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ABSTRACT

The main objective of this study was to assess the effect of Supply Chain Optimization on Supply Chain Performance in manufacturing sector in Kenya with Bidco Oil Refineries Limited as the case study. The study was guided by the following specific objectives: to assess the effect of outsourcing on supply chain performance in manufacturing sector in Kenya and to determine the effect IT integration on supply chain performance in manufacturing sector in Kenya. In this regard, the employees of Bidco Oil Refineries Limited were the target population. The study targeted 400 employees Bidco Oil Refineries Limited but only 80 respondents constituted the sample population. The study adopted a descriptive research design. Questionnaires were the major instrument for data collection. Both qualitative and quantitative data was collected in this study. The quantitative data collected was analyzed further for both inferential and descriptive statistics by use of the SPSS. It was notable that there existed a strong positive relationship between the independent variables and dependent variable. This implied that outsourcing and ICT integration are very significant therefore need to be considered in any effort to boost supply chain optimization in the manufacturing firms in Kenya. The study could not exhaust all the factors affecting supply chain optimization of manufacturing firms in Kenya. Therefore other factors affecting the supply chain optimization in manufacturing firms in Kenya need to be established. A review of literature indicated that there has been limited amount of research on the supply chain optimization of manufacturing firms in the Kenyan context. Thus, the findings of this study serve as a basis for future studies on the role of independent variables studied on supply chain optimization of manufacturing firms.

Key Words: Outsourcing, IT Integration, Supply Chain

INTRODUCTION

In today's demand driven in the world, it is not easy to underestimate the complexity of global supply chains. Yet the growth of global markets, increasing customer expectations, rising costs, and more intense and diverse competitive pressures are driving the development of new supply chain strategies and intricate network designs (Mentzer *et al.*, 2011). That increasing complexity is exactly why supply chain networks need to be frequently re-evaluated. In fact, a world class supply chain network is essential for product to consistently flow from the point of manufacture to the end user, regardless of the industry served. A well-designed supply chain network can significantly improve margins, support expansion into new markets, enhance the customer experience, and reduce operating costs. That applies to companies in all stages of maturity: Growth-oriented companies, companies in transition, and companies with stable business operations can all benefit from distribution networks that are optimized to meet ever present challenges and opportunities (Kopczak & Johnson, 2010).

Supply chain management (SCM) is one of the most recent branches of management that have evolved over the last decades. It has a crucial impact on economic growth as well as investment decision of firms all over the world as well as the economy of a certain state. As defined by Mentzer *et al.* (2011), Supply Chains are interrelationship of organizations where there is flow of services, products, information and finances either upstream or downstream. SCM has been termed as a crucial function in many organizations whether in the service or production industry and either in the public or private sectors. This is because every organization aims at satisfying their customers whether internal or external which in turn lead to improved performance (Kopczak & Johnson, 2010).

A Supply Chain is therefore a global network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical and cash, Lejuene and Yakova. (2005) stressed the need to have coordinative mechanism that would uphold standards. These standards are present along the supply chain to ensure performs at its level best and every plays is squarely involved and that the customer or the end user receives the best service or product. This is referred to as supply chain optimization.

Gheidar-Kheljani *et al.* (2010) stated that the major role for supply chain optimization is to come up with mechanisms to align the objectives of independent supply chain participants and coordinating their decisions and activities in order to optimize the system performance. Xu and Nozick (2009) showed that a well-integrated supply chain requires coordinating the flow of materials and information between suppliers, manufacturers, retailers and other component of the Supply Chain (SC). Yung *et al.* (2006) stated that global planning and coordination among all entities in a supply chain is needed to achieve effective supply chain management. Several models such as quantity discounts, credit option and buy back/return policies have been applied to align and coordinate the decisions between members of a supply chain.

Supply chain optimization has changed the way the manufacturing firms operate. This is as a result of integration of models and systems which enhances co-ordination of demand in order to satisfy customers' needs. According to Bravo and Vidal (2013), models such as computer-aided decision-making processes have been widely used to date as an advanced support to the experts' opinions in the distribution networks. Such models have adequately aided in reduction of transportation and distribution costs along the different supply chain.

Globally, the manufacturing firms have invested in on the supply chain processes, tools and resources to achieve optimization in terms of efficiency and effectiveness through their supply chains. Many of them have migrated to an integrated planning approach with the objective of increased service level, responsiveness and on-time full delivery while judiciously balancing working capital needs. However such integrated planning often starts with an assumption that supply chain networks are static and tend towards driving optimization around the same. Since supply chains themselves are dynamic, supply chain network design exercises attempt to make supply chains agile enough to address current changes and future uncertainties in the manufacturing firms. (Chao & Pucik, 2005).

