

**INFORMATION SHARING AND SUPPLY CHAIN
RESPONSIVENESS OF MANUFACTURING FIRMS LISTED AT
NAIROBI SECURITIES EXCHANGE, KENYA**

ABDIRAHMAN SHAKIR ALI

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DECLARATION

This project is my original work and has not been submitted for an award of a degree in this or any other University.

Signature _____

Date _____

Abdirahman Shakir Ali

D61/87840/2016

This project has been presented and submitted for examination with my approval as the University Supervisor.

Signature _____

Date _____

Dr. Ombati Ogoro Thomas

School of Business,

University of Nairobi

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I give thanks to Allah for giving me the strength and opportunity to come this far.

Special appreciation also goes to my supervisor Dr. Ombati Thomas for his guidance, encouragement and support throughout my project.

DEDICATION

This project is dedicated to my lovely wife, my parents , siblings and to all my family members for their continuous support, love and care.

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ABBREVIATIONS AND ACRONYMS

GDP	Gross Domestic Product
IS	Information Sharing
KAM	Kenya Association of Manufacturers
NSE	Nairobi Security Exchange
SPSS	Statistical Package for Social Sciences
SCR	Supply chain Responsiveness
SRM	Supplier relationship management

ABSTRACT

Information has turned out as one of the vital asset that enhances supply chain responsiveness helping an organization to effectively meet customers' needs. The study sought to determine the effect of information sharing on supply chain responsiveness of listed manufacturing firms at the Nairobi Securities Exchange. Specifically, the study focused on identifying extent of information sharing among manufacturing firms listed at Nairobi Securities Exchange, establishing the relation between information sharing, and supply chain responsiveness of manufacturing firms listed at Nairobi Securities Exchange and establishing the barriers to information sharing among manufacturing firms listed at Nairobi Securities Exchange. The study targeted 9 firms listed at the Nairobi Securities Exchange and census was used. The study gathered primary data using questionnaires and the analysis was done with use means, standard deviations and regression analysis. It was established that the extent which firms share information across supply chains is determined by the implementation of information sharing, quality of the information shared, the type of information shared and the technologies used in sharing of this information. It was shown that information sharing has positive and significant effect on supply chain responsiveness. Some of the barriers during information sharing include information leakages and the heavy costs. The study concludes that information sharing has significant effect on supply chain performance of the firm. The study recommends that industry players in the manufacturing sector should work closely to enhance the information quality that is shared by the members in the industry with other suppliers. The key limitation faced in the study was that respondents were busy during the data collection exercise and it was not possible to gather data in a day. To prevail over this limitation, a drop and pick latter method was adopted in distribution of the study items. Assurance was also provided to respondents that information given was only to be used for academic purpose and no one was to be victimized for sharing the information sought.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Currently, organizations are faced with a challenge of ensuring smooth flow of their supply chain operations because of the changing forces of environment (Ha, Tian & Tong, 2017). Although a firm may have influence on its internal environment, the level of influence of the firm on its macro forces of environment like suppliers is limited. Suppliers of an organization are part of these external environmental factors that a firm may not directly control hence the need to cultivate and grow good relationship (Singh, 2015). Wachira (2013) argues that the efficiency of such relationships are informed by how information flow between the firm and its stakeholders such as suppliers, hence, the concept of information sharing. Currently, information has turned out to be one of the assets that help organizations to improve their supply chain responsiveness (Cai, Huang, Liu, & Liang, 2016). The timely flow of information helps an organization to reduce costs and lead times thus effectively meet the needs and wants of customers hence supply chain responsiveness (Rucha & Abdallah, 2017).

The systems theory and the stakeholder theory were used to underpin the study. The systems theory views an organization as sets of components that are interlinked such that they collectively work in unity in realization of the set goals. As such, the interaction and functioning of parts within the systems determine the properties of the system itself (Ahrne, 1994). The stakeholder theory on the other hand argues that firms relates with many stakeholder groups such as suppliers, employees, customers and lobby groups

(Freeman & Evan, 1991). Information sharing is paramount for this relationship between the firm and its stakeholders.

1.1.1 Information Sharing

The rapid advancement in technology around the world has made it possible for firms to share information on a real time basis across the various units and functions (Lotfi et al, 2013). Information sharing (IS) within the supply chain is the degree at which proprietary or crucial information is availed to all members operating in supply chains. IS occurs when a firm is able to access data across supply chains resulting into collaboration which eliminates inefficiencies in the supply chain (Waithaka & Waiganjo, 2015). According to Njagi and Shalle (2016), the growing complexity of the relationship between buyers and suppliers complicates the information shared between crucial parties. To overcome these complexities, firms have implemented technologies like the internet and the electronic data interchange (EDI). These technologies facilitate easy flow of information between parties within the supply chain. Similarly, Waithaka and Waiganjo (2015) indicates that the key drivers of IS within the supply chain are the internet and the EDI by facilitating real time flow of data and information between entities and thus cost reduction.

In the supply chains, IS helps the firm to make timely and real time decisions making an organization to respond to customer demands on time (Singh, 2015). It is through information sharing that firms are able to meet demand uncertainties. Information sharing helps an organization to meet orders by customers in time (Wachira, 2013). Furthermore, information sharing helps an organization to have real time information on when to place orders and replenish stock levels. Replenishment is an important decision because it helps an organization to reduce stock outs (Waithaka & Waiganjo, 2015).

According to Lancaster and Uzzi (2003), the information to be shared can either be private or public. Unlike private information, public information is available in public domain for verification by third parties. Due to the multidimensional nature of information sharing, Madlberger (2012) came up with four operational measures namely the type of information shared, the frequency of information to be shared, the detail of the information to be shared and the 'up-to-datedness' of the information to be shared. These four dimensions are collectively seen as determinants of the extent of quality of the shared information in supply chains. Information sharing according to Sahin and Robinson (2005) manifests itself in different amounts and levels within the supply chain. Wu, Chuang and Hsu (2014) consider information sharing in terms of benefits/value of IS, technologies supporting IS, the information quality shared, and shared information content.

1.1.2 Supply Chain Responsiveness

The increasingly competitive environment requires that firms should be responsive enough in order to survive (Kumar & Kumar, 2017). Supply chain responsiveness (SCR) is the degree with which partners are able to timely respond to the ever changing business environment. SCR is the propensity of the firm to act on the basis of the generated information. According to Kim and Chai (2017), supply chain responsiveness requires access to market information with respect to competitors of the firm. Fayezi, Zutshi and O'Loughlin (2017) view SCR as the capability of a firm being flexibly as well as simultaneously react to operational as well as strategic demands.

