risks, responsiveness, and innovation. *Journal of Operations Management*, 24 (5), 637-652

Chopra, S., & Sodhi, M. (2004). Managing Risk to Avoid Supply Chain Breakdown. *Sloan , Management Review, 46*(1) 53-62.

Chopra, S., & Sodhi, M.S. (2014). *Reducing the Risk of Supply Chain Disruptions*. Retrieved from: http://sloanreview.mit.edu/article/reducing-the-risk-of-supply-chain-disruptions/

Chopra, S., Sodhi, M.S., 2004. Managing risk to avoid supply-chain breakdown. *MIT Sloa Management Review, 46*(1), 53-62.

Chopra.s.,& Sodhi.S. (2004). *Managing Risks to avoid Supply Chains Breakdown*. Retrieved from: http://sloanreview.mit.edu/article/managing-risk-to-avoid-supplychain-breakdown/

Choy, K.L., Lee, W.B., & Lo, V. (2004). An enterprise collaborative management system: a case study of supplier relationship management. *Journal of Enterprise Information Management, 17*(3), 191-207.

Christiansen & Bran, (2015). Handbook of Research on Global Supply Chain Management, Advances in Logistics, Operations and Management Science. Michigan: IGI Global.

Christopher, M. (2005). *Logistics and Supply Chain Management: Creating Value-Adding Networks.* London: FT Prentice Hall.

Christopher, M., Peck, H. and Towill, D. (2006). A taxonomy for selecting global supply chain strategies. *The International Journal of Logistics Management, 17*(2), 277-87.

Clements, M.D. & Munoz, A. (2007). *Disruptions in Information Flow: A Revenue Costing Supply Chain Dilemma:* Retrieved from: http://ro.uow.edu.au /cgi/viewcontent.cgi?article=3125&context=commpapers

Closs, D.J., Goldsby, T.J., & Clinton, S.R. (1997). Information technology influences on world class logistics capability. *International Journal of Physical Distribution & Logistics Management,* 27(1), 4-17.

Compton, D. (2007). *Purchasing and Supplies Chain Management*. (3rd ed.). New York: New York Press.

Cooper, D. R., & Schindler, P. S. (2011). *Business Research Methods.* (11th ed.). New York: McGraw-Hill.

Cox, A. (2014). *Sourcing Portfolio Analysis: Power Positioning Tools for Category Management & Strategic Sourcing.* Retrieved from: http://earlsgatepress .com/book-spa.html

Creswell, J.W. (2003). *Research Design: Quantitative, Qualitative, Mixed Methods Approaches.* (2nd ed.). London: Sage Publications

Culp, S. (2012). Supply Chain Risk a Hidden Liability for Many Companies. Retrievd from: http://www.forbes.com/sites/steveculp/2012/10/08/supply-chain-risk-a-hidden-liability-for-many-companies/#262468265574

D'Souza, D.E. and Williams, F.P. (2000). Toward a taxonomy of manufacturing flexibility dimensions. *Journal of Operations Management, 18*(5), 577-593.

Daft, R. L. (2006). *The new era of management: International Edition. Mason: South Western Thomson*: Retrieved from: http://www. Cengagebrain .co.uk /content/daft25714_1111525714_02.01_chapter01.pdf

Daily Nation, (2015). *Kenya Economy's Profile Suffers from Insecurity Setback*. Retrieved from: http://www .businessdailyafrica .com/Kenya-economy-suffers-insecurity-setback/-/539552/2334260/-/25gjyx/-/index.html

Dani, S., Chester, M., & Kalawsky, R. (2013). A Systems Approach for Modelling Supply Chain Risks. Supply Chain Management. *An International Journal, 18*(5), 523-538

Davis, F. D., R. P. Bagozzi & P. R. Warshaw (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science Journal, 35*(8), 982–1003.

DeGroote, S. E. & Marx, T. G. (2013). The impact of IT on supply chain agility and firm performance. *International Journal of Information Management, 33*, 909 - 916.

Dehning,, B., Richardson V.J. & Zmud, , R.W. (2007). The financial performance effects of IT-based supply chain management systems in manufacturing firms. *Journal of Operations Management, 25*(4), 806–824.

Deloitte. (2004). *Supply chain risk management. Enterprise Risk Services*: Retrieved from: https://www2.deloitte.com/content/dam /Deloitte global/ Documents/ Governance-Risk-Compliance/dttl-grc-riskassessment inpractice. pdf

Derrick, RD. (2003). *Challenging the bullwhip effect with advanced information sharing.* Retrieved from http://www.jtscm. co.za/index. php/jtscm/ article /view/88/84:

Dey.K. & Lockström. M., (2011). Strategic sourcing: a combined QFD and AHP approach in Manufacturing Supply Chain Management. *An International Journal, 16*(6), 446 – 461

Drost, E. A. (2011). Validity and Reliability in Social Science Research. *Education Research and Perspectives, 38*(1), 105-123.

East African Community Facts and Figures(2011). March Issue

Economic News Update (2014). Kenya Pursuing Manufacturing Growth. Retrieved from: http://www.oxfordbusinessgroup.com/news/kenya-pursuing-manufacturing -growth

Eiteman, D., Stonehill, A & Moffett, M. (2007). *Multinational Business Finance* (9th ed). Boston: Pearson Education.

Elahi, E. (2010). *How risk Management can turn into Competitive advantage*. A Management project, Boston: University of Massachusetts

Elbashir, M.Z., Collier, P.A. & Davern, M.J. (2008). Measuring the effects of business intelligence systems: the relationship between business process and organiza-tional performance. *International Journal of Accounting Information Systems, 9*(3), 135–153

Ellegaard. C., (2008). Supply risk management in a small company perspective", Supply Chain Management. *An International Journal, 13*(6), 425 – 434

Faisal, M.N., Shankar, R., & Banwet, D.K. (2006). Supply Chain Risk Mitigation: Modelling the Enablers. *Business process Management Journal, 12*(4) 535-552.

Ferguson, R (2003). *Apriso, i2 tools manage supply chain businessprocesses*. eWeek, Retrieved from http://www.accessmy library .com /coms2/summary_0286-24895290_ITM

Finch, P. (2004). Supply chain risk management", Supply Chain Management. *An International. Journal, 9*(2), 183-96

Fischl. M., Scherrer-Rathje.M. & Friedli.T., (2014). Digging deeper into supply risk: a systematic literature review on price risks", Supply Chain Management. *An International Journal, 19*(5), 480 – 503.

Florian, G.L. & Constangioara, A. (2014). *The Impact of Risks in Supply Chain on Organizational Performances: Evidence from Romania*. Retrieved from: http://www.management.ase.ro/reveconomia/2014-2/6.pdf

Galbraith, J.R. (1973). *Designing complex organizations*. New York: Addison-Wesley Publishing Company

Garson, D.G. (2009). *Partial Least Squares regression* (PLS), NC State University.

Gavirneni, S. (2006). Price fluctuations, information sharing, and supply chain performance. *European Journal of Operational Research, 174* (3), 1651-1663.

Geary, S., Childerhouse, P., Towill, D., (2002). Uncertainty and the seamless supply chain *Supply Chain Management Review, 6* (4), 52-61.