Supply chain optimizations in many manufacturing companies in Africa are systems that are used to connect firms together for the purpose of the management of products, materials, information and financial report flows manage. They integrate different sets of operations into a single supra-organization that crosses individual organizations boundaries (Schary, Skjott-Lasen, & Tag, 2015). Supply chain optimization is applied by companies across the globe due to its demonstrated results such as delivery time reduction, improved financial performance, greater customer satisfaction, building trust among suppliers, and others. According to Ronald, Michael and Rodger (2014) properly implemented, SCM can positively impact many functions and outcomes of the organization including product quality, customer responsiveness and resultant satisfaction, manufacturing cost control, product and market flexibility, and macro performance outcomes including market share.

Kenya's manufacturing sector is going through a major transition period largely due to the structural reform process, which the Kenya Government has been implementing since the mid-eighties with a

view to improving the economic and social environment of the country. Bolo and Wainaina (2011) noted in their study that corporations have increasingly turned to global markets for their supplies, and that 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 in Kenya.

Manufacturing is the art of transformation of raw materials into either intermediate goods or final products through the mechanized process. Manufacturing sector comprises establishment that engages in the mechanical, physical or chemical transformation of materials, substances or component into new products. Kenya has a large manufacturing sector serving both the local market and exports to the East African region and the rest of the world. It is dominated by subsidiaries of multinationals. Kenya's manufacturing sector is among the key productive sectors identified for economic growth and development because of its immense potential for wealth, employment creation, and poverty alleviation. Also, the sector would continue to provide impetus towards the achievement of Millennium Development Goals (MDGs) both in the medium and long term particularly goal one on Eradication of Extreme Poverty and Hunger and goal eight on Global Partnerships for Development. The sector is expected to play a fundamental role in the growth of the Kenyan economy. The overall purpose of the industry is to increase its contribution to Gross Domestic Product (GDP) by at least 10 percent per annum (Kimani, 2013).

Throughout the years, Bidco Oil Refineries has effectively won over the business sector, turning

into, the biggest and quickest developing maker of vegetable oils, fats, margarine, cleansers and protein packs in East and Central Africa. Bidco Africa Ltd. was initially settled as an assembling association, focused on utilizing the most proficient cutting edge advances to deliver an unrivaled scope of items. Throughout the years, Bidco effectively won over the business sector, turning into, the biggest and quickest developing producer of vegetable oils, fats, margarine, cleansers and detergents in East and Central Africa. The business sector achievement of these items has driven Bidco to look to the future and grow its viewpoints. As the organization extends its system crosswise over Africa, it has developed into a Marketing Organization. Right now, Bidco market the biggest and largest scope of value palatable oil and cleanliness items in East and Central Africa (Soft Kenya, 2016).

Statement of the problem

Supply chain optimization contribute to over 50% to the profitability of any manufacturing firm (Choy, 2012). The supply chain optimization manufacturing firms in Nairobi have been affected by use of obsolete inventory management systems and technologies (ROK, 2012) Decline in profitability of the manufacturing industry resulted to a decline in the global Gross Domestic Product (GDP) from 5.00 percent in the year 2010 to 3.08 percent in the year 2011 as a result of poor supply chain optimization strategies Kenya National Bureau of Statistics (KNBS, 2013). KNBS (2013) also observed that, poor supply chain optimization of the manufacturing firms in Kenya contributed to a decline in GDP to 1.5 percent in the year 2014 from 7.0 percent achieved in the year 2013. The GDP rose to 2.7 percent in the year 2009 and a further increase of 5.8 percent in the year 2010. However, this growth declined to 4.4 percent in the year

2011. This was attributed to poor inventory control, reduced consumer effective demand, delays in fulfilling customer's orders and inappropriate technology application due to lack of proper supply chain forecasting in the firms.

In recent years, there has been considerable interest in supply chain practices by researchers especially in the manufacturing sector. For instance, Cao et al (2011) investigated the gap between the interests in supply chain collaboration (SCC) and the relatively few recorded cases of successful applications. The study established that the prerequisites for the supply chain collaboration are collaboration process; where the process starts; and where it terminates. Agus & Hajinoor (2012) sought to examine the relationship of lean production of SCM to product quality improvement and business performance in the Malaysian manufacturing industry. The findings show that there is a strong association between lean production, product quality performance and business performance., Wanjihia (2011) did a study in the manufacturing sector. He examined innovation management in this sector and found that more investment needed to be put in innovation in order to improve on the performance of the supply chain in the Kenyan manufacturing sector. Naliaka and Namusonge (2015) investigated the role of inventory management on competitive advantage of manufacturing firms in Kenya, with reference to Unga Group Limited. Kathurima et al. (2016) sought to establish the effects of materials handling systems in order to achieve better performance and generate available efficiency and cost reduction benefits. In this case, none of these studies had a specific focus on supply chain optimization in the local manufacturing sector hence the need to undertake the study to investigate determinants of supply chain optimization in the manufacturing firms in Nairobi, Kenya.

