LEAN SUPPLY CHAIN MANAGEMENT PRACTICES AND OPERATIONAL PERFORMANCE OF THE MANUFACTURING FIRMS IN KENYA

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DECLARATION

This research project is my original work and has not been presented to any other institution of learning for the award of an academic certificate.

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This research project has been submitted for examination with my approval as the student supervisor.

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LIST OF ABBREVIATION

GDP - Gross Domestic Product

GoK - Government of Kenya

JIT - Just in Time

KAM - Kenya Association of Manufacturers

LSM - Lean Supply Chain Management

MRP - Material Resource Planning

OPT - Optimized Production technology

RBV - Resource Based View

SCM - Supply Chain Management

TOC - Theory of Constraints

TPS - Toyota Production System

USD - US Dollars

ABSTRACT

Implementation of lean supply chain management practices has become a vital strategy for gaining competitive edge among competitors because competition amongst organizations have risen to high level that organizations fail to develop ways of survival either fail to perform or are eliminated out of business. This study tested five lean management practices namely Demand Management, Waste management, Cross enterprise collaboration, cultural practices and standardization against selected operational performance measures in the manufacturing firms in Kenya. The study adopted a survey method of data collection, collecting data from 104 manufacturing firms in Kenya through stratified sampling. The data was then analyzed using both descriptive and inferential statistics. The study used both Pearson correlation to test the relationship and regression to analyze the data using SPSS program. It was concluded from the study that lean supply chain management practices have very strong correlation with manufacturing firms in Kenya with demand management having the highest level of effect. Therefore in order to improve firms' performance, organizations should adopt lean supply chain management practices.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

In the business environment high worldwide rivalry, quick advancements, progresses on IT, producing and perceiving clients are convincing assembling firms to enhance producing procedure, operations, and all the conceivable purposes of supply chains to allow them convey standard products in a brief timeframe. To accomplish this, firms are currently developing adaptive supply chain management practices in order for them to remain competitive in the globalization scene. The success of a company depends on how well they develop creative supply chain techniques that can help the organization to win. At the moment, numerous companies turn into a part of no less than one supply chain and they should have the capacity to perform well with a specific end goal to accomplish better financial results (Harps, 2000; Stonebraker and Afifi, 2004).

Most of the manufacturing firms have a long way to go in achieving a well synchronized lean supply chain that can yield great performance. Transnational organizations have expanded more than twofold, rapidly increasing geographically and supply chains now include more companies. A few organizations are expecting the quantity of cooperative relationships with suppliers and outsiders to heighten and an ever-more extensive scope of activities is being outsourced (Corsten and Kumar, 2005). Supply chains are finding it difficult to keep pace with cost volatility (Kushwaha, 2012). Organizations are currently concentrating more on technique alignment, constant process enhancement and cost mitigation to guarantee reduced input to attain more. Notwithstanding, as worldwide

markets develop, accomplishing this objective has turned out to be progressively intricate because of constantly changing business environment, international competitive environments, asset constraints and capability difference in the production floors.

Lean philosophy, which began with the Toyota production system (TPS) as described by Womack and Jones (1991) is one of the activities that numerous significant organizations around the globe have been attempting to embrace keeping in mind the end goal to streamline the manufacturing procedure and attain enhancement in resources. The term lean has been explained by Womack and Jones (2009) as a framework that uses less as far as all inputs, to make an indistinguishable output from those made by a conventional large scale manufacturing framework while contributing expanded assortments for the end client. Aside from this, organizations need to not only utilize existing assets more proficiently, but also inventively (Ahmed, 2009). Sound strategic supply chain planning within the firms is important in taking care of the customer preferences and is a key competitive tool that can enhance successful firm performance (Magutu, 2013).

