

**INFORMATION SYSTEMS AND SUPPLY CHAIN INTEGRATION  
IN MANUFACTURING INDUSTRY IN KENYA**

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## DECLARATION

I declare that this is my original work and it has not been presented for moderation in any other university.

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Thank you all and God Bless you

## **DEDICATION**

This work is dedicated to my Mum Resila Chelimo, my dad Mangusho Chelimo, my brother Len Koskei and my sister Caren Chebet. May God grant you a long life full of joy. I am forever indebted to you.

## ABSTRACT

Manufacturing firms as a long-time leading in competitive edge in business. Manufacturing industry have realized the importance of SC integration through the use of IT which as enable them achieve value of the firm by reducing cost and maximize profit. The benefits however lie wide within integration circles that can allow expertise in SCM of manufacturing companies to interlink supply chain integration and the TI application according to Christopher and Towill (2000). There has been massive adoption of information systems by Kenyan manufacturing firms in a bid to achieve delivering just-in-time insights, standardization and seamless innovation for implementing new age solutions. The study's general objective was to find out the effect of information systems on supply chain integration by large manufacturing firms in Nairobi, Kenya. The study's specific objectives were; to establish the extent to which information systems has been adopted by large manufacturing firms in Nairobi, Kenya and to determine the effect of information systems on supply chain integration by large manufacturing firms in Nairobi, Kenya. This study was informed by the technology acceptance model and the resource based view. The study used the descriptive research design. The target population was the 230 large manufacturing firms in Nairobi County, Kenya upon which 70 were sampled. Primary data was collected from the respondents by use of self-administered structured questionnaires containing closed ended questions. The collected data was edited and coded and fed into the SPSS computer package version 23 to generate both descriptive and inferential statistics. The inferential statistics was undertaken by performing a regression analysis on the dependent variable (supply chain integration) and the independent variables (Electronic Data Interchange, Radio Frequency Identification Systems, Enterprise resource Planning, E-Procurement). The study found p values of 0.000 and 0.002 at 95% level of confidence on the relationship between information systems and supplier integration and information systems and customer integration respectively. This shows that the model adopted for this study was significant and that information systems statistically significant influence on supply chain integration by large manufacturing firms. It was concluded from the study that the firm had adopted to a large extent information systems including electronic data interchange and enterprise resource planning while they were yet to fully adopt others such as RFDI and E-procurement. The research recommends that the manufacturing firms should focus on improving their processes and linkages within the supply chain network through adoption of information systems. The companies should also put in place the precautions that come with adoption of information systems such as cyber crimes to avoid loss of fundamental information or business secrets.

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## **ABBREVIATIONS**

EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
IT	Information Technology
RFDI	Radio Frequency Identification System
SC	Supply Chain
SCI	Supply Chain Integration
SCM	Supply Chain Management
SPSS	Statistical Package for Social Sciences

# **CHAPTER ONE: INTRODUCTION**

## **1.1 Background of the Study**

Since the formation of supply chain management, integration of the varied external and internal components has been the primary objective (Min & Zhou, 2002; Lambert & Cooper 2000). Wu and Shen (2013) state that in order to facilitate financial success companies need to optimize SC integration through using IT technology hence leading to increase in customer service. To stay competitive most firms have achieved on collaboration and coordination among supply chain partners using IT in an approach called SCI. IT plays vital role in customers, manufactures, suppliers, integrating and distributors to satisfy the quantity and quality of products through SC process.

Manufacturing firms has for long-time been leading in competitive edge business. Manufacturing industry have realized the importance of SC integration through the use of IT which as enable them achieve value of the firm by reducing cost and maximize profit. The benefits however lie wide within integration circles that can allow expertise in SCM of manufacturing companies to interlink supply chain integration and the TI application according to Chrisopher and Towill (2000). There has been massive adoption of information systems by Kenyan manufacturing firms in a bid to achieve delivering just-in-time insights, standardization and seamless innovation for implementing new age solutions.

This study will be informed by the resource technology acceptance model and supported by the resource based view theory. The Technology Acceptance Theory implies that once

a customer is given alternative innovations, some factors affect their choices on the time of utilization and means which goes a long way to determining its apparent seen helpfulness and convenience while the resource based view theory states that an organization is endowed with certain resources which is of value, is rare, is hard to imitate and the organization has the capability to exploit it (VRIO qualities), then the resource permits the organization to achieve and sustain competitive advantage over its competitors

### **1.1.1 Information Systems**

In the current highly competitive and global environment firms need to improve their efficiency on the use of information technology. Information technology is the storage, processing, acquisition and dissemination of pictorial, vocal, numerical information and textual by telecommunications and microelectronics-based combination of computing.

Anyokoha (1991) observes that IT is the use of man-made communication tools, recording, exploitation of information, generation, recording and collection. IT in SCM is required to attain information sharing effectively beyond and across the organizations. IT can be integrated with supply chain through cost reduction, revenue growth and market expansion hence this will lead to firm competitive advantage. Technology therefore plays vital role in SC success . Previously without the application of internet organizations had challenges in obtaining information because it was difficult to send updates, receive or other vital information in a timely approach (Powerand Simon, 2004).

The strategic benefit of Information Technology lies in its capacity to develop value chain concept in any firm through creation of interdependent value activities constituting

aspects such as production, customers, suppliers, finance etc. Information Technology changes the value chain activities also the physical components of the product or process either through product differentiation or by lowering cost of value activities. IT can add value to the companies by increasing revenue or reducing cost. information technology can be transform by competition pace itself (Wahab, 2012).

### **1.1.2 Supply Chain Integration**

Literature on operations management purports that companies will perform effectively if they largely adopt SCI. The use SCI is organizational processes involves integrating customers, suppliers and internal functional units so as to boost performance of all players in the SC (Westbrook & Frohlich , 2001). Integrated supply chain can entails the integration of major business processes from end user through suppliers who provide services, product and information which add value for other stakeholders and customer (I CPE, 1994).

The integrated supply chain enables the firm to achieve significant cost savings and boost linkages in the supply chain networks and their stakeholders. SCM according to Cox et al (1995) is the function outside and within a firm that enables the value chain to provide customer services and make product.

Forward integration within manufacturing sector seek to gain proactive feedback of anticipated customer preferences, order quality and emerging new demand in order to trigger reactive strategies. Supply Chain Integration (SCI) is the recent strategy that is widely employed from different firms in supply chain to discuss how the growth strategy aligned and anticipate challenges that affects the companies. According to Lee (2003)

SCI dimensions are organizational relationship linkage, information sharing, resource sharing and coordination. Simatupang et al. (2002) expounds this framework by suggesting other mechanism required for the SCI processes of different firms in supply chain to discuss budgets, future product plans, anticipated challenges and growth strategies alignment.