Global Computer Hardware, (2015). *Market Line Industry profile*. retrieved from: http://web.b. ebscohost.com/ ehost/pdfviewer/ pdfviewer?sid=4efbbea8-acea-4a68-9462-04d713f7060 c%40sessionmgr 198&vid= 1&hid= 116

Global Finance, (2012). *Supply Chain Risk Management. Supply Chain Risk Management Practice*. Retrieved from: http://usa .marsh.com/ Portals/9/ Documents/ SupplyChainRiskMgmtFactSheet.pdf

Goffin,K.,Lemke,F.& Szwejczewski,M.(2006). An exploratory study of 'close' supplier manufacturer Relationships. *Journal of Operations Management, 24* (2), 189-209.

Gono, S., Harindranath, G., & Ozcan, G.B. (2009). *Challenges of ICT Adoption by South African SMEs: A Study of Manufacturing and Logistics Firms*. London: Royal Holloway University of London

Government of Kenya (2012). *Appraisal of the Proposed SMEs Policy in Kenya*. Nairobi: Government press.

Guillaume, R., Thierry,c. & Grabot,B. (2014).*Integration of the Supplier Capacity for Choosing Less Risky Schedule within an Uncertain Environment*. Retrieved from: https://hal.inria.fr/hal-01055952/document

Gunasekaran, A. & Kobu, B. (2007). Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications. *International Journal of Production Research, 45* (12), 2819-2840.

Hahn, C.K., Duplaga, E.A., & Hartley, J.L. (2000). *Supply Chain Synchronization: Lessons from Hyundai Motor Company Interfaces*: Retrieved from: http://sjbae.pbworks.com/w/file/fetch/44897900/Supply%252520chain%252520synchronization%252520lessons%252520from%252520Hyundai%252520Motor.pdf

Handfield, R.B & Ernest, L.N. (2002). *Supply Chain Redesign: transforming Supply chains into Integrated value Systems*. Upper saddle river (USA): Prentice Hall

Harland, C., Brenchley, R.& Walker, H. (2003). Risk in supply networks. *Journal of Purchasing and Supply Management, 9*(2), 51-62

Hartley-Urquhart, R., 2006. Managing the financial supply chain. *Supply Chain Managemen Review*, 18-25.

Harvie,C., Narjoko,D. & Oum,S. (2010). Firm Characteristics Determinants of SME Participation in Production Networks: ERIA Discussion Paper Series

Hausman, H.W. (2004). *Financial Flow and Supply Chain Efficiency*. Retrieved from: https://www.visa-asia.com/ ap/sea/ commercial /corporates/ includes/uploads/Supply_Chain_Management_Visa.pdf

Helo, P. & Szekely, B. (2005). Logistics information systems: an analysis of software solutions for supply chain co-ordination. *Industrial Management & Data Systems, 10* (1), 5-18.

Hendricks, K.B. & Singhal, V.R. (2003). The Effect of Supply Chain Glitches on Shareholder Wealth. *Journal of Operations Management, 21*(5), 501-522.

Hernandez, O., Galindo, R., & Colin, M. (2015). Information and Communication Technology as a Key Strategy for Efficient Supply Chain Management in Manufacturing SMEs. *Procedia Computer Science,* 55, 833 – 842

Hervani AA., Helms MM., & Sarkis, J. (2005) Performance measurement for green supply chain management: Benchmarking. *An International Journal, 12*(4), 330–353.

Hillary, G. & Hui, K.W. (2007). The Influence of Corporate Culture on Economic Behavior: Does religion Matter in Corporate Decision Making? Retrieved from: http://www.efmaefm.org/0EFMAMEETINGS/ EFMA%20ANNUAL %20 MEETINGS/200 -Austria/papers/0077.pdf

Hillman & Keltz, (2007). Managing Risks in the Supply Chain: A Quantitative Survey. Retrieved from: http://www.scrlc.com/articles/AMR _Managing_ Risk.pdf

Hopkins, A. (1999). *The Limits of Normal Accident Theory*. Retrieved from: http://www.cdc.gov/niosh/mining/userfiles/works/pdfs/onatf.pdf

Hugos, M. (2006). *Essentials of supply chain management*. New Jersey: John Wiley.

Irene, D. (2011). *The Relationship between Foreign Exchange Risk and Financial Performance of Airlines in Kenya.* Unpublished MBA project,Nairobi: University of Nairobi.

Jain, V.P., (2004). *Importance of information flow, customer relationship management & customer satisfaction in strategic management of e-commerce*. Retrieved from: http://hosteddocs.ittoolbox. com/ VJ0 70 204.pdf

Jamil, George, L., soares., Antonio, L., Pessoa, Claudio, R.M. (2016). Handbook of Research on Information Management for Effective Logistics and Supply Chains. Retrieved from: https://books.google.co.ke/books? id=Tpgo DQAAQBAJ&dq =does+ ICT+improve +material +flow &source =gbs_navlinks_s

Jian, S. (2010). *Risk Response Strategies in the Supply Chain: Examining Attributes of stakeholders and risk Attitude*. Retrieved from: http ://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=1064&context=etd_ coll

Jiang,F., Jiang, Z., Kim, K. & Zhang, M. (2015). Family-Firm risk –taking: Does Religion Matter?. Retrieved from: http://www. sciencedirect.com /science/article/pii/S0929119915000085

Johnson, M & Templar,S. (2011). The relationships between supply chain and firm performance. *International Journal of Physical Distribution & Logistics Management, 41*(2), 88 – 103

Johnson, M.E., 2001. Learning from toys: lessons in managing supply chain risk from the toy industry. *California Management Review, 43*(3), 106-124.

Juttner, U. & Ziegenbeing, A. (2009). Retrieved from: http://link .springer. com/chapter/10.1007%2F978-0-387-79934-6_13

Juttner, U., peck, H. & Christopher, M. (2002). Supply Chain Risk Management: Outlining an Agenda for Future Research. Annual Conference proceedings in Logistics Research Network. *International Journal of Logistics*, *6*(4), 197-210.

Juttner, U., Peck, H. a& Christopher, M. (2003). Supply chain risk management: outlining an agenda for future research. *International Journal of Logistics*, *6* (4), 197-21

Kaipia, R. (2009). Coordinating material and information flows with supply chain planning. *The International Journal of Logistics Management*, *20 (*1), 144-162

Kalawsky, A.G. (2013). A systems Approach for modeling supply chain risks: Supply Chain Management. *International Journal of physical Distribution and Logistics Management*, *38*(3) 192-223

Kamrad, B., Siddique, A., 2004. Supply contracts, profit sharing, switching, and reaction options. *Management Science Journal, 50* (1), 64–82.

Kane, M. T. (2006). Validation. Educational measurement. *Journal of Educa Management. 4*(2), 17-64

Kangongo, J., Guyo, W., Bowen, M., & Ragui, M. (2013). Supply chain disruption in the floriculture industry: A case study of Equator Flowers. *European Journal of Business and Management*, *5*(7), 246-253.

Kaya, E., & Azaltun, M. (2012). Role of information systems in supply chain management and its application on five-star hotels in Istanbul. *Journal of Hospitality and Tourism Technology*, *3*, 138 – 146

Kenya Association of Manufacturers (KAM), (2015). *Kenya association of Manufacturers & Exporters Directory* (11th end). Nairobi: KAM.

Kenya Association of Manufacturers (KAM, 2014). *KAM Thika Chapter Membership Recruitment and Retention Strategy for 2014 Report*, pp1-14

Kenya Association of Manufacturers. (2013). *The Kenya Association of Manufacturers and Exporters Directory*. Nairobi: Adafric Communications Limited.