According to Kumar and Kumar-Singh (2017), supply chain responsiveness refers to how well the procurement activities in an organization are coordinated with information flow

between the parties in supply chains. SCR encompasses the flow of materials and knowledge as well as information between the supply chain parties. Measures of supply chain responsiveness include timely response to customer orders, timely replenishment, real time, flexibility and leanness (Bian, Shang & Zhang, 2016).

1 .1.3 Manufacturing Firms Listed at Nairobi Securities Exchange

Manufacturing firms operate by converting inputs into finished outputs that are demanded by consumers to generate revenue (Brandt & Morrow, 2017). Manufacturing firms in Kenya have come together under a lobby group called Kenya Association of Manufacturers (KAM) that voices the concerns and interests of their members (Naliaka & Namusonge, 2015). Manufacturing firms in Kenya operate in different sectors including the health, agriculture, transport and infrastructure and building and construction. As of December 2018, the manufacturing sector contributed 8.4 per cent to GDP of the country (KNBS, 2018). The manufacturing sector also contributes to over 15% of the overall employment in Kenya (KNBS, 2019). In fact, the manufacturing entities are currently some of the pillars of the Big-4 Agenda of the National government where the government anticipates improving the contribution of manufacturing sector to the GDP from 9.2% in 2016 to 15% by 2022 (Nimeh, Abdallah & Sweis, 2018). This however cannot be realized with the current challenges including inadequate capacities to invest in technologies that would facilitate information sharing with suppliers. These manufacturing firms are also under stiff competition and the changing tastes and preferences of customers who demand their manufactured products (Naliaka & Namusonge, 2015).

There are nine listed manufacturing entities in Kenyan context (Appendix I). These listed manufacturing firms operate in compliance with regulations by the Capital Market Authority besides the Kenya Association of Manufacturers (KAM), which is their lobby group (Magutu, Aduda & Nyaoga, 2015). These listed manufacturing firms have found them in highly competitively environment characterized by changing customers' needs and preferences. At the same time, majority of these listed manufacturing firms are faced with a challenge of increased demand uncertainty brought about inaccuracies in forecasting and inaccessibility to information (Yuen & Thai, 2017). Thus, to remain competitive and enhance their supply chain responsiveness, information sharing between these manufacturing firms listed at NSE and their suppliers is paramount and this forms the backbone of this current study.

1.2 Research Problem

Information has turned out as one of the vital asset that enhances supply chain responsiveness helping an organization to effectively meet the needs of customers (Hsin, Chang, Tsai & Hsu, 2013). Effective information sharing between the buying firm and its suppliers results into quality, responsiveness and cost savings which are summed up under supply chain performance (Leuschner, Rogers & Charvet, 2013). Firms today are not just interested in sharing information with suppliers but such information should be relevant and timely in making ordering and replenishment decisions hence greater supply chain responsiveness (Kembro, Näslund & Olhager, 2017).

Manufacturing firms operate by ensuring that raw materials are transformed into products that are demanded by various end users. For smooth flow of operations, there is need for constant supply of materials and the finished products should be demanded on a timely

basis (Liu, Ke, Wei & Hua, 2013). Today, manufacturing companies listed at NSE are under stiff competition with changing needs and demands of customer resulting into demand uncertainties. To overcome this challenge, listed manufacturing firms in Kenya ought to timely share information with suppliers.

Globally, Tan, Wong and Chung (2016) looked at information sharing and its influence on leakage of knowledge within the supply chain. IS was seen to have a direct interaction with SCR. Kembro, Näslund and Olhager (2017) conducted a study on IS and its influence on SCR. The study found positive interaction between information sharing and responsiveness. There emerge contextual gaps as these investigations focused on other developed countries away from Kenya.

Locally, Waithaka and Waiganjo (2015) investigated how cultivation of relationship between suppliers and buyers influences supply chain performance with references to state corporations. The study established that one way of establishing relationship with suppliers is through information sharing. This study however focused on state corporations and not specifically manufacturing firms hence a contextual gap. With reference to Kenya Red Cross, Kyalo and Omwenga (2018) looked at how IS influences ability of supply chains to perform. It was established that IS has an undeviating influence on the perform of supply chain. However, focused in humanitarian organization and not the manufacturing firms hence creating a contextual gap. While focusing on flower farms in Kenya, Bonuke (2015) assessed how IS moderated the interaction between the linkages in supply chains and their ability to perform. In this study, IS was used a moderating rather than an independent variables creating a methodological gap.

Therefore, in as much as a growing body of literature has focused on IS and SCR, some of these studies were carried out in different global contexts. Other studies linked information sharing and organizational performance and not with firm responsiveness. In response to these gaps, following research questions guided the study; what is the effect of information sharing on supply chain responsiveness of manufacturing firms listed at Nairobi securities exchange, Kenya?

1.3 Research Objectives

- i. To identify the extent of IS among manufacturing firms listed at Nairobi Securities Exchange
- ii. To assess the relationship between information sharing and supply chain responsiveness of manufacturing companies listed at Nairobi Securities Exchange
- iii. To establish barriers to information sharing among manufacturing companies listed at Nairobi Securities Exchange

1.4 Value of the Study

The management team Kenyan manufacturing entities would be able to strengthen on their information sharing practices for improvement in supply chain responsiveness. Policy makers like the Capital Market Authority and the Kenyan Association of Manufacturers would rely on the findings of the study in formulating the best rules and regulation that promote information sharing among firms in the manufacturing sector.

It will aggrandize the existing knowledge and literature about information sharing and how it influences supply chain responsiveness. This would help future researcher in conducting literature review on the related topic. By relying on limitations of the study,

future scholars would be able to invest in further studies which would grow the available level of knowledge.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This study will look at materials concerning IS and SCR. The chapter will start by looking at the theories that will support the interaction between IS and SCR. Besides the theories, literature will also be reviewed on the independent variables which covered IS and the dependent variable being SCR. The review of literature will be centered along the two specific objectives of the study that was IS and SCR. The conceptual framework is presented in this chapter clearly detailed with the independent variable being information sharing and the dependent variable being supply chain responsiveness.