Supply chain integration will enable the top professionals in this area to enable them coordinate all supply chain activities. This approach will lead to efficient activities such as development of supplier relationships, logistics and transportation, acquisition of goods, storage, among the primary activities managed in an integrated SC. Through integration there will be cost efficiency in the organization, whereby organization will be able to cut on cost of communication. SCI will collaborate across supply network, transparency of material flow and data analysis and real time communication. Manufacturing firm can be triggered by backward integration process that ensure suppliers of various raw materials implement strategies that positively impact the use of IT in SC, through integration of manufacturing firms.

### **1.1.3 Large Manufacturing Firms, Kenya**

Manufacturing sector is the corner stone of Kenya's industrial sector. Manufacturing sector it is not only seen as economy's engine of growth but also as a mean of diversifying it. There are key specific goals which has been set to steer industrial growth. They consist special Economic Zones development, industrial park, clusters and niche

product. The manufacturing industry is a major player in the Kenyan economy (Kenya Association of Manufacturers, 2013).

The wide range of investment opportunities in the sector such as garments, agro-processing, pharmaceuticals, the assembly of electronics and automotive components, chemicals, paper, plastics, metals, engineering materials for export and local consumption. vision 2030 role of manufacturing sector is the creation of employment and wealth. The manufacturing sector overall objective in the MTP is to increase its GDP contributions by at least 10% annually as forecasted in the vision 2030. Some of the constraints noted for example by Kirui (2005) include access to market, unfavorable regulations, inadequate access to finance, technology, poor infrastructure, and poor coordination of supply chain.

World Bank (2011) report on the current situation of the manufacturing firm competitiveness project, pointed that there has been decline in factor productivity and efficiency of capital in the sector. Given the different challenges facing the sector, more so with regards to increasing competition and liberalization has subjected Kenyan manufacturers to a lot of pressure on Kenyan manufacturers to reduce delays, demand for higher quality goods, increase customer service level and increase variety offerings. So as to attain these goals, understanding supply chain technology (SCT) is highly crucial Byrd and Davidson (2003).

Therefore, the objective that has to be done is to raise the products share in the regional market from 7% to 15%. In addition to high demand for locally manufacturing goods, regional markets are available for Kenya's manufactured goods due to its memberships of

the two regional economic blocs the COMESA and EAC. In 2004 the growth was 1.4% as compared to 1.2% in 2003 (www PricewaterhouseCoopers).

## **1.2 Research Problem**

The concepts of supply chain management and supply chain technology have drawn the attention of scholars as two distinct research fields, however few other scholars have combined those (Shen 2004). IT-integrated SC can easily manage information flows with main business processes, money, materials, contribute to firm margins by reducing coordination cost and improving quality (Sanders, 2002; Mabert *et al.*, 2001; Stroeken, 2000;). Quick information sharing and organization coordination is enhanced through integration of firms by the use of IT.

Manufacturing is one of the big four agenda that seek to drive Kenya towards being an industrialized country providing high quality of life to its entire population by 2030. This has compelled Kenyan manufactures to link with the global supply chains in order to explore new markets and expand their businesses. Manufacturing firms are utilizing information technology to accelerate information and product flows within the supply chain network

Different studies have been conducted on supply chain integration. Globally, McDonnell (2004) did an investigation on IT and SC and established that IT plays a crucial role in streamlining performance within the supply chain. Yunus (2014) undertook an experimental study on incorporation in Indonesian supply chain incorporation and the results were in line with previous studies related to positive relationships linking supply chain integration practices and firm performance. Didia & Nkowakah (2015) delved into



SCI and performance of business in the telecommunication industry in Nigeria. The findings showed that SCI associates with business performance in the Nigerian Telecommunication industry.

Locally, Nzuve (2013) studied implementation of e-procurement among THE private hospitals in Nairobi and established that supply chain integrations was influential in the implementation of E-procurement. Similarly, Abdow and Cherotich (2014) determined lean SCM practices of service industries in Kenya a case of KNH. The study found that KNH applied components of lean SCM such as reduction of waste to ensure clients do not spend much time as expected, reduce excess inventory and minimize unnecessary movement. More recently, Mideva (2019) conducted a study to explore the influence of integrated supply chain on performances of beverage manufacturing firms in Kenya. The findings revealed that purchasing practices, distribution practices, supplier partnerships and operations management have a significant and positive impact on performance of Kenyan food and beverage manufacturing firms.

From the foregoing, although various studies have been undertaken on supply chain technology, few studies has focused on the identification of the factors that influence Information technology on SC integration in Kenyan manufacturing sector. Thus the current study sought to bridge this important gap in knowledge by answering the research question; what is the impact of information Systems on supply chain integration by Kenyan manufacturing firms?

### **1.3 Research Objective**

The objective of this paper was to examine Information systems and supply chain integration in manufacturing industry in Kenya.

### **1.4 Values of the Study**

This survey will be useful to Kenyan manufacturing industry players as it will enable them assess their supply chain integration and realign them with new IT trends. This will enable them to identify areas of opportunities most especially the ones related to cost reduction and efficiencies within supply chain and benefits.

This study will highlight the interdependence between information technology and SC integration and how it is used in the manufacturing industries in Kenya. The research will also focus on identifying the challenges that incur when implementing the SCI and IT. Policy makers in the fields of information technology gain insights on how information technology can be used to boost supply chain integration.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This section looks at previous researches on IT and Supply Chain Integration. The chapter looked and presented literature and previous studies that had been conducted on uses of technologies and supply chain integration.

### **2.2 Theoretical Framework**

This section employs a review of theories on the study on Information Technology and Supply Chain Integration as commented by different authors worldwide. Two theories were reviewed in this section namely, technology acceptance model and the resource based view

#### **2.2.1 Technology Acceptance Model**

TAM was first advanced by Davis in 1986. This model is important in explaining and determining technological behavior (Chen Shing-itan and Chien-Yi 2011). Acceptance and rejection of technology can be used by this approach. The model implies that once a customer is given is exposed to alternative innovations, some components affect their choices on the time and means of utilization. This constitutes its apparently seen helpfulness and convenient. This was produced from the hypothesis of contemplated activity by social clinicals. In Davis' research, two fundamental parts are recognized; seen helpfulness and convenience (Davis, Pallister & Foxall, 2002).

Despite the importance of TAM being the foundation for theoretical underpinning in the study of use of technology and adoption it has numerous limitations which include the reason behind designing the model which is generality and parsimony (Strong & Dishaw,

1999), does not consider the firm's non-organizational setting (Davis & Venkatesh 2000), and neglecting the moderators of ICT adoption (Sun & Zhang, 2006). This Framework is applicable to the current research in that a firm is perceived to be beneficial by use of technologies in supply chain integration. TAM will document factors surrounding information technology in supply chain integration. These factors are size of company, organization structure and suppliers pressure.