Objectives of the Study

The purpose of this study was to establish the determinants of supply chain optimization in manufacturing firms in Kenya. The specific objectives were:-

- To find out the influence of outsourcing on supply chain optimization on supply chain performance in the manufacturing sector in Kenya.
- To determine the effect of ICT integration on supply chain optimization on supply chain performance in the manufacturing sector in Kenya.

LITERATURE REVIEW

Theoretical Perspective

Game Theory

The major tenets of the game theory would be applied in investigating the role of outsourcing on the supply chain performance. Game theory is a mathematical theory of decision making by participants in conflicting or cooperating situations. Its goal is to explain or provide a normative guide for, rational behavior of individuals confronted with strategic decisions or involved in social interactions (Cachon & Netessine, 2004). The theory is concerned with optimal strategic behavior, equilibrium situations, stable outcomes, bargaining, coalition formation, equitable allocations, and similar concepts related to resolving group differences. Game theory has a profound influence on methodologies of many different branches of sciences, especially those of economics, operations research and management sciences. Traditionally game theory can be divided into two branches: non cooperative and cooperative game theory. The non-cooperative game theory uses the notion of strategic equilibrium or simply balance to

determine the rational outcomes of a game (Osborne, & Rubinstein, 1990). Inventory management of physical goods and other products or elements is an integral part of the logistics system common to all the sectors of the economy including industry, agriculture, and defense.

Adaptive Structuration Theory

Based on structuration theory, the study intends to determine the effects of information technology on supply chain performance. Structuration theory was first proposed by Anthony Giddens in his constitution of the society in 1984, which was an attempt to reconcile social systems and the micro/macro perspective of organizational structure. Desanctis and Poole (2014) borrowed from Giddens to propose AST and the rise of group decision support systems. AST provides the model whereby the interaction between advancing information technologies, social structures, and human interaction is described, and which social structures, rules, and resources provided by IT as the basis for human activity. AST is a viable approach in studying how IT affects supply chain performance because it examines the change from distinct perspectives. AST is relevant in today's supply chain practices due to the expanding influence that advancing technologies have had concerning the human- interaction aspect of AST and its implication on socio-biologically inspired structuration in security software applications (Ramakrishna, 2005). AST theory presents specific advances in information technology that are driving supply chain performance in the areas of business alignment, IT planning, and development show that AST is being used as a driving force of active management within organizations. The study would use the theory to investigate how the complexity of supply chain performance is influenced by Information Technology (Ramakrishna, 2005).

Information Integration Theory

Information integration theory states that when we obtain new information (often from persuasive messages), those new pieces of information would affect our attitudes (Anderson, 2006). They won't replace our existing attitudes. However, when we learn new positive information, negative attitudes tend to become less negative and attitudes that are positive are likely to become somewhat more positive (Anderson, 2006).

This theory considers the ideas in an influential message to be pieces of information, and each major piece of information has two qualities: value and weight. The value of a bit of information is its evaluation and the weight is the information's perceived importance (Anderson, 2006). Information that has high value is considered to be highly favorable, and information that is high in weight, that is, information that is of great importance to us, would have more influence on our attitudes than information low in value or weight (Norman, 2007). The opposite of this is true, information with low value and low weight would have the least influence on our attitudes (Norman, 2007). This theory means that new information is combined with existing information to give a new attitude.

Conceptual Framework

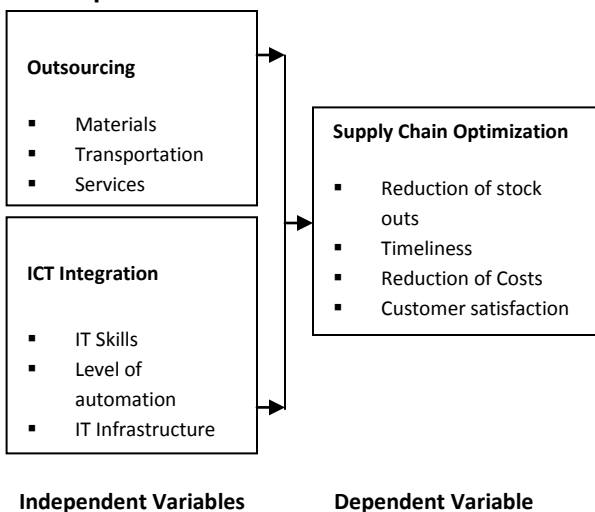


Figure 1: Conceptual Framework

Outsourcing

Companies in any manufacturing sector are always looking for low-cost raw material, domestic or imported. With the objective of improving their competitive advantage, some of them see importing as an appealing option. As there are some advantages when importing resources, such as lower labor cost and lower cost of resources, there are also some disadvantages that companies have to take into account when evaluating whether or not to work with offshore companies. Importing raw materials, components or products increases the dependence on suppliers (Lockamy & McCormack, 2010), and some risks are identified such as culture, language, foreign exchange rate, regulations, quality, political and economic stability, and transportation delays (Canbolat *et al.*, 2008).