Kenya Economic Report (2013). Creating an Enabling Environment for Stimulating Investment for Competitive and Sustainable Counties. Retrieved from: http://www.kippra.org/downloads/Kenya%20Economic% 20Report% 202013 .pdf

Kenya Industrial Research and Development Institute (KIRDI], (1997). *Kenya Directory of Manufacturing Industries.* Nairobi: KIRDI.

Kenya Information Guide, (2015). Overview of Kiambu County. Retrieved from: http://www.kenya-information-guide.com/kiambu-county.html

Kenya Investment authority. (2013). *Promoting investment in Kenya*. Retrieved from: http://www.investmentkenya.com/ opportunities/ manufacturing

Kenya-Vision 2030. (2007). *Globally Competitive and Prosperous Kenya*. Nairob Government Printer.

Kersten, W.B., Blecker, T. (2006). *Managing Risks in Supply Chains: How to Build Reliable Collaborations in Logistics*. Verlag: Erich Schmidt GmbH & Co

Kha. K.A.& Pillania.R., (2008). Strategic sourcing for supply chain agility and firms' performance: Management Decision. *Journal of Management History*, 46 (10), 1508 - 1530

Kidd, P. (2000). *Two definitions of agility*. Retreieved from: http ://www .cheshirehenbury.com/agility/

Kiganane, L.N.M. (2013). *The Perceived Effect of Mobile Phone Services on Performance of Manufacturing firms in Thika Town in Kenya*. Unpublished Thesis, Juja: JomoKenyatta University of Agriculture and Technology

Kimanzi, E.N. (2013). Effects of Insurance function on supply Chain Risk Management in Kenya: A Case of Kenya Re Insurance. Retrieved from: http://www.ijsse.org/articles/ijsse_v1_i6_98_126.pdf

Kinyanjui, B.M., (2013). *Procurement Outsourcing and Supply Chain Performance of Manufacturing Firms in Nairobi, Kenya*. Retrieved from: http :// erepository.uonbi.ac.ke/bitstream/handle/11295/76032/Kinyanjui_Determinants%20of%20project%20sustainability%20among%20selected%20non%20-%20governmental%20organizations%20in%20the%20health%20sector.pdf?sequence=1

KITOS, (2017). The Industry Catalyst for Kenyan IT. Retrieved from: http :// kitos.or.ke/

Kleindorfer, P.R. & Saad, G.H. (2005). Managing disruption risks in supply chains. *Journal of Production and Operations Management, 14* (1), 53-68.

Klibi, W., Martel, A., & Guitoni, A. (2010). The Design of a Robust Value Creating Supply Chain Networks: A Critical Review. *European Journal of operational Research, 203* (2), 283-293

Kombo, D. K., & Tromp, D. L. A. (2009). *Proposal and Thesis Writing: An Introduction* Nairobi: Don Bosco Printing Press.

Kothari, C. R. (2009). *Research Methodology: Methods and Techniques* (5th ed.). Ne Delhi: New Age International.

Kothari, C.R. (2004). *Research methodology: Methods and Techniques*. New Delhi: new Age International (P) Limited Publishers.

Koul, R. B. (2008). Educational Research and Ensuring Quality Standards. *E-journal of All India Association for Educational Research (EJAIAER), 20*(3), 1-8.

KPMG (2001).*University of California Office of the President System Wide E-Procurement Assessment and Strategy Recommendation*. Berkely, CA: KPMG Consulting

Kumar, K.B., Rajan, R.G. & Zingales, L. (2001). What Detrmines Firm Size? Retrieved from: http://faculty.chicagobooth.edu/finance/papers/size.pdf

Kuria, W. (2015). Kiambu County Emerges the Leading County in The Kenyan Governments Digital Transformation. Retrieved from: http://www .kachwanya.com/2015/08/03/kiambu-county-emerges-the-leading-county-in-the-kenyan-governments-digital-transformation/

Kushwaha, G.S (2011). Competitive Advantage through Information and Communication Technology (ICT) Enabled Supply Chain Management Practices. *International Journal of Enterprise Computing and Business Systems, 1* (2), 2230-8849.

Lambert, D.M., & Cooper, M.C., (2000). Issues in Supply Chain Management. *Industrial Marketing Management Journal, 29*(11), 287-303

Lavraka, P.J. (2008). Population of Inference. Retrieved from: http: //methods .sagepub.com/reference/encyclopedia-of-survey-research-methods/ n384.xml

Lee & Lim, G.G. (2005). The impact of partnership attributes on EDI

Lee, H.L. & Whang, S. (2000). Information Sharing in a Supply Chain. *International Journal of Technology management, 20* (4) 373-383

Lee, H.L., (2004). The triple-A supply chain. *Harvard Business Review,* 102 112.

Lee, H.L., Padmanabham, V. & Whang, S. (1997). The bullwhip effect in supply chains *Sloan Management Review, 38* (9), 93-102.

Lee, H.l., Padmanabham, V., & Whang, S. (1997). The Bullwhip Effect in Supply Chains. *Sloan Management Review, 38* (3) 93-102.

Lee, H.L., Padmanabhan, V., & Whang, S. (2004). Information distortion in a supply chain: the Bullwhip effect. *Journal of Management science, 50* (12), 1875-1886

Leung, Y.T., Cheng, F., Lee, Y.M., & Hennessy, J.J A. (2007). Tool set for exploring the value of RFID in a supply chain. *Advanced Manufacturing, (*2), 207-215.

Lewis, I. & Talalayevsky, A. (2004). Improving the inter organizational supply chain through optimization of information flows. *Journal of Enterprise Information Management, 17*(3), 229-37.

Li, J. & wang, S. (2011). *Risk Management of Supply and Cash Flows in Supply Chains*. USA. Springer Science Business Media

Loice, K., & Ronald, B. (2011). *Effect of Entrepreneural Supply Chain Management Competencies on Organizational performance in Manufacturing Firms, Nairobi County,* Kenya. Retrieved from: http://ir.mu.ac.ke:8080 /xmlui/bitstream/handle /123456789/1663/Effect%20of%20 entrepren eurial% 20supply%20chain%20management%20competencies %20on%20 organizational %20performance%20in%20 manufacturing%20firms,% 20 nairobi %20 county,%20 kenya.pdf?sequence=1

Martinez, L. (2014). *% Best practices for New Supply Chain Leaders.* Retrieved from: http://www.healthcarefinancenews.com/blog/5-best-practices-new-supply-chain-leaders

Martz, E. (2013). *Enough is Enough! Handling Multicollinearity in Regression Analysis*. Retrieved from Minitab: http://www .blog.minitab.com.

Maurer, C. (2011). *The Measurement of Information Flow Efficiency in Supply Chain Management*: Desertation, University of South Africa

Mburu, D.K, Ngugi, P.K., & Ogollah, K. (2015). An Assessment of the Effect of Risk Identification Management Strategy on Supply Chain Performance in Manufacturing Companies in Kenya. *International Journal of Economics, Commerce and Management*, *3*(4), 1-17

McBeath, B. (2013). Supply Chain Risk Solutions: A Market Overview. Retrieved from: http://www.clresearch.com/media /docs/original/Supply %20Chain %20Risk%20Solutions%20Market%20Overview.pdf

McKinsey & Company, (2011). *McKinsey on Supply Chain*. Chicago: Select Publications

McLaren, T.(2006). *A measurement modelfor web-enabled supply chain integration. Paper presented at the 19th Bled eConference eValues,Bled,Slovenia*. Retrieved from mb.si/proceedings.nsf/0/ 4d3c3c1241bfe7fec 12571 800 03 260d0 /$FILE/ 29_McLaren.pdf

Mensah, C., Diyuoh, D.,& Oppong, D. (2014) Assessment of Supply Chain Management Practices and its effects on the Performance of Kasapreko Company Limited in Ghana. *European Journal of Logistics Purchasing and Supply Chain Management, 2*(1), 1-16.