This study is informed by two main issues of operations management, lean supply chain management practices and operations performance. A lean supply chain is a framework whose system comprises of material providers, manufacturing offices, disbursement services and clients incorporated together through forward stream of material and in reverse stream of information and uses minimal inputs to yield more (Yusuf et al. 2004). A lean manufacturing firm comprehends client esteem and centers its key procedure to persistently expand it. A definitive objective is to give appropriate value to the client

through a perfect value creation procedure that has zero waste (Liker, 2014). Lean supply chain management practices are centered on taking out waste from all procedures while upgrading material and data stream along the supply chain (McManus, 2012). Operational performance on the other hand is the efficiency of an entity in transforming inputs into outputs (Knod and Schonberger, 2001). Effect of lean thinking as a technique for the supply chain and not simply assembling is essential and has gotten a great deal of interest from both industry and the scholarly world. Consequently, the motivation behind this study is to explore the lean supply chain management activities in the assembling firms in Kenya, and establish the effects of these practices on organisational output.

According to Haron and Chelakumar (2012) the manufacturing firms in Kenya have a great potential in promoting economic growth and competitiveness in the country. The firms strive to be globally competitive and the growth of the manufacturing sector has been stagnant for some years at 11% now and the key constraint identified include uncompetitive high energy costs, low capital injection, use of obsolete technologies and high costs of doing business (GoK, 2015). Despite the challenges, the firms are expected to play a pivotal role towards the achievement of Kenya's vision 2030 and boost its ability to compete internationally.

1.1.1 Lean Supply Chain Management Practices

Jorgensen and Emmitt, (2009) defines supply chain management (SCM) as the administration of the stream of materials, data, and funds over the whole supply network, from providers to part makers to ultimate assemblers to dissemination (distribution

centers and retailers), and at last to the customer. It is a cooperation of system of retailers, merchants, transporters, warehouses, and providers that take an interest in the production, conveyance, and sale of an item to the buyer and is basically comprised of different organizations who arrange activities to alienate themselves from the rivalry (Kouvelis, 2011). A supply chain is a well-coordinated system that should deliver a product package from the source as raw materials until it reaches the end customer. McKee and Ross (2010) defines lean supply chain management (LSM) as a supply chain operational and tactical management philosophy that uses Internet-enabling innovations to impact the constant recovery of provider and service partner channels. Manrodt and Vitasek (2008) on the other hand has defined lean supply chain as a strategic way to deal with upgrading quality to the client by identifying and removing waste that is time, exertion and materials through persistent change, by streaming the item at the pull of the client, in quest for flawlessness

Lean supply chain management practice is a topic that has had numerous researches in operations management. According to Dean and Bowen, (1998) lean standards are executed through a few practices which are exercises embraced to realize upgrades in organisation, the lean practices are upheld by set of devices and systems. The authors have emphasized the difference between principles, practices, and techniques and try to separate them from one another. It is argued by Ugochukwu, (2009) that due to the connectivity between the three terms, it is difficult to separate them, especially practices and techniques and that some authors use practices, tools and techniques interchangeably.

Gadde (2001) has argued that proper optimization of the supply chain where all costs are minimized to enhance the customer value creates high levels of efficiency and effectiveness in the firm's supply chain and optimized supply chain is made up of competitive firms.

According to Levy (1997) the lean practices which have been identified from his research are as follows: sourcing of client need data, value stream analysis (VSA), end clients focus, waste management, workplace organisation, solid and compelling relationship, creation of correct relationship, manufacturing of desired customer demands only when required, problem search and critical thinking. According to Daud and Zailan (2011), Mandrot, Thomson and Vitasek (2008), the lean practices are demand management, standardization, cost and waste management, cross-enterprise collaboration and organizational behavior and these will form the basis for this research.

1.1.2 Operational performance

Operations performance has been defined by Voss et al., (2010) as the measurable aspects of organizations' processes such as reliability, production cycle time and inventory turns. Knod and Schonberger (2001) define operational performance as the effectiveness of an organization in converting inputs into outputs. The pursuit for operational performance improvement has heightened the interest for higher commodity advancement speed, producing adaptability, waste disposal, better process control, proficient labor usage and worldwide reach to increase competitive advantage (Karim et al. 2008). Cunneen (2006) suggests that operational performance should be measured in

order to ensure that it is a continuous process that can be used for coaching and feedback, improving performance and developing talent that suit the organizations' needs.

