INFORMATION AND COMMUNICATIONS TECHNOLOGY AND SUPPLY CHAIN PERFORMANCE AMONG LOGISTICS FIRMS IN NAIROBI, KENYA

BY

ATIENO ELVINA OSODO

REG. NO. D61/79077/2012

SUPERVISOR:

MICHAEL K. CHIRCHIR

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION (MBA), UNIVERSITY OF NAIROBI

NOVEMBER 2014

DECLARATION

STUDENT'S DECLARATION

I declare that this research project is my original work and has not been presented to any other university for the award of a degree.

Signature:…… **Reg. No: D61/79077/2012**

Atieno Elvina Osodo **Date: ……**

SUPERVISOR'S DECLARATION

This research project has been submitted with my permission as the University Supervisor.

Signature: …… **Date: ……**

Michael K Chirchir

Lecturer, Department of Management Science, School of Business

University of Nairobi

DEDICATION

This work is dedicated first to my parents John Osodo and Risper Otieno who in deep poverty spared nothing in ensuring that I am educated. “For I testify that they gave as much as they were able, and even beyond their ability”. I also dedicate this work to my beloved husband Jorim Oyago and our two beloved sons James Julius Oyago and Johnstanley Ochung to be a source of inspiration and encouragement in their endeavors in life.

ACKNOWLEDGEMENTS

This project would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this project.

First and foremost, I give thanks to the Almighty God for granting me peace, knowledge and sanity of mind that has enabled me to complete this research work. It is through His abundance grace that has brought this research work this far.

Secondly, my utmost gratitude to my supervisor Mr. Michael K Chirchir whose sincerity and encouragement I will never forget. As my supervisor, he has been very helpful in research topic formulation, and also identification of objectives in line with the topic of study. He also reviewed this document to ensure the attainment of high quality.

My sincere gratitude also goes to my 2014 MBA classmates and the academic staff in the University of Nairobi for their input especially in units that were essential in formulation and development of this study. They were ready to assist where their assistance was sought during the development of this document. They have shared valuable insights in the relevance of the study.

Finally, I appreciate the most important people who directed and encouraged me in the adventure of academics and have been my anchor. They include my lovely parents John and Risper Otieno, husband Mr. Jorim Oyago and sons James Julius and Johnstanley who provided moral support in one way or another and which contributed to the development of this project. Their understanding and moral support went a long way in making this a success.

ABSTRACT

The objectives of SCM are to achieve the desired customer service level in the targeted market segment and to optimize the total cost of the supply chain investment. In order to achieve the optimal level of service efficiency and ensure cost minimization in SCM, there is a need to eliminate unnecessary activities. ICT solutions in SCM have often been approached from various dimensions with a focus on the overall effect on efficiency, customer value and cost. In Kenya, logistics companies have strived to implement various ICT applications in their supply chain processes. Efficiency and reliability in the logistics industry through various modalities such as adoption of ICT solutions has seen improvements in customs management systems, security (tracking and tracing shipments) and information sharing. However, many sectors of the logistics industry still run on traditional or manual systems and this could be attributed to their ineffective and inefficient performance. There exists a research gap on this area of the influence of ICT on supply chain performance among logistics firms in Nairobi. The study employed a descriptive research design. The population comprised of approximately 1000 logistics firms in Kenya. The study targeted 30 large firms operating in Nairobi County because logistic firms in Nairobi were likely to have adopted the use of ICT in managing their supply chain processes as opposed to other Counties in Kenya. The 60 respondents of the study were selected from the supply chain management and ICT departments since they were the ones conversant with the impacts of ICT on supply chain performance of the logistics firms. The descriptive statistical tools such as Statistical Package for Social Sciences (SPSS) and MS Excel were applied. Tables and charts were used to summarize responses for further analysis and facilitate comparison. The study found that the logistics firms adopted ICT in supply chain that affects supply chain performance significantly. Radio Frequency Identification (RFID) and Global Positioning Systems (GPS) affect the supply chain performance of the logistics firms to great extents among other ICT applications. The study also concludes that the high degree of complexity leads to a context contingent set of synergistic combinations of IT and other organizational resources, including workplace practices, change initiatives, organizational structure, and financial condition. The study recommends that there is need for adoption of improved technology so as to ensure efficiency in information flow. The study recommends that there is need for a given supply chain to set clearly the kind of strategy it needs to adopt in the market and then set the right performance measures. There is need for integration of the supply chain design so as to increase efficiency which will lead to improved financial performance. The logistics firms need to have a correct analysis of lead time as this provides the industry with various benefits.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

EDE	-	Electronic Data Exchange
ERP	-	Enterprise Resource Planning
GPS	-	Global Positioning System
ICT	-	Information and Communication Technology
PMS	-	Performance Management System
RFID	-	Radio Frequency Identification
SAP	-	System Application Programme
SCM	-	Supply Chain Management
SCPM	-	Supply Chain Performance Management
VMI	-	Vendor Managed Inventory
WMS	-	Warehouse Management System

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In the era of globalization and increasing business challenges, Supply Chain Management (SCM) has become a major focus point for many organizations. The concept of SCM has therefore gained much prominence in recent years as a way of gaining competitive advantage in the market. On a basic level, the objectives of SCM are to achieve the desired customer service level in the targeted market segment and to optimize the total cost of the supply chain investment. In order to achieve the optimal level of service efficiency and ensure cost minimization in SCM, there is a need to eliminate unnecessary activities. Information and communication technology (ICT) offers the promise of fundamentally changing the lives of much of the world's population (Kurien & Qureshi, 2011).

In its various forms, ICT affects many of the processes of business and government, how individuals live, work and interact, and the quality of the natural and built environment. The use of technologies such as ERP systems, electronic payment systems and bar coding is on the rise as many companies seek ways to track their supply chain distributions (Gunasekaran, Patel & McGaughey, 2004). Maintaining information across the chain is the most critical aspect. SCM should be a "win-win" game in which the organization and its external suppliers and customers enjoy the interaction. ICT solutions are used in managing distribution and supply chains in order to increase efficiency while reducing waste in value chains.

Organizations can use ICT solutions in the management of supplier networks, facilitating traceability and managing distributions networks. Nowadays, competition is no longer company to company but supply chain to supply chain, (Christopher, 2011). Industries find that they have to rely on effective supply chain management to compete globally. The globalization of supply chains has forced companies to look for better and more inter-linked systems between SCM competencies, multiple SCM strategies and the implementation processes and SCM capabilities to coordinate the flow of materials into and out of the company as opposed to the fragmented systems, which have characterized many organizations.

1.1.1 Information and Communications Technology

Information & Communication Technology is essentially an umbrella term which encompasses any communication application or device such as radio, cellular phones, television, computer software and hardware, software satellite systems and so on in addition to their various applications such as wireless communication and video conferencing (Fasanghari, Roudsari & Chaharsooghi, 2008). ICTs are all those electronic technologies that are capable of accepting data in forms such as texts, voice, graphics, or videos for processing to produce information for decision making. Kushwaha (2011) also defines ICTs as technologies and tools that people use to share, distribute, and gather information to communicate with one another, one on one, or in groups, through the use of computers and interconnected networks. At the basic level, ICT is concerned with storage, retrieval, manipulation, transmission and receipt of digital information. It also focuses on how these different aspects relate and work with each other.

The exponential growth in the ICT sector has been fuelled by the advancements in networking, Microsystems, electronics and the mastery of these systems across different sectors. The developments in ICT provide the appropriate platform upon which innovative ideas, systems and services can be developed and implemented. ICT provides new solutions which trigger a range of new developments in business this boosting competitiveness, supporting business growth and creating jobs (Shoemaker, Rainey & Wilson, 2012). In business parlance, ICT is often categorized into the traditional computer-based technologies and the emerging digital communication technologies. ICT and e-business applications provide many benefits across the business arena. These applications are critical in improving information sharing and knowledge management within and outside the organization business processes. In addition, they reduce transaction costs while increasing the speed and reliability of business transactions. These solutions are focused on supporting transactional exchanges and collaborative partnerships.

ICT solutions in SCM have often been approached from various dimensions with a focus on the overall effect on efficiency, customer value and cost (Wainwright, Green, Mitchell & Yarrow, 2009). The recent past has seen an eruption of many supply chain ICT solutions. In

most stores, the use of warehouse management systems (WMS) facilitates the efficient management of goods by optimizing warehouse space and using rules to maximize the shelf life of various products. Warehouse staff can be linked using handheld terminals across a wireless network. In addition, such applications make it easier for the staff to fill orders much faster and accurately (Wainwright et al. 2009).

Software companies have developed data translation technology which enables warehouses to integrate different applications to work together. In the face of ERP, there has been a shift away from the traditional function-based structures into the process-based approaches. The traditional systems meant that every department had its own computer system (Zhang, Donk & Vaart, 2011). The enterprise solutions availed through ERP provide for a single integrated software platform running on a single database so that different organizations can communicate and share information easily. As a focus on supply chain needs, ERP systems facilitate customer and supplier linkages across and outside the organization. This has been a crucial step towards supply chain integration (Zhang 2007). The growing complexity of SCM has forced many organizations to adopt online communication systems such as e-Procurement. On the operational front, ICT is used in notifying customers of stock outs through Electronic Data Exchange (EDE) programs.

1.1.2 Supply Chain Performance

Supply chain (SC) is defined by Mentzer et al. (2001) as a set of three or more entities directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer. In addition, Christopher (2005) defines supply chain as a network of connected and interdependent organizations mutually and cooperatively working together to control manage and improve the flow of materials and information from suppliers to end users. Accordingly, Supply Chain Management (SCM) is the integration of key business processes from end user through original suppliers that provide products, services, and information that adds value for customer and other stakeholders (Chan and Qi, 2003).

Reyes et al. (2002) describe the supply chain as a network of entities where companies must capture `moments of information,' in order for the linked companies to better respond to

changes. Supply chain management is the management of all internal and external processes or functions to satisfy a customer's order (from raw materials through conversion and manufacture through shipment). SCM is a proactive relationship between a buyer and supplier and the integration is across the whole of the SC, not just first-tier suppliers (Cox, 2004). Further, Christopher (2005) defines SCM as the management of upstream and downstream relationships with supplier and customers to deliver superior customer value at less cost to the supply chain as a whole. Most SCM-related challenges stem from either uncertainties or an inability to co-ordinate several activities and partners Turban et al. (2004). The vision of the supply chain as a holistic construct with close cooperation between the different organizational units has replaced the traditional picture of it as a collection of vertically organized functional units (Stadtler and Kilger, 2005).

The cost and non-cost performance measures include strategic, tactical and operational approaches (Gunasekaran, Patel & McGaughey, 2004). A performance measurement system should be balanced and dynamic and capable of supporting decision making by processing information. Kurien & Qureshi (2011) notes that performance measures should be inclusive, universal, measurable and consistent. Any performance measurement program follows a series of steps: system design, implementation, managing and review. The digitally enabled SCM differs significantly from vertical integration in traditional organizations in that supply chain partners are integrated via information flows rather than ownership. Innovations enabled by information technology (IT) are creating new ways for firms to manage supply chain relationships (Sambamurthy et al. 2003). ERP, Bar-coding, RFID and GPS have been able to achieve this need and organizations should aspire to include these systems in their supply chain.

ICT tools enhances the performance of the entire supply chain to make it less troublesome (Lysons and Farrington 2006).Organizations must be sensitive of the ever changing business environment that dictates the competitive environment they operate in. Staying ahead of the competition ensures an organizations survival and lagging behind may lead to its demise. Embracing of Information Communication Technology (ICT) ensures that the supply chain balances its need to satisfy customer needs and also to manage costs so as to attain profits.