Mercado, E.C. (2008). *Hands-on Inventory Management, Auerbach Publication*. New York –London: Taylor & Francis Group, LLC.

Mohammed, K.S., & Omwenga, J. (2015). *Supply Chain Risk Mitigation strategies Adopted by Manufacturing Firms in Kenya*: A Case of Coca cola Company (K). Retrieved from: http://www.iajournals.org /articles/iajpscm _v1_i4_ 45_65.pdf

Montgomery, D. C., Peck, E. A., & Vining, G. G. (2001). *Introduction to Linear Regression Analysis* (3rd ed.). New York: John Wiley.

Morgan, C. (2004). Structure, speed and salience: performance measurement in the supply chain. *Business Process Management Journal 10*(5), 522–536.

Mugenda & mugenda (1999). *Research methodology*; (3rd ed). Nairobi: Longman Publishers.

Mugenda, A. (2008). *Social Science Research: Conception, Methodology and Analysis.* Nairobi: Kenya Applied Research and Training Services.

Mugenda, O., & mugenda, A. (2003). *Research Methods: Qualitative and Qualitative Approaches.* Nairobi: Acts press.

Mulupi, D. (2015). Unpacking Kenya's Manufacturing Sector. Retrieved from: http://www.howwemadeitinafrica.com/qa-unpacking-kenyas-manufacturing-sector/

Musa, F.R. (2013). *The Effect of Foreign Exchange Rate Volatility On The Financial Performance of Oil Marketing Companies in Kenya*. Retrieved from: http://chss.uonbi.ac.ke/sites/default/files/chss/project%20Farah.pdf

Musa, S.N. (2012). *Supply Chain Risk Management: Identification, Evaluation and Mitigation Techniques.* Retrieved from: http://www.diva-portal.org /smash /get/diva2:535627/FULLTEXT01.pdfii

Mutegi, L. (2015). Kenya: Kiambu County Leads Kenya's Digital Transformation With SAP- Enabled Digital Platform: Retrieved from: http: //allafrica .com/stories/201508031572.html

Nagy, J. & venter, L. (2010). *How Risk Management in Supply Chains Affects Supply Chain Performance*: Corvinus: Corvinus University of Budapest

Nambisan, S. (2000). EC and supply chain management: towards cross-industry supply chains. *Electronic Markets, 10*(3), 197-202.

Naude,M.J. & Badenhorst-eiss,J.A. (2011) Supply Chain Management Problems at SouthAfrican Automotive Component Manufacturers. *Southern African Business Review, 15*(1), 201

Nelson, J. (2013). *Evaluating Supply Chain Risks with Single Vs. Multiple Vendor Sourcing Strategies*. Retrieved from: http://spendmatters.com /2013/02/28/ evaluating-supply-chain-risks-with-single-vs-multiple-vendor-sourcing-strategies/

Njaaga, W.G. (2013). *The Effect of Exchange Rate Translation Exposure on The Financial Performance of Companies Listed At The Nairobi security Exchange*. Retrieved from: http://erepository.uonbi.ac.ke/ bitstream /handle /11295/75931 /Njaaga_The effect of exchange rate translation exposure on the financial performance

Norman, S. & Janson, S. (2004). The Trading Agent Competition Supply Chain Management Game. Retrieved from: http://reports-archive.adm.cs.cmu.edu /anon /isri/CMU-ISRI-03-106.pdf

Orodho, C.R. (2009). *Elements of education and social Science Research Methods*, (2nd ed). New delhi: Kaneza Publishers.

Osman, J.K. (1984). *The Essentials of Research Methodology for Nigerian educators*. Ibadan. University Press Limited.

Osodo, A.L. (2012). *Information and Communication Technology and Supply ChainPerformance among Logisticsl Firms in Nairobi Kenya*. Retrieved from: http://erepository.uonbi.ac.ke/bitstream/handle/ 11295/76498 /Atieno _Information%20and%20communications%20technology %20 and%20supply%20chain.pdf?sequence=2

Pagano, M., & K. Gauvreau. (2000). *Principles of biostatistics*. (2nd ed.). Belmont, CA Duxbury. Panicker, V.V., Govindan, K,. & Diabat, A. (2012). Supply Chain Risk Management and its mitigation in a food Industry. *International Journal of Production research*, *50*(11), 3039-3050

Park, H. M. (2008). *Univariate Analysis and Normality Test Using SAS, Stata, and SPSS. Working Paper:* The University Information Technology Services (UITS) Center for Statistical and Mathematical Computing, Indiana University.

Partida, B. (2012). *Inventory Accuracy Improves Performance on Logistics Metrics*: Retrieved from: http://www.industryweek.com/inventory-management / inventory -accuracy-improves-performance-logistics-metrics

Perrow, C. (1984). *Normal Accidents: Living with High-Risk Technologies*. New York: Basic Books Inc.

Peterson, K. (2015). Supply and Demand: Effective Solutions for Supply Chain Management. Retrieved from: http://www.business.com/ operations/ effective-solutions-for-supply-chain-management/

Price water house Coopers, (2013). *Industrial manufacturing in Kenya.* Retrieved on from*:* http://www.pwc.com/ke/en/industries/industrial-manufacturing .jhtm

PricewaterhouseCoopers, (2008). *A practical guide to risk assessment*. Retrieved from: www.pwc.com/en_us/us/issues/ enterprise-risk-management/ assets /risk_assessment_guide.

Rad, M.H. (2008). *Lead Time Reduction: A Case Study of BEAB Etikett & System AB.* Unpublished Masters Thesis, Bora: University College of Bora.

Raman, A., DeHoratius, N., Ton, Z., (2001). The Achilles' heel of supply chain management *Harvard Business Review*, *79* (5), 25-28.

Rao, F.B. (2008). *Exchange Rate Risk in Automobile Industry: An Empirical Study on Swedish, French and German Multinational Companies*. Retrieved on from: http://www.diva-portal.org/smash/get/ diva2: 141979 /FULLTEXT01.pdf

Rao, S. & Goldsby .J., (2009). Supply chain risks: a review and typology. *The International. Journal of Logistics Management, 20*(1), 97 – 123

Ravi, V. & Rajesh, R. (2015). *Modelling Enablers of Supply Chain Risk Mitigation in Electronic Supply Chains: A Grey-Dematel Approach*. Retrieved from: http://www.sciencedirect.com/science/article/pii/S0360835215002065

Ray, G., Barney, J.B. & Muhanna, W.A. (2004). Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. *Strategic Management Journal* , *25*(1), 23-37

Resilinc, (2015). *Supplier Capacity Management Challenges*. Retrieved from: https://www.resilinc.com/solutions/for-supplier-capacity-management/

Ruriani, D.G. (2013). Minimizing Supply Chain Risk. Retrieved from: http ://www.inboundlogistics.com/cms/article/minimizing-supply-chain-risk/

Sammarco, J.J. (2003). *A Normal Accident Theory-Based Complexity Assessessment Methodology For safety-Related Embedded Computer Systems*. Retrieved from: http://www.cdc.gov/niosh/ mining/userfiles/ works/pdfs/ anatb.pdf

Saunders, M., Lewis, P. & Thornhill, A. (2009). *Research methods for business students* (5 ed.). Harlow: Pearson Education

Shang, J., Tadikamalla, P.R.., Kirsch, L.J.& Brown, L. (2008). A decision support system for managing inventory at GlaxoSmithKline. *Decision Support Systems 46*(1) (2008)1–13.