Ketchen and Hult (2010) contend that the short run targets of SCM are basically to expand profitability and decrease stock and process duration, while long run aims are to raise market stock and returns for all individuals of the supply chain. The performance management of lean in the production process is key in identifying problems related to specific areas then the areas be highlighted and ways to tackle them could be discovered. Taggart (2009) observes that there are three groups interested in assessing the performance of an organization; these include public investors, internal stakeholders and customers. Internal stakeholders include group level management and employees. Customers include those with a vested interest in buying a firms product or service based on its cost, delivery and quality. External stakeholders look for the following characteristics: operating profit, return on invested capital, financial stock returns. Internal stakeholders look for cost of quality, On-Time- Delivery, lead time, direct labor, efficiency, lost time injury rate, order book and price-cost ratio. This research duels on the internal stakeholders.

Two key measures have been identified by Beamon (1999) as resource and outcome measures. Resource measures encompass: stock levels, item utilization, energy application and cost. The outcome measures of lean supply chain are highlighted by Gunasekaran (2004) and Poluha (2007) as order lead time, productivity ratio, total cycle time and range of products. Kushwaha (2012), has identified key operational

performance parameters which can be tracked as a measure of the lean supply chain practices performance are; cost of procurement, production cost, inventory carrying cost, cost of distribution, cost of transporting, order fulfillment cycle time, inventory turnover (number of times), on time delivery, frequency of stock out, product rejection rate, backorder and cash-to-cash cycle time.

1.1.3 Manufacturing Firms in Kenya

Manufacturing involves transformation of raw materials into either intermediate goods or final products through mechanized process. The manufacturing firms consist of setups that engage in the mechanical, physical or chemical transformation of materials, substances or component into new products. According to KAM (2011) there are 752 manufacturing firms in Kenya operating in twelve subsectors ranging from construction, food processing, chemicals, energy, plastic, textiles, wood, pharmaceuticals, metal, leather, automobiles and paper processing firms According to the ministry of industrialization of Kenya, in the past decade, the assembling base has stayed static at 11% of the nation's GDP, and its industrial exports have diminished in supreme terms. Expanding this base is basic to creating jobs and fiscal growth and development, in addition improvement in both local and foreign investment.

It is reported by the industrialization ministry that due to stagnation of growth, the quantity of formal occupations in manufacturing has developed at only 7% every year in the course of four years; the exports have stagnated at 15% of GDP, while imports have developed to 40% of GDP making an commercial imbalance, weakening the Kenyan

Shilling and expanding inflationary pressure. These gaps can only be closed by revitalizing the industrial sector and turning Kenya into an industrial hub. The government has recognized opportunities that will dramatically increase the measure of current formal assembling division occupations to around seven hundred thousand and add USD 2 to 3 billion to our GDP (GoK, 2015).

The manufacturing firms in Kenya consist of transnational companies and local firms. Some of the key challenges that have been pointed out by the ministry of industrialization that needs to be overcome to realize the opportunities are infrastructure and land accessibility, aptitudes and capacities in priority divisions, nature of inputs, cost of operation, market availability and investor-friendly regulations. The government has built up a five-point procedure to capture these chances throughout the following ten years and one of the strategies is to drive results through the newly formed Ministerial Delivery Unit (GoK, 2015). This will require clear measurement of performance of the manufacturing firms which is also key objective of this research.

The country's Vision 2030 has a clause on the manufacturing firms which it suggests should be able to create wealth and employment and to increase contribution to the GDP by at least 10% per annum. A number of key interventions have been suggested to lead Kenya to be globally competitive and prosperous. These include strengthening their capacity and domestic content of locally made merchandise, expanding the production and usage of research leads to the raising of the share of items in the local market from

7% to 15 % and creating new markets and expanding the current market niche for existing products

(GoK, 2015).