2.2 Theoretical Foundation

The systems theory and the stakeholder theory supported the study as illustrated below:

2.2.1 Systems Theory

It is Shultz (1987) who advanced this theory where a system was deemed to an interaction of components that work together to attain the specified goals of the firm. Systems fall into two categories: either open or close. The underlying difference in these two types of systems lies in their ability to interact with their environment. Unlike the close systems, the open systems closely interact with their environments.

An organization as a social system (open system) takes resources from the environment which is transformed into final products. Communication is very crucial for the system to operate as it interacts with the environment. An organization cannot survive without suppliers (who are part of the outside or external forces). The relationship between an

organization and its supplier is supported by constant communication (Ali, Babai, Boylan, Syntetos, 2017).

The theory therefore shows how information sharing influences SCR. The partners along the supply chains can be recognized as the elements of the system and information sharing is critical for effective response to the needs of each party. System theory illustrates how IS across the supply chains make the entity to effectively respond to the needs in the environment.

2.2.2 Stakeholder Theory

It was Freeman in 1984 that developed this theory and it identifies key stakeholders who determine the success of the business. These stakeholders include employees, customers, lobby groups, investors the government and suppliers. Stakeholders are people who have an interest in the way an organization operates. Stakeholders according to Freeman (1984) are all those people who determine the survival and growth of the business. The theory has been criticized by a number of scholars. According to Williamson (1993), the theory mainly focuses on the financial and ethical aspects of the firm. Despite this criticism, the theory explains how the firm relates with suppliers as part of the stakeholders of the business.

This relationship between the entities and its trade payables is best supported by information sharing which is the mainly focus of the current study. Stakeholder theory has an implication that firms should relate well with its stakeholders including the suppliers. Fostering good relationship with suppliers requires proper flow of information which will be the central theme of this study. Hence, the theory will provide an explanation of how information sharing creates good interaction between an entity and its

stakeholders including the suppliers and how this influence supply chain responsiveness of the firm.

2.3 Information Sharing

Information sharing is where crucial information is distributed to people or systems within organizations. Madlberger (2009) established four dimensions of information sharing which are; the type (content), frequency, detail and up-to-datedness of the shared information. These dimensions were collectively established as determinants of the quality of the shared information (Ramanathan, Gunasekaran & Subramanian, 2011). Information sharing has been operationalized into its dimensions that include quality sharing of information, technologies in sharing information, information sharing implementation and type of data shared (Goswami, Engel & Krcmar, 2013). Each of these dimensions is indicated below.

Quality is a wider concept that has been defined differently by scholars. In the management of supply chain context, term quality is used to refer the capabilities that a company has in achieving the requirement of customers in vies of requirement specifications (Ramanathan & Gunasekaran, 2014). Information sharing quality can be measured and determined using various indicators including how relevant, accurate, complete, timely, coherent, accessible, compatible, available and valid the information is (Nudurupati, Bhattacharya, Lascelles & Caton, 2015).

Information sharing technology refers to the device or medium that facilitates the flow of information between parties. The key information sharing technologies include the point of sale terminals; the electronic data interchange (EDI) and the internet (Pettit, Croxton, & Fiksel, 2013). EDI is the widely applied IS technology in the supply chains. The other

key technologies that help in information sharing include relational Data Base Management System (DBMS), the Enterprise Resource Planning System (ERP) and wireless communications (Imad, Khufash, Hebah, Nasereddin, 2015).

Information sharing implementation focuses on the need for an organization to invest in sharing of information within their supply chains and the entire process of information sharing. According to Pereira, Christopher and Silva (2014), information sharing results into reduction in costs within the supply chain of an organization. Additionally, investment in IS would result into a reduction in lead times and batch sizes hence a reduction in operating costs (Kong, Rajagopalan & Zhang, 2017).

Diverse information is conveyed to members in a supply chain. The key details shared in the supply chain can be aggregated to include inventory information, sales data, sales forecast information, information on the orders, information on product availability, production and delivery schedules and capacity. The widely shared information in the supply chain is the one concerning inventories. Sharing information on inventories helps to reduce stock levels. Information on the sales can represent the actual level of demand from customers while reducing losses arising from shortages (Li, Fan, Lee & Cheng, 2015). Sharing information on inventories results into implementation of a vendor managed inventory system (VMI) where the firm relinquishes all activities of replenishment of inventories to suppliers. Information on order tracking helps the customer to accurately determine the status of the order (Lotfi, Sahran, Mukhtar, Zadeh, 2013). By leveraging on delivery schedule of the supplier, a manufacturing entity is able to enhance the production schedule in place (Kache & Seuring, 2014).

2.4 Supply Chain Responsiveness

Responsiveness is a measure of how well an organization attains the set goals and objectives. The measures of supply chain responsiveness include reduction in wastes, product quality and production efficiency and reduced cycle times. Pujawan (2005) offered costs, flexibility, responsiveness and reliability as key measures of supply chain responsiveness. Panayides and Lun (2009) noted that SCR can be operationalized into cost reductions, reliable delivery, quality improvement and process improvement. Supply chain responsiveness simply determines how well an organization is better placed to timely act to changes in its environment (Bruque-Cámara, Moyano-Fuentes & Maqueira-Marín, 2016).

Based on market information, McBeath, Jolles, Chuang, Bunger and Collins-Camargo (2014) argues that supply chain responsiveness constitutes two key sets of activities; response design (leveraging on market intelligence to formulate plans) and response implementation (relying on market intelligence for execution of such plans). Yu, Lo, and Li (2017) identify several key forms of responsiveness to cover selection of target markets, offering of goods that are aligned with the needs of the customers and distribution of products that meets consumer needs. Bruque-Cámara. (2016) views SCR as ability by the firm's to flexibly, and simultaneously react to operational as well as strategic demands.

According to Qi et al. (2017), firm responsiveness can be measured by how well the key activities within the supply chain system are coordinated. This covers coordination and flow of material, information, processes and knowledge. According to Flynn et al. (2016), the level of responsiveness has an influence on the degree and extent of

coordination within the supply chain systems. For instance, higher level of organizational responsiveness requires heavy sharing of information by parties in supply chains and proper flow of materials. Hoyt, Huq and Kreiser (2007) indicates that firm responsiveness can be reflected in the ability of the organization to timely fulfill orders and replenish inventories as well as an increase in flexibility in operations.