While it is generally agreed that ICT solutions are critical in conventional business operations, there is need to review these applications in order to evaluate the ultimate benefits of ICT. SC performance calls for the setting of goals, monitoring and improving the performance of the various processes for strategic, financial and non-financial goals. The performance measurement frameworks in SC should be balanced, multidimensional and well integrated into the organizational performance measurement framework.

1.1.3 Logistics Firms in Kenya

The logistics industry in Kenya draws its origin from the Kenya Uganda railway. Like in much of sub-Saharan Africa, Kenya has a largely linear spatial logistics structure situated along a single corridor. Much of the economic activity and many cities and towns are located along the Northern corridor. According to World Bank (2005) the industry is characterized by logistics firms struggling against a wave of physical and procedural impediments to transport goods across the corridor. Millions of tons of goods are moved along the corridor by road, railway and the Kenya pipeline. The location of Kenya as a gateway into the interior of Eastern Africa (Uganda, Rwanda, Burundi and Southern Sudan) through the port of Mombasa has created a much vibrant trade logistics industry. Many private logistics firms compete along this corridor. Similarly, different modes of transportation such as road, rail and air freight compete. Inefficient public policies create serious bottlenecks especially in infrastructure and customs (World Bank, 2005).

In the East African region, major international logistics industries only have agencies as opposed to full subsidiaries. The expansion of trade and investment translates into a huge potential for logistics companies in Kenya. According to Gichuru (2012) the major players in the logistics industry include clearing and forwarding agents, transport companies and express carriers. The first two sectors are well developed in Kenya seen by organized companies. However, the express carrier segment relies on international companies and is largely controlled by DHL Global Forwarding. There are presently over 1000 registered clearing agents most of whom do not have offices. Much of the trade is dominated by large companies which are often affiliates of global operators such as Panalpina and SDV Transami. In addition, a lot of trade cargo is carried by road transport companies which are not registered as logistics service providers (World Bank, 2005).

Air cargo operators are still limited as the service is expensive. One major challenge seen in the logistics industry in Kenya is the limited use of ICT solutions especially at the ports and revenue offices. The pipeline system experiences many capacity constraints forcing many oil shippers to use the costly road transport. The growth of the industry has also been facilitated by logistics outsourcing especially from large manufacturing companies. Mulama (2012) argued that the increase in trade across the East African region offers better growth prospects for the logistics industry. The government of Kenya has focused on sanitizing the industry through efficient port and customs operations. This will provide a better working environment for the logistics firms (Kenya Shippers Council, 2013).

1.2 Statement of the Problem

Modern supply chains are very complex, with many parallel physical and information flows occurring in order to ensure that products are delivered in the right quantities, to the right place in a cost-effective manner. ICT offers powerful advanced technology solutions to support and enhance nearly every facet of a business (Klein and Rai, 2009). In the dynamically competitive environment, many logistics companies have adopted ICT in emerging supply chain trends in improving business performance. Considering the need for competitive advantage and global competition, many logistics firms are adopting the latest ICT solutions in their operations (Evangelista & Sweeney, 2006). Asabere, Oppong & Sarpong (2012) conducted a review of the role of ICT in supply chain operation for companies. In the study, it was noted that e-SCM has become the common language in reference to the electronic processes that should characterize modern supply chain operations. Sweeney (2005) evaluated the usage of "Point", "Best of Breed", "Enterprise" and "Extended Enterprise" solutions as approaches towards achieving business competitiveness in SCM. From their results, the ensuing challenge is the fact that use of ICT applications in SCM do not necessarily translate into efficiency and greater performance of the process.

In Kenya, logistics companies have strived to implement various ICT applications in their supply chain processes. Ayugi (2007) examined the effectiveness and efficiency of the supply chain model in Wrigley's East Africa. He indicated that efficient supply chain activities would increase the organization's performance significantly. Cheruiyot (2013)

conducted a study on the impact of integrated supply chain on performance at Kenya Tea Development Agency. The findings indicated that the supply chain integration was positively associated with supply chain performance. Apiyo & Mburu (2012) did a study on the role of ICT tools in supply chain performance and found that ICT tools can have revolutionary impact on supply chain performance and that viewing ICT tools as an incremental improvement of supply chain performance can turn out to be the best thing to all organizations that are involved in logistics and manufacturing.

Magutu (2013) carried out a study on supply chain strategies, technology and performance of large-scale manufacturing firms in Kenya which established that when ICT tools are well implemented, the company will benefit from them and as a result, the organization will be able to save on costs and eventually make high profits. Efficiency and reliability in the logistics industry through various modalities such as adoption of ICT solutions has seen improvements in customs management systems, security (tracking and tracing shipments) and information sharing. However, many sectors of the logistics industry still run on traditional or manual systems and this could be attributed to their ineffective and inefficient performance. Not many studies have been carried out to establish the influence of ICT on SCM performance among logistics firms in Nairobi hence the research gap. It was in this light that the study sought to answer the following research question: What is the influence of ICT on supply chain performance among logistics firms in Nairobi?

1.3 Objectives of the Study

The study was guided by the following research objectives:

i. To determine the extent to which ICT is applied in supply chain of logistics firms in Nairobi
ii. To determine how ICT application, level of automation and procurement lead time affects supply chain performance in the logistics firms in Nairobi
iii. To establish the challenges of ICT in supply chain performance in the logistics firms in Nairobi

1.4 Research Questions

The study sought to answer the following research questions

i. To what extent is ICT applied in supply chain of logistics firms in Nairobi?

ii. How does ICT application affect the supply chain performance in the logistics firms in Nairobi?
iii. What are the challenges of ICT faced in supply chain performance the logistics firms in Nairobi

1.5 Value of the Study

The findings in this study would provide supply chain managers with critical information on the need for ICT solutions in enhancing the efficiency of the process. Such information would be critical in making decisions on how to go through the evaluation and implementation processes. This study would provide clear evidence with or against the studies that indicated a positive impact of ICT on supply chain performance. The study would help to identify determinants of organizational SCM dimensions that impact overall organizational performance.

An understanding of the ICT impact on SCM would help the top management and decision makers within the logistic firms in Kenya to focus on achieving these conditions and desired effects. The study would enable logistics firms to evaluate the benefits of implementing ICT solutions and the challenges arising thereof. The logistics industry would benefit from the improved efficiency in operations.

The results of the study would provide material for researchers and academicians interested in understanding the concept of ICT in supply chain. It would also form the foundation for further research into the topic. The study would provide insights for future researchers to apply the research findings to different areas.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This study investigates the impacts of ICT on supply chain performance of logistics firms in Nairobi Kenya. The chapter provides a review of the literature related to the study area. The literature included studies conducted by other researchers on the impact of ICT on SCM performance. The areas of focus include ICT and supply chain performance and ICT in logistics operations. More importantly, the chapter provided a review of ICT supply chain, supply chain, supply chain performance, impact of ICT on supply chain performance and the conceptual framework of the study.

2.2 ICT & Supply Chain

There has been a rapid development in the use of ICT in SCM and logistics. Many organizations are adopting ICT solutions in a range of operational areas. Such solutions continue to provide new ways and opportunities in storage, processing, distribution and exchange of information within companies and with suppliers and customers across the supply chain. In SCM, ICT has been an important enabler of information sharing by eliminating the bullwhip-effect (Evangelista & Sweeney, 2003). Various new SCM initiatives such as vendor managed inventory (VMI) rely greatly on the automation of the flow of materials and finished goods as well as the flow of information across organizations (Gunasekaran, Patel & McGaughey, 2004). From an operations management perspective, organizations seek to enhance their supply chains by sharing information to match demand and supply through demand forecasting, short- and long-term production planning and capacity planning (Lau & Huang, 2012).

The impact of ICT in supply chains can be demonstrated in relation to the changes in performance and relationships. SCM provides a variety of tools and techniques which help organizations to navigate around the business environment. Effective supply chains therefore provide opportunities to create sustainable competitive advantage (Tracey, Lim & Vonderembre, 2005). SCM focuses on availing the right goods at the right time at the right place (Slem 2005). As electronic businesses gain importance across various sectors, new opportunities emerge especially in information technology (Haag & Stephen, 2010).

ICT also emerges as an important source of competitive leverage for organizations which have adopted it especially in the logistics sector such as DHL and Airlines.

Logistics companies are now adopting Information Technology as a vital operational tool (Lysons & Farrington, 2006). In SCM, time and customer satisfaction are core and getting information on time is especially important. Accurate and on-time information increases service level thus decreasing costs and lead time (Boltani, 2008). Improvements in ICT infrastructure have enabled logistics companies to embrace opportunities to substitute paper-based processes by electronic interchanges (Raisinghani, 2008). This optimizes the flow of information within and across organizations taking full advantage of the diffusion and e-business software systems. ERP systems provide such paperless platforms where a supplier can exchange data related to orders.

Nevertheless, there is still a huge gap in the logistics sector in relation to the diffusion of ERP systems. In freight transport and logistics, e-Commerce is facilitated through initiating and tracking shipments online. By using GPS systems, a person equipped with the receiver can locate and move on land, sea, air and space around the earth. The GPS system has gained considerable application in the civilian sector and created a huge commercial development in many areas; shipping, road transport and tracking. By using GPS systems, transporters can easily track the locations of a vehicle at any time thus anticipate any delays in deliveries. The system also helps in reducing theft and locating the best transport routes (Zhang 2007).

2.3 Supply Chain

Supply chains encompass the companies and the business activities needed to design, make, deliver, and use a product or service. Businesses depend on their supply chains to provide them with what they need to survive and thrive. Every business fits into one or more supply chains and has a role to play in each of them. A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. According to Chopra & Peter (2004) the supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, such as manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development,

marketing, operations, distribution, finance, and customer service. A supply chain is dynamic and involves the constant flow of information, product, and funds between different stages.

Supply Chain Management aims to link all the supply chain agents to jointly cooperate within the firm as a way to maximize productivity in the supply chain and deliver the most benefits to all related parties (Finch, 2006). Adoption of Supply chain management practices in industries has steadily increased since the 1980s. Over the past decade, the traditional purchasing and logistics activities have emerged and shifted into broader strategic approach to materials and distributions management known as supply chain management. It is currently a major issue as organizations realize the substance of developing an integrated connection with their suppliers and final users. Theoretically, as described by Mentzer et al (2001), a supply chain can be defined as "a set of three or more organizations directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer."

The main goal and important aspect of supply chain is leveraging the expertise, experience, skills and capabilities of the supply chain professionals who comprise this competitive network (Mentzer et al, 2001). The performance of a firm depends not only on how efficiently it cooperates with its direct partners, but also on how well these partners cooperate with their own business partners. Net work theory (NT) can be used to provide a basis for the conceptual analysis of reciprocity in cooperative relationships. Here, the firm’s continuous interaction with other players becomes an important factor in the development of new resources (Haakansson and Ford, 2002). Supply chain is a complex process which requires the best practices to achieve the desired organizational goal which is basically the optimization of profits.

Supply Chain management revolves around efficient integration of suppliers, manufacturers, warehouses, and stores, it encompasses the firm’s activities at many levels, from the strategic level through the tactical to the operational level. The competitive criteria generally differ during the different phases of product life cycle; for instance, availability and technology are needed at the introduction phase, and cost, quality and speed are needed at the maturity phase (Chang, 2006). Supply chains and distribution channels today battle more on the basis of

time and quality, having defect-free products to customers faster and more reliably than the competitor is no longer seen as a competitive advantage but just as a market place prerequisite.