1.2 Research Problem

Operations performance is a vital measure in the manufacturing firms. Increase in pressure on organizations to find new ways to create and deliver value to customers with fewer resources or to maximize customer value while minimizing wastes and improving profitability while reducing costs in the supply chain has become so important than never before (Farah, 2013). Effective supply chain management has become a very important way of securing competitive advantage and improving organizational performance since competition is no longer between organizations, but among supply chains. Many organizations have begun to recognize that lean supply chain management is the key to building sustainable competitive edge for their products and/or services in an increasingly crowded marketplace (Li , Nathan and Rao, 2004).

Baum (2004) contends that around 250 to 400 billion USD are wasted annually in North American industries alone because of inefficiencies in the supply chains and that this amount would be as high as 1 trillion USD worldwide. Firms face an increasing pressure of customer requirements while at the same time need to reduce cost, shorten lead times and lower inventory levels to ensure profitability (Holweng, 2005). The issue of lean supply chain management practices is a key input to firms' operational performance and

a vital pointer to a thematic concern that informed this study on the manufacturing firms in Kenya.

Lean philosophy is one of the initiatives that many major businesses around the world have been trying to adopt in order to streamline the production process and achieve optimization in resources (Womack et al. 1991; Schonbergerm, 2007). Operational performance of a manufacturing firm is said to be quality of any company and is achieved by valuable outcome such as higher returns or less input use. A lot of research has been done on lean supply chain management practices but very few have tried to link it to operational performance of the firms that they have studied. Womack, Jones and Roos (1990) have done extensive research on the topic of lean and even written a book which they have christened lean as 'the machine that changed the world' which makes it a very interesting topic to investigate.

Rahman (2009) conducted a study to examine the extent to which lean management practices are adopted by manufacturing organizations in Thailand and their impact on firms' operational performance. He used a survey questionnaire and data collected against 13 lean practices from 187 middle and senior managers belonging to 187 Thai manufacturing firms and noted that Just In time has much higher impact on operational performance followed by waste minimization and then flow management.

Daud and Zailani (2011) conducted a study on lean supply chain management practices and performance in the context of Malaysia and found out that lean supply chain

practices are directly related to the performance of the electrical and electronics manufacturing service companies in Malaysia. Chong et al. (2011) has researched on a framework which identified the relationships between supply chain management practices, operational performance and innovation performance of Malaysian manufacturing and service firms. The research was tested using structural equation modeling and the results showed that SCM practices in both the upstream and downstream supply chain have a direct and significant impact on organizational and innovation performance of Malaysian firms.

However, Skorstad (1994) and Berggren (1993) have criticized lean claiming that it results in increased autonomy of workers and the intensification of work, which has been variously described as mean production or management by stress as improvement programs add stress to the organization because the work pressure is higher. Smart et al. (2003) criticized the lean model for achieving efficiency gains through cost reduction at the expense of loss of mission, integrity and failure. All these studies were conducted outside Kenya and may not be relevant due to the difference in economic and geographical set ups of the areas of the study. The study also sought to clarify on this conflict of findings regarding the effect of lean supply chain management practices on operational performance.

More recently and locally Farah (2013) researching on implementation of lean supply on water companies in Kenya noted that water companies embracing lean supply chain management strategies have had improved performance. His study only concentrated on a

single sector. Wamalwa, Onkware and Musiega (2014) also researching on operational performance in Mumias concluded that lean manufacturing tools and techniques have a positive effect on manufacturing performance if the lean technology is holistically embraced with total productive maintenance contributing the highest level of performance . Again this study only researched on a single firm. Kimani (2013) has also researched on lean supply chain implementation on manufacturing firms in Kenya but she has not exploited its effects on their operational performance and only limited her sampling within a small region. Ondiek and Kisombe (2013) also studying the sugar manufacturing industries in Kenya concluded that the sugar sector in Kenya has not implemented very important tools and techniques in their operations like standardization of work and total productive maintenance again this study on touched on a single firm.