Sharma, R. & Yetton, P. (2007). *The contingent effects of training, technical complexity, and task interdependence on successful information systems implementation*. Misq Quarterly, pp. 219-238.

Silanpaa, I. (2010). *Supply Chain Performance Measurement in the Manufacturing Industry*. Unpublished PhD Desertation, Finland:University of Oulu.

Simchi-Levi, D, Kaminsky, P., & Simchi-Levi, E. (2009*). Designing and managing the supply chain:concepts, strategies, and case studies* (3rd ed). Singapore: McGraw-Hill Irwin.

Simon, H.A. (1962). *The Architecture of Complexity*. Retrieved from: http :// ecoplexity.org/files/uploads/Simon.pdf

Sinha, S. (2015). Youe Employees: A Principal Factor in the Supply-Chain Risk Equation. Retrieved from: http://www.qualitydigest.com/inside/risk-management-column/110915-your-employees-principal-factor-supply-chain-risk-equation.html

Soderoa, A. C., Rabinovich, E., and Sinha, R. K. (2013). Drivers and outcomes of open standard interorganizational information systems assimilation in high-technology supply chains. *Journal of Operations Management*, *330*-334.

Sodhi, M.S. & Tang, C.S. (2012). *Strategic Approaches for Mitigating Supply Chain Risks: Managing Supply Chain Risks*. New York: Springer

SoftKenya, (2013). Vision 2030 Economic Pillar-Manufacturing. Retrieved from: http://softkenya.com/vision-2030/vision-2030-economic-pillar-manufacturing/

Solakivi, T. (2014). *The Connection between Supply Chain Practices and Firm Performance Evidence from Multiple Surveys and Financial Reporting Data*: Published thesis, Tuku: Tuku school of Economics

Son, J.Y., Narasimhan, S. & Riggins, F.J. (2005). Effects of relational factors and channel climate on EDI usage in the customer-supplier relationship. *Journal of Management Information Systems, 22*(1), 321-53.

STANLIB (2015). SA Manufacturing had a Shocking start in 2015. Retrieved from: http://www.stanlib.com/EconomicFocus/Pages /SAmanufacturing 2015.aspx

Stapleton, D., Hanna, J.B., Yagla, S., Johnson, J. & Markussen, D. (2002). Measuring logistics performance using the strategic profit model. *International Journal of Logistics .Management, 13*(1), 89-107.

Stefansson, G. & Lumsden, K. (2008). Performance issues of Smart Transportation Management systems. *International Journal of Productivity and Performance Management*, *58*(1), 55 -70

Stoel, M.D. & Muhanna, W.A. (2009). IT capabilities and firm performance: a contingency analysis of the role of industry and IT capability type. *Journal of Information & Management*, *46*(3), 181–189.

Summer (2014). Managing Risks in Global Supply Chains. Retrieved from http://globalsupplychaininstitute.utk.edu/publications/documents/Risk.pdf

Suparna, E., & Krcmar (2013). A comparative analysis of information visibility in two supply chain management information systems. *Journal of Enterprise Information Management, 26*, 276 - 294

Supply Chain leadership Council, (2011). Supply Chain Risk Management: A Compilation of Best Practices. Retrieved from: http://www.scrlc.com/articles /Supply_Chain_Risk_Management_A_Compilation_of_Best_Practices_final%5B1%5D.pdf

Sushil, S., & Verma, N. (2010). Questionnaire validation made easy. *European Journal Scientific Research, 46*(2), 172-178.

Sweeney, E. (2005). *Managing the Supply Chain: The Role of Information and Communication technology (ICT) as a key Enabler of the Process*. Retrieved from: http://arrow.dit.ie/cgi/viewcontent.cgi?article=1051&context=nitloth

Sweeney, E. (2006). *Managing Information Flows: The Key to Effective Supply Chain Integration*: Retrieved from: http://arrow.dit.ie /cgi/view content .cgi?article=1011&context=nitloth

Tang, C.S., (2006). Robust strategies for mitigating supply chain disruptions. *Internationa Journal of Logistics: Research and Application, 9* (1), 33-45.

Tate, W. (2014). *The Essential Concepts of Purchasing and Supply Management*. Retrieved from: http://www.ftpress.com/ articles/article.aspx? p=2165644 &seqNum=5

Teymouri, M. & Ashoori, M. (2011). The Impact of Information Technology on Risk Management, Procedia Computer Science. *World Conference on Information Technology, 3*, 1602–1608

Trkman, P& Groznik, A. (2006).Measurement of supply chain integration benefits.Interdisciplinary. *Journal of Information, Knowledge, and Management,* 1.

Trochim, W. M. K. (2006). *Introduction to Validity.* Retrieved from socialresearchmethods: http:// www.socialresearchmethods .net/kb /introval .php.

True Commerce, (2018). What is EDI? Retrieved from: https://www .true commerce.com/resources/what-is-edi

Tyrinopoulus, Y. (2004). A complete conceptual model for the integrated management of the transportation work. *Journal of Public Transportation, 7*(4).

U.S. Trade & Investment with Sub-Saharan Africa (2002), *3rd Report*, 332-415. U.S.A. DIANE Publishing

UKAID, (2016). Manufacturing in Kenya: features, Challenges and Opportunities. Retrieved from: https://set.odi.org/wp-content/uploads/2016 /09/ Manufacturing in-Kenya-Anzetse-Were.pdf

Vachon, S. & Klassen, R. (2002). An Exploratory Investigation on the Effects of Supply Chain Complexity on Delivery Performance: Transaction on Engineering Management. *IEEE Journal, 49*(3), 218-230

Vedel.M. & Ellegaard.C., (2013). Supply risk management functions of sourcing intermediaries: an investigation of the clothing industry. Supply Chain Management. *An International Journal, 18*(5), 509 - 522

Venkatesh, V.G., Rathi, S., & Patwa, S. (2015). *Analysis on supply chain risks in Indian apparel retail chains and proposal of risk prioritization model using Interpretive structural modeling.* Retrieved from: http://www. sciencedirect. com/science/article/pii/S0969698915000673

Vickery, S.K.; Jayaram, J.; Droge, C. y Calantone, R., (2003). The effect of an integrative supply chain strategy on customer service and financial performance: an analysis of direct vs. indirect relationships. *Journal of Operations Management, 21*, 523-539.

Wagner, S., Bode, C. (2008). An empirical examination of supply chain performance along several dimensions of risk. *Journal Of Business Logistics, 29*(1), 307-25

Wagner, S.M., & Neshat, N. (2012). A Comparison of Supply Chain Vulnerability Indices for Different Categories of Firms. *International Journal of Production Research*, *50*(11), 2877-2891.