Originally, outsourcing was only used by large corporations, but nowadays it is becoming more and more popular among small-sized enterprises (Koszewska, 2004). The broader use of outsourcing in the industrial market results from the build-up of competitive pressures and progressing globalization (Lewin, 1996). As the environment becomes increasingly complex, faster and faster advancement of technology, with the consequent changes in the conditions in which any given enterprise functions, necessitate the search for more and newer methods which keep one ahead of ones competitors. In the past the key to success was bulk; today the importance of high quality is growing. In the past the key to success was the bulk, today the importance of high quality is growing. As the managerial paradigm shifts from bigger is better to lean and mean, and from high-volume to high-value, companies are being forced to identify exactly where they have the greatest competitive advantage, and to redefine their organizational structures to maximize that advantage. An

increasingly common way for organizations to try and increase their flexibility and generate high value is through outsourcing (Lewin, 2006). This situation requires precise identification of the line of business one wishes to follow (ensuring a competitive advantage) and a careful analysis of its weak and strong points (Dencker, 2009). One important result of this process is a recognition and reassessment of those activities which are not core ñ in particular, whether these non-core activities should be carried out by the organization itself (make) or outsourced to a specialist third party (buy) (Lewin, 2006).

Information Technology integration

Information Technology is defined as a critical factor to enhance the supply chain performance, and the huge advances in information technology over the past two decades enabled the emergence of modern supply chain management (Fawcett, 2011), with its power to provide timely, accurate, and reliable information, to enhance collaboration and integration between partners, and to improve the agility and flexibility of both the focal firm and the partners in the supply chain. The positive effects of IT on supply chains' performance have been approved by many researchers (Zhang and Wang, 2011), while other researchers indicated that there was no real consensus about how that maintenance of competitive advantage was related to IT capabilities (Jin et al., 2014), this phenomenon is widely cited in the literature as the productivity paradox in information technology.

Information systems play the role of integration coordination between different parts of the supply chain and the performance of this system has a direct impact on the efficiency of supply chain performance (Amid et al, 2007). Jiang and his colleagues believed that the creation and deployment of information systems requires a variety of information technologies. Information technology can also support cooperation between

companies and their internal operations in supply chain and effective use of technology is a key factor in the success of the company. Major cause of uncertainty is, poor information flow, which can include inaccurate, being premature or incorrect information management. Information technology with ability of managing information flow effect on dimensions of supply chain, Such as cost, quality, flexibility and timely delivery of goods and services and ultimately profit of organization (Droodchi & Nikmehr, 2008) Systems supported by Information technology are applicable in major field of supply chain management. Major Fields in supply chain management products and services are including design, production, marketing and sales, customer service and logistics (Droodchi & Nikmehr, 2008).

Supply Chain Optimization

Wholesalers, manufacturers, retailers, distributors, suppliers, third party service providers (3PLs) and every party involved in the supply chain are under pressure to reduce and balance their costs, time and inventories in order to continue to be profitable while still meeting their customers' demands. One of the major ways through which this has been possibly achieved is through supply chain optimization.

Supply chain optimization is the application of processes and tools to ensure the optimal operation of manufacturing and distribution (Kinsey, 2009). This includes the optimal placement of inventory within the supply chain and minimizing manufacturing costs, transportation costs and distributional costs (Kinsey, 2009). Many organizations are now working hard to try to maximize the profitable operation of their manufacturing and distribution supply chain through maximizing gross margin return on inventory invested, that is, balancing the cost of inventory at all points in the supply chain with

availability to the customer, minimizing total operating expenses, transportation, inventory and manufacturing, or maximizing gross profit of products distributed through the supply chain (Shen, 2006).

Supply chain optimization addresses the general supply chain problem of delivering products to customers at the lowest total cost and highest profit. This includes trading off the costs of inventory, transportation, distributing and manufacturing (Shen, 2006). In addition, optimizing storage and transportation costs by means of product / package size is one of the easiest and most cost effective initial implementations available to save money in product distribution (Salhi & Nagy, 2009). Supply chain optimization has become one of the most crucial things that every state corporation manager is striving to achieve by ensuring that they apply up to date processes and tools that keep operations of manufacturing and distribution optimal (Herbert, 2013). There have been global challenges in supply chain. According to Price Water House Coopers (PWC), organizations are facing common challenges which include poor cost management and low customer satisfaction (PWC, 2013).