Prakash and Rana (2006) also noted that most of the research done on supply is on very few industries covering the consumer goods retailing, computer assembling and automobile manufacturing a gap which is filled by this study by covering a wide range of subsectors for the manufacturing firms and targeting to sample from the entire country. Most of the studies conducted including the ones conducted in Kenya have also not to attempted to link the lean supply chain practices with their effects on operational performance leaving a huge research gap that this study seeks to address by answering the following research questions; To what extent is lean supply chain management practices used in the manufacturing firms in Kenya and how does the implementation of lean supply chain management practices affect operational performance of the manufacturing firms in Kenya and also seek to identify the challenges of

implementation of the lean supply chain management practices in the Kenyan manufacturing firms ?

1.3 Research Objectives

The specific objectives include:-

i. To establish the extent to which lean supply chain management practices are used in the manufacturing firms in Kenya.
ii. To determine the effect of lean supply chain management practices on the operational performance of the manufacturing firms in Kenya.
iii. To establish the challenges faced in implementation of lean supply chain management practices in the manufacturing firms in Kenya.

1.4 Value of the Study

The study will be very beneficial to both professionals in the academia, contributing to the theories and business managers especially operations and finance managers who are seeking to maximize profit and widen their market niche'. The study is important in putting in place best supply chain management practices in manufacturing that will ensure that the organization can minimize operational costs and improve operational performance. The findings for this research will also be important to policy makers in formulating adequate policies that will enable an organization in the manufacturing firms to fully realize their full potential using the least available resources. The study findings will also be of great benefit to management consultants, researchers, governments,

organizational change strategists that are seeking to implement breakthrough performance improvement for manufacturing firms.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature on the concept of the study. The chapter looks at supply chain, lean supply chain management practices, operational performance and theories involved. It also links the lean supply chain management practices to the operational performance indicators in the manufacturing sector.

2.2 Supply Chain Management

According to Romanio and Ganakis (2000), the concept of supply chain management has been considered from various perspectives in various scholarly works for example purchasing and supply management, logistics and transportation, operations regulation, promotion, and organisational theory. Ellram and Cooper (1990) have defined supply chain management as an integrative philosophy to manage the total flow of distribution channel from the supplier to the final user. Johnson and Pyke (1999) defines supply chain management (SCM) as the stream of materials, data and funds over the whole supply network, from providers to segment makers to ultimate assemblers to circulation (distribution centers and retailers) and at last to the purchaser. Supply chain management basically consists of multiple companies who coordinate activities to set themselves apart from the competition (Keiztman, 2009).

The study is guided by Mohanty and Deshmukh's (2005) definition that describes supply chain as consisting of the flow of raw materials, finished goods, finances and

information while aiming to achieve high customer expectations through proper planning on demand forecasts, sales generation and efficient distribution. The core function of the supply chain management is for the realization of business strategy.

2.2.1 Lean Supply chain Management Practices

According to Li et al. (2006) and Tan et al. (1998) the supply chain management concept was derived from the areas of purchasing and supply management, and transportation and logistics management. Li et al. (2006) further contends that from the purchasing and supply chain perspective SCM is the integration of the supply base that evolved from the traditional purchasing and materials functions. From the transportation and logistics management perspective it has been argued by Fisher, (1997) that SCM is integrated logistics systems, and focuses on inventory reduction both within and across organizations in the supply chain. Lean supply chain on the other hand is a concept that was started as a manufacturing concept and developed by Taiichi Ohno at Toyota Motor Company in the 1950's as an innovative technique in an assembly-line manufacturing methodology for the manufacturing of the automobiles (Fricke, 2010

Dean and Bowen, (1998) contend that lean principles are implemented through some practices which are activities done to bring about improvements in organization, the lean practices are supported by set of tools and techniques. Lean focuses on eliminating or reducing wastes and on maximizing or fully utilizing the activities that add value from the customer's perspective (Gaither and Frazier, 2004). Anand and Kodali (2008) suggested that the theory and principles of lean and its associated tools, practices and

procedures can be extended outside the boundaries of an organization to its supply chains.