Waiguru, A. (2015). 2015 Economic Survey Report Highlights

Waqas, M., Yasir, L., Nauman, L. Hassan, R.S. (2010). *Managing Supply Risks in Fresh Food Items.* Retrieved from: http://www.diva-portal.org/ smash/ get/diva2:322786/FULLTEXT01.pdf

Waters, D. (2011). *Supply Chain Risk Management: Vulnerability and Resilience Logistics*. USA. Kogan Page Publishers

Wernerfelt, B. (1984). A Resource-Based View of the Firm. *Strategic Management Journal, 5*(2), 171-180.

Wharton, P. (2011). *The Key to Supply Chain ROI-Improving Visisbility to Drive Out Inefficiencies in Your Supply Chain.* Retrieved from: http://www .industry week.com/software-amp-systems/key-supply-chain-roi-improving-visibility-drive-out-inefficiencies-your-supply-

Williams, F. (2006). *What should be the transportation provider's role in supply chain management?,* Proceedings of the 8th World Conference on Transport Research, 12-17 July, Antwerpen, Belgium.

Wolf, F. G. (2000). *Normal Accidents and Petroleum Refining*: A Test of the Theory. Unpublished PhD dissertation, Nova: Nova Southeastern University.

Womack, J. & Jones, D. (2003). *Lean Thinking: Banish waste & create Wealth in Your Cooperation*. New York: Simon & Schuster.

World Economic Forum (2013). Building resilience in supply chains: an initiative of the risk response network in collaboration with Accenture. *Industrial Agenda, Accenture*, 1-44.

World economic Forum (WEF), (2012). *Connected World: Hyperconnected World and Transportation in Action*. Retrieved from: http://www3 .we forum .org/docs/WEF_Connected_World_HyperconnectedTravelAndTransport ationInAction_2014.pdf

Zerbini, F., caru, A. & Cugini, A. (2007). The Cost of Customer Satisfaction: a Framework for Strategic Cost Management in Service Industries. *European Accounting Review*, (16), 499-530.

Zhang, D., Donk, T. & Vaart, V., (2011). Does ICT influence supply chain management and performance. *International Journal of Operations & Production Management*, *31*(11), 1215 – 1247.

Zibra, A. (2010). The Role of Information and Communication technology in the Management of Selected Secondary Schools in Central Uganda. Retrived from: https://www.researchgate.net/publication/ 249314748 _THE _ROLE _OF_INFORMATION_AND_COMMUNICATION_ TECHNOLOGY _IN_THE _MANAGEMENT_OF _SELECTED_SECONDARY_ SCHOOLS_IN_ CENTRAL_ UGANDA

Zinnov.K, (2006). *How exchange rates affects outsourcing*. Retrieved from: http://www.sourcingmag.com/how-exchange-rates-affect-outsourcing/

Zsidisin, G., Panelli, A. & Upton, R. (2000), "Purchasing organization involvement in risk assessment, contingency plans, and risk management: an exploratory study", Supply Chain Management: *An International Journal, 5* (4)

Zsidisin, G.A. (2003). Managerial Perception of supply Chain Risk. *The Journal of Supply Chain Management,* 14-26.

APPENDICES

Appendix I: Letter of Introduction

Date: …….

To …….

……..

……..

Dear Sir/Madam,

RE: COLLECTION OF RESEARCH DATA

I am a student at Jomo Kenyatta University of Agriculture & Technology (JKUAT) pursuing a Ph.D in Supply chain management. I am carrying out a research on "Moderating *Effects of ICT on Supply Chain Risk and Firm Performance in manufacturing firms in Kiambu County Kenya*". I am in the process of gathering relevant data for the purpose of this study. You have been identified as one of the collaborators and a key respondent in this study and I would like to kindly invite you to participate in my PhD research. I therefore write to request for your invaluable assistance towards making this study a success by taking time off your busy schedule to respond to the attached questionnaire.

The information collected and used in the PhD Dissertation will be kept strictly confidential, and you will remain completely anonymous throughout data processing. The final report will be made available to you once all analyses are completed. It will be appreciated if you can fill the questionnaire within the next one week to enable early finalization of the study. I thank you very much in advance for your consideration, time and responses. Thank you.

Yours sincerely,

Miriam Thogori

Student Reg. No. HD411-3369/2014; Mob. +254 724 159 176

Appendix II: Letter of Authorization

Date: …….

To Executive Director

……..

……..

NAIROBI

Dear Sir/Madam,

RE: ACADEMIC RESEARCH DATA: "MODERATING EFFECT OF ICT ON SUPPLY CHAIN RISK AND FIRM PERFORMANCE IN MANUFACTURING FIRMS IN KENYA"

I am a student at Jomo Kenyatta University of Agriculture & Technology (JKUAT) pursuing a Ph.D in Supply chain management. I am required to undertake a thesis whose title is as indicated above as partial fulfillment for the award of the doctoral degree. I am kindly requesting for your assistance in making my research a success by granting permission to collect relevant data of your organization from your Head of Supply Chain Division and finance manager. I would like to assure your office that all the data collected will be treated with utmost confidentiality and will be used exclusively for the purposes of this academic research.

I am looking forward to your kind consideration and at the same time wishing your esteemed organization success in all her endeavors.

Yours sincerely,

Miriam Thogori

Student Reg. No. HD411-3369/2014; Mob. +254 724 159 176

Appendix III: Questionnaire

This questionnaire seeks to investigate the Moderating effect of ICT on supply chain risk and firm performance in manufacturing firms in Kiambu County Kenya. In particular, it will involve aspects of information flow risk, financial flow risk, material flow risk and organizational characteristic risks.

Note

(a) All responses will be treated in the strictest confidence

(b) If you would like a copy of the findings please supply name and address for receipt of your copy of the findings.

(c) Alternatively, if you would prefer your responses to remain completely anonymous, put only an email address in the address section. Please tick, (√), using copy & paste, where appropriate.

Name:

Address:

PART A: Organizational Data

Please provide the following information regarding your organization.

1. Company name _____

2. Type of manufacturing sector in which your company falls (tick as appropriate)

a. Metal and Allied [ ]

b. Pharmaceuticals [ ]

c. Textile [ ]

d. Building [ ]

e. Food, Beverage [ ]

f. Chemical [ ]

g. Energy [ ]

h. Plastic [ ]

i. Wood products [ ]

j. Leather [ ]

k. Motor [ ]

l. Paper [ ]

m. Fresh produce [ ]

n. Service consultancy [ ]

3. Ownership of company (tick one)

a. Locally owned by individual [ ]

b. Locally owned by group [ ]

c. Foreign [ ]

d. Foreign and local [ ]

4. Markets served (tick)

a. Domestic markets only [ ]

b. Foreign markets only [ ]

c. Domestic and foreign [ ]

5. Number of years the organization has been in operation in Kenya ---------years

7. How many people are employed in your organization? …….

8. Which part of Kiambu County is your firm in (Consider 5 KM Radius from the town)

Juja [ ] Limuru [ ] Kiambu town [ ] Gatundu [ ] Thika [ ] Ruiru [ ] other (specify) ---------

9. How far is your company from the above (8) indicated town……KM

10. How many years have you been in operation…….

11. Which is the average age of employees in your company other?

21-30 [ ] 31-40 [ ] 41-50 [ ] 51-60 [ ] (Specify)……...

12. How far is your company from ICT service provider?…….

13. How many employees are in your company?.....

PART B

Information flow risk

Please indicate the extent to which of the following aspects of information flow risk affect the performance of the firm. Please record your answer by ticking in the spaces provided, indicating to what extent you agree with the following statements (**S.A-**

Strongly Agree, A-Agree, N-Neutral, D- Disagree, S.D-Strongly Disagree) Tick as appropriate.