Expansion into new markets introduces complex taxation, invoicing and localization burdens, and dispersed market segments demand different pricing models and services (PWC, 2013). According to Kinsey (2009), organizations are still facing supply chain challenges which include rising pressure from global competition, consumer expectation and increasing complex patterns of customer demand. Organizations are facing challenges that affect their competitiveness in terms of supply chains. These include the modes of transport used, some of which are very costly, and the ease of interchange between them as well as the lack of skills and inadequate use of technology (Kumar, 2012). The

two major contributors to high transport costs are the absence of multi-modal transport and a fragmented industry, because transport modes are so geographically dispersed (Kumar, 2012). Therefore, supply chain management has the ultimate goal to satisfy the customers preferably on the most cost effective level through the supply chain optimization.

Empirical Review

Outsourcing

A study by Hassan and Alim (2015) on the Factors affecting supply chain management efficiency in cross border outsourcing: A case study of H & M and its outsourcing operations in Bangladesh. The purpose of our thesis is to investigate how inefficiency factors affect the Supply Chain system of Multi National Corporations (MNC"s) during outsourcing process. With that view the study had to analyze what implications of these factors in overall efficiency in entire value chain System, how this factor affects Supply Chain efficiency and, in particular, which factors are significantly responsible for inefficiency. We would also analyze probable solutions to minimize inefficiency in Cross Border Outsourcing. Finding shows that some factors acting as a hindrance to this smooth operation in cross boarder outsourcing. Finally we analyzed several factors and find out the potential ways to minimize the effect of these inefficiency factors and recommended some probable measures to increase overall supply chain efficiency in total value chain system. According to the Outsourcing Institute, on average, companies can save 9% of production costs and increase the capacity and quality by 15% through global outsourcing (Elmuti & Kathawala, 2000). Multinational Corporations (MNCs) use to go for internationalization of their production in low cost countries in order to achieve the competitive advantages in their own business field. The comparative advantages of different

countries and companies" intention to maintain increased focus on their core businesses drive them to go offshore for sourcing their needs.

ICT Integration

Ibrahim, Ahmad, Shahad and Asif (2015) did a study on the Factors Influencing the Performance of Supply Chain Management in Manufacturing Industry of Pakistan. The aim of the study was to find out the effect of critical factors like, information technology, on the performance of supply chain management in Pakistan. The research was based on primary data which was collected through questionnaire by 172 selected manufacturing companies in Pakistan. The random Sampling Technique was used and the regression analysis was made to test the model through SPSS software. The regression analysis shows that RSquare = 0.567 F-Value = 50.76 and significance (P-Value <0.05) which shows strong significance relationship of information technology on dependant variable (the performance of supply chain management).

A study carried out by Tim (2007) states that through the use of communication tools, such as the web sites, industrial organizations can build value in their supply chain relationships. According to Turner (2013), another key for supply chain management success is the use of planning tools. He also mentions that without the use of information systems, companies cannot handle costs, offer superior customer service and lead in logistics performance. Turner (1993) indicates that firms cannot effectively manage cost, offer high customer service, and become leaders in supply chain management without the incorporation of top-of-the-line information technologies. Li (2001) identified 14 such information technology tools, among them electronic data interchange (EDI), enterprise resource planning (ERP), internet, and

extranets. Li grouped these tools into three groups in terms of their primary purpose: communication tools, resource planning tools, and supply chain management tools.

Supply Chain Optimization

A study by Szucs and Hassen (2012) sought to how supply chain optimization in could be useful in an oil industry. The study established that supply chain optimization was important to an oil industry for it helped cut down costs. Gheidar-Kheljani et al. (2010) sought to investigate supply chain optimization policy for a supplier selection problem. In this case, the study found out that there were actually models that had been developed to practically coordinate decisions between the members of a supply chain and guarantee cooperative relationship between them. Gunnarsson, (2011) on her study on supply chain optimization in the forest industry found out that supply optimization made it possible for customers to get wood chips at the right time by use of the correct channels of transport. Further, Cao et al. (2011) investigated the gap between the interests in supply chain collaboration (SCC) and the relatively few recorded cases of successful applications. The study established that the prerequisites for the supply chain collaboration are collaboration process; where the process starts; and where it terminates. Agus & Hajinoor (2012) sought to examine the relationship of lean production of SCM to product quality improvement and business performance in the Malaysian manufacturing industry. The findings show that there is a strong association between lean production, product quality performance and business performance.

Kimani (2013) sought to investigate lean supply chain management in the manufacturing sector in Kenya. The study adopted a survey study design and targeted manufacturing companies in Kenya. In this

regard, the study established that the main reasons for adoption for these practices was to reduce cost profitability and long term survival of the firm. Mwale (2014) sought to establish supply chain management practices adopted by large manufacturing firms in Kenya, and to determine the effect of supply chain management practices on organizational performance of large manufacturing firms in Kenya. The study established that there existed a significant relationship between supply chain management practices and organizational performance explained by the seven independent variables strategic supplier partnership, customer relationship, level of information sharing, quality of information, extent of outsourcing, lean practices and postponement.