Alvarado and Kotzab (2001) have defined lean supply chain practices in terms of reducing duplication effects by focusing on core competencies, and use of inter-organizational standards such as activity- based costing and eliminating unnecessary inventory levels by postponing customizations towards the end of the supply chain. Norek (2002) contends that improving outbound supply chain efficiencies has become a top priority for companies seeking to increase their bottom line. It has been proposed by Sahay and Mohan (2003) that lean supply chain management practices can be measured in four dimensions, that is: alignment between supply chain strategies with business strategies, supply chain integration, partnerships and information technologies.

Lean supply chain management practices have been summarized by Tan et al. (2002) and Chong et al. (2009a, b) as the following aspects: supply chain integration, information sharing, supply chain characteristics, customer service management, geographical proximity and IT collaboration tools.

Having reviewed the literature there are five significant main lean supply chain management practices noted and discussed in this research. They include demand management, standardization, waste management, cross-enterprise collaboration and organizational behavior. Waste management in the supply chain according to Barac and Milovanovic (2006) can be measured in time, inventory and unnecessary costs and value

added activities are those that contribute to efficiently placing the final product at the customer. The seven types of waste to be eliminated in the supply chain are: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects (Aquilano et al. 1995). Just in time production, uniform plant loading, Kanban production control system and minimizing set-up times are important aspects of lean supply chain minimizing wastes. Other means of waste reduction is through standardization that ensures consistency in quality of product generated. According to Lysons and Farrington (2006) standards clear specification, achieve reliability and reduce costs, accurate comparison of quotation, less dependent on specialist suppliers, reduce error and conflict and reduce cost of material handling.

Demand management has been argued by Lysons and Farrington (2006) as the activities involved in providing products when and where they are requested by the customer. According to Mowat and Collins (2000), understanding and meeting consumer needs has principal importance in SCM as a way of optimizing value to customers and improving return to all stakeholders in the supply chain. Suppliers therefore at each level of the process must receive their downstream customer's demand signal and convert it to something usable such part number or quantity to their upstream partners. Demand management practices include: planning demand, communicating demand, influencing demand, managing and prioritizing demand. Planning demand involves more than just forecasting. It entails balancing the requirement of internal and external customers with supply chain capabilities. Demand management includes forecasting demand,

synchronizing supply and demand, increasing flexibility, reducing the variability of demand by means of standardization and the control of inventory (Manrodt and Vitasek, 2008).

According to Manrodt and Visatek (2008) standardization can be done in both the process and industry. Standards are documents that state the minimum levels of performance and quality of goods and services and operational conditions in a given environment. Standardization helps in providing specification, achieving reliability, cost reduction, accurate comparison of quotation, less dependence on specialist suppliers, reducing error, conflict and reducing cost of material handling. Benefits can be gained from standardizing products but also the processes used in the manufacturing or assembly of goods by sharing sub-components across product lines. Thus, fewer unique components are needed reducing manufacturing, warehousing and development costs.

Cross-enterprise collaboration is achieved through the proper application of technology and true partnerships. Buyer-supplier relationship in the past used to be characterized by distrust and competition with each other (Ross, 1998). Ertugrul et al. (2016) have argued that effective suppliers customer collaboration enables an organization to save costs that might arise out of stock-out, lead time and holding costs. According to New and Ramsay (1997) emphasis on strong and effective relationships among the players in the value creation activities is one of the major distinguishing factors of lean approach and makes various activities in the chain be aligned and synchronized. Reliable suppliers form an integral part of supply chain system by ensuring that the firm gets the right goods at the

right time. This results in customer confidence and trust leading to increased sales and improved organizational performance. According to Vedanta (2007), for the smooth flow of information and product in the supply chain collaboration should be enabled. For example customer collaboration enables demand signals to be transmitted efficiently up the supply chain; without it the signals may be transmitted late, incorrectly or not at all. The collaboration promotes efficient flow of components and products resulting in reduced inventory and costs. Manrodt and Visatek (2008) argue that one of the key enablers of cross-enterprise collaboration is the use of teams and that the teams are not just focused on one manufacturing setup but across the entire supply chain.