### **2.2.2 The Resource Based View**

The research is supported by the RBV theory on how IT creates value through Supply Chain Integration (Zhu & Kraemer 2002, 2005). RBV focuses attention on organization internal resources as a mean of organizing process and obtaining competitive advantage. According to the model, suppose a certain resource is of value, is rare, is hard to imitate and the organization has the capability to exploit it (VRIO qualities), then the resource permits the organization to achieve and sustain competitive advantage over its competitors (Rothaermel, 2012). The proponents of RBV asserted that firms ought to look within the firm to find competitive advantage sources rather than focusing on the external business environment (Rotharmel, 2012).

This model is applicable to the current survey in that IT will be applied in SCI leading to cost reduction, revenue growth and market expansion hence competitive advantage to the manufacturing firm. Therefore, it is beneficial to the researchers to use intermediate dependent variables at the department and business process, (Hulland & Wade, 2004). In accordance to this perspective the study pays attention on the uses of technology, the nexus of IT enabled SCI to industry success. Cost reduction and revenue generation these

are the key parameters of improvements on process performance via SCI (Kekre 2002 and Mukhopa).

### **2.3 Information System and Supply Chain**

Most recent evidence demonstrates that companies obtain large benefits through application of IT. SC thinking has brought about revolution through internet. Unveiled major productivity gains from free information flow (Barua and Lee 1997). Other studies suggest that adequate evidence gathered on the positive impacts of IT that the productivity paradox considered as a forgotten myth (Mukhopadhyay., 1997).

The supply-and-demand chains across establishments has enhanced attempts to connect the reduce the cost of internet (Brooks & Davenport, 2004). Firms feel motivated in cost reduction purposes leading to increased supply chain efficiencies and enhanced network relationships and customer service. Supply chain(SC) is significant success factor for organization challenged by the globally sourced of proliferation, products, rapid technological change, improved functional integration, and weakened economies (Kerr, 2001). SC plays an important role in achieving competitive advantages for organization this enable companies meet market demand. A good SC is able to speed on the move of product in the market and cut on cost of goods movement from the source to customer.IT enable organization to improve the overall business operation in SC.

The most common technologies used in supply chain technologies used include Enterprise Resource Planning (ERP), transportation management system (TMS), Customer Relation Management (CRM), E-procurement, Distribution Resource Planning (DRP), bar-coding technologies, ERP and Radio Frequency Identification system (RFID), Supply Chain Planning (SCP), Electronic Commerce (E-commerce), Electronic supply

chain, smart card, demand forecasting management (DFM), warehouse management systems (WMS), Extranets and Supply chain planning (SCP).

### **2.3.1 Radio Frequency Identification Systems**

RFID technology depends on the use of tags which receive and emit the identify via unique serial numbers. It uses wireless connections via radio signals on the readers who collect the transmitted data to enable them forward to the information system of the company for future evaluation and analysis.

By RFID technology adoption, SC can be improved by productivity improvement, visibility of the customer needs, counterfeit identification, better tracking, cost reduction, theft prediction, reliable and accurate order forecast (Attaran, 2007). Amcor utilizes RFID for warehouse management (Micheal, 2005), Walmart started setting deadlines for supplier to start on use of RFID tags on their shipment in 2003 (Coronado, 2004). The RFID tag plays an important role in artificial security tags, which could be easily integrated into the existing chains. RFID also assist the company to avoid duplication due to unique and authenticated of tags. RFID reduce the fraud triggered chances manipulation in entry and free authorization from the suppliers to customers.

### **2.3.2 Enterprise Resource Planning**

This is a system which includes the core accounting undertakings of general ledger, account receivable and accounting payable coupled with logistics functions for management of the firm's distribution and manufacturing components. Farrington and Lysons and (2006) have described ERP as a management system that backed by

multimodal application software, integrates all the functions and departments of a business.

ERP systems are important in organization because it helps on integrating their SCM and automating. According to Edwards et al.,(2001), ERP system benefits in operational efficiency and reduce cost in organization. Most organizations today are using ERPs technologies to enhance competitive improvement and performance (Davenport & Brooks, 2004). The evolution of ERP took over the planning with creative thinking and continuous improvement for integration .

### **2.3.3 Electronic Data Interchange**

EDI is the computer interchange of structured, information and business documents in standard, data formats that can easily retrieved using machines. EDI was used to share transactional data within supply chain network through paperless communication (Garcia Lambert and Dastuge, 2007), transportation, inventory controlling, order processing, accounting, better customer service, increased productivity, quick access to information, competitive advantage, cost efficiency, expediting and better tracing, improved invoicing within out bound and in bound supply chain. EDI is important in absorbing the Bullwhip effect and supply chain firms can overcome fluctuations in demand and supply information through the use of technology to promote supply information and real-time information sharing.

### **2.3.4 E-procurement**

E-procurement applications exceed mere purchase online. A well implemented systems directly connects firms and business processes with suppliers while managing the

associations between them (Burt et al., 2003). An e-procurement can be integrated into larger purchase-to-pay (P2P) value chain towards computerized SCM. An e-procurement is done with a software applications that consists e-Auctioning, Vendor Management, e-Tendering DSL or fiber optics. According to a 1999 survey of over 200 global organizations by Deloitte Consulting (1999) some of reasons companies adopts e-procurement and their importance include: self-service approach, cost reduction transaction, and integrated supplier management.

#### **2.4 Measures of Supply Chain Integration**

Internal refers to integrating the organization's supply chain beyond the organization and includes external entities who are the supply chain players. Bowersox, Stank and Closs and (1999) classify integration is classified into six categories in the SC context which are; customer, measurement, technology and planning, internal, relationship , material and service supplier integration

In recent years however, companies enhance a competitive advantage in a highly competitive, dynamic marketplace, (Bagchi, & Larsen, 2002). Organizational relationship linkages involve performance measurement, channels of communication between the partners in the supply chain and sharing of the objectives and common visions. SCI is broadly viewed in terms of organizational and information integration. According to (Flores and O'Leary-Kelly, 2002), SCI is defined as the degree to which supply chain partners achieve mutual beneficial outcome by working together. The idea of leveraging linkages in the SC can be linked to Porter's value chain model which identifies the significant of exploring both inter firm linkages (Porter, 1985).