2.5 Information Sharing and Supply Chain Responsiveness

The interaction linking IS and SCR has emerged as a contiguous issue among scholars. In fact, information sharing has emerged as a critical mechanism that shape and enhance competitive edge of an organization (Kaemey, 2013), as it positively enhances the ability of the firm to be responsive (Hall & Saygin, 2012). In order to positively influence their supply chain responsiveness, Baihaqi and Sohal (2013) note that most firms have invested huge amount of in technologies including electronic data interchange for real time sharing of information across different functions.

Information sharing has been acknowledged as an important platform through which organizations are able to meet demand uncertainties hence positively influencing their supply chain responsiveness (Inderfurth, Sadrieh & Voigt, 2013). In line with the observation that IS directly results into SCR, Ellitan and Muljani (2017) opines that firms that have IS mechanisms are more responsiveness as compared to organization where information sharing within their supply chains is very poor.

Information sharing has emerged as a significant mechanism for firms in gain competitive merits. For instance, Marinagi, Trivellas and Reklitis (2015) argue that communication of information in supply chains is the only way that firms are surviving and enhancing their competitive merits in the dynamic business context. Responsive

organizations within an industry are deemed to be competitive as supported by Kumar, Pugazhendhi, Muralidharan and Murali (2018) who indicate that information sharing is one avenue of enhancing competitiveness of the firm and thus making it to be more responsive.

2.6 Barriers to Information Sharing among Manufacturing Firms

There are several barriers encountered during information sharing among manufacturing firms. Some of these barriers include ensuring that the shared information is confidential, issues with incentives, the cost and reliability of the information shared, regulations, accuracy and timelines of the shared information and establishment of capabilities that help firms to utilize the information shared. Proper information sharing requires the creation of a trusted network (Pettit, Fiksel & Croxton, 2010). This however may not be practical as supply chain partners may lack trust to each other hence limiting the flow of information. It requires a lot of time in gaining information on how to use information and communication systems for people within supply chains. Additionally, adequate information sharing should be supported by a user friendly interface. Having non user unfriendly system interfaces and inefficiencies may limit how information flows within supply chains.

The other barrier affecting IS is making sure that incentives of different partners are aligned. In essence, each party within supply chains may have feelings that the shared information may be misused for individual gain. Technology also stands out as a challenge in information sharing. This is because effective flow of information requires heavy costs in terms of technologies, it is risky and time consuming. Lack of confidentiality results into information leakage; where confidential information is shared

with external parties which would threaten the competitive edge of the company (Tan et al., 2016).

2.7 Summary of Literature and Knowledge Gaps

The summary of literature and research gaps is shown in Table 2.1. The Table has four columns covering the author, the study, the key results and the gaps that arise from the reviewed studies.

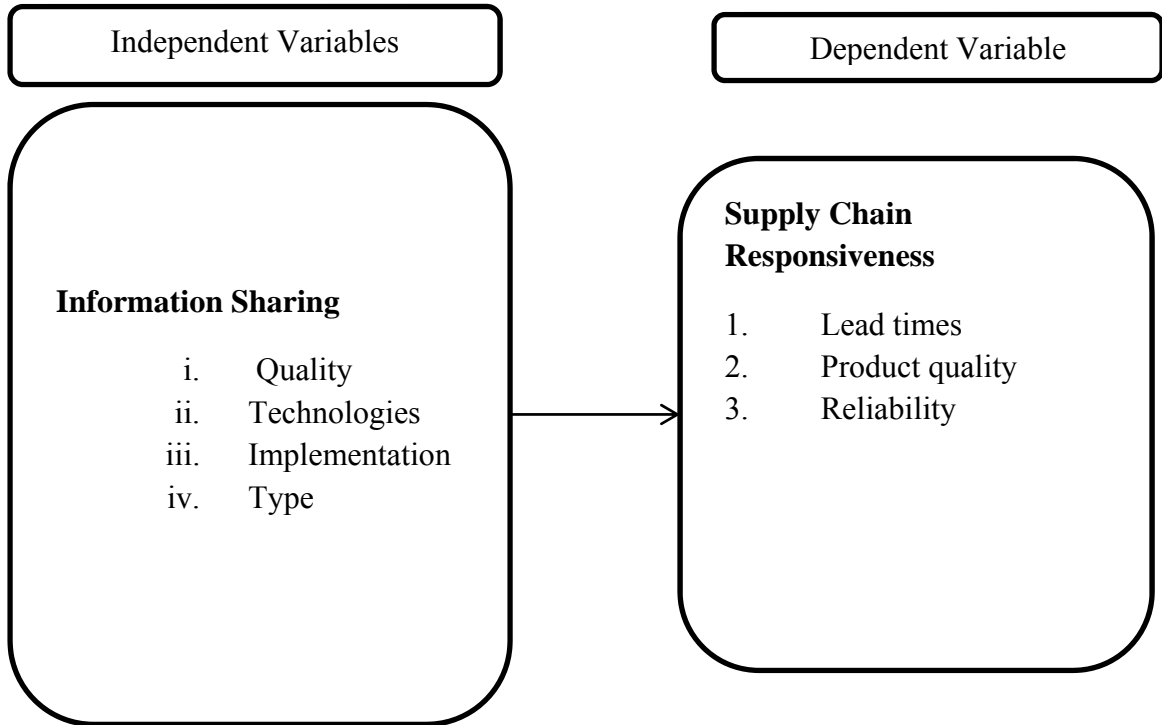
Table 2.1: Summary of Literature and Knowledge Gaps

Author	Study	Key Findings	Research Gap
Kumar et al. (2018)	How information sharing influenced supply chain performance.	Information sharing positively influenced supply chain performance.	The study was done in the Indian automotive industry and not in Kenyan context
Ellitan and Muljani (2017)	How information sharing and quality influenced supply chain performance.	Information sharing had significant effect on supply chain performance.	The study however focused on SMEs and not specifically listed manufacturing firm
Keitany et al. (2017)	the influence on cross functional information sharing on supply chain agility	Information sharing positively influenced supply chain agility.	The study focused on supply chain agility and not responsiveness hence conceptual gap
Kaemey (2013)	The analytical solutions of procurement	Procurement plays an important role as far as supply chain activities in the firm are concerned	The study was however done in Korea and not in Kenyan context

2.8 Conceptual Framework

From Figure 2.1, the independent variables of the study will be IS quality, IS technologies, IS implementation and IS type, while the dependent variable is supply chain responsiveness. Therefore, the study will be interested in establishing the effect of the independent variables (IS quality, IS technologies, IS implementation and IS type) on dependent variable (supply chain responsiveness). Responsiveness of supply chain has been operationalized as under lead times, product quality and reliability. Figure 2.1 presents proposed study conceptual framework.