Organizational behavior or cultural change is a very vital attribute in achieving improved organizational performance using lean. Each participant in the process must concentrate on reduction of waste and it should become a way of life, not just a goal to be achieved one time as part of a new company initiative Vedanta (2007). Mandrot and Viatek (2008) have discussed that implementation of lean must start with a series of trainings, meetings and information exchange with partners in-order to achieve a change in people's culture and move away from the status quo.

2.2.2 Operations performance

Voss et al. (1998) and Cagliano et al. (2001) have argued that operations performance can be measured according to the following factors: rapid equipment changeover, production cycle time, frequency of priority orders, process capability, internal defects and inventory turns. In addition to these aspects, they also defined external aspects: delivery reliability,

product reliability and product cost. According to Industry Week (2010), a lean firm optimizes the flow of products and services to its customers. It delivers customer value by: Reducing lead times, improving quality, eliminating waste, reducing the total costs and engaging and energizing people. Kumar et al. (2011) developed a longitudinal study that built upon previous findings that operations performance of service delivery can positively affect customer satisfaction.

According to Stewart (1995) and Gunasekaran et al. (2001) operational performance measurement can be done in the context of the following supply chain activities or processes: planning, source, make/assemble, and delivery/customer. The metrics for order planning include Order lead-time which is the total order cycle time also known as order to delivery cycle time and refers to the time elapsed in between the receipt of customer order until the delivery of finished goods to the customer. Christopher (1992) contend that reduction in order cycle time leads to reduction in supply chain response time and as such is an important performance measure, source of competitive advantage and a crucial determinant for competitiveness.

Measuring customer service and satisfaction is also a crucial measure of operational performance in the lean supply chain management. According to Lee and Billington (1992) and Van Hoek et al. (2001) to assess supply chain performance, supply chain metrics must centre on customer satisfaction. According to Kushwaha (2012), operational performance parameters which can be tracked as a measure of the performance of the lean supply chain practices include; procurement cost, manufacturing cost, inventory

carrying cost, distribution cost, transportation cost, order fulfillment cycle time, inventory turnover (number of times), on time delivery, frequency of stock out, product rejection rate, backorder and cash-to-cash cycle time as independent variables. These are the variables that will be used in this research.

Order cycle time is equivalent to speed and therefore the faster the better. Reduced cycle time can translate into increased customer satisfaction (Hetzel, 1993). Order cycle time has been defined as the time in manufacturing stretching from the moment the raw material is collected from its source to the moment when the fine product is delivered to the ultimate customer (Ford, 1988). According to Papouras (1991) companies with shorter cycle times can launch new products earlier, penetrate new markets faster, meet changing demand, and can deliver rapidly and on time and can also offer their customers lower costs because quick response companies have streamlined processes with low inventory and less obsolete stock.

Inventory turnover has been defined by Rao (2009) as a measure of the number of times a company sells its inventory during the year. A high inventory turnover ratio indicates how best the firm is operating economically in selling its products it is a measure of management's ability to use resources effectively and efficiently.

Reduction of defective products rate entails reducing number of defects and unnecessary physical wastage, including excess use of raw material inputs, preventable defects, costs

associated with reprocessing defective items and unnecessary product (Kovacheva, 2010).

A stock-out has been defined by Vasconcellos and Sampaio (2009) as a situation where an item that is regularly commercialized at a point of sale and occupies a specific place on the shelves is not available to the consumer in the store at the moment of purchase. Consumers may respond to the stock-out by substituting the item, delaying the purchase or leaving the store (Fitzsimons, 2000). Anderson, Fitzsimons and Simester (2006) have argued that stock-outs should be managed with a combination of efforts to reduce the number of stock-out instances and offer remedies to manage the consumer's response whenever the stock-out is unavoidable or is too expensive to eliminate.