Customers constantly demand that products are delivered quicker, on time, and with no defects. This is achieved with proper synchronization of efforts by connecting systems and processes to create synergy (Christopher, 2005). The global orientation and increased performance-based competition, combined with rapidly changing technology and economic conditions, all contribute to market place uncertainty. This uncertainty requires greater flexibility on the part of the individual companies and distribution channels, which in turn, demands for more flexibility in channel relationships. For this to be achieved, a firm must have a fit between SCM, logistics and e-commerce within its operations. This will enhance competitive advantage of the business and improve corporate performance.

2.4 Supply Chain Performance

The study of Mishra, (2012) focused on the role of Information technology (IT) in supply chain management. It also highlights the contribution of IT in helping to restructure the entire distribution set up to achieve higher service levels and lower inventory and lower supply chain costs. The broad strategic directions which need to be supported by the IT strategy are increasing of frequency of receipts/dispatch, holding materials further up the supply chain and crashing the various lead times. Critical IT contributions and implementations are discussed. Fundamental changes have occurred in today's economy. These changes alter the relationship we have with our customers, our suppliers, our business partners and our colleagues. It also describes how IT developments have presented companies with unprecedented opportunities to gain competitive advantage. So IT investment is the pre-requisite thing for each firm in order to sustain in the market.

The Study of Dong et al., (2009) aimed to better understand the value of information technology (IT) in supply chain contexts. Grounded in the resource-based theory in conjunction with transaction cost economics, they developed a conceptual model that links three IT-related resources (back end integration, managerial skills, and partner support) to firm performance improvement. The model differs from previous studies by proposing a

moderating effect of competition on the resource-performance relationships. Using data of 743 manufacturing firms, their analysis indicates significant contribution of IT to supply chains, which is generated through development of the digitally enabled integration capability and manifested at the process level along the supply chain. The technological resource alone, however, does not hold the answer to IT value creation. In fact, managerial skills, which enable adaptations on supply chain processes and corporate strategy to accommodate the use of IT, are shown to play the strongest role in IT value creation.

A number of beneficial changes were made, including the implementation of a major new business system replacing the old accounting system. In all these developments, the work of a teaching company associate, now known as knowledge transfer partnerships associate supported the analysis, but the full participation and support of all key personnel within the company was essential. Although there were problems during the implementation, these have being resolved and Beale and Cole now has a fully supported and integrated IT system which will maintain their competitive advantage and facilitate their continued growth and profitability. The study of David et al., (2004) indicated that the supply chain management is critical since firms always confront the competition on their supply chain efficiency.

Specialized tools address the critical issues in food production management including product tracing, quality management, product identification and specification, expiration dates, production lots, date codes and hold management. Lead time being the time between order and placement of materials and the actual delivery, he shorter the lead time the better the supplier. Every logistics company is comfortable when the lead time is shortest possible. Long lead time has time has the impression that the specific supplier is less efficient or he just has some more customers than he can serve thus delaying deliveries (Beamon,2005). Organization technologies have led to a host of innovations which seem to be radically changing the nature of manufacturing industry.

The increasing replacement of mass production, specialized single –purpose, fixed equipment by computer aided design and engineering capabilities (CAD/CAE). robots, automatic handling and transporting devices, flexible manufacturing systems (FMS), computer aided/ integrated manufacturing(CAM/CIM),cellular manufacturing, just in time (JIT) techniques,

materials resource planning(MRP), and telematics has allowed firms to produce a larger variety of outputs efficiently in smaller batches and less time (Kaplisky,2006). State-of –the art supply chain management systems can be obtained from the supply chain operations Reference Model for business applications, advancement and practices.

Problematic management processes in standard process reference model form improves competitive advantage, communication, dimensions, management, control and alter to a specific purpose among the supply chain management processes. SCOR (Supply Chain Operations Reference) is a reference framework that models supply chains, developed by the Supply Chain Council, set in 1996 by Pittiglio. Rabin,Todd McGrath (PRTM) and MR Research. SCOR models supply chain by these complementary perspectives, approach, functional domains and levels of analysis (Stewart, 1997). SCOR has been developed for applying and advancing state-of-the art supply chain management systems and practices through its structured framework and approach. It provides a comprehensive methodology to improve the overall supply chain operations. SCOR, is a flexible framework and has common language that can help companies improve their SC internally and externally, were developed by real-world supply chain experiences.

SCOR evaluates the objective, effectiveness of reengineering, performance, quantification, testing and future planning as well as specific process operations in SC. It is not possible to have a perfect SCM model but a closely adapted model is being applied at PTC, which is a first in the history of SCOR at the factory level (Gulledge, Cavusoglu & Kessler, 2010). Complex management processes can be transformed in standard process reference model form to achieve competitive advantage, communication, measurement, management, control systems and alterations for a specific purpose. Since SCM systems can be represented in the form of a model which represents the real world situation .It is necessary to study modelling approaches for the integration of each function through SCM concepts.

According to Archie & Kevin (2004) SCOR includes main functional domains, with a concept similar to GEF and porter's value chain planning processes, Plan the supply chain: operations planning (similar to GEF), Execution Processes, Source: equivalent to Porter's Inbound Logistics; Make: equivalent to Porter's Operations ,includes the realization of

products via blending, separation, mechanical work, chemical transformation; Deliver, equivalent to porter's outbound Logistics +Porter's Sales; and Return: return of materials by the customer to the supplier, e.g. because they have not been positively tested. SCOR includes also a wide class of "enabling processes", that are intended to prepare, file, handle information needed to planning and execution processes.

Gulledge et al., (2010) argues that SCOR process elements are described by a thick Manual, that contains diagrams and cards that list their properties in terms of Text description; Metrics by which business performances of a process, element are measured in terms of reliability, responsiveness, flexibility, cost, asset; Best practices, that mentioned reference solutions to perform or computerize the process element considered, and also, mention excellence criteria, e.g. planning is excellent if balances supply and demand. The SCOR method is a customization of the reference framework processes, problematic management processes, lead time being the time between order and placement of material and the actual delivery, the shorter the lead time, the better the supplier. Every logistics company is comfortable when the lead time is shortest possible. Long lead time has the impression that the specific supplier is less efficient or he just has more customers than he can serve thus delaying deliveries (Beamon, 2005). Organization technologies have led to a host of innovations which seem to be radically changing the nature of manufacturing industry.

The increasing replacement of mass production, specialized, single-purpose, fixed equipment by computer aided design and engineering capabilities (CAD/CAE), robots, automatic handling and transporting devices, flexible manufacturing systems (FMS), computer aided/integrated manufacturing (CAM/CIM), cellular manufacturing, just-in-time (JIT) techniques, materials resource planning (MRP) and telematics has allowed firms to produce a larger variety of outputs efficiently in smaller batches and less time (Kaplinsky, 2006). The implementation of ICT affects supply chain performance in various ways as outlined in the following section.

2.5 Influence of ICT on the Supply Chain Performance

The subject of ICT in supply chain and logistics has attracted many researchers who have conducted studies on different areas of the subject. In its report on transport and logistics, the European Commission noted that the use of ICT software positively drives organizational changes (European Commission, 2008). The study tested the hypothesis that ICT usage positively correlates to organizational changes and it was noted that ICT skills and software have different implications on the conduct and performance of organizations. In the same study, it was again noted that whereas ICT hardware is necessary for an organization, it does not automatically guarantee business transformation. Positive change comes from ICT skills coupled with the use of innovative software to manipulate operations. The success derived from ICT investment from a logistics companies therefore largely hinges on innovation, skills and software used.

In a feasibility study of an integrated ICT-based logistics system for the Friuli Venezia Giulia region in Italy, Danielis et al. (2008) finds that intermodal transport needs can be enhanced by connecting the regional stakeholders with an ICT system. By interviewing 20 stakeholders, the researchers noted that a generic ICT system might not be applicable to the region. It was realized that a successful ICT system must be implemented in phases beginning with the sharing of information on the benefits of the system. From the findings, it emerged that an ICT-based system in logistics operations greatly reduces transportation costs, energy usage and carbon emission. Transportation management System (TMS) helps in planning and executing external flows thereby optimizing transportation while taking account of multimodal transport, and international trade.

In the East African Logistics Performance Survey (2012), the Shippers Council of Eastern Africa did a field assessment of the challenges faced by logistics companies in the region. 54.4% of the respondents indicated that they always experienced delays arising from insufficient ICT infrastructure. In addition, it was seen that the security of cargo is a major challenge to the shippers as it is not always guaranteed in the supply chain. In this regard, the ability of the companies to track and trace their shipments becomes an important issue. The respondents were also asked how easily they could always track their shipments while in

transit. 31.25% said they use electronic means of cargo tracking while the rest rely on telephone as the main way of tracking.

Zhelyazkoz (2008) studied the impact of ICT systems on road logistics for companies in Australia. The research identified the major reasons and inhibitors to the adoption of ICT by logistic companies. Considering the cost implications and technical features of ideal ICT systems, it was realized that it was not always certain that ICT investment fulfils the needs of companies. Technology constraints were identified as major barriers due to the lack of standard communication platforms between different suppliers and buyers. It was realized that different ICT applications adopted in the market meant that companies always invest heavily in order to communicate to all parties. It is therefore seen that ICT only influences an organization's supply chain system when used appropriately and in the presence of supporting infrastructure. This study focuses on effects of ERP, RFID, Bar coding and GPS on supply chain performance.

2.5.1 Automation

According to Michael Hurns (2002) supply-chain problems cost companies between 9 and 20 percent of their value over a six-month period. The problems range from part shortages to poorly utilized plant capacity. When you place this in the context of the over-all business-to-business (B2B) market expected to reach US$7 trillion by 2004 (37 percent of which is projected to be e-commerce sales), it's easy to see that effective supply-chain management (SCM) tools could save companies billions of dollars.
Attempts to automate solutions to these problems are complicated by the need for the different companies in a supply chain to maintain the integrity and confidentiality of their information systems and operations.

According to Wieder et al. (2006) the objective of an enterprise resource planning (ERP) solution is to unify and standardize business processes. Centralizing information makes it easier to collect, access, and manage data across the enterprise. But the critical value businesses reap from ERP is expanded visibility into data that can be used to better inform their business decisions and operational proficiency. The Enterprise Resource Planning (ERP) phenomenon provides an opportunity to drastically rethink supply chain strategies.

ERP system can cope with different functional area, such as, sales, accounts receivable, accounts payable, engineering, inventory management, production, purchase, quality management, human resources, production, and distribution planning. Basically, ERP systems competent to integrate, optimize, and coordinate physical, cash, and information flow in the above-mentioned functional area as well as within the entire supply chain of the company (Zheng et al., 2000).

ERP systems aims at understanding the key drivers of the ERP phenomenon, the determination of costs and anticipated benefits, the principal challenges during the implementation project, and the maintenance of the software once it is in place. Such an understanding would provide valuable guidance to managers who are currently undertaking such far-reaching projects. Bradford and Florin (2003) draw upon Diffusion of Innovation and Information Systems Success theories to determine that the level of employee training in the ERP system and competitive pressure to adopt the system positively impact implementation performance.

Implementing all modules of ERP system is not affordable by many companies and this is because of the large sum of money that the company needs to pay in order to implement the whole package of ERP system and then obtain all functionality of the system (Parr and Shanks, 2000; Sheikh, 2003). Companies usually implement some modules of ERP system and not all modules. The selection of the modules depends on the requirement of the company and on what functionality they need to be provided within the company as well as on the need of specific modules that can fit to particular requirements and therefore satisfy the business objectives (Parr and Shanks, 2000; Sheikh, 2003). For instance, when companies need to improve their financial performance they implement modules related to finance and when they need to improve SCM performance they implement modules related to SCM (SAP, 2006). Davenport and Brooks (2004) noted the large impact of ERP system on SCM in helping companies to share information with other partners.