RESEARCH METHODOLOGY

This study was a descriptive survey designed to establish the determinants of supply chain optimization in manufacturing firms in Kenya. The target population was the employees of Bidco Oil Refineries Limited. The units of analysis was the Production Department, Quality Assurance Department, Accounting department, Finance Department, HRM Department, Procurement Department, Marketing department and the ICT Department. Unit of observation were the senior managers, middle-level managers and general staff members in the departments. The study targeted 400 employees. Primary data was collected by use of a structured questionnaire. A pilot study was done to assess the capability of the research instruments to collect required data for the research. The data collected was quantitative and qualitative. Qualitative data was analyzed by the use of content analysis Quantitative data would be analyzed by employing descriptive statistics and inferential analysis using statistical package for social science (SPSS) version 22.

RESEACH FINDINGS, PRESENTATION AND DISCUSSIONS

From the data collected, out of the 80 questionnaires administered 65 questionnaires were fully completed and returned making a response percent of 81.25%. The study sought to find out the demographic information of the respondents which included gender, age, the level of education and work experience. The findings as indicated that majority (53%) were male respondents with (47%) being females respondents. The results indicate that the two genders were adequately represented in the study since there is none which was more than the two-thirds. From the findings, majority (45%) indicated that they ranged between 41-50 years, followed by those who indicated that they are 51 and above years with few (15%) and (5%) and indicating that they were 31-40 years and 20-30 years respectively. This implied that respondents were well distributed in terms of their age during the study. From the study findings majority (40%) indicated that they had university first degree, followed by those who indicated that they had diploma at (33%) with few (14%) indicating that they had master's degree and (7%) doctorate qualification respectively and this implied that respondents were well educated and that they were in a position to respond to research questions with ease. On work experience of respondents, the findings indicated that majority (40%) of the respondents indicated that they had been in the organization for a period ranging from 1-10 years followed by those who indicated that they had been in the organization for a period of 10-20 years, (20%) indicating that they had less than one year and with only few (10%) indicating that they had been in organization for a period more than 20 years.

Outsourcing

This section presented findings to survey questions asked with a view to establish the influence of outsourcing on supply chain optimization in manufacturing firms in Kenya. Responses were given on a five-point likert scale (where 5 = Strongly Agree; 4 = Agree; 3 = Neutral; 2 = Disagree; 1= Strongly Disagree). The scores of 'strongly disagree' and 'disagree' have been taken to represent a statement not agreed upon, equivalent to mean score of 0 to 2.5. The score of 'Neutral' has been taken to represent a statement agreed upon moderately, equivalent to a mean score of 2.6 to 3.4. The score of 'agree' and 'strongly agree' have been taken to represent a statement highly agreed upon equivalent to a mean score of 3.5 to 5.4. Table 1 presents the findings.

As indicated by high levels of agreement in Table 1, a majority of respondents affirmed that the service providers were always ready to offer a competitive cost thus cost reduction in the organization (mean of 3.5642 and Std of 1.0092) though the sentiments were very much contested as shown by a standard deviation above 1.0.; The original equipment manufacturer was used to predict demand beyond a 4 week horizon (mean of 3.1123 and Std of 1.3578) though the sentiments were very much contested as shown by a standard deviation above 1.0; Outsourcing frees up cash thus allowing investments on core activities and improves organization focus (mean of 3.0883 and Std of

1.3462) though the sentiments were very much contested as shown by a standard deviation above 1.0. It frees management time and reduces staff costs as well as giving organization flexibility (mean of 3.4582 and Std of 1.0094) though the sentiments were very much contested as shown by a standard deviation above 1.0.; It provided an improved quality by utilizing a service provider who had more knowledge, experience and expertise (mean of 3.1126 and Std of 1.4562) though the sentiments were very much contested as shown by a standard deviation above 1.0. It frees up management and instilled confidence in them to take up more risk in core areas which had more value addition (mean of 3.1126 and std of 1.4562) though the sentiments were very much contested as shown by a standard deviation above 1.0. The study findings were in agreement with literature review by Kenneth and Lysons (2006) who established that the service provider must be ready to offer a competitive cost. These costs should be compared with that of insourcing or planned budget and an analysis done to justify its viability. Clear boundaries should be drawn to show all areas covered in the costing. Occasionally the costs should be reviewed in view of adjusting either upwards or downwards depending on market changes. Outsourcing frees up cash thus allowing investments on core activities, improves organization focus, frees management time and reduces staff costs as well as giving more organization flexibility.