Cost is another vital measure of operational performance. They include distribution costs, manufacturing costs and transportation cost. The goal of a lean supply chain is to use practices such as just in time to drive all inventory queues to zero, thus minimizing inventory investment and shortening lead time (Aquilano et al. 2005).

2.2.3 Lean Supply Chain Management Practices and Operational Performance

Lean has been defined by The National Institute of Science and Technology as a systematic approach to identifying and eliminating waste that is non-value adding activities through continuous improvement by following the product at the pull of the customer in pursuit of perfection. Chong et al. (2011) conducted a research to establish the relationships between supply chain management practices, operational performance

and innovation performance of Malaysian manufacturing firms and the research result showed that supply chain management practices in both the upstream and downstream have a direct and significant impact on organizational and innovation performance of Malaysian firms.

According to Alukal and Manons (2002), a planned implementation of lean production system leads to improved quality, better cash flow, increased sales, better productivity, improved morale and higher profits. It has also been argued that a lean organization optimizes the flow of products and services to its customers and that it delivers customer value by reducing lead times, improving quality, eliminating waste, reducing the total costs, engaging and energizing people (Industry Week, 2010). A number of studies have been done on the relationship between lean practices and manufacturing performance of the firms and also have showed the improvement in manufacturing through lean practice (Papadopoulo and Ozbayrak, 2005; Bonavia, 2006).

2.3 Theoretical Literature Review

This section will look at two theories which have been put forward that are related to lean supply chain. The research looks at the resource Based View Theory and the Theory of Constraints and seeks to understand on how the theories relates to lean supply chain.

2.3.1 Resource Based View Theory

The resource-based approach sees firms with superior systems and structures as being profitable because they have lower costs, higher quality or superior product performance

(Teece, Pisano and Shuen, 1997). The Resource Based View (RBV) considers that the external perspective of strategy is insufficient to fully explain the sources of competitive advantage. Some resources may belong to the firm, whereas others, such as consultants may be accessed on a temporary basis (Mills, Platts and Bourne 2003a). The RBV is concerned with efficiency and the elimination of waste (Peteraf and Barney, 2003). Resources are the tangible and intangible assets that a company controls, possesses or has access to in combination with the human resources of the firm (e.g. skills, knowledge and motivation) which create organizational capabilities (Grant, 1991). Barney (1991) argued that resources which are heterogeneously distributed across firms and are imperfectly mobile and can be a source of sustainable competitive advantage. The resource-based perspective focuses upon strategies for exploiting firm specific assets to maximize economic value (Teece et al. 1997).

There are a number of strategic choices such as; engaging in strategic alliances, developing new products or improving processes implementing Lean practices. The Resource Based View and Lean Production both focus upon customer value, efficiency and waste (Peteraf and Barney 2003; Womack, 2002). The implementation of lean helps reducing economic cost, whilst improving quality, responsiveness and delivery performance, which increases the perceived benefits. Thus additional economic value is created, which is then shared between customers and the suppliers in accordance with the price. Lean can therefore make companies more competitive because at a given price they can achieve a larger producer surplus than their non-Lean competitors. Their products are also more attractive to customers because they offer a larger customer surplus. This study

will be anchored on this theory because it focuses on cycle time, turnover, product quality, operational costs and stock-out which are competitive advantages gained from better resource utilization.

2.3.2 Theory of Constraints

Theory of constraints (TOC) is a philosophy of management put forth by Goldratt in 1984 which claims that each system has at least one constraint. Theory of Constraints (TOC) focuses on the weakest ring(s) in the chain to improve the performance of systems and companies, whether they are in the production or service sector. It adopts the common idiom that a chain is no stronger than its weakest link as a new management paradigm. This means that processes, organizations, etc., are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome.

The analytical approach with TOC comes from the