Figure 2.1: Proposed Conceptual Framework



Source; Author (2019)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter outlines type of design that was utilized as well as targeted respondents. The chapter also outlines how the researcher sampled the population as well as reviewed the methods to be used in collecting data from the identified population. The chapter outlines how the collected data was analyzed.

3.2 Research Design

The adopted design was descriptive and Cooper and Schindler (2008) argues that such a design helps in giving an account of the way things exist in their status quo. A descriptive design helps in answering questions of what? Where? When? How? The design therefore helped the researcher to examine how information sharing has affected supply chain responsiveness of listed manufacturing entities in Kenyan context. Different scholars have used the descriptive research design. For instance, Khurana, Mishra and Singh (2011) used the descriptive design in establishing the barriers to information sharing among Indian manufacturing entities through use of interviews as well as questionnaires.

3.3 Population of the Study

Any list of items or individuals that are collected together with key features in common is said to be population (Ngechu, 2004). A total of 9 listed manufacturing entities in Kenyan context were targeted (Appendix II). All these firms were censured.

3.5 Data Collection

Information for the study was obtained from first hand sources with aid of questionnaires. Questionnaires facilitated the process of data collection. Questionnaires were used

because of their ability to contain fixed responses. Questionnaires were divided into sections based on key formulated study objectives. The items on the questionnaires were largely close ended so as to ease the process of analysis.

The respondents included supply chain managers, procurement officers and ICT managers. Supply chain managers were selected because they were responsible for decisions that enhance SCR of an entity. On the other hand, the procurement officers were responsible for decisions of long term acquisition of facilities in the firm and thus will deemed to have relevant information that the study will be sought. The inclusion criteria included the years of experience and the level of management. The selection of respondents was based on senior managerial levels. The study items were dropped and then collected at a later date. This offered an ample time to respondents to fill in the questionnaires.

3.6 Data Analysis

To conduct an analysis is about extracting meaning from the collected information so as to draw inferences, make conclusions and recommendations (Kothari, 2004). Data collected is usually in raw form and cannot help in decision making and thus requires to be analyzed. Before analysis of the collected data, the researcher first cleaned it and then code into SPSS.

The analysis was descriptively as well as inferentially. The adopted regression model took the following form.

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

Whereby:

Y = Supply chain Responsiveness

β_0 = constant

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ = coefficients of information sharing

X_1 = Information sharing quality

X_2 = Information sharing technologies

X_3 = Information sharing implementation

X_4 = Information sharing type

ε = Error term

3.6.1 Measurement of Variables

Table 3.3 shows how the variables of the study were measured;

Table 3.1: Measurement of Variables

Objective	Variables/Indicators	Scale of Measurement	Operationalization	Type of Analysis
To identify the dimensions of information sharing among manufacturing firms listed at Nairobi Security Exchange	<ul style="list-style-type: none"> Information sharing quality Information sharing technologies Information sharing implementation Information sharing type 	Ordinal Scale	Question 4 of questionnaire	Descriptive Statistics
To assess relationship between information sharing and supply chain performance of manufacturing firms listed at Nairobi Security Exchange	<ul style="list-style-type: none"> Information sharing Supply chain performance 	Ordinal Scale	Analyzed through inferential statistic	Correlation Analysis
To establish the barriers to information sharing among manufacturing firms listed at Nairobi Security Exchange	<ul style="list-style-type: none"> Lack of trust Heavy costs Information leakage Inability to align the incentives 	Ordinal Scale	Question 5 of questionnaire	Descriptive analysis

Source; Author (2019)

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings of the analysis on data that was gathered for the study. Questionnaires helped in gathering data and it was analyzed with the help of SPSS tool. The presentation of results was done using tables.

4.2 Response Rate

A total of 27 questionnaires were issued to procurement managers, supply chain managers and ICT managers of listed manufacturing entities. From these, 21 of them were completely filled and returned representing a response rate of 77.8%, and was deemed to be sufficient as supported by Mugenda and Mugenda (2003), argues that response rate above 70% is good for presentation of the results.

4.3 General Information

This section details general information findings from the respondents under study.

4.3.1 Gender Distribution

From Table 4.1, show that 76.2% were male while 23.8% were female. It can be inferred that there was gender diversity in the study and thus representative information was sought from the respondents.

Table 4.1: Gender Distribution

	Frequency	Percentage
Male	16	76.2
Female	5	23.8
Total	21	100.0

Source: Researcher, 2019

4.3.2 Level of Education

Table 4.2 indicates education levels with 52.4% as undergraduates, 33.3% were diploma holders, 9.5% were post graduate holders while 4.8% had other qualifications. Thus, it can be inferred that they were generally learnt, and had knowledge on IS and supply chain responsiveness as sought by the study.

Table 4.2: Level of Education

	Frequency	Percentage
Undergraduate	11	52.4
Diploma	7	33.3
Post Graduate	2	9.5
Other	1	4.8
Total	21	100.0

Source: Researcher, 2019

4.3.3 Years of Experience

Table 4.3 shows that about 71.4% had over 3 years of experience. This shows they were experienced, and thus were well conversant with information sharing mechanisms and how they affected supply chain responsiveness of their entity.

Table 4.3: Years of Experience

	Frequency	Percentage
3-6 Yrs	8	38.1
Less than 3 yrs	6	28.6
6-8 Yrs	4	19.0
Over 8 Yrs	3	14.3
Total	21	100.0

Source: Researcher, 2019

4.4 Information Sharing Among Manufacturing

The first study objective was identifying the extent of information sharing among manufacturing companies listed at the NSE in Kenya. The findings are as detailed in subsequent sections.

4.4.1 Information Sharing Implementation

The study sought to determine IS implementation among listed manufacturing firms in Kenya. From Table 4.6, overall score on information sharing implementation was (M=4.00), which shows that information sharing implementation was highly practiced in the studied manufacturing firms. The study noted that most of the firms had implemented information sharing mechanisms so as to reduce their operating costs (M=4.15), reduce batch sizes (3.95) as well as reduce lead times (M=3.91). Thus, firms implement information sharing mechanisms with clearly established goals.