ERP system is generally conceived as an important precursor to SCM performance and a very useful tool for its improving (Zheng et al., 2000). With ERP system companies are able to integrate all functional units, standardize and manage information sharing within their

entire departments and then extended it to suppliers and customers in order for suppliers to expedite the delivery of necessary raw materials and also in order for customers to place an order faster and smoother. Usually the implementation of ERP system will be linked to business process reengineering in order to focus on business process activities in entire company (Subramoniam et al., 2009). There is a wide consensus among many authors on the importance of ERP system in the improvement of supply chain performance. For instance, Wieder et al. (2006) found that, there are positive impacts of ERP system on supply chain performance. Zeng and Pathak (2003) stated that, there are several records of success indicating that the integration of supply chain can enhance and improve the performance of the supply chain to be effective and competitive in the global business environment. Moreover, Hitt et al. (2002) pointed out that, investment in ERP system improves productivity and business performance.

Cotteleer (2002) found that, ERP system is able to improve operational performance within the supply chain. Themistocleous et al. (2002) come up with a conclusion that ERP system supported SCM since long time. On the other hand, there is a large argument among several authors in ERP literature about the section or the area that ERP system improves inside the company as well as within the whole supply chain. Rom and Rohde (2006) argue that, ERP system can support data collection and management accounting better than other systems such as strategic enterprise management system. Spathis & Constantinides (2004) noted that, ERP system improves flexibility in information generation, as perceived by many companies, and it is able to decrease operational costs and cycle time and thus increase customer satisfaction and loyalty. Tarn et al. (2002) pointed out that, ERP system able to expedite information sharing within SCM in order to enable closer cooperation among supply chain partners and to reduce the cost of transaction.

The overall supply chain performance could be improved through the channel coordination, information sharing, operational efficiency, and integrated communication within the supply chain. ERP system provides integration for better communication and coordination within the company and its supply chain. The success of ERP system and the supply chain highly depends on the process of integration achieved in the company and this could be achieved smoothly with the core functionality of ERP system which provides web linkage, facilitates

electronic data interchange, and integrates the entire supply chain in order to support effectively the company's supply chain activities (Olson et al., 2005; Park & Kusiak, 2005). According to a study conducted in Thailand on Thai-owned and multinational companies, ERP system able to improve scheduling, tracking, and managing inventories and raw materials. It also able to save costs, improves business processes and internal integration, reduce human error and staff costs, enhance visibility and accessibility to data, and increase responsiveness (Arunthari, 2005).

2.5.2 Lead Time

One way to hedge against random fluctuations of demand in supply chains is to keep inventories at various points in the chain as well as working with multiple suppliers, using transportation options, having the option to expedite certain processes, or having different routes for a unit to go through the supply chains (Beyer and ward, 2001). Modern supply chains are expected to respond rapidly, effectively and efficiently to changes in the work place. Similarly there is the drive to achieve world class customer service levels coupled with minimum reasonable inventory (Dennis R. Towill, 2006). A number of today's companies have created global strategies to source raw materials, components and labor from low-cost countries (Ballou,2004; Bowersox, 2010), which are often located far from the countries where they will be used. This means that they can have more options for selecting supplies and negotiate lower prices. By that they hope to achieve competitive advantages (Coyle, 2003) and secure supply sources (Waters, 2011). Common business strategies influencing global operations are, for example, aiming for economies of scale by optimization of manufacturing size or cross-border mergers spreading operations over a large number of countries (Waters, 2011).

According to the World Trade Organization, world trade is growing faster than the gross national product in most countries and most probably will continue to do so for the predictable future (Christopher, 2008). Thereby, the complexity and expansion of companies keeps increasing continuously as well. The main challenges resulting from globalization are longer supply lead times, unreliable transit times, various consolidation possibilities and a number of transportation mode as well as cost options (Bowersox, 2010). There are a number of reasons causing these challenges according to Bowersox (2010) such as financial

requirements, need for special packaging, ocean freight scheduling and customs clearance. Moreover he states that supply chains become less consistent and flexible because of longer supply lead times.

Accordingly planning and coordination of the material flow becomes a demanding task. The increased distance from suppliers and complexity of logistics in global companies tends to create longer order lead times and higher inventory levels. Meanwhile in companies that practice cost efficient philosophies, the goal is to move towards reduced lead times and elimination of excess stock levels. Therefore it creates a challenging task for the logistics to accomplish both goals. (Rushton et. al, 2006). One of the key business considerations for companies is reaching a balance between supply and demand (Christopher, 2008) and thereby increasing its profitability. Thus, for optimizing the performance of the supply chain, product availability has to be met exactly with the customer requirements.

As Lysons (2007) suggests, an important concern in the interest of supply chain optimization is inventory management. Even though the current developments like JIT and cost efficient principles are against holding inventory (Waters, 2011), there exists plenty of reasons for carrying inventory. For example, to lower the risk of supplier failure, lead time uncertainty, meeting the sudden changes in demand and hedging against foreseen shortages and price fluctuations (Lysons, 2007).

A somewhat contrasting approach to cost efficient is responsive strategy, which instead considers flexibility by having buffers and overcapacity, rather than costs concerning the supply chain. Ignoring the need for responsiveness could lead to cost of stock outs, which causes loss of production, idle time of workforce and machines, cost of action taken to overcome the stock-out and possible loss of customer goodwill (Waters, 2011). Unfortunately the latter costs are often hidden and hard to estimate, which makes them also difficult to compare adequately with inventory holding costs (Lysons, 2007).The above described situation implies that all the cost drivers should be made clear and considered while planning inbound logistics operations. The key would be finding the balance between being cost efficient meanwhile securing necessary responsiveness. From a theoretical perspective this means looking for opportunities to combine previously mentioned cost efficient and responsive approaches, in order to compromise between costs and

responsiveness (Christopher, 2000). Christopher (2008) further explains that in today's demanding business conditions there is a need to have several supply chain designs, rather than "one size fits all" solution.

2.5.3 ICT Application

Information and communication technologies (ICT) are one of the most important enablers of effective supply chain management Jack et al (2006). A great deal of interest in supply chain management stems from the availability of information and the methods to analyze this information to reach meaningful results. As electronic business gain importance, new opportunities exist, and the wide spread use of internet is increasing the interest for the information technologies (Haag and Stephen, 2010). ICT tools are a source of competitive power for many companies. Especially for service industries such as big retailers, transportation companies such as DHL and airline companies where they are now using information technologies them widely as a result, information technologies have earned a vital role in many organizations (Lysons & Farrington, 2006). In supply chain management, time and opportunities to get information on time is very important. Accurate and timely information will enable the organization to increase service level and as a result decrease the costs and lead times (Bottani (2008). Along with this, many companies are offering information technologies based services to their customers in order to gain competitive edge and sustain long term relationships with them

Logistics and distributors and virtually every other type of industry are using bar code to replace keyboard data entry. The warehouse, when the goods enter through a conveyor, they are further scanned by the hand held scanner or scanner fixed alongside the conveyor. The information decoded by the scanner is immediately logged in the central computer which helps real time update of inventory records (Witt, 2004). During the production process the identification of in-process and finished items become easier due to bar coding. The various bathes at different stages of production can be easily tracked. During distribution, barcode helps in identifying and tracking the transit of finished goods to the customers. Bar codes according to Jones (2004) have many features and benefits likely to stimulate and facilitate substantial change within numerous industry supply chains.

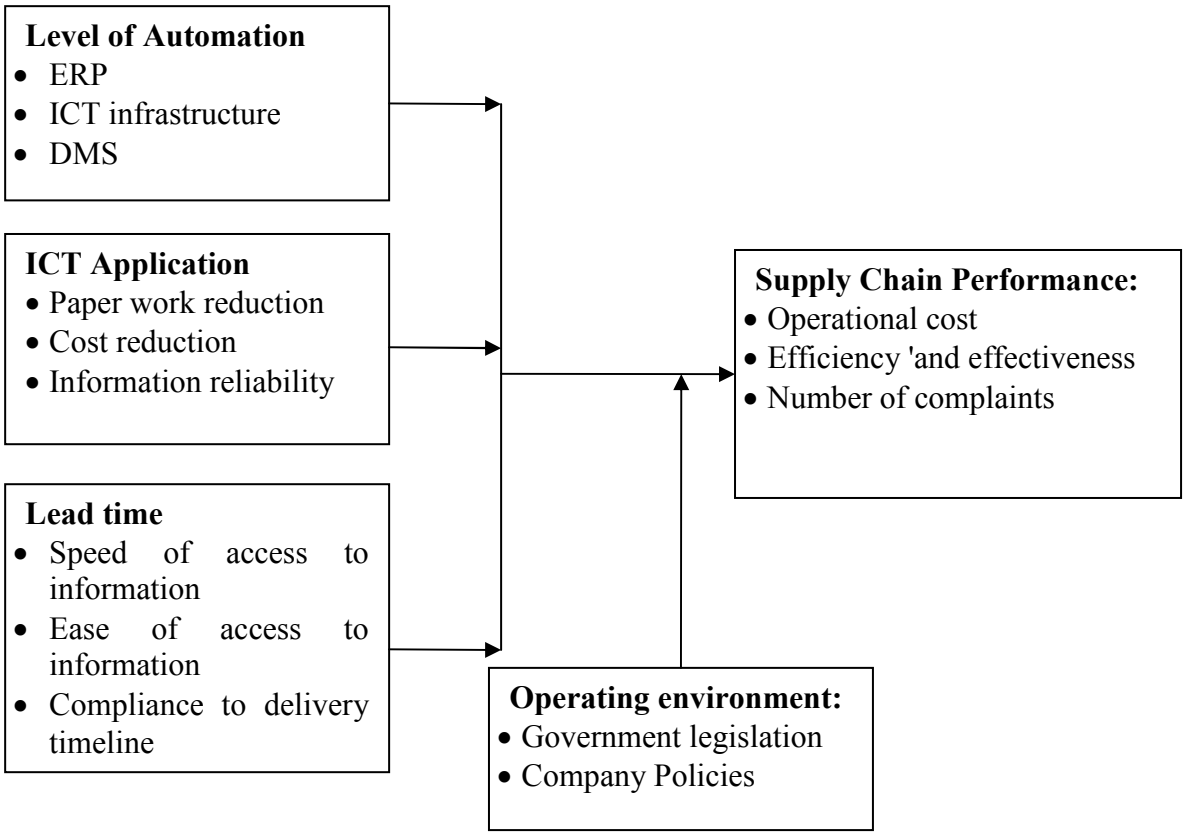
According to Glidden et al., (2004) Bar codes also offer the potential to gain several additional key business advantages including labour savings from eliminating manual bar code scanning or keypad entry, theft and loss prevention capabilities; streamlined inventories and cost reduction; reduced turnaround time and responsiveness; increased efficiency by minimizing unnecessary handling; potential for production adjustment to real-time downstream inventory level reports; and on-demand replenishment at the distribution center or retail store level. Barcodes have influenced almost every aspect of Supply Chain Management. The use of barcodes makes business integration processes in supply chain management simpler and more efficient. Barcodes are an effective identification tool that helps track products and greatly reduce errors.

Barcode technology has a range of advantages such as being affordable, easy to handle, and accurate. These advantages make barcodes widely used in supply chain management and accepted across the world. According to Quagliariello (2004) employing barcode technology in inventory practices enables timely and accurate information that helps to operate with greater warehouse efficiency and lower inventory on hand. One of the problems associated with Bar Code is that, these are prone to environmental conditions, such as temperature, dirt, or hazardous contamination making it difficult for reader to scan the items. Barcode may be useful in some cases, where time is not that much crucial but cost is a major concern.