## **2.5 Empirical Review**

Different studies have been documented both globally and locally on the concepts of information technology and SCI. Nagery (2012) carried out a study on Information Technology and SCI strategy at British American Tobacco Kenya Ltd and found out that adoption of ICT at the company has increased the supplier's information processing capabilities. He also found that the automation business undertakings will reduce costs of the supplier and manufacturer relationship. Ijomba (2010) studied the effects of integrated supply chain on supply chain performance of Nairobi Bottlers and the major finding was that the organization benefited from integrated supply chain which was realized through increased customer satisfaction and profitability since being adopted. Ayugi (2007) sought to find out the efficiency and effectiveness of the Supply chain model in the Wrigley Company (East Africa) limited.

Mbaisi (2016) studied the effect of SCI on large manufacturing firms in Kenya. The survey used the descriptive research design in executing the study. A survey technique was adopted with the use structured questionnaires. The study established that the existence of strategic partnership between large manufacturing firms and their supplier is higher and they consult their suppliers through electronic platform on their value of the firm when they are being developed. There was existence of information sharing between firms and the suppliers so to improve quality, responsiveness and generally the firm's performance. It was established that cross-functional integration is significant to all supply chain initiatives and supplier integration

Magutu (2012) investigated challenges associated with adoption of Supply Chain Information Systems for inventory tracking among logistics service providers in Kenya and found that supply chain information system is important to improve on the inventory tracking, customer service and efficiency in business operations.

Gituro et al., (2007) investigated the supply chain management best practices used by large private manufacturing firms in Kenya. Nyakoe (2007) examined the adoption of ICT in human resource management among large manufacturing organizations in Nairobi, and established that large proportion of these enterprises have not fully adopted information communication technology in human resource management. These organizations attributed this to lack of sufficient financial, technical and employee skills.

Mose (2012) carried out a research of e-procurement adoption among Kenyan large scale manufacturers; The literature has shown several of studies have been done in the both locally and globally on IT and supply chain management issues separately, however among the studies reviewed none has sought to investigate the effect of information technology on supply chain integration among large Kenyan manufacturing companies. The main shortcoming of these studies has been their inability to aptly come up with an empirical link between the adoption of information technology and expansion of supply chain integration networks. This work therefore differs from previous works in terms of its scope.

## 2.6 Conceptual Framework

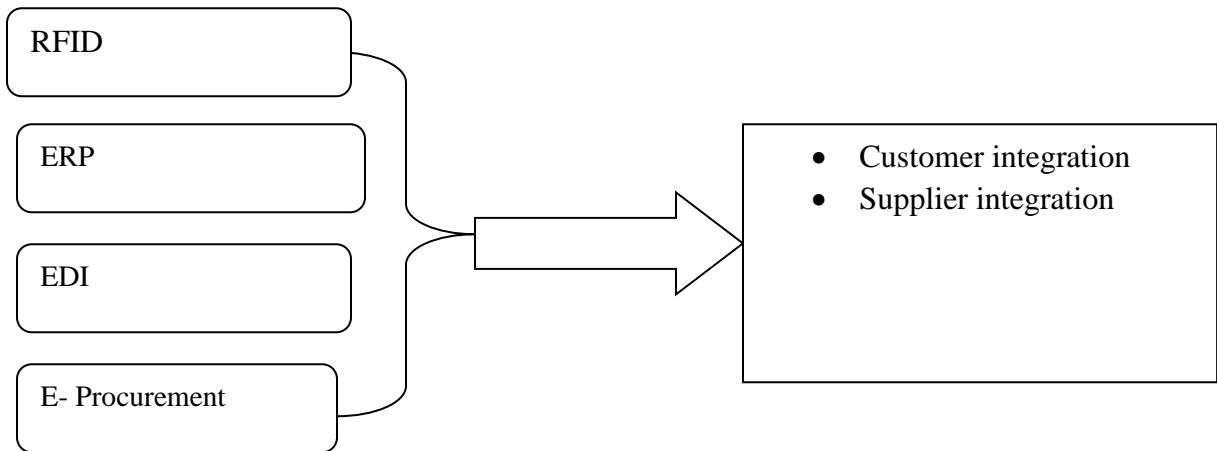
The independent variable for this study was information systems while the dependent variable was supply chain integration.

### Independent variable

#### Information Systems

### Dependent Variable

#### Supply Chain Integration



**Figure 2.1: Conceptual Framework**

**Source: Researcher (2019)**

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

It contains information about the design of the research, population and sample that was chosen for the study. The criteria that were used for data collection and analysis and presentation are highlighted in this chapter.

### **3.2 Research Design**

The descriptive research design was adopted in this study. The design was adopted as the researcher has interest in the affairs state in a specific field and the variables should not be manipulated.

### **3.3 Population and Sample**

The population used for the study was all the large-scale manufacturing companies in the Nairobi County, Kenya. There were 230 large scale manufacturing firms in Nairobi (KAM 2015). The study considered Nairobi since most large scale manufacturers are based in Nairobi and thus gave a large population that the sample can be derived from.

### **3.4 Sampling Design and Sample Size**

Stratified sampling method was used in this study. The companies were stratified according to sector. The target population comprised of twelve strata; each being a sector in the large scale manufacturing firms. Kothari (2004) states that a representative sample should be at least 10% of the target population. 30% of the target population will be sampled for this study yielding a total of 70 respondents which is considered suitable for the research.

**Table 3.1: Sample Population**

<b>Sector</b>	<b>Target Population</b>	<b>Sample</b>
Construction, Building & Mining	<b>5</b>	<b>2</b>
Foods, Tobacco and Beverage	<b>45</b>	<b>14</b>
Chemicals and related products	<b>29</b>	<b>9</b>
Electrical and Energy	<b>18</b>	<b>5</b>
Rubber and Plastics	<b>30</b>	<b>9</b>
Textiles, Apparel	<b>24</b>	<b>7</b>
Furniture, Wood and Timber Products	<b>12</b>	<b>4</b>
Medical Equipment and Pharmaceuticals	<b>12</b>	<b>4</b>
Hard Metal and Allied	<b>20</b>	<b>6</b>
Footwear and leather products	<b>7</b>	<b>2</b>
Motor vehicle accessories and assembly	<b>8</b>	<b>2</b>
Paper and related products	<b>20</b>	<b>6</b>
<b>Total</b>	<b>230</b>	<b>70</b>

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**Source : KAM (2015)**

### **3.5 Data Collection**

According to Jensen (1976), data collection involves obtaining and measuring information of interest in a systematic manner in order to enable a researcher come up

with answers for the research questions. A research questionnaire targeting supply chain manager and or their representative in each firm was used for data collection. The first section, A, consisted of a brief background regarding the biographic information of the organization. The second section, B, focused on information technology in selected manufacturing firms while the third section focused on supply chain integration. A register was kept to keep track of those questionnaires that have been returned and those still in the process.