Table 4.4: Information Sharing Implementation

Statements	Mean	Std. Dev
We share information with suppliers to reduce operating costs	4.15	.968
We have invested in information sharing to reduce batch sizes	3.95	.804
The company shares information with suppliers to reduce lead times	3.91	1.09
Overall Score	4.00	.954

Source: Researcher, 2019

4.4.2 Information Sharing Quality

The study aim was establishing the extent of information sharing quality among listed manufacturing companies in Kenya. From Table 4.4, the various statements on information sharing quality are supported by higher values of means, implying that

respondents agreed on these statements. The overall mean score is 3.86, which shows that respondents generally agreed on the fact that their firms practiced information sharing quality. Some of the highly valued qualities of information shared among the studied firms included reliability (M=4.08), relevance (M=3.97), accuracy (M=3.95) and adequacy (M=3.91). Hence, it proves that IS quality was a factor that influences information sharing among the studied firms.

Table 4.5: Information Sharing Quality

Statements	Mean	Std. Dev
We share reliable information with suppliers	4.08	1.05
The information we share with our suppliers is relevant	3.97	1.03
We share accurate information with suppliers	3.95	.862
Adequate information is shared between us and supply chain partners	3.91	.885
Timely information is shared between the company and suppliers	3.81	1.09
The company ensures that secure information is shared with suppliers	3.75	.968
We receive complete information from our supply chain partners	3.58	.812
Overall Score	3.86	.957

Source: Researcher, 2019

4.4.3 Information Sharing Type

The study focused on determining IS type among the listed manufacturing firms in Kenya. From the findings in Table 4.7, information sharing type had an overall score (M=3.85), show most of the respondents concurred on the statements under review. More specifically, most of the studied firms shared information on inventories (M=4.11), order tracking (M=4.01) as well as sales data (M=3.85). It can therefore be deduced that the studied firms shared various types of information with suppliers across their supply chains.

Table 4.6: Information Sharing Type

Statements	Mean	Std. Dev
The company shares inventory information with its suppliers	4.11	.885
We share information on order tracking to help customer accurately determine the status of their orders	4.01	1.06
We share sales data with suppliers determine the reorder level	3.85	.816
We share information on production and delivery schedules with suppliers	3.65	1.26
The company shares sales forecast information with its supply chain partners	3.63	1.03
Overall Score	3.85	1.010

Source: Researcher, 2019

4.4.4 Information Sharing Technologies

The study sought to determine the information sharing technologies used in IS among listed manufacturing firms in Kenyan context. From Table 4.5, the overall score is (M=3.81), which shows that respondents generally agreed on information sharing technologies in place among their respective firms. More specifically, the most commonly used information sharing technologies among the studied firms included internet (M=4.41) and electronic data interchange (M=3.99). This therefore implies that technologies played an important role as far as information sharing among the studied firms was concerned.

Table 4.7: Information Sharing Technologies

Statements	Mean	Std. Dev
We use internet to share information with suppliers	4.14	.645
We share information with supply chain partners through an electronic data interchange	3.99	.940
The company has an Enterprise Resource Planning System for sharing information with its suppliers	3.58	1.16
We use wireless communications to share information with suppliers	3.51	.862
Overall Score	3.81	.902

Source: Researcher, 2019

4.5 Supply Chain Responsiveness

An investigation of SCR was conducted among listed manufacturing firms in Kenya. According to Table 4.8, results overall mean was 3.82; showing that most of the respondents agreed on the different statements provided under supply chain responsiveness in their respective firms. Most of the respondents highly agreed on the fact that the quality of manufactured products had improved (M=3.93), lead times had dropped (M=3.88) and that production efficiency had improved (M=3.87) largely due to information sharing. Hence, it can be shown that information sharing has played an important role as far as supply chain responsiveness of the studied firms was concerned.

Table 4.8: Supply Chain Responsiveness

	Mean	Std. Dev
The quality of manufactured products has improved due to information sharing	3.93	.922
Lead times have significantly reduced due to information sharing	3.88	.812
Information sharing has increased production efficiency of the company	3.87	.992
We effectively respond to customer demand due to information sharing	3.73	.812
Information sharing has resulted into reliable delivery of raw materials from suppliers	3.67	1.08
Overall Score	3.82	.924

Source: Researcher, 2019

4.6 Information Sharing and Supply Chain Responsiveness

The study sought to establish relationship between IS, and supply chain responsiveness.

This objective was realized through use of regression analysis as detailed in subsequent sections.

4.6.1 Model Summary

It shows the coefficient of correlation R and determination R squared are shown in Table 4.9. The value of R in Table 4.9 is 0.896; showing that IS has a strong, and far reaching impact on supply chain responsiveness of the firm. The R square value is 0.803; which shows that the study model utilized was fit. The adjusted R square is 0.785; which infers that 78.5% change in supply chain responsiveness of the manufacturing firms listed at the NSE is explained by information sharing.

Table 4. 9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.896 ^a	.803	.785	1.41220

Source: Researcher, 2019

4.6.2 Analysis of Variance

ANOVA was done at 5% significance level and the findings presented in Table 4.10. The calculated F value is 16.304; meaning the model used was significant in discussing and establishing a valid explanation of the association. The value of significance represented by $p=0.000$ which is lower than 0.05; implying that IS has significant impact on supply chain responsiveness of the firm.

Table 4.10: ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	357.638	4	89.409	16.304	.000 ^b
Residual	87.750	16	5.484		
Total	445.388	20			

Source: Researcher, 2019

4.6.3 Regression Coefficients and Significance

Table 4.11 indicates the findings on the coefficients and P-values showing significance of the study variables. The predicted equation from Table 4.11 therefore becomes:

$$Y = 4.375 + .326X_1 + .273X_2 + .329X_3 + .304X_4$$

Where **Y** = Supply Chain Responsiveness

X_1 = Information sharing quality

X_2 = Information sharing technologies

X_3 = Information sharing implementation

X_4 = Information sharing type

Thus, at 5% significance level, the study noted that information sharing quality ($p < 0.05$) significantly affected supply chain responsiveness. IS technologies, IS implementation and IS type at ($p < 0.05$) were found to have significant impact on supply chain

responsiveness. Hence, the inference drawn from these findings is that IS has significant effect on supply chain responsiveness of the firm.