Table 1: Outsourcing

Outsourcing	N	Min.	Max.	Mean	Std
The service providers are always ready to offer a competitive cost thus cost reduction in the organization	65	1	5	3.5642	1.0092
Outsourcing frees up cash thus allowing investments on core activities and improves organization focus	65	1	5	3.1123	1.3578
It frees management time and reduces staff costs as well as giving organization flexibility	65	1	5	3.0883	1.3462
It provides an improved quality by utilizing a service provider who has more knowledge, experience and expertise	65	1	5	3.4582	1.0094
It frees up management and instill confidence in them to take up more risk in core areas which have more value addition	65	1	5	3.1126	1.4562

Information Communication and Technology Integration

This section presented findings to survey questions asked with a view to establish the influence of Information Communication Technology integration on supply chain optimization in manufacturing firms in Kenya. Responses were given on a five-point likert scale (where 5 = Strongly Agree; 4 = Agree; 3 = Neutral; 2 = Disagree; 1= Strongly Disagree). The scores of 'strongly disagree' and 'disagree' have been taken to represent a statement not agreed upon, equivalent to mean score of 0 to 2.5. The score of 'Neutral' has been taken to represent a statement agreed upon moderately, equivalent to a mean score of 2.6 to 3.4. The score of 'agree' and 'strongly agree' have been taken to represent a statement highly agreed upon equivalent to a mean score of 3.5 to 5.4. Table 2 presents the findings.

As indicated by high levels of agreement in Table 2, a majority of respondents affirm that the intranet and internet are highly reliable (mean of 3.3345 and Std of 1.7654) though the sentiments were very much contested as shown by a standard deviation above 1.0.; The systems can

accommodate and process massive data at once (mean of 3.4561 and Std of 1.5432) though the sentiments were very much contested as shown by a standard deviation above 1.0; The staff were well trained in the existing IT services provided (mean of 3.8923 and Std of 1.3245) though the sentiments were very much contested as shown by a standard deviation above 1.0; Additional investments should be made on existing infrastructure (mean of 3.0921 and Std of 1.2135) though the sentiments were very much contested as shown by a standard deviation above 1.0. The existing IT infrastructure could lead to greater productivity (mean of 3.6542 and Std of 1.6324) though the sentiments were very much contested as shown by a standard deviation above 1.0. This was in tandem with Bedey (2012) who asserted that overall, enterprises employing organized procedures, resources and ICT systems to consistently employ and align all procurement strategies in a consistent and integrated method outperformed peers in cost savings, expenditure under management, compliance, supplier integration, and greater contribution to enterprise value. Simms (2008) adds that most of the public entities lacked clear accountability on how the resources provided impacted on their performance

therefore going against the fundamental principles of public procurement due to lack of adoption of

information communication and technology.

Table 2: ICT Integration

ICT Integration	N	Min.	Max.	Mean	Std
The intranet and internet are highly reliable	65	1	5	3.3345	1.7654
The systems can accommodate and process massive data at once	65	1	5	3.4561	1.5432
The staff are well trained in the existing IT services provided	65	1	5	3.8923	1.3245
Additional investments should be made on existing infrastructure	65	1	5	3.0921	1.2135
The existing IT infrastructure can lead to greater productivity	65	1	5	3.6542	1.6324

Supply Chain Optimization

The study sought to determine supply chain optimization, attributed to the influence of outsourcing and ICT integration. The study was particularly interested in three key indicators, namely reduction of stock outs, Cost reduction, timely Purchases-stock out reduction and customer satisfaction, with all the three studied over a 5 year period, running from 2012 to 2016. Table 4.6 below presents the findings.

Findings in Table 3 below revealed poor supply chain optimization in the organization across the 5 year period running from the year 2012 to 2016. Reduction of stock outs low but positive productivity with a majority affirming to less than 10% in 2012 (32.3%) and 2013 (47.7%), to 10% in

2014 (26.1%) then more than 10% in 2015 (11.1%) and 2016 (17.5%). A similar trend was recorded in cost reduction, from less than 10% (34.1%) in 2012, to more than 10% in 2013 (36.4%), 2014 (20.4%) and 2016 (27.3%). Customer satisfaction recorded low but positive productivity with a majority affirming to less than 10% in 2012 (32.3%) and 2013 (47.7%), to 10% in 2014 (26.1%) then more than 10% in 2015 (11.1%) and 2016 (17.5%). Timely Purchases-stock out reduction further low positive growth with a majority affirming to less than 10% in 2012 (27.9%) and 2013 (35.9%), to 10% in 2014 (25.9%) and 2016 (25.3%) then by more than 10% in 2016 (26.2%). It can be deduced from the findings that key supply chain optimization indicators have lowly improved as influenced by outsourcing, manufacturer/supplier collaboration, supply chain forecasting and ICT integration.