2.6 Conceptual Model

.

Figure 2.1: Conceptual Model



Source: Author (2014)

An overview of the conceptual framework in Figure 2.1, illustrates the underlying variable relationships as used in this study. In this study, the independent variables are automation, lead time and ICT application, while the dependent variable is supply chain performance

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter sets out various stages and phases that were followed in completing the study. It involves a blueprint for the collection, measurement and analysis of data. This section was an overall scheme, plan or structure conceived to aid the researcher in answering the raised research questions. The research identified the procedures and techniques that were used in the collection, processing and analysis of data. The subsections included are research design, target population, data collection instruments, data collection procedures and finally data analysis.

3.2 Research Design

For the purposes of this study, the researcher employed a descriptive research design. A descriptive study is concerned with determining the frequency with which something occurs or the relationship between variables (Bryman & Bell, 2003). Thus, this approach was appropriate for this study, since the researcher intended to collect detailed information through descriptions and is useful for identifying variables and hypothetical constructs. The design was deemed appropriate because the main interest was to explore the viable relationship and describe how the use of ICT affects supplies chain performance in logistics firms in Nairobi.

3.3 Population

The population comprised of approximately 1000 logistics firms in Kenya. This being an academic study, it may not be logical to study the 1000 firms in Kenya due to finance and time constraints against the short period of doing the project. Accordingly, the study targeted 30 large firms operating in Nairobi (Appendix I) in investigating the impact of ICT on supply chain performance among logistics firms in Nairobi. The researcher used quota sampling technique to identify the sample size. Nairobi has thirty (30) registered and recognized logistics firms and are likely to have adopted the use of ICT in managing their supply chain management processes and thus the reason for the sample size of thirty. In this regard, two managers or their equivalent officers were selected purposively from the sampled firms to participate in this study. As such, the respondents were selected from the supply chain management and ICT departments since they were the ones conversant with the impacts of

ICT on supply chain performance of the logistics firms. This entailed interviewing 60 managers currently employed at these firms.

3.4 Data Collection

Primary data is information gathered directly from respondents (Kombo & Tromp, 2006) and for this study the researcher used a questionnaire. The questionnaire had both open and closed-ended questions. Secondary data was also collected for this study. Secondary data involved the collection and analysis of published materials and information from other sources such as annual reports and published data. The researcher administered the questionnaire individually to all respondents of the study using a drop and pick later method. Prior to the data collection exercise, the researcher carried out a pilot study to pretest and validate the questionnaire. To establish the validity of the research instrument the researcher sought opinion of experts in the field of study especially the researcher's supervisor and lecturers in the school of business. This facilitated the necessary revision and modification of the research instrument thereby enhancing validity. The researcher selected a pilot group of 10 individuals from the target population to test the reliability of the research instrument. The clarity of the instrument items to the respondents was established so as to enhance the instrument's validity and reliability. The results helped the researcher to correct inconsistencies arising from the instruments, which ensured that they measured what was intended.

3.5 Data Analysis

Data collected was purely quantitative and it was analyzed by descriptive analysis. The descriptive statistical tools such as Statistical Package for Social Sciences (SPSS) and MS Excel helped the researcher to describe the data and determine the extent used. Data analysis used frequencies, percentages, means and other central tendencies. Tables and charts were used to summarize responses for further analysis and facilitate comparison. This generated quantitative reports through tabulations, percentages, and measure of central tendency. To analyze the first objective, descriptive analysis technique were used to derive descriptive statistics.

To determine the impact of ICT use on the supply chain performance of logistics firms in Nairobi, the study applied both descriptive statistics and content analysis. In addition, the researcher carried out a multiple regression analysis so as to determine impacts of ICT on supply chain performance among logistics firms in Nairobi.

The regression equation ($\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3}$): Whereby Y = supply chain performance of logistics firms; X_1 = level of automation; X_2 = ICT application; X_3 = Lead time while β_1, β_2, β_3 are regression coefficients and ε = Error term. This provided the generalization of the findings on the influence of ICT on supply chain performance of logistics firms in Nairobi.

CHAPTER FOUR: DATA ANALYSIS, FINDINS AND DISCUSSION

4.1 Introduction

This chapter presents analysis and findings of the study as set out in the research methodology. Having identified the problem of study in chapter one, reviewed existing literature and shown gaps of knowledge in chapter two, chapter three explained the methods that the study used to collect data. This chapter presents analysis and findings of the study as set out in the research methodology. The results are presented on the relationship between information and communications technology and supply chain performance among logistics firms in Nairobi. The data was gathered mainly using a questionnaire as the research instrument and secondary data was used to supplement the data collected from the questionnaire. The questionnaire was designed in line with the objectives of the study.

4.2 Response Rate

The study administered 60 questionnaires to the management staff working in the logistics firms from the supply chain management and ICT departments from the target population in collecting data with regard to the relationship between information and communications technology and supply chain performance among logistics firms in Nairobi. The questionnaire return rate results are shown in Table 4.1.

Table 4.1: Response Rate

Response rate	Frequency	Percentage
No Response	19	31.7
Response	41	68.3
Total	**60**	**100.0**

Source: Author (2014)

From the study, 41 out of 60 sample respondents from the logistics firms that participated filled in and returned the questionnaire contributing to 68.3%. This is regarded as a good and adequate response rate, in line with the literature by Mugenda and Mugenda, (2003) which recommends that for generalization, a response rate of 50% is adequate for analysis and reporting. 60% is good and any response rate of 70% and over is excellent for descriptive studies. This commendable response rate can be attributed to the data collection procedure, where the researcher personally administered questionnaires and waited for

respondents to fill in, kept reminding the respondents to fill in the questionnaires through frequent phone call and picked the questionnaires once fully filled. The 31.7% questionnaires that were not returned were due to reasons like, the respondents were not available to fill them in at that time and with persistence follow-ups there were no positive responses from them. The response rate demonstrates a willingness of the respondents to participate in the study.

4.2.1 Age of the Respondents

This study sought to investigate the composition of the respondents in terms of age brackets to understand their familiarity with the influence of ICT on supply chain performance among logistics firms in Nairobi. Table 4.2 shows the results of the findings on the age brackets of the respondents.

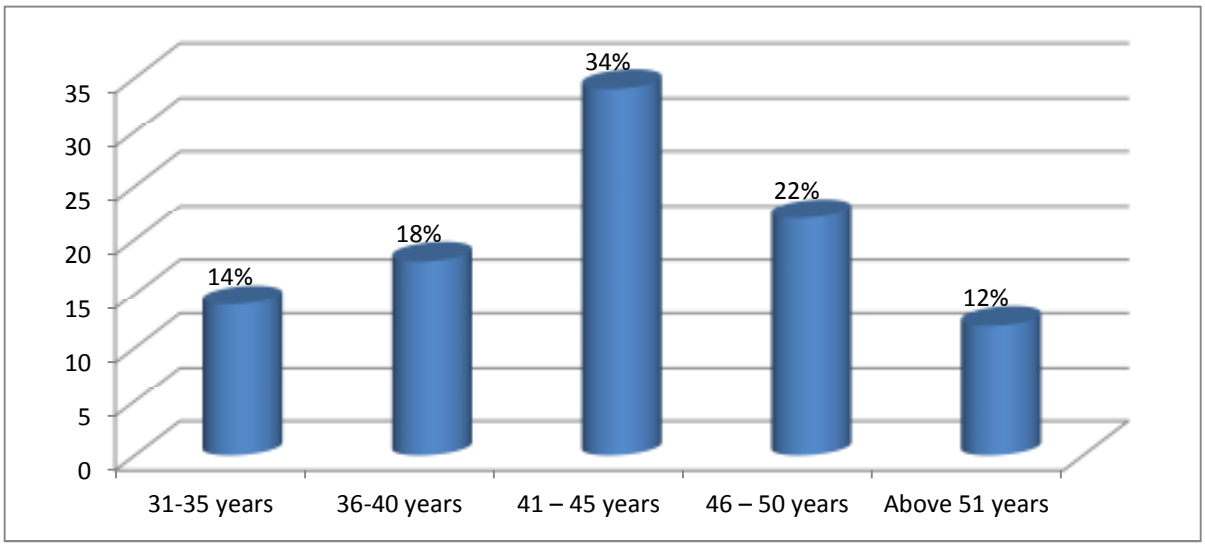
Table 4.2: Age Bracket

Age bracket	Frequency	Percentage
31-35 years	6	14
36-40 years	7	18
41 – 45 years	14	34
46 – 50 years	9	22
Above 50 years	5	12
Total	**41**	**100**

Source: Author (2014)

According to the results depicted in table 4.2 and figure 4.1, majority (34%) of the respondents were aged between 41 – 45 years, 22% of them indicated that they were aged between 46 – 50 years, 18% of the respondents indicated that they were aged between 36-40 years, 14% of them indicated 31-35 years while 13% of them were aged over 50 years. From these results it is clear that the respondents were well distributed in terms of age and that they are active in technological advancements and productivity and hence can contribute constructively in the influence of ICT on supply chain performance among logistics firms in Nairobi.

Figure 4.2: Distribution of the Respondents by Age Brackets



Source: Author (2014)

4.2.2 Working Experience

The length of service/working in an organization determines the extent to which one is aware of the issues sought by the study. The study therefore sought to establish the length of time that the respondents had been working in the logistics firms in Nairobi. The results on this question are presented in Table 4.3.

Table 4.3: Duration Worked in the Logistics Firms in Nairobi

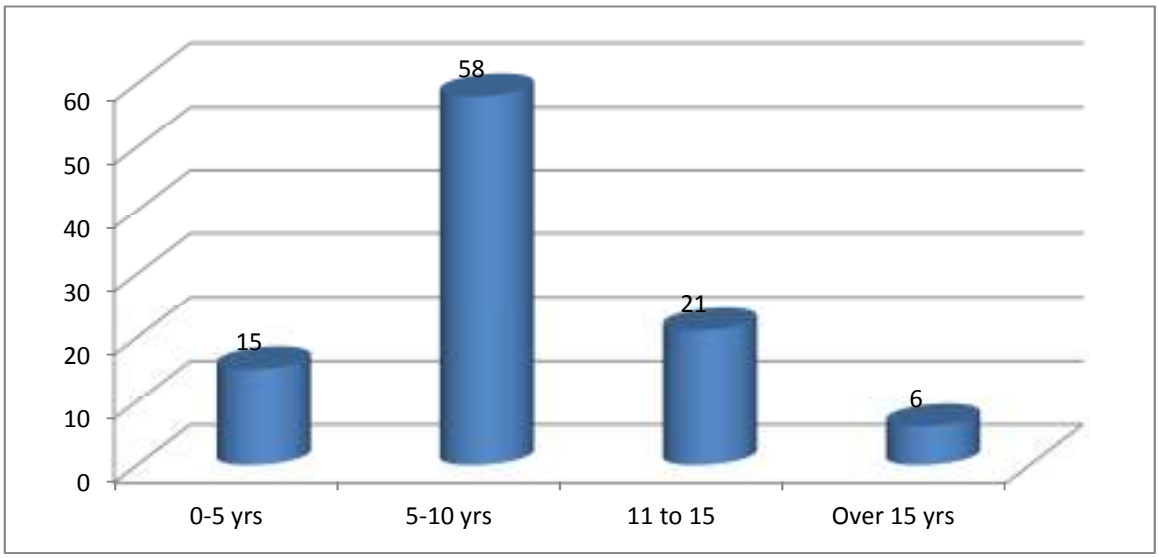
Duration in Years	Frequency	Percentage
0-5 yrs	6	15
5-10 yrs	24	58
10-15	9	21
Over 15 yrs	2	6
Total	**41**	**100.0**

Source: Author (2014)

The study results depicted in table 4.3 reveal that 58% of the respondents indicated that they had an experience of 5-10 years in the logistics firms, 21% of them had worked in the logistics firms for a period of 10-15 years, 15% of them had a working experience of 0-5 years, while 6% of the respondents indicated that they had an experience of over 15 years.

This shows that majority respondents had enough work experience in the logistics sector in Kenya. The respondents are conversant with the influence of ICT on supply chain performance among logistics firms in Nairobi. The results are further presented in figure 4.2.

Figure 4.3: Duration Worked in Logistics Firms in Nairobi



Source: Author (2014)

4.2.3 Level of Education

The logistics firms in Nairobi employ staffs in different work stations hence different academic qualifications. This difference might contribute to differences in the responses given by the respondents. The study therefore sought to investigate the education level achieved by the respondents.

Table 4.4: Respondents' Level of Education

Education Level	Frequency	Percent
Certificate	5	12.5
Diploma	7	16.7
Bachelor's degree	27	66.7
Masters Degree	2	4.2
Total	**41**	**100.0**

Source: Author (2014)

On the respondents' highest level of education, the study found that majority of the respondents as shown by 66.7% had attained undergraduate/ bachelor's degrees as their highest level of education, 16.7% of them had attained diploma level of education, those who

had certificate level of education were shown by 12.5%, while 4.2% of them had attained postgraduate qualifications like masters degrees. This information shows that the respondents were knowledgeable enough to contribute positively in this study.

4.2.4 Departmental Representation

Application of ICT among firms affects the various aspects of performance of the organizations across various departments especially the supply chain performance in the logistics firms. It was therefore important to ensure that questionnaires were distributed and returned from the vital departments within the selected firms. This was to ensure that the all areas of supply chain performance influenced by ICT in the firms are captured in the study. The results are as depicted in table 4.5.

Table 4.5: Respondents' Departments

Department	**Frequency**	**Percent**
Supply chain	12	29
ICT departments	23	57
Others (HR, Finance & Operations)	6	14
Total	**41**	**100**

Source: Author (2014)

From the results shown in table 4.5, 57.0% of the respondents were working in the ICT department, 29.0% of them were working in the supply chain department and 14.0% worked in the other departments like operations, HR and Finance departments. This implies that all departments that were targeted by the study were involved and that the findings are not biased hence representative of the various departments' views on influence of ICT on supply chain performance among logistics firms in Nairobi. It thus shows that the entire organizational departments were well represented and thus the quality contributions from all the departments of the logistics firms have been captured.

4.2.5 Designations of the Respondents

Further the study was interested to investigate the various managerial positions held by the respondents in their institutions concerned with ICT and supply chain performance in the logistics firms. This was relevant to assess the distribution of the respondents across the

management levels since they are part and parcel in the process of determining the ICT applications in supply chain. The study targeted to collect data from the management staffs. The results are as depicted in Table 4.6.

Table 4.6: Respondents Designations

Designation	Frequency	Percentage
CEO/executive	3	8.1
Manager/head of department	32	78.7
Other	5	13.2
Total	**41**	**100**

Source: Author (2014)

The study findings in table 4.6 show that all the respondents occupy positions concerned with implementation of decisions like ICT utilization on supply chain therefore they are aware of the relationship between ICT and supply chain performance in the logistics firms. As such, an overwhelming majority, shown by 78.7%, comprised of managers/ heads of departments, 13.2% of them occupied other positions like assistant heads of departments, supervisors and general staffs.

4.3 Extent to which ICT is applied in Logistics Firms

The main objective of this study was to determine the extent to which ICT is applied in supply chain of logistics firms in Nairobi. As such the respondents were required to indicate their opinion on the extent to which the logistics firms make use of ICT in supply chain. The responses are as depicted in table 4.7.

Table 4.7: Extent which the Logistics Firms make use of ICT in Supply Chain

Extent	Frequency	Percent
To a great extent	25	60
To a moderate extent	7	18
To a little extent	9	22
Total	**41**	**100**

Source: Author (2014)

From the study, 60% of the respondents indicated that the logistics firms make use of ICT in supply chain to a great extent, 22% of the respondents indicated that the logistics firms make use of ICT in supply chain to a little extent, while 18% of the respondents indicated that the logistics firms make use of ICT in supply chain to a moderate extent. These results imply that

majority of the logistics firms adopted ICT in supply chain that affect supply chain performance significantly.

The study further sought to establish how the respondents would rate the use of ICT in the various aspects of supply chain performance in the logistics companies. A scale of 1 to 5 was provided where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent.

Table 4.8: Use of ICT in Various Aspects of Supply Chain Performance

Use of ICT in the following aspects of supply chain performance	No extent	Little extent	Moderate Extent	Great extent	Very great extent	Mean	Std. Dev.
Sharing of Information	0	6.3	18.7	37.5	37.5	3.6250	1.4083
Material Requirements Planning	4.1	26.3	18.1	19.2	32.3	3.4612	1.2633
Distribution Requirement Planning	29.2	43.8	8.3	8.3	10.4	3.5428	1.5152
The Advance Planning and Scheduling	0	23.1	46.2	30.7	0	3.0769	.75955
Coordination of logistics flows	0	23.1	69.2	7.7	0	2.8462	.55470
Supports planning and execution operations	2.3	27.1	6.7	41.3	22.6	3.5489	1.1772

Source: Author (2014)

From the study, majority of the respondents recapped that ICT is used in sharing of information to a great extent as shown by a mean score of 3.6250 as well as support planning and execution operations to a great extent as shown by a mean score of 3.5489 and distribution requirement planning to a great extent as shown by a mean score of 3.5428. In addition they indicated that ICT is used in material requirements planning to a moderate extent as shown by a mean score of 3.4612, the advance planning and scheduling to a moderate extent as shown by a mean score of 3.0769 and coordination of logistics flows to a moderate extent as shown by a mean score of 2.8462.

4.4 Effects of ICT on Supply Chain Performance

The second objective of the study was to determine how ICT application affects supply chain performance in the logistics firms in Nairobi. In this regard, the respondents were required to

indicate the extent to which the use of ICT affects the supply chain performance of the logistics firms.

Table 4.9: Extent to which the Use of ICT affects the Supply Chain Performance

Extent	Frequency	Percentage
Very great extent	14	33
Great extent	16	39
Moderate extent	9	23
Little extent	2	5
Total	**41**	**100.0**

Source: Author (2014)

According to Table 4.9, majority (39%) of the respondents stated that use of ICT affects the supply chain performance of the logistics firms to a great extent and 33% to a very great extent while 23% said that use of ICT affects the supply chain performance of the logistics firms to a moderate extent. According to 5% of the respondents, use of ICT affects the supply chain performance of the logistics firms to a little extent. These results indicate that use of ICT affects the supply chain performance of the logistics firms to a great extent as shown by majority of the respondents, 72%.

The study further sought to ascertain the extent to which ICT applications affect the supply chain performance of the logistics firms. The results are as depicted in Table 4.xx.

Table 4.10: Extent to which ICT Applications affect Supply Chain Performance

ICT Applications	No extent	Little extent	Moderate Extent	Great extent	Very great extent	Mean	Std. Dev.
Enterprise Resource Planning (ERP)	27.1	37.5	6.3	14.6	14.6	3.2083	1.1842
Radio Frequency Identification (RFID)	2.1	16.7	10.4	60.4	8.3	3.6250	1.0028
Bar Coding	4.1	26.3	18.1	19.2	32.3	3.4612	1.2633
Global Positioning Systems (GPS)	0	27	7	41	23	3.5528	1.1843

Source: Author (2014)

According to the results depicted in Table 4.10, Radio Frequency Identification (RFID) applications affect the supply chain performance of the logistics firms to a great extent as shown by a mean score of 3.6250 as well as Global Positioning Systems (GPS) shown by a mean score of 3.5528, while Bar Coding and Enterprise Resource Planning (ERP)

applications affect the supply chain performance of the logistics firms to moderate extent as shown by a mean scores of 3.4612 and 3.2083 respectively.

The study was also inquisive on how applications of ICT affect the various aspects in supply chain performance in the logistics firms. A scale of 1 to 5 was provided where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent.

Table 4.11: Effects of ICT on Supply Chain Performance

Effects of ICT on supply chain performance	No extent	Little extent	Moderate Extent	Great extent	Very great	Mean	Std. Dev.
Lead time	0	4.2	45.8	37.5	12.5	3.5845	0.77251
Proportion of budget on ICT	0	12.5	14.6	25	29.2	3.3322	1.4923
Order Fulfillment Cycle Time (OFCT)	3.8	5.3	27.8	18	45.1	3.9521	1.1334
Supply Chain Adaptability	2.3	27.1	6.8	41.4	22.6	3.5489	1.1812
Supply Chain Flexibility	12.5	12.5	18.8	18.8	37.5	3.3725	1.2021

Source: Author (2014)

Majority of the respondents recapped that ICT affects Order Fulfillment Cycle Time (OFCT) to a great extent as shown by a mean score of 3.9521 as well as lead time shown by a mean score of 3.5845 and supply chain adaptability shown by a mean score of 3.5489. On the other hand they recapped that ICT affects supply chain flexibility and proportion of budget on ICT to moderate extent as shown by a mean scores of 3.3725 and 3.3322 in that order.

4.5 Multiple Regression Analysis

To complement the descriptive analysis conducted the researcher conducted a multiple regression analysis so as to determine the effects of information and communications technology on supply chain performance among logistics firms in Nairobi.

Table 4.12: Coefficient of Determination (R^2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig.
1	.757(a)	0.574	0.533	0.91241	0.04

Source: Author (2014)

Coefficient of determination explains the extent to which changes in the dependent variable

can be explained by the change in the independent variables or the percentage of variation in the dependent variable (supply chain performance) that is explained by all the three independent variables (automation, lead time, and ICT Application). The three independent variables that were studied, explain 57.4% of the relationship between information and communications technology and supply chain performance among logistics firms in Nairobi as represented by the R^2. This therefore means that other factors not studied in this research contribute 42.6% of the supply chain performance.

The purpose of multiple regressions on this study was to establish the relationship between several independent or predictor variables and the dependent or criterion variable which for this study was supply chain performance. Multiple regression analysis was used to determine whether independent variables (X_1, X_2 and X_3) simultaneously impact the dependent variable (Y). Table 4.15 presents the results of the analysis.

Table 4.13: Multiple Regression Analysis

	Unstandardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	2.318	.509		4.552	0.00000
Automation	.528	.116	.323	2.834	0.00460
Lead time	.983	.055	.970	7.975	0.00014
ICT Application	.453	.057	.419	1.393	0.00047

Source: Author (2014)

Dependent Variable: supply chain performance

To investigate the effects of automation (X_1), lead time (X_2) and ICT application (X_3), on supply chain performance (Y), the model used for the regression analysis was expressed in the general form as given below:

$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \&}$ which becomes:

$\mathbf{Y = 2.318 + 0.528 X_1 + 0.983 X_2 + 0.453 X_3}$ whereby Y = supply chain performance; X_1 = automation, X_2 = lead time and X_3 = ICT application.

According to the regression equation established, taking all factors (automation, lead time, and ICT application) constant at zero, the supply chain performance of logistics firms in Nairobi realized would be 2.318 as shown by the Beta Value. The study results showed that taking all other independent variables at zero, a unit increase in automation will lead to a 0.528 increase in supply chain performance of logistics firms in Nairobi. A unit increase in lead time will lead to a 0.983 increase in supply chain performance of logistics firms in Nairobi. In addition, the beta value recorded for ICT application showed that a unit increase in ICT application will lead to a 0.453 increase in supply chain performance of logistics firms in Nairobi.

In estimating the contribution of each independent variable in the study, it was established that all independent variables significantly contributed to supply chain performance of logistics firms in Nairobi at significance level of 0.05. However, the relative importance of each independent variable was different with lead time contributing the most to supply chain performance of logistics firms in Nairobi followed by automation while ICT Application contributed the least.

In order to identify whether significant differences in responses to factors exist among the staffs and employees of logistics firms in Nairobi, Analysis of Variance (ANOVA) was used. These measures were calculated using statistical package for social sciences (SPSS 21) software.

Table 4.14: ANOVA (a)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.296	1	27.296	156.292	0.000(a)
	Residual	46.63	40	0.175		
	Total	73.925	41			

Source: Author (2014)

The overall model significance was presented in table 4.14. An F statistic of 156.292 indicated that the overall model was significant. This was supported by a probability value of (0.000). The reported probability of (0.000) is less than the conventional probability of (0.05). The probability of (0.000) indicated that there was a very low probability that the

statement "overall model was insignificant" was true and it was therefore possible to conclude that the statement was untrue.

4.6 Challenges of ICT in Supply Chain Performance

The respondents were required to indicate the extent to which they face various challenges in application of ICT in supply chain processes in their firms. The results are as depicted in Table 4.15.

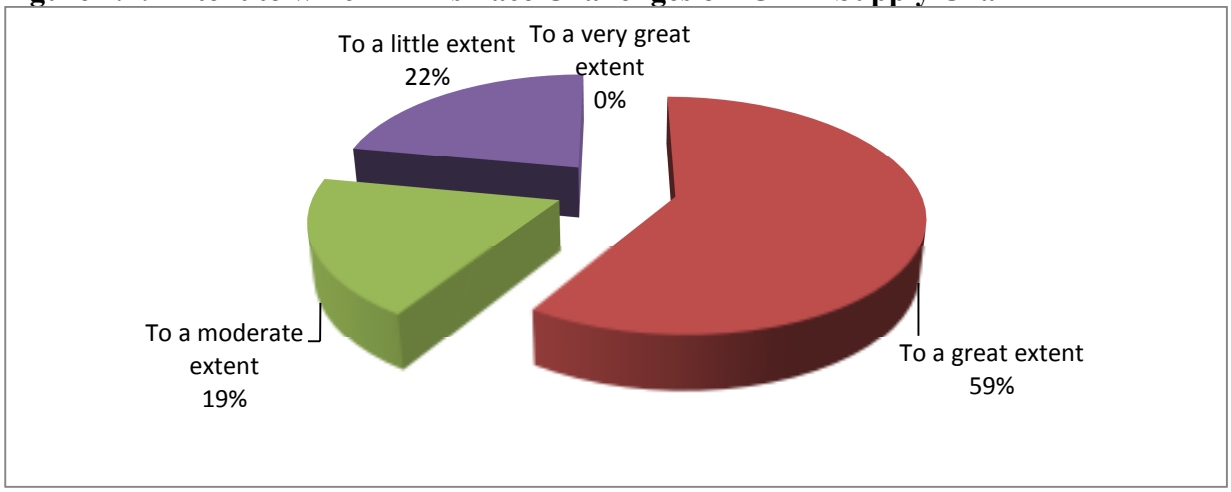
Table 4.15: Extent to which Firms Face Challenges of ICT in Supply Chain

Extent	Frequency	Percent
To a very great extent	0	0
To a great extent	24	59
To a moderate extent	8	19
To a little extent	9	22
Total	**41**	**100**

Source: Author (2014)

From the study results shown in table 4.15, an majority (comprising 59%) of the respondents unanimously indicated that they face various challenges in application of ICT in supply chain processes to a great extent, 22% of the respondents indicated that they face various challenges in application of ICT in supply chain processes to a little extent, while 19% of the respondents indicated that they face various challenges in application of ICT in supply chain processes to a moderate extent.

Figure 4.4: Extent to which Firms Face Challenges of ICT in Supply Chain



Source: Author, (2014)

The study further sought to establish the extent to which logistics firms experience the various challenges in applying ICT in the supply chain processes.

Table 4.16: Challenges facing ICT in the Supply Chain Processes

Challenges facing ICT in the supply chain processes	No extent	Little extent	Moderate Extent	Great extent	Very great extent	Mean	Std. Dev.
Limited visibility into market trends	6.3	6.3	25	31.3	31.3	3.7533	1.1823
Shifting consumer and market demand	25	25	12.5	29.2	8.3	2.7083	1.352
Increasing operating costs	8.3	50	18.8	18.8	4.2	2.6042	1.026
Untapped business development opportunities	11.9	7.4	22.6	21.2	24.3	3.0071	1.695
Limited collaboration	0	27	7	41	23	3.5528	1.1843
Inefficient operations	0	22.2	16.7	27.8	33.3	3.7222	1.17851
Highly inconsistent implementation of e-procurement processes	0	0	41.7	45.8	12.5	3.2222	1.30859
Lack of integration of the e-procurement management systems	18.8	10.4	35.4	35.4	33.3	3.2972	1.6102
Inadequate skills on the management of e-procurement systems at the central and local levels	0	12.5	14.6	25	29.2	3.3322	1.4923

Source: Author, (2014)

From the study, majority of the respondents indicated that their firms faced challenges of limited visibility into market trends to a great extent as shown by a mean score of 3.7533, inefficient operations shown by a mean score of 3.7222 and limited collaboration shown by a mean score of 3.5528, while they showed that their logistics firms face challenges of inadequate skills on the management of e-procurement systems at the central and local levels, lack of integration of the e-procurement management systems, highly inconsistent implementation of e-procurement processes, untapped business development opportunities, shifting consumer and market demand and increasing operating costs to moderate extents as shown by mean scores of 3.3322, 3.2972, 3.2222, 3.0071, 2.7083 and 2.6042 respectively.

On other information to share about the effects of ICT and supply chain performance of logistics firms in Nairobi, the respondents indicated that the technological resource alone does not hold the answer to ICT value creation. Others indicated that ICT skills, which

enable adaptations on supply chain processes and corporate strategy to accommodate the use of ICT play the strongest role in ICT-supply chain value creation. Furthermore, ICT integration and skills are more valuable in more competitive environments that the logistics firms in Nairobi operate in. In addition, the respondents recapped that the information technology infrastructure is highly cost effective for the executive managers, designers and merchandisers in the logistics industry. The information technology infrastructure also helps to speed up their retrieval of worldwide industry information. By always being able to keep track of the most current product trends worldwide, the users' competitive advantage will be increased.

CHAPTER FIVE: SUMMARY, DISCUSSION AND CONCLUSIONS

5.1 Introduction

This is the final chapter in this study which gives the summary of the findings, the discussion, conclusions, recommendations of the study based on the objective of the study and suggestions for further findings. The chapter finally presents the suggestions for further studies.

5.2 Summary of Findings and Discussions

The study found that the logistics firms adopted ICT in supply chain that affects supply chain performance significantly. From the results, ICT is used in sharing of information support planning and execution operations and distribution requirement planning to great extents, while it is used in material requirements planning, advance planning and scheduling and coordination of logistics flows to moderate extents. These findings concur with the findings by Danielis et al. (2008) that intermodal logistics needs can be enhanced by connecting the regional stakeholders with an ICT system. The study realized that a successful ICT system must be implemented in phases beginning with the sharing of information on the benefits of the system. It emerged that an ICT-based system in logistics operations greatly reduces costs, helps in planning and executing external flows thereby optimizing transportation while taking account of multimodal logistics and trade.

The study established that ICT affects the supply chain performance of the logistics firms. From the findings, Radio Frequency Identification (RFID) and Global Positioning Systems (GPS) affect the supply chain performance of the logistics firms to great extents as compared to Bar Coding and Enterprise Resource Planning (ERP) applications which affect the supply chain performance of the logistics firms to moderate extent. ICT affects Order Fulfillment Cycle Time (OFCT), lead time and supply chain adaptability as well as supply chain flexibility and proportion of budget on ICT. The findings indicated that information system factor that had the highest effect is accuracy of information followed by flow of information and compatibility of technology. From the literature review, long lead time has time has the impression that the specific supplier is less efficient or he just has some more customers than he can serve thus delaying deliveries as indicated by Beamon (2005). The study established that ICT solutions are seen as recording and data collection systems that need to be used on a

daily basis at the operational level if they have to add value to the company's operations, decision making and buyer supplier relationships. These systems are very valuable in operational planning and control and provide the basis for improved operational, tactic and strategic decision making.

The study found that most of the logistics firms face various challenges in application of ICT in supply chain processes to a great extent. The challenges established include firms faced challenges of limited visibility into market trends, inefficient operations and limited collaboration as well as inadequate skills on the management of e-procurement systems at the central and local levels, lack of integration of the e-procurement management systems, highly inconsistent implementation of e-procurement processes, untapped business development opportunities, shifting consumer and market demand and increasing operating costs. A major technological barrier is the complexity of the ICT solutions. In their daily use, these system are too complex and not user friendly. Another barrier lies in constant updating of the data that these solutions require. Other major barriers are the lack of classification schemes and standard formats to represent the data to be inserted into the ICT system, incompatibility of different solutions, implying a lot of re-keying if it is necessary to change the system or to move the data from one system to another within the same organization or updated software releases making it more complicated to learn how to use the system. The East African Logistics Performance Survey (2012) also found that there are always delays arising from insufficient ICT infrastructure. However, Raisinghani (2008) indicated that improvements in ICT infrastructure have enabled logistics companies to embrace opportunities to substitute paper-based processes by electronic interchanges. This optimizes the flow of information within and across organizations taking full advantage of the diffusion and e-business software systems. ERP systems provide such paperless platforms where a supplier can exchange data related to orders.

5.3 Conclusions

The study concludes that ICT is valuable, offering an extensive menu of potential benefits ranging from flexibility and quality improvement to cost reduction and productivity enhancement. It was evident from the results that the logistics firms that have adopted ICT in supply chain perform better in their supply chain. This is because ICT is used in sharing of information support planning and execution operations and distribution requirement planning

as well as in material requirements planning, advance planning and scheduling and coordination of logistics flows.

The study also found that there is a strong and positive relationship between ICT and SC performance of logistics firms. ICT solutions are mostly web-based as well as Enterprise Resource Planning, lead time DPS and bar coding combined with other types of e-business solutions. ICT systems are also used at the operational level for e-procurement, for supplier-customer communication and for communication with the users of the supply chains among others.

The study also concludes that the high degree of complexity leads to a context contingent set of synergistic combinations of IT and other organizational resources, including workplace practices, change initiatives, organizational structure, and financial condition. The technological resource alone does not hold the answer to ICT value creation and ICT skills, which enable adaptations on supply chain processes and corporate strategy to accommodate the use of ICT play the strongest role in ICT-supply chain value creation. The information technology infrastructure is highly cost effective for the executive managers, designers and merchandisers in the logistics industry.

5.4 Recommendations

Based on the findings and conclusions, the study recommends that there is need for adoption of improved technology so as to ensure efficiency in information flow. For a supply chain to achieve its maximum level of effectiveness and efficiency, material flows, money flows and information flow throughout the entire chain must be managed in an integrated and holistic manner, driven by the overall service and cost objectives.

The study recommends that there is need for a given supply chain to set clearly the kind of strategy it needs to adopt in the market and then set the right performance measures. The ever changing customer demands and increasing product variety has forced supply chains to be responsive to meet the needs of these customers.

The study further recommends that there is need for integration of the supply chain design so as to increase efficiency which will lead to improved financial performance. As such,

executives should develop supply chain partnerships/collaborations in an attempt to reduce costs, improve service and to gain competitive advantage. The best supply chains have buyer supplier relationships that are based on value and consistent delivery of this value.

The study also recommends that the logistics firms need to have a correct analysis of lead time as this provides the industry with various benefits which include; better understanding of the market behavior, meeting customer's needs, and creating opportunity areas to improving customer relations by increasing the level commitment. It was noted that different customer require response within a specified time. The Kenyan logistics market is quite complex, therefore customers will go for what is available if they do not receive the products in time. To improve lead times, proper planning and communication within the supply chain is important. This will eradicate unnecessary costs like; demurrage, lost time, and the cost of meeting customers' demands in timely manner.

5.5 Limitations of the Study and Suggestions for Further Research

Due to unavailability of information, the study didn't include all the logistics firms operating in the country but rather concentrated on 30 large logistics firms in Nairobi. The researcher also faced financial constraints and thus the limited resources also contributed to the researcher narrowing the research to 30 logistics firms in Nairobi. The study was limited to the logistics sub-sector only having in mind the bigger logistics and supply chain institutions industry in the country and the challenges facing the industry. The primary data used was only from those organizations which were accessible and actively involved in the logistics business to ensure generalization of the findings to the entire industry.

The sensitive nature of the information sought was one of the limitations to the data collection process. This challenge was handled by the use of a signed letter of introduction that quoted the student registration number to prove that the information was solely for academic purposes. Time and location were also a limitation because the researcher was not permanently based in Nairobi where the study was conducted, and all the questionnaires needed to be delivered and collected within a short period of time. It therefore became necessary to engage an assistant to help with the distribution and collection.

Some of the respondents were not co-operative to the research and attempted to ignore the questionnaires; this threatened to reduce the response rate. The researcher minimized non response cases by taking and collecting summary questionnaires by hand from each respondent. Also, by having trustworthy people (especially one employee in each sampled logistic firm) to distribute and collect the questionnaires and knowing how best to deal with those reluctant to data collection instrument.

The study has assessed the relationship between ICT and supply chain performance among logistics firms in Nairobi. The application of ICT in supply chain of logistics firms was found to bring various benefits to the institutions. However, there has been several challenges encountered which hinder the firms from reaping the full benefits of ICT application in supply chain performance. This warrants the need for another study which would ensure generalization of the study findings on the relationship between ICT and supply chain performance among logistics firms and other firms in Kenya as well as paving way for new policies. The study therefore recommends another study be done with an aim to investigate the relationship between ICT and supply chain performance among firms in Kenya where the focus can be on firms cutting across various sectors of the economy.

REFERENCES

Apiyo R.K., and Mburu, K.M. (2012) *The Role of ICT tools in Supply Chain Performance*. An Unpublished MBA Project, University of Nairobi

Archie, L. and Kevin, (2004) *Linking SCOR planning practices to supply chain performance:* An exploratory study. International Journal of Operations & Production Management Vol. 24 No. 12, 2004 pp. 1192-1218

Arjan, J.V. (2000) *Purchasing and supply management, Analysis, Planning and Practice*. Vikas Publishing house.

Cheruiyot, K. P. (2013). Impact of integrated supply chain on performance at Kenya Tea Development Agency. *International Journal of Social Sciences and Entrepreneurship*, 1 (5), 194-203.

Chopra, S and Peter M. (2004) Supply Chain Management. 2 ed. Upper Saddle River: Pearson Prentice Hall.

Christopher, M.P. (2005) *Logistics and supply chain management: creating value-added networks*, Edition: 3, Pearson Education.

Claire, R.F. (2002), The changing face of distribution: as all players in the supply chain work to reduce their costs and improve their efficiency, distribution has come increasingly under the spotlight during the past year, *Food Engineering & Ingredients*, Vol. 27 No.2, pp.25-6.

Evangelista, P. and Sweeney, E. (2006) Technology usage in the supply chain: the case of small 3PLs, *The International Journal of Logistics Management*, Vol. 17 No. 1, pp. 55-74.

Gichuru, M. (2012). Critical success factors in business process outsourcing of logistics companies in Kenya, unpublished MBA project, University of Nairobi.

Gulledge, T., Cavusoglu, T., and Kesseler, T. (2010) Aligning the Supply Chain Operations Reference (SCOR) Model with Enterprises Applications: Real-time Value Chain Interlligence.Enterprise Engineering and Policy Program George Mason University

Gunasekaran, A., Patel, C. and McGaughey, R.E., (2004) A framework for supply chain performance measurement", International Journal of Production Economics, 87 (3), p.333-347.

Kushwaha, G.S (2011) Competitive Advantage through Information and Communication Technology (ICT) Enabled Supply Chain Management Practices, *International Journal of Enterprise Computing and Business Systems*, 1:2, p. 3.

Kurien, G. P. Qureshi,M.N. (2011), Study of performance measurement practices in supply chain management, International Journal of Business, Management and Social Sciences Vol. 2, No. 4, pp. 19-34

Lambert, D.M. and Pohlen, T.L. (2001), Supply chain metrics, *International Journal of Logistics Management*, Vol. 12 No. 1, pp. 1-19.

Lee, H. L. (2002). Aligning supply chain strategies with product uncertainties. *California Management Review*. 44(3) 105–115

Magutu, P.O., (2013) *Supply Chain Strategies, Technology and Performance of Large-Scale Manufacturing Firms in Kenya*. PhD Thesis, University of Nairobi.

Melville, N., Kraemer, V. (2004). Information technology and organizational performance: An integrative model of IT business value. *MIS Quart*erly. 28(2) 283–322.

Mulama, O. (2012). Logistics outsourcing practices and performance of large manufacturing firms in Nairobi, unpublished MBA project, University of Nairobi.

Rai, A., Patnayakuni, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quart*erly. 30(2) 225–246.

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

Sambamurthy, V., Bharadwaj, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS Quart*erly. 27(2) 237–263.

Stewart, G. (1997), "Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management", Logistics Information Management, Vol. 10 No. 2, pp.62-7

Tummala R., Cheryl, L., Johnson, P., (2006). Assessing supply chain management success factors: A case study. Supply Chain Management: *An International Journal*, 11(2), 179-92.

Yusuf, Y., Gunasekaran, A., Adeleye, E. and Sivayoganathan, K. (2004), Agile supply chain capabilities: determinants of competitive objectives, *European Journal of Operational Research*, Vol. 159 No. 2, pp. 379-92

Zhu, K., K. Kraemer. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research*. 16(1) 61–84.

Zhu, K., Kraemer, S. Xu, J. Dedrick. (2004). Information technology payoff in e-business environments: An international perspective on value creation of e-business in the financial services industry. *Journal of Management Information Systems* 21(1) 17–54.

APPENDICES

Appendix I: List of Logistics Firms in Nairobi

1. Afri Global Ltd
2. ABA Freight Logistics
3. Afrofreight Forwarders Ltd
4. Bristish Airways World Cargo
5. Care Freight Clearing
6. DB Schenker
7. Diamond Acres Ltd
8. DHL Global Forwarding (K) Ltd
9. Dolphin Cargo Ltd
10. Express Kenya Ltd
11. Eurolink Services Ltd
12. Fast Freight Services Ltd
13. Gem Logistics Ltd
14. Globe Forwarders Ltd
15. Horizon (KENYA) Express Ltd
16. Inland Services
17. Jim Cab Services – Just In A Minute Cab
18. Lantern Freight Ltd
19. Lloyd Cruise International Limited
20. Macfreight Forwarders Co
21. Oceanic Cargo Agency Ltd
22. Ocean Atlantic Services Ltd
23. Primcargo Agencies Ltd
24. Roy Transmotors Ltd
25. Sharis Logistics Ltd
26. Shah & Partners Ltd
27. Siginon Freight Ltd
28. Skylift Cargo Ltd
29. Venture Africa Co Ltd
30. World Link Logistics

Sourcehttp://www.businesslist.co.ke(2009-2014)

Appendix II: Research Questionnaire

This research is in partial fulfillment of requirements for a degree in Masters of Business Administration from the University of Nairobi and I will be most grateful if you could kindly complete this questionnaire. This questionnaire consists of two parts; kindly answer all the questions by ticking in the appropriate box or filling in the spaces provided. The information given here will only be used for purposes of this study and will be treated with utmost confidentiality. Your cooperation will be highly appreciated.

SECTION A: BIO-DATA

1. Kindly indicate your age bracket (Tick as appropriate)

Less than 30 Years	☐	31 - 35 years	☐
36 – 40 years	☐	41 – 45 years	☐
46 – 50 years	☐	Over 51 years	☐

2. How long have you been working in this logistics firm?

0-5 yrs	☐	5-10 yrs	☐
10-15	☐	Over 15 yrs	☐

3. What is your highest academic qualification?

Certificate	☐	Diploma	☐
Bachelor's degree	☐	Masters Degree	☐
Others (Specify.....)	☐		

4. In which department do you work in?

Supply chain	☐	ICT departments	☐
Other (Specify……)	☐		

5. What is your designation?

CEO/executive	☐	Manager/head of department	☐
Other (Specify……..)	☐		

PART B: EXTENT TO WHICH ICT IS APPLIED IN LOGISTICS FIRMS

6. Rate the extent to which this logistics firm makes use of ICT in supply chain?

To a very great	To a great	To a moderate	To a little	To no extent

extent	extent	extent	extent	

7. How would you rate the use of ICT in the following aspects of supply chain performance in this logistics Company? Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

Use of ICT in the following aspects of supply chain performance	**1**	**2**	**3**	**4**	**5**
Sharing of Information					
Material Requirements Planning					
Distribution Requirement Planning					
The Advance Planning and Scheduling					
Coordination of logistics flows					
Supports planning and execution operations					
Others (Specify.....)					

PART C: EFFECTS OF ICT ON SUPPLY CHAIN PERFORMANCE

8. In general to what extent does the use of ICT affect the supply chain performance of this logistic firm?

To a very great extent	To a great extent	To a moderate extent	To a little extent	To no extent

9. To what extent do the following ICT applications affect the supply chain performance of the logistic firm? Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

ICT Applications	**1**	**2**	**3**	**4**	**5**
Enterprise Resource Planning (ERP)					
Radio Frequency Identification (RFID)					
Bar Coding					
Global Positioning Systems (GPS)					
Others (Specify.....)					

10. How does application of ICT affect the following aspects in supply chain performance in the Firm? Rate on a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

Effects of ICT on supply chain performance	**1**	**2**	**3**	**4**	**5**
Lead time					
Proportion of budget on ICT					

Order Fulfillment Cycle Time (OFCT)					
Supply Chain Adaptability					
Supply Chain Flexibility					
Others (Specify.....)					

PART D: CHALLENGES OF ICT IN SUPPLY CHAIN PERFORMANCE

11. To what extent do you face challenges in application of ICT in supply chain processes in this Firm?

To a very great extent	To a great extent	To a moderate extent	To a little extent	To no extent

12. With regard to this Firm, to what extent do you experience the following challenges in applying ICT in the supply chain processes? Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

Challenges facing ICT in the supply chain processes	**1**	**2**	**3**	**4**	**5**
Limited visibility into market trends					
Shifting consumer and market demand,					
Increasing operating costs					
Untapped business development opportunities					
Limited collaboration					
Inefficient operations					
Highly inconsistent implementation of e-procurement processes					
Lack of integration of the e-procurement management systems					
Inadequate skills on the management of e-procurement systems at the central and local levels					
Others (Specify.....)					

13. What other information would you like to share about the effects of ICT and supply chain performance of logistics firms in Nairobi?

……
……

14. What do you think should be done to enhance ICT application in supply chain performance among logistics firms in Kenya?

……
……

THANK YOU