Table 4.11: Regression Coefficients and Significance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.375	2.031		2.154	.037
X ₁	.326	.098	.118	3.327	.021
X ₂	.273	.094	.317	2.904	.002
X ₃	.329	.115	.305	2.861	.015
X ₄	.304	.085	.449	3.576	.001

Source: Researcher, 2019

4.7 Barriers to Information Sharing

The study conducted an assessment of the barriers in IS among listed manufacturing entities in Kenyan context. Table 4.12 indicates the barriers in the information sharing among the studied firms. These barriers included information leakage that made confidential information to be accessed by unauthorized parties (M=4.03), heavy costs in terms of technologies that inhibited information flow between the organization and its supply chain partners (M=3.87), inability to align the incentives of different supply chain partners (M=3.68) and the issue of trust between the firm and the supply chain partners (M=3.58). Therefore, the full realization of the benefits of information among the studied firms had been affected by the inherent barriers that the study focused on.

Table 4.12: Barriers to Information Sharing

	Mean	Std. Dev
Information leakage makes confidential information to be accessed by unauthorized parties	4.03	.922
Heavy costs in terms of technologies inhibits information flow between the organization and its supply chain partners	3.87	.992
Inability to align the incentives of different supply chain partners limits the information flow between the organization and its supply chain partners	3.68	.697
Lack of trust between the company, and partners in the supply chain limits flow of information	3.58	.812

Source: Researcher, 2019

4.8 Discussion of the Findings

It was established that the studied firms shared information with other parties across the supply chains. This could be attributed to a number of factors where Lotfi et al. (2013) argues that the rapid advancement in technology around the world has made it possible for firms to share information on a real time basis across the various units and functions. The extent which these firm's information shared with other partners across supply chains is determined by their implementation of IS, value of IS, type of shared information and technologies of IS. All these are collectively described as dimensions of information sharing where Madlberger (2009) established four dimensions of information sharing which are; the type (content), frequency, detail and up-to-datedness of the shared information. According to Ramanathan et al., (2011), these dimensions were collectively established as determinants of the quality of the shared information.

It was established that information sharing implementation helps most firms in IS with other participators in supply chains so as to reduce on their operating costs, batch sizes as

well as lead times. This finding concurs with Pereira et al. (2014) who noted that information sharing results into reduction in costs within the supply chain of an organization. Furthermore, Kong et al. (2017) indicate that investment in IS would result into a reduction in lead times and batch sizes hence a reduction in operating costs. The study established that information sharing quality ensures that manufacturing firms share reliable, relevant, accurate and adequate information with other parties across supply chains. This results are echoed by Nudurupati et al. (2015), that information sharing quality can be measured and determined using various indicators including how relevant, accurate, complete, timely, coherent, accessible, compatible, available and valid the information is.

The study established that information sharing type ensures that firms share inventory as well as order tracking information and sale data with other parties in supply chains. Similarly, Li et al. (2015) observe that the key information shared in the supply chain can include inventory data, sales data, sales forecast information, information on the orders, information on product availability, production and delivery schedules and capacity. It is through IS technologies companies are able to eminent information with suppliers through the internet and electronic data interchange. This is in line with Pettit et al. (2013) who indicated that the key IS technologies include the point of sale terminals and the EDI as well as the use of internet.

The study established that information sharing has positive as well as significant effect on SCR of the firm. The finding is empirically supported by Tan et al (2016) who established a positive interaction between IS and SCR. Kembro et al. (2017) found positive interaction between IS and responsiveness. Kyalo and Omwenga (2018) found

that IS has a valuable and important impact on SCR. According to Inderfurth et al. (2013), IS has been acknowledged as an important platform through which organizations are able to meet demand uncertainties hence positively influencing their SCR. Ellitan and Muljani (2017) opines that firms that have IS mechanisms are more responsiveness as compared to organization where information sharing within their supply chains is very poor.

The study established that various barriers affect full adoption and implementation of information sharing among firms. Some of these barriers include information leakages that make confidential information to be accessed by unauthorized parties, heavy costs in terms of technologies that inhibit information flow between the organization and the other parties with supply chains. Pettit et al. (2010) identified some of the challenges in information sharing to include ensuring that information shared is kept as confidential as possible, issues with incentives, the cost and reliability of the information shared, regulations, accuracy and timelines of the shared information and establishment of capabilities that help firms to utilize the information shared.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

It presents a concise of the analyzed findings, conclusions and recommendations to this study along with proposals for further studies informed by the study objectives.

Conclusions are based on informed key study results as well as formulated objectives, while recommendations arise from the key analysis findings. Study limitations and areas which should be considered in future are also discussed in detail in this chapter.

5.2 Summary

It was based on determining the effect of information sharing on supply chain responsiveness of manufacturing entities listed at the NSE. Summarized study results are presented in this section.

The first objective of the study was establishing the extent of information sharing among manufacturing firms listed at the NSE in Kenya. The research revealed extent of IS among manufacturing firms include IS implementation, IS quality, information sharing type and IS technologies. In view of IS implementation, it was established that most of the studied firms shared information with suppliers so as to reduce their operating costs, reduce batch sizes as well as reduce lead times. On the basis of IS quality, it was established that reliability, relevance, accuracy and adequacy determined the quality of information of the studied firms shared with other partners across their supply chains. Based on IS type, the study established that most studied entities shared information on inventories order tracking as well as sales data. With reference to IS technologies, it was

shown that the most commonly used information sharing technologies among the studied firms included interchange in internet, and electronic data.

The study sought to determine association between information sharing and supply chain responsiveness. From the results, IS quality has positive and significant effect on SCR. IS technologies were found to have a valuable and significant effect on SCR. IS implementation was established to have positive and significant effect on SCR. The study established that IS types have positive and significant effect on SCR.

The last objective sought to determine the barriers in IS among manufacturing firms. The key identified barriers included information leakage that made confidential information to be accessed by unauthorized parties, heavy costs in terms of technologies that inhibited the flow of information between an entity and its supply chain partners, inability to align incentives of different supply chain partners, and the issue of trust between firm, and supply chain partners.

5.3 Conclusion

Most of the manufacturing firms in Kenya do share information with suppliers across the supply chains. Implementation of IS, the shared information quality, shared information type and the technologies of IS all determine and shape the extent to which firms share information with other supply chains parties. IS implementation helps most businesses in sharing data with other partners in supply chains so as to reduce on their operating costs, batch sizes as well as lead times. Information sharing quality ensures that manufacturing firms share reliable, relevant, accurate and adequate information with other parties across supply chains. Information sharing type ensures that firms share inventory as well as order tracking information and sale data with other parties in supply chains. It is through

IS technologies that organizations can share information with suppliers through the internet and electronic data interchange.