### **3.6 Data Analysis**

The returned questionnaires were edited to check completeness, consistency and coherence. The data collected was quantitative. The data collected was further tabulated and classified into subcategories based on the aspects explored. Descriptive statistics were be used for data analysis by way of tables, percentages, frequencies, means, standard deviation and variance. Regression analysis was utilized to determine the relationship between information technology and supply chain integration.

The regression model of the study was as depicted below;

$$Y1, Y2 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where;

Y1= Supplier integration

Y2= Customer Integration

$\beta_0$ = Constant (coefficient of intercept)

X<sub>1</sub>= Radio Frequency Identification System

X<sub>2</sub>= Enterprise Resource Planning

X<sub>3</sub>= Electronic Data Interchange

$X_4$ = E-procurement

$\varepsilon$ = Error term

$\beta_1$ .....  $\beta_4$  = Regression coefficient of the four variables.

## CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

### 4.1 Introduction

The survey looked into information systems and supply chain integration in large manufacturing firms in Nairobi, Kenya. This section therefore presents findings based on the proposed methodology and procedures. The chapter comprised of the following sections; response rate, background information, information systems, supply chain integration, regression analysis and discussion of the results. The results were presented using tables.

### 4.2 Response Rate

For the research, out of the 70 questionnaires administered to the respondents, 63 were fully completed and returned. The response rate for research was as depicted in Table 4.1 below;

**Table 4.2 : Response rate**

<b>Response</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Returned	63	90%
Unreturned	7	10%
<b>Total</b>	<b>70</b>	<b>100%</b>

**Source: Researcher (2019)**

The results in Table 4.1 indicate a response rate of 90 %. Thus the response rate was found viable according to Mugenda and Mugenda (2008) that a 70% response rate and above is good for making inferences.

### 4.3 Demographic Characteristics



The researcher sought to establish basic characteristics of the respondents such the duration worked for the organization, duration of existence of the establishment and the number of employees working for the organization. To explore these factors, an analysis of frequencies was undertaken after which the output was presented as shown below.

#### 4.3.1 Duration worked in the Organization

The research resolved to ascertain the duration to which the various respondents had worked for their organizations. The findings were as shown in Table 4.3 below

**Table 4.3 :Duration Worked in the Organization**

	<b>Frequency</b>	<b>Percent</b>
1-5 years	13	20.0
5- 10 years	29	46.7
10-15 years	17	26.7
Over 15 years	4	6.7
<b>Total</b>	<b>63</b>	<b>100.0</b>

**Source: Researcher (2019)**

The responses as shown in Table 4.3 above show that the majority 46.7% had worked for the firm for a period ranging between 5-10 years followed by 26.7% 10-15 years then, 20% between 1-5 years while 6.7% had worked for over 15 years. It can be deduced from the findings that majority of the employees had been in the organization for many years and thus exhibited adequate knowledge on the extent to which information systems had been adopted by the organization and therefore the information provided was considered to be reliable.

### 4.3.2 Duration in Operation

The research sought to establish the duration to which those interviewed had been working for their companies. The results were as shown in Table 4.4 below

**Table 4.4: Duration Worked**

	<b>Frequency</b>	<b>Percent</b>
11-20 years	33	53.3
Over 20 years	17	26.7
Below 10 years	13	20.0
<b>Total</b>	<b>63</b>	<b>100.0</b>

**Source: Researcher (2019)**

The findings revealed that 53.3% of the pharmaceuticals had been in operation for 11-20 years, 26.7 for over 20 years while 20% had been running for below 20 years. It can be said that majority of the firms had been in the industry for a considerable duration thus were conversant with the contribution of information systems in driving supply chain integration.

### 4.3.3 Number of employees

In a bid to determine the size of the company, the respondents were asked to indicate the number of employees working for the firm and the findings were as depicted in Table 4.5 below

**Table 4.5: Number of employees**

	<b>Frequency</b>	<b>Percent</b>
50-100	14	23.3
101-200	21	33.3
Over 200	19	30.0

Less than 50	8	13.3
<b>Total</b>	<b>63</b>	<b>100.0</b>

**Source: Researcher (2019)**

The results show that 33.3% had between 101-200 employees, 30% over 200 employees, 23.3% 50-100 employees while 13.3% had less than 50 employees. It can be concluded that there were adequate staff in firms to execute different tasks and the firms were large in size.

#### **4.4 Information Systems**

In order to establish the degree to which the use of information systems has been employed by the large manufacturing companies in Nairobi County, the respondents were asked to state the level of adoption of information systems. The responses were rated using a five point Likert- scale of 1=Very little extent, 2= Little extent, 3= Moderate extent, 4=Large extent, 5=Very large extent.

##### **4.4.1 Electronic Data Interchange**

The study sought to establish the degree to which the companies have adopted electronic data interchange in executing its operations. The respondents were issued with different attributes related to EDI and asked to rate in a five point Likert scale. The findings were as depicted in Table 4.6 below;

**Table 4.6: Electronic Data Interchange**

<b>Statement</b>	<b>N</b>	<b>Mean</b>	<b>Std Deviation</b>
The organization uses EDI in order process	63	4.2333	.67891
Organization uses EDI on inventory control	63	4.0123	.93526
Organization uses EDI in customer services	63	3.9624	.66436

The organization uses EDI in transportation systems	63	3.6667	.77608
<b>Average</b>	<b>63</b>	<b>3.9687</b>	<b>0.76365</b>

**Source: Researcher (2019)**

From the results as shown in Table 4.6 above, the greatest mean was on the organization uses EDI in order process (M- 4.233, SD- 0.6789) followed by organization uses EDI on inventory control (M- 4.0123, SD- 0.935), then organization uses EDI in customer services (M-4.200, SD- 0.664 while the least mean was on the attribute organization uses EDI in transportation systems (M- 3.9687, SD- 0.76365). The grand mean attained was 3.968 implying that EDI had been adopted to a large extent in the organization especially in order process, inventory control and delivery of services to customers.

#### **4.4.2 Enterprise Resource Planning (ERP)**

The study sought to establish the extent to which enterprise resource planning making has been adopted in the organization. The respondents were presented with statements related to enterprise resource planning and asked to rate using a five point Likert scale. The findings were as shown in Table 4.7 below

**Table 4.7: Enterprise Resource Planning (ERP)**

<b>Statement</b>	<b>N</b>	<b>Mean</b>	<b>Std Deviation</b>
The organization uses ERP to optimize the business process	63	4.3667	.62606
Organization uses ERP on Automation process	63	4.1667	.50742
The organization uses ERP on integrating their supply chain and business activities	63	4.1000	.80301
The organization uses ERP in carrying out business transactions	63	3.9667	.76489
<b>Average</b>	<b>63</b>	<b>4.15</b>	<b>0.67534</b>

**Source: Researcher (2019)**

From the results on the different attributes of ERP, the highest mean attained was on organization uses ERP to optimize the business process (M- 4.3667, SD- 0.626). On the other hand, the firm engages in discussions with the suppliers on issues related to product design came second with (M- 4.1667, SD- 0.5074) closely followed The organization uses ERP on integrating their supply chain and business activities (M- 4.100, SD- 0.80301) while the organization uses ERP in carrying out business transactions (M- 3.200, SD- 3.9667). The aggregate mean was 4.15 showing that ERP has been largely adopted in the organization.