		SA	A	N	D	SD
a)	We frequently share information with our supply chain partners (status of orders, delivery of orders, status of inventory e.t.c)	□	□	□	□	□
b)	We have appropriate technology that helps in information sharing	□	□	□	□	□
c)	Information is not shared in every stage of the supply chain	□	□	□	□	□
d)	We rarely share information with our supply chain partners	□	□	□	□	□
e)	We share objective information along the supply chain free of error	□	□	□	□	□
f)	We have many levels through which documents are passed through before the actual implementation (bureaucracy)	□	□	□	□	□
g)	We have adopted information technology to enable accurate information sharing along the supply chain	□	□	□	□	□
h)	We are not aware of the exact quantities and timings of the deliveries from suppliers	□	□	□	□	□
i)	We have minimum technology for information sharing	□	□	□	□	□
j)	We share information such as sales data, product planning, logistical schedules etc	□	□	□	□	□
k)	Minimal information on inventory levels and lead times is availed to supply chain partners	□	□	□	□	□
l)	We share information on production capacity	□	□	□	□	□
m)	We share supply chain information only within the company	□	□	□	□	□
n)	Supply chain information is only communicated with the suppliers, customers and 3rd party service providers	□	□	□	□	□
o)	All the company personal information is available in the website	□	□	□	□	□
p)	We do not have a centralized information sharing system and all the departments share information freely	□	□	□	□	□

We use ICT to do the following in order to prevent information flow risk (tick (√) all that apply)

a. Gather Sales [ ]

b. Analyze Demand forecast data [ ]

c. Post Inventory levels data [ ]

d. Gather Order status data [ ]

e. Analyze Production schedules information [ ]

f. Store Plans of the orders [ ]

g. Gather Logistical data [ ]

h. Corporate Social Responsibility (CSR) [ ]

i. Any other……(specify)

Please suggest how information flow affects performance in the manufacturing……..

Financial Flow Risk

Please indicate the extent to which of the following financial flow risk issues affect the performance of the firm. Please record your answer by indicating to what extent you agree with the following statements using the scale (**S.A-Strongly Agree, A-Agree, N-Neutral, D-Disagree, S.D-Strongly Disagree) Tick as appropriate.**

		SA	A	N	D	SD
a)	We only buy goods and services that are important to the firm	□	□	□	□	□
b)	We are not able to timely pay our suppliers	□	□	□	□	□
c)	The strategies we have to prevent the effect of currency volatility are rarely effective	□	□	□	□	□
d)	We buy most of our materials from outside the country	□	□	□	□	□
e)	We frequently change our sources of supply when the currency exchange rate increase	□	□	□	□	□
f)	Most of our firms materials are sourced locally	□	□	□	□	□
g)	We do not evaluate our suppliers financially to determine their financial status before engaging them in the organization	□	□	□	□	□
h)	We rarely monitor the financial status of the suppliers throughout the contract	□	□	□	□	□
i)	We engage 3rd parties to manage the financial status of our suppliers regularly	□	□	□	□	□
j)	We are monitoring the strength of our suppliers	□	□	□	□	□
k)	We have consistently performed well at the NSE	□	□	□	□	□
l)	We are concerned with the price and not the total cost	□	□	□	□	□

when buying products from suppliers

m)	We always use technology to enhance the firm cash flow	□	□	□	□	□
n)	We manage the finances of the firm through strategic sourcing (sourcing based on total spend)	□	□	□	□	□
o)	There are many complaints about nonpayment of suppliers	□	□	□	□	□
p)	We have a procurement schedule that is strictly adhered to	□	□	□	□	□
q)	We have procurement schedules that frequently overlap	□	□	□	□	□

We use ICT to do the following in preventing financial flow risk (tick (√) all that apply)

a. Payments to suppliers [ ]

b. Analyzing purchasing spend [ ]

c. Exchange rates management [ ]

d. Supplier relationships management [ ]

e. Sourcing goods [ ]

f. Analysis of supplier financial performance [ ]

g. We use text messages to post notices of supplier payment [ ]

h. We use whatsup to post payment documents to suppliers [ ]

i. We use intranet to send payment information to suppliers [ ]

j. Wi-fi is used to transmit payment information [ ]

k. Any other……(specify……

Please suggest how your firm can manage finances in order to enhance the performance of the firm.

……
……
……..……
……

Material flow risk

Please indicate the extent to which of the following material flow issues are implemented within your firm in order to improve the performance of the firm. Please record your answer by ticking in the spaces provided, by the scale indicator

(S.A-Strongly Agree, A-Agree, N-Neutral, D-Disagree S.D-Strongly Disagree) Tick as appropriate.

		SA	A	N	D	SD
a)	We frequently experience logistical, barriers in trade routes , language and cultural difficulties as materials flow along the supply chain	□	□	□	□	□
b)	The flow of materials is often disrupted due to lack of information and finances	□	□	□	□	□
c)	We always select our suppliers competitively	□	□	□	□	□
d)	When sourcing internationally, we experience disruptions in material flows due to long lead times, terrorism, quality risk (non compliance)	□	□	□	□	□
e)	We rarely engage suppliers based on competitive basis	□	□	□	□	□
f)	Our suppliers postpone processing of our orders in case of changes in demand	□	□	□	□	□
g)	We consider the flexibility of the suppliers when selecting them to ensure that the manufacturing processes are agile	□	□	□	□	□
h)	We rarely are not able to keep pace with new products in the market because our suppliers do not adjust easily	□	□	□	□	□
i)	We maintain Economic Order Quantities (EOQ) monitored by our system	□	□	□	□	□

We use ICT to do the following in preventing material flow risk (tick (√) all that apply)

a. Conduct Market research [ ]

b. Supplier selection [ ]

c. Price volatility monitoring [ ]

d. Capacity management [ ]

e. Collaboration with customers and suppliers [ ]

f. Any other……(specify) [ ]

Please suggest how your firms can employ reduce the risks of materials flow in order to improve the performance of a firm

……
……
……

……
……**Organization characteristic risk**

Please indicate the extent to which each of the following organization characteristic issues are implemented within your firm in order to improve the performance of the firm. Please record your answer by ticking in the spaces provided, by the scale indicator (**S.A-Strongly Agree, A-Agree, N-Neutral, D-Disagree, S.D-Strongly Disagree) Tick as appropriate.**

Organization characteristic Risks	SA	A	N	DA	SD
Employee size					
a) In this company, we have too many employees unnecessarily	□	□	□	□	□
b) Our recurrent expenditure is high due to too many employees	□	□	□	□	□
c) We have a lot of logistical challenges due to too many employees	□	□	□	□	□
Location					
d) Most of our company branches are located in areas that have poor road networks	□	□	□	□	□
e) We often experience delays because some of our materials are shipped from our companies	□	□	□	□	□
Firm ownership					
f) Decisions are often made after consultation by the board of management	□	□	□	□	□
g) Our company is jointly owned with foreign investors who are involved when making decisions	□	□	□	□	□

Please suggest how your firms can employ reduce the risks of organization characteristics in order to improve the performance of a firm

……
……
……
……

ICT Vs Firm Performance

To what extent do you agree with the following statements relating to ICT using the scale? (**S.A-Strongly Agree, A-Agree, N-Neutral, D-Disagree S.D-Strongly Disagree) Tick as appropriate**

	SA	A	N	D	SD
a) ICT use to share supply chain information has increased our sales volume	□	□	□	□	□
b) ICT use in supply chain decision making often increases profits	□	□	□	□	□
c) ICT use in information sharing reduces sales volume	□	□	□	□	□

d)	The computers in the supply chain department are not adequate to monitor sales volume	□	□	□	□	□
e)	We use ICT in our tendering to reduce costs	□	□	□	□	□
f)	Use of ICT in Planning systems aids in inventory forecasting which increases customer satisfaction	□	□	□	□	□
g)	We have received training on supply chain management system in the last six months to monitor the sales volume	□	□	□	□	□
h)	Our ICT skills have enabled us to manage distribution and value chain activities	□	□	□	□	□
i)	Every one appreciates the use of ICT to manage supply chain risks due to the training that we have received	□	□	□	□	□
j)	Our ICT data is always encrypted when being transmitted to suppliers and customers	□	□	□	□	□
k)	We use text messages to post information on Annual General Meetings	□	□	□	□	□
l)	We use internet to communicate to our suppliers	□	□	□	□	□
m)	Whatsup is the communication method of sending quotations to suppliers	□	□	□	□	□
n)	Our tenders are always placed in our website	□	□	□	□	□
o)	We post the winners of the tenders and the amounts allocated in our website	□	□	□	□	□

We use ICT to do the following (tick (√) all that apply)

a. Share information [ ]

b. Make supply chain decisions [ ]

c. Place orders [ ]

d. Evaluate suppliers [ ]

e. Tender application [ ]

f. Managing logistics [ ]

g. Manage stock levels [ ]

h. Any other……(specify)

Please suggest how your firm can employ ICT in order to reduce risks along the supply chain and enhance the performance of the firm……
……
……

Firm Performance

To what extent do you agree with the following statements related to the performance of the firm using the scale? (**S.A-Strongly Agree, A-Agree, N-Neutral, D-Disagree, S.D-Strongly Disagree) Tick as appropriate.**

Firm Performance	SA	A	N	DA	SD
h) Our profits has steadily increased over the last three years	□	□	□	□	□
i) Our market share has increased by over 50% in the last five years	□	□	□	□	□
j) The number of products that we sell has also increased during the past three years	□	□	□	□	□
k) We are constantly monitoring the exchange rates of the currency that we use	□	□	□	□	□
l) Our expenditures on procured items has greatly reduced	□	□	□	□	□
m) We has opened more branches in the last five years	□	□	□	□	□
n) Over 60% of our employees have been employed in the last two years	□	□	□	□	□
o) The number of customers refereed to our products has increased by at least 50% in the last three years	□	□	□	□	□
p) The number of complaints by customers has reduced by at least 70% in the last three years	□	□	□	□	□
q) The level of customer satisfaction has been on the rise in the last five years	□	□	□	□	□

Please suggest other ways which you can rate the performance of your company……
……
……
……..

Firm Performance and information flow risk, financial flow risk, material flow risk, organization characteristic risk and ICT

To what extent do you agree with the following statements using the scale? (**S.A-Strongly Agree, A-Agree, N-Neutral, D.A-Disagree, S.D-Strongly Disagree) Tick as appropriate.**

Firm Performance vs Information flow risk	SA	A	N	DA	SD
a) The high levels of inventory can be attributed to lack of information	□	□	□	□	□
b) Our customers are dissatisfied due to lack of accurate information	□	□	□	□	□
c) Our distribution system is not accurate due to lack of logistical information	□	□	□	□	□

d)	Collaborative planning and forecasting have not been possible due to Information in connectivity	□	□	□	□	□
e)	Our customers do not pay for their products on time which leads to untimely payment of the suppliers	□	□	□	□	□
f)	Exchange rate risks have not affected the way the firm sources for the materials	□	□	□	□	□
g)	Managing the financial failure risks of the suppliers is not priority for an organizations	□	□	□	□	□
h)	The cash flow of the firm has been affected due to lack of technology	□	□	□	□	□
i)	We delay customer orders due to material flow disruption	□	□	□	□	□
j)	We single source our suppliers	□	□	□	□	□
k)	Our suppliers are not able to adjust to changing market conditions for example, drop in demand	□	□	□	□	□
l)	Lack of supplier capacity has led to lost sales	□	□	□	□	□

Please suggest other ways which you can rate the performance of your company as affected by information flow risk, financial risks, materials flow risk and how ICT has contributed to the effect of these risks on the performance of the firm…….

……
……

THANK YOU

Appendix IV: List of sampled manufacturing firms in Kiambu County, Kenya

1. Jasper ltd
2. Vallem Construction Ltd
3. Kels Chemical Ltd
4. Superfoam ltd
5. Alliance One Tobacco Kenya Ltd
6. Umoja Flour Mills Ltd
7. Vinepack Industries Ltd
8. Sunny Processors Ltd
9. Palmhouse Dairy Ltd
10. Nicey Nicey Millers Ltd
11. Mama Maize Millers
12. Mayfeeds Kenya Ltd
13. Kevian Kenya Ltd
14. Mjengo Limited
15. Munyiri Special Honey Ltd
16. Mount Kenya Bottlers Ltd
17. Lari Dairies
18. Mafuko Industries Ltd
19. Bidco Oil Refineries Ltd
20. Kenya Nut Ltd
21. Broadway Bakery Ltd
22. Brookside Dairy Ltd
23. Caffe Del Ducca Ltd
24. Jetlak Foods Ltd
25. Highlands Mineral Water Co. Ltd
26. Githunguri Dairy Farmers Cooperative Society
27. Capwell Industries Ltd
28. Centrofood Industries Ltd
29. Coffee Agriworks Ltd
30. Del Monte Kenya Ltd

31. Kenblest Limited
32. Brookside Diary
33. European food
34. Fresh Au Juice Ltd
35. Delmonte Kenya Ltd
36. Sky foods
37. Leather Industries of Kenya Limited
38. Data Shoe Company
39. Footplus (K) LTD
40. Aluminum Manufacturers Ltd
41. .Booth Extrusions Limited
42. Devki Steel Mills
43. Nampak Kenya Ltd
44. Ravenswood Ltd
45. Kenya Vehicle Manufacturers Limited
46. Autoxpress
47. East African Paper Mills Ltd
48. Benmed Pharmaceauticals Ltd
49. Medivet Products Ltd
50. Universal Corporation Ltd
51. Medisel Pharmaceuticals Ltd
52. Benmed Pharmaceuticals Ltd
53. Acme Containers Ltd
54. Ombi Rubber Rollers Ltd
55. Dune Packaging Ltd
56. Bata Shoe Company Ltd
57. Belsize Industries
58. Blue Sky Ltd
59. Kenrub Ltd
60. Princeware Africa (Kenya) Ltd
61. Red Lands Roses Ltd
62. World Plastic Ltd

63. Alpha Knits Limited
64. Kenwear Garments Ltd
65. Spinners & Spinners Ltd
66. Thika Cloth Mills
67. Top Pak Industries Ltd
68. Trust Feeds Ltd
69. Trust Flour Mills
70. Busara Feeds
71. Neema Farm Products ltd
72. Juja pulp
73. Red lands Roses Ltd
74. Farm Refrigeneration and electrical system
75. Balozi Industries
76. Box Pack Ltd