It emerged from the findings that IS quality has valuable and important impact on SCR. IS technologies have a positive and significant effect on SCR. IS implementation, and IS types have positive, and important effect on SCR. Hence, IS has valuable and important effect on SCR of the firm.

Majority of the companies don't realize the full potential of information sharing on enhancing their supply chain responsiveness due to some barriers. Some of these barriers include information leakages that make confidential information to be accessed by unauthorized parties, heavy costs in terms of technologies that inhibit the flow of information between the organization and the partners in the supply chains. Inability to align the incentives of various partners in supply chains and trust issues between firm and partners in a supply chain are other identified barriers in information sharing among firms.

5.4 Study Recommendations

Information sharing across the supply chain partners is a key factor influencing SCR of the firm. Although most of the manufacturing firms are sharing information with suppliers, more is required for optimization of on their SCR. This study recommends that industry players in the manufacturing sector should cooperate to enhance the quality of information shared by the members in the industry with other suppliers.

Majority of the firms are faced with challenges as they try to share information with other parties across supply chains. Of major concern is the issue of information leakage which

adversely affects the confidentiality of the shared information. Thus, the study recommends for measures to be adopted including encrypting the shared information so that no unauthorized third parties may open the leaked information.

5.5 Limitations of the Study

Conceptually, the investigation looked at IS and CSR. To operationalize IS, the study used IS quality, IS type, IS implementation and IS technologies. In this case, independent variable was information sharing while the dependent variable was SCR.

Theoretically, the study was limited to systems theory and the stakeholder theory. The systems theory was key since it provided the rationale as to why partners supply chain should cooperate and thus share information for optimizing supply chain responsiveness of their respective firms. The RBV theory on the hand was used to explain the role played by resources as far as IS by parties in supply chains is concerned.

Contextually, the Kenyan manufacturing sector was covered. Specifically, the study looked at listed manufacturing entities. The rationale for use of manufacturing sector was that it is one of the pillars of Big-4 Agenda of the national government. The study covered 9 companies listed at NSE in Kenya.

5.6 Areas for Further Research

The present study established information sharing explains 78.5% change in supply chain responsiveness of the firm. Therefore, meaning there still exist opportunities for future research on other factors variables including SRM that influence supply chain responsiveness of the firm.

The study recommends further research to be conducted in other economic sectors away from the manufacturing sector. These other sectors would include the service firms like insurance, banking entities as well as real estate firms. Future studies can also be conducted in public sector firms including the commercial state corporations that are facing challenges with performance.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

Kindly fill this questionnaire on **INFORMATION SHARING AND SUPPLY CHAIN RESPONSIVENESS OF MANUFACTURING FIRMS LISTED AT NAIROBI SECURITIES EXCHANGE**. The information you give will only be used for academic purpose.

SECTION A: GENERAL INFORMATION

1. Kindly indicate your gender

Male ()

Female

2. What is your highest level of education?

Diploma ()

Under graduate ()

Post graduate ()

Other.... Specific

3. How long have you worked in the current company?

Less than 3 years ()

3-6 Years ()

6-8 Years ()

Over 8 Years ()

SECTION B: EXTENT OF INFORMATION SHARING AMONG MANUFACTURING

4. Below are several statements on extent of information sharing. Kindly indicate the extent of your agreement with each of these statements on a five point Likert scale where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree.

INFORMATION SHARING QUALITY					
Statements	1	2	3	4	5
We share reliable information with suppliers					
The information we share with our suppliers is relevant					
We share accurate information with suppliers					
Timely information is shared between the company and suppliers					
The company ensures that secure information is shared with suppliers					
Adequate information is shared between us and supply chain partners					
We receive complete information from our supply chain partners					
INFORMATION SHARING TECHNOLOGIES					
Statements	1	2	3	4	5
We share information with supply chain partners through an electronic data interchange					
We use internet to share information with suppliers					
The company has an Enterprise Resource Planning System for sharing information with its suppliers					
We use wireless communications to share information with suppliers					
INFORMATION SHARING IMPLEMENTATION					
Statements	1	2	3	4	5
The company shares information with suppliers to reduce lead times					
We share information with suppliers to reduce operating costs					
We have invested in information sharing to reduce batch sizes					
INFORMATION SHARING TYPE					
Statements	1	2	3	4	5
The company shares inventory information with its suppliers					
We share information on order tracking to help customer accurately determine the status of their orders					
We share sales data with suppliers determine the reorder level					
We share information on production and delivery schedules with suppliers					
The company shares sales forecast information with its supply chain partners					

SECTION C: BARRIERS TO INFORMATION SHARING AMONG MANUFACTURING FIRMS

5. Given are several barriers in information sharing. Kindly indicate the extent of your agreement with each of these statements, use a 1-5 scale where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree.

	1	2	3	4	5
Lack of trust between the company and supply chain partners limits the flow of information					
Heavy costs in terms of technologies inhibits the flow of information between the organization and its supply chain partners					
Information leakage makes confidential information to be accessed by unauthorized parties					
Inability to align the incentives of different supply chain partners limits the flow of information between the company and its supply chain partners					

SECTION D: SUPPLY CHAIN RESPONSIVENESS

5. Kindly indicate the extent of your agreement on the following statements on supply chain responsiveness. Use a 1-5 scale where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree and 5=strongly agree.

	1	2	3	4	5
Lead times have significantly reduced due to information sharing					
We effectively respond to customer demand due to information sharing					
Information sharing has increased production efficiency of the company					
The quality of manufactured products has improved due to information sharing					
Information sharing has resulted into reliable delivery of raw materials from suppliers					

THANK YOU

APPENDIX II: MANUFACTURING FIRMS LISTED AT NAIROBI SECURITIES

EXCHNAGE

1. B.O.C Kenya Ltd
2. British American Tobacco Kenya Ltd
3. Carbacid Investments Ltd
4. East African Breweries Ltd
5. Mumias Sugar Co. Ltd
6. Unga Group Ltd
7. Eveready East Africa Ltd
8. Kenya Orchards Ltd
9. Flame Tree Group Holdings Ltd

Source; (NSE, 2019)