#### 4.4.3 Radio Frequency Identification Systems (RFDI)

The research resolved to determine the degree to which the establishment has adopted RFDI. The findings were as presented in Table 4.8 below;

**Table 4.8 : Radio Frequency Identification Systems (RFDI)**

<b>Statement</b>	<b>N</b>	<b>Mean</b>	<b>Std Deviation</b>
Organization uses RFID on better tracking and theft prediction	63	3.700	.808
Organization uses RFID on item tags	63	3.566	1.136
Organization uses RFID on counterfeit identification	63	3.423	.727
The organization uses RFID on order forecasting	63	3.103	.681
<b>Average</b>	<b>63</b>	<b>3.4483</b>	<b>0.838</b>

**Source: Researcher (2019)**

The responses on the different statements of RFID recorded an aggregate mean of 3.448 implying that RFID has been adopted to a moderate extent by the firms. The individual means recorded were; Organization uses RFID on better tracking and theft prediction (M- 3.700, SD- 0.808), Organization uses RFID on item tags (M=3.566, SD=1.136), organization uses RFID on counterfeit identification (M=3.423 SD=0.727) and the

organization uses RFID on order forecasting (M=3.103, SD=0.681). From the results above, it can be concluded that although the organization had adopted in areas such as better tracking and theft prediction, its application in fundamental areas such as counterfeit identification and order forecasting remains low.

#### 4.4. 4 E- Procurement

The research further sought to explore the degree to which E- procurement has been utilized by the organization. The respondents were issued with different statements related to the same and asked to rate in a five point Likert scale. The results were as presented in Table 4.9 below;

**Table 4.9 : E- Procurement**

<b>Statement</b>	<b>N</b>	<b>Mean</b>	<b>Std Deviation</b>
Organization uses E-procurement on e-auction	63	3.8667	.62606
Organization uses E- procurement on Fibre optic	63	3.3547	.50742
Organization uses E-procurement on vender management	63	3.2001	.80301
Organization use E-procurement on E-tendering DSI	63	3.1327	.76489
<b>Average</b>	<b>63</b>	<b>3.3886</b>	<b>0.67534</b>

**Source: Researcher (2019)**

When presented with different attributes on the extent of adoption of E- procurement, Organization uses E-procurement on e-auction was ranked the highest (M- 3.866, SD- 0.626) followed by Organization uses E- procurement on Fibre optic (M- 3.355, SD- 0.507), then organization uses E-procurement on vender management (M- 3.200, SD- 0.803) while the organization use E-procurement on E-tendering DSI an (3.132, SD-

0.764). The overall mean was 3.388 implying that the level of implementation of E-procurement in the firm was not satisfactory.

#### 4.5 Supply Chain Integration

The research sought to establish the extent to which supply chain integration had been attained in the firm. To achieve this, the extent of both supplier integration and customer integration was analyzed.

##### 4.5.1 Supplier Integration

**Table 4.10: Supplier Integration**

	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
The firm actively involves the suppliers during product development	63	4.000	.80872
The firm's production processes are an outcome of consultations with the suppliers	63	3.8467	0.9642
The firm and other players within the supply chain engage in joint decision making	63	3.7667	1.13664
Our firm would immediately have to change our competitive strategy if our major suppliers went out of business.	63	3.4333	.72793
We consider our major suppliers as a large part of the picture when developing our firm's strategy.	63	3.1333	.68145
<b>Overall mean</b>	<b>63</b>	<b>3.5833</b>	<b>0.83869</b>

**Source: Researcher (2019)**

The study resolved to explore the extent to which supplier integration had been achieved.

The respondent rating on the different aspects presented were; the firm actively involves the suppliers during product development (M- 4.000, SD- 0.808), the firm's production

processes are an outcome of consultations with the suppliers (M- 3.847, SD- 0.9642), the firm and other players within the supply chain engage in joint decision making (M- 3.7667, SD- 1.136), our firm would change its competitive strategy if our key suppliers went out of business and the response time to clients queries is immediate (M- 3.133, SD- 0.681) and we consider our major suppliers as a large part of the picture when developing our firm's strategy (M- 3.133, SD- 0.68145). The overall mean attained was 3.583 implying that to the firm had to a good extent collaborated with the suppliers. The overall SD of 0.83869 shows that the responses were dispersed around the mean.

#### **4.5.2 Buyer Integration**

##### **Table 4.11: Customer Integration**

**Source: Researcher (2019)**

When presented with different statements on the extent of buyer integration, majority of the respondents stated that the firm's production processes are an outcome of consultations with buyers in the supply chain (M- 4.066, SD- 1.363), followed by the there has been increased intensity of external linkages the firm and customers (M – 3.866, SD- 1.1058) then the firm works along the customers during product development process ( M- 3.833, SD- 1.1842) while are your customers willing to pay extra money in the firm engages customers in joint decision making within the supply chain produced the smallest mean of 3.4667. The average mean of 3.8084 confirms the existence of supplier integration in the firm.



#### 4.6. Regression Analysis

The study performed two separate regressions to determine the relationship between information systems and supply chain integration and the relationship between information systems and supply chain integration.

##### 4.6.1 Relationship between Information Systems and Supplier Integration

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.667 <sup>a</sup>	.445	.407	.89355

**Source: Researcher (2019)**

a. Predictors: (Constant), Electronic Data Interchange, Radio Frequency Identification Systems, Enterprise resource Planning, E-Procurement

The R<sup>2</sup> value in the model was 0.445 meaning 44.5% of the variation in supplier integration can be predicted by information systems while the other 55.5% was attributed to other factors not factored in for the study

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.120	4	9.280	11.623	.000 <sup>b</sup>
	Residual	46.309	58	.798		
	Total	83.429	62			

**Source: Researcher (2019)**

a. Dependent Variable: Supplier Integration  
 b. Predictors: (Constant), Electronic Data Interchange, Radio Frequency Identification Systems, Enterprise resource Planning, E-Procurement

The results from analysis of variance produced a P value of 0.000. The p value of 0.000 shows that the model was statistically significant and information systems can be used to predict supplier integration.

<b>Coefficients<sup>a</sup></b>						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
	(Constant)	1.205	.775		1.265	.792
1	EDI	.274	.166	.218	1.655	.103
	ERP	.789	.233	.423	3.385	.001
	RFIS	.458	.085	.548	5.373	.000
	E-Procurement	.530	.182	.378	2.906	.005

**Source: Researcher (2019)**

a. Dependent Variable: Supplier Integration

Therefore, the regression model becomes;

$$Y = 1.205 + 0.274X_1 + 0.789X_2 + 0.458X_3 + 0.530X_4$$

The model shows that keeping all factors constant, the supplier integration will be held at 1.205. A unit increase in electronic data interchange holding all other factors constant would lead to 0.27 changes in supplier integration. Similarly, a unit change in ERP will result to 0.789 unit changes in supplier integration. Moreover, a unit change in RFIS would result to 0.458 changes in supplier integration while a unit change in E-procurement will lead to 0.53 change in supplier integration.

#### **4.6.2 Relationship between Information Systems and Customer Integration**

##### **Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.496 <sup>a</sup>	.246	.194	.82415

**Source: Researcher (2019)**

a. Predictors: (Constant), Enterprise resource Planning, Electronic Data Interchange ,Radio Frequency Identification Systems, E-Procurement

The R-square value in the model was 0.246 meaning 24.6 % of the variation in customer integration can be predicted by information systems while the other 75.4 % was attributed to other factors not factored in for the study

#### ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.827	4	3.207	4.721	.002 <sup>b</sup>
	Residual	39.395	58	.679		
	Total	52.222	62			

The results from analysis of variance produced a P value of 0.000 at 95% confidence level. The p value of 0.002 The results from analysis of variance produced a P value of 0.000. The p value of 0.000 shows that the model was statistically significant and information systems can be used to predict customer integration.

#### Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.250	.715		1.749	.086
1 EDI	.070	.153	.070	.456	.650
ERP	.420	.215	.285	1.955	.055
RFIS	.061	.079	.092	.777	.440
E-Procurement	.382	.168	.344	2.273	.027

Source: Researchers (2019)

a. Dependent Variable: Customer Integration

Therefore, the regression model becomes;

$$Y = 1.250 + 0.070X_1 + 0.420X_2 + 0.061X_3 + 0.382X_4$$

The model shows that when all factors are kept constant, the customer integration will be held at 1.250. A unit increase in electronic data interchange holding all other factors constant would lead to 0.070 changes in customer integration. Similarly, a unit change in ERP will result to 0.420 changes in customer integration. Moreover, a unit change in RFIS would result to 0.061 changes in customer integration while a unit change in E-procurement will lead to 0.382 change in customer integration

#### 4.7 Discussion of the Findings

Supply chain technology and supply chain management have attracted attention from different investigators as two separate research areas, however few other researchers have combined them (Shen 2004). IT-enabled SC for easily management of information flows of business processes, money, materials, within the chain networks and makes additions to firm profits through reduction of coordination cost and improving quality (Stroeken, 2000; Sanders, 2002 ; Mabert *et al.*, 2001;). Quick information sharing and organization

coordination is enhanced through integration of firms by the use of IT. This research sought examined the effect of information systems on supply chain integration by large manufacturing companies in Nairobi, Kenya.

An analysis of descriptive statistics revealed that whereas some types of information systems including electronic data interchange and enterprise resource planning had been adopted to a large extent, others including radio frequency identification and E-procurement had been adopted to a moderate extent. The overall mean on the extent of adoption of electronic data interchange produced an overall mean of 3.968. This implies that most of the transactional data on transportation, inventory control and level of customer service is stored and transmitted electronically in the organization which enables the firm to overcome distortions in demand and real time sharing of actual demand.

On the extent to which Enterprise Resource Planning (ERP) has been implemented, the study established that this technique has been adopted to a large extent in the organization has evidenced by an overall mean of 4.15. The study found that companies have used this tool to optimize business process as well as integration of their supply chain and business activities so as to streamline business activities and attain superior performance. The study further notes the ERP was used by the companies to execute most of its functions such as resource planning. This findings agree with Moon (2007) who reported that ERP system enables an enterprise to integrate, optimization of business process and transactions in corporation this enhancing competitive advantage and performance (Moon, 2007)

The findings on the level of adoption of Radio Frequency Identification Systems produced varied finding with the respondents agreeing with statements such as the use of RFID in tracking and tagging of items while showing reluctance in fully accepting that RFID is used in counterfeit identification and order forecasting. However, the study produced a grand mean of 3.448 implying that RFID had to some extent been adopted in the organization. This findings concur with (Attaran, 2007) that RFID drives the organization towards productivity improvement, visibility into customer needs, counterfeit identification, efficient business process, better tracking, cost reduction, theft prediction, reliable and accurate order forecast .

Further, the results on the degree to which E-procurement were inconsistent with most fully citing the application of E-procurement in e-action. Others commented the application of e-procurement in fibre- optic, vendor management and e-tendering to be fair. The overall mean recorded on this attribute was 3.3886 implying that E-procurement system was important in connecting firms and business processes directly with suppliers while managing the interactions between them.

From the regression analysis model on the effect of information systems on supply chain integration, the model was found to be significant at 95% confidence level as depicted by a p values of ( $p=0.001$ ) on the effect of information systems on supplier integration and 0.002 on the influence of information systems on customer integration This therefore implies that information systems can be used to predict supplier chain integration among large manufacturing firms in Nairobi, Kenya. These findings concur with Burtet al., (2003) that the information systems plays a critical role in connecting firms and business processes directly with suppliers thus managing the interactions between them.

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

This chapter describes the summary of findings, conclusion, recommendations, limitations, suggestions for further research and implication of the study to the theories, practice and the government.

### **5.2 Summary of Findings**

The study's objective was to ascertain the effect of information systems on supply chain integration among large manufacturing firms in Nairobi, Kenya. The research used field data to derive findings. The demographic information results indicated that most of staff had worked for the firms for longer periods hence had a deeper understanding on matters related to information systems and supply chain integration. The findings also indicated that the firms had employed many employees which was a good sign of growth. Furthermore, most firms were found to have been in existence for between 11-20 years which is a long period thus a good sign of sustainability.

The regression analysis findings on the effect of information systems on supplier integration produced an R square value of 0.445 implying that 44.5% variation in supplier integration can be predicted by can be predicted by information systems while

the other 55.5% was attributed to other factors not factored in for the study. The results also produced a p value of 0.000 showing that information systems could reliably be used to supplier integration. The coefficient of determination had positive and significant values for all the independent variables except for electronic data interchange.

The regression analysis findings on the relationship between the variables showed that there exists positive and significant relationship between information systems and customer integration. The R-square value in the model was 0.246 meaning 24.6 % of the variation in customer integration can be predicted by information systems while the other 75.4 % was attributed to other factors not considered in the study. The results from analysis of variance produced a P value of 0.000 at 95% confidence level.

### **5.3 Conclusion**

From the data analysis, it can be concluded that information systems had been adopted by the large manufacturing firms. The firms were found to have largely adopted information system tools such as electronic data interchange and electronic resource planning while others including radio frequency identification systems were yet to be fully adopted. The study established that the major drivers of supply chain integration are to attain production efficiencies, process efficiencies, curb competition, proper inventory management, reduction of lead and well-informed strategy formulation. From the findings, we also see that information systems has a positive effect on supply chain integration by large manufacturing firms.



The study concludes that the firm involves the suppliers in most of its decisions such as product design, product development, cost improvements and production planning both and technological improvements. The study however notes that the firm's strategic decisions were to some extent kept secret and there was less involvement of the suppliers. This is attributed to the fact that the firm's success is attributed to strategies that are unique and profitable. The study further concludes that the adoption of information systems by firms would in the long run determine their survival and they would increase supply chain linkages thus efficiency and effectiveness in the supply chain network. The firms must therefore understand the areas which they should concentrate their resources.

#### **5.4 Recommendations from the Study**

Based on the study findings, the study makes the following recommendations. First, manufacturing firms should focus on supply chain linkages through full adoption of information systems. The adoption of information systems ensures that component is taken care of efficiently which ensures cost cuttings through speed and standardized procedures through gains of information flow.

Secondly, the firms involve the suppliers that are very key to the running of the business in most of its decisions through adoption of systems that ease the communication and transactions between the two parties. They should increase the elements integrated from each category namely EDI, ERP, RFIS, E-Procurement. Further, the companies should

put in place the precautions that come with the adoption of information systems such as cyber crimes to avoid loss of fundamental information or business secrets

Lastly, the manufacturing firm's management should be recognized that supply chain integration exposes them to different risks. It is therefore imperative for the organization to put in place strict measures to mitigate the difficulties that comes with this integration since most become a management menace. The firm should always ensure that the integration relationship is beneficial and convenient to them.

### **5.5 Limitations of the Study**

Because of confidentiality policy that is in various manufacturing companies, it was difficult to obtain all the required information as some of the respondents were seeking approval from the legal department. This also explains why we were only able to receive back 90 % of the questionnaires issued. The research focused one respondent per firm. This could have left out important information that is vital for the study. The understanding of information systems by different employees in the organization might vary.

Some of the respondents were senior management and may have felt obligated to give a positive response to the questionnaire since it was measuring the extent supplier integration in order to create a positive impression about the the firm so as to attract clients hence may have responded positively to the questionnaire. This problem of limited cooperation was overcome through making the respondents understand that the findings will be used only for academic purposes.

### **5.6 Suggestions for Further Research**

Further research should be conducted to test and validate the research findings using the qualitative approach to ascertain if the same findings hold. Further studies should be carried out on more potential predictors supply chain integration. The same study can also be carried out using a wider population across other industries in Kenya so as to get findings that are useful to all industries in Kenya where supply chain integration is evident.

Since the study was highly quantitative, a qualitative study with an interview guide would have generated detailed qualitative data that capture opinions, beliefs and value expressions by respondents. This study looked only into customer integration and supplier integration ignoring other supply chain integration measures such as process integration and strategic integration. A further study with inclusion of these factors can go a long way in bringing insight to scholars and owners of large manufacturing firms on the effect information systems on supply chain integration.

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## APPENDICES

### Appendix I: Questionnaire

This questionnaire has been designed for intended purpose of collecting data on Information Technology and Supply Chain Integration in manufacturing firms in Kenya. The data will be treated with a high degree of confidentiality and it is meant for academic and research purpose only.

Your participation on questionnaire by putting an “X” on the applicable provided space of the applicable answer.

#### Section A: General Information

1. How long have you been working for the company?

a) 1-5 years [ ]

b) 5-10 years [ ]

c) 10-15 years [ ]

d) Over 15 years [ ]

2. For how long has the company been in operation?

Below 10 years

11 to 20 years

Above 20 years

3. How many employees are there in your company?

a) Less than 50 ( )    b) 51 – 100 ( )    c) 101 – 200 ( )    d) Above 200 ( )

**SECTION B: EXTENT TO WHICH INFORMATION TECNOLOGY HAS ADOPTED IN ORGANIZATION**

1. Rate the extent to which you agree with the following statement on the extent to which EDI has been adopted in your organization? Use the scale 1- not at all, 2- small extent,3- neutral , 4-large extent, 5-very large extent

<b>EDI</b>	1	2	3	4	5
The organization uses EDI in order process					
Organization uses EDI in customer services					
The organization uses in transportation systems					
Organization uses EDI on inventory control					

<b>ERP</b>	1	2	3	4	5
The organization uses ERP on integrating their supply chain and business activities					
The organization uses ERP to optimize the business process					
The organization uses ERP in carrying out business transactions					
Organization uses ERP on Automation process					

<b>RFID</b>					
The organization uses RFID on order forecasting					
Organization uses RFID on better tracking and theft prediction					
Organization uses RFID on item tags					
Organization uses RFID on counterfeit identification					



<b>E-procurement</b>	1	2	3	4	5
Organization use E-procurement on E-tendering DSI					
Organization uses E-procurement on vender management					
Organization uses E- procurement on Fibre optic					
Organization uses E-procurement on e-auction					

### SECTION C: SUPPLY CHAIN INTEGRATION

2. 7. Could you kindly indicate how integration on supply chain management has achieved on your organization? Please tick as appropriate 1 to 5 1- not at all, 2- small extent,3- neutral , 4-large extent, 5-very large extent

<b>Supplier Integration</b>	1	2	3	4	5
The firm actively involves the suppliers during product development					
The company monitors supplier markets for technological developments					
The firm and other players within the supply chain engage in joint decision making					
The firm's production processes are an outcome of consultations with the suppliers					
We consider our major suppliers as a large part of the picture when developing our firm's strategy.					
Our firm would immediatly have to change our competitive strategy if our major suppliers went out of business.					

<b>Buyer Integration</b>	1	2	3	4	5
The firm works along the buyers during product development process					
There has been increased intensity of external linkages the firm and customers					
The firm engages with suppliers in players within the supply chain engage in joint decision making					
The firm's production processes are an outcome of					

consultations with buyers in the supply chain					
We consider our major customers as a large part of the picture when developing our firm's strategy.					

**THANK YOU VERY MUCH FOR YOUR RESPONSES**