Table 3: Supply Chain Optimization

Reduction of Stock Outs	2012	2013	2014	2015	2016
Increased by less than 10%	42.3	37.7	31.6	30.7	29.5
Increased by 10%	31.8	32.9	36.1	28.2	33
Increased by more than 10%	25.9	29.4	32.3	41.1	37.5
Timeliness	2012	2013	2014	2015	2016
Increased by less than 10%	44.1	35.2	33.4	25.7	27.1
Increased by 10%	31.7	32.6	30.2	33.9	35.6
Increased by more than 10%	23.5	32.2	36.4	40.4	37.3
Reduction of Costs	2012	2013	2014	2015	2016
Increased by less than 10%	37.9	35.9	31.2	25.7	33.1
Increased by 10%	36.2	31.3	35.9	35.3	30.7
Increased by more than 10%	25.9	32.8	32.9	39	36.2
Customer Satisfaction	2012	2013	2014	2015	2016
Increased by less than 10%	37.9	35.9	31.2	25.7	33.1
Increased by 10%	36.2	31.3	35.9	35.3	30.7
Increased by more than 10%	25.9	32.8	32.9	39	36.2

CONCLUSIONS AND RECOMMENDATIONS

The reviewed literature showed that supply chain optimization in manufacturing firms in Kenya played an important role in the development in the country. Further, it was revealed that outsourcing and ICT Integration positively and significantly influenced on supply chain optimization in manufacturing firms in Kenya.

From the descriptive statistics, the study established that majority of respondents were found to highly agree that the service providers were always ready to offer a competitive cost thus cost reduction in the organization. The original equipment manufacturer was used to predict demand beyond a 4 week horizon. Outsourcing frees up cash thus allowing investments on core

activities and improves organization focus. It frees management time and reduces staff costs as well as giving organization flexibility. It provides an improved quality by utilizing a service provider who has more knowledge, experience and expertise. It frees up management and instills confidence in them to take up more risk in core areas which have more value addition.

From qualitative analysis and descriptive statistics, the study established that ICT integration influenced manufacturing firms in Kenya. The study established that majority of respondents affirmed that the intranet and internet were highly reliable. The systems could accommodate and process massive data at once. The staffs were well trained in the existing IT services provided. Additional

investments should be made on existing infrastructure. The existing IT infrastructure can lead to greater supply chain optimization in manufacturing firms in Kenya.

The study established that there was poor supply chain optimization across the 5 year period running from the year 2012 to 2016. Reduction of stock outs low but positive reduction of stock outs with a majority affirming to less than 10% in the last five years. A similar trend was recorded in cost reduction, customer satisfaction recorded low but positive supply chain optimization with a majority affirming to less than 10% and timely Purchases-stock out reduction further low positive supply chain optimization. It can be deduced from the findings that key supply chain optimization indicators have lowly improved as influenced by among other independent variables. All the independent variables were found to have a statistically significant association with the dependent variable at ninety-five level of confidence.

Conclusions of the Study

The study established that outsourcing influence supply chain optimization in manufacturing firms in Kenya. Outsourcing had a positive influence supply chain optimization in manufacturing firms. Further, the study revealed that the variable statistically and strongly correlated to supply chain optimization in manufacturing firms.

The study established that ICT integration influenced supply chain optimization in manufacturing firms in Kenya. ICT integration had a positive influence supply chain optimization in manufacturing firms. Further, the study revealed that the variable statistically and strongly correlated to supply chain optimization in manufacturing firms.

Recommendations of the Study

The study established that outsourcing played a significant role on the supply chain optimization. The study recommended that the service providers could be used to always to offer a competitive cost thus cost reduction in the organization. The outsourcing could always to free up cash thus allowing investments on core activities and improved organization focus. It can free management time and reduces staff costs as well as giving organization flexibility. It would provide an improved quality by utilizing a service provider who has more knowledge, experience and expertise and instills confidence in them to take up more risk in core areas which have more value addition.

To enhance supply chain optimization in manufacturing firms, there is need to ensure that the staff is computer literate to comply with the rules and regulations. The level of automation should be adequate and level of systems usage should be adequate to enhance procured quality goods. The ICT should be adequately observed in the organization. Most notably, there is need to improve the IT infrastructure to enhance supply chain optimization in manufacturing firms.

Suggestions for Further Studies

Due to constraints, this study could not exhaust all the factors affecting supply chain optimization of manufacturing firms in Kenya. Therefore other factors affecting the supply chain optimization of manufacturing firms in Kenya need to be established. A review of literature indicated that there has been limited amount of research on the supply chain optimization of manufacturing firms in the Kenyan context. Thus, the findings of this study serve as a basis for future studies on the role of independent variables studied on supply chain optimization of manufacturing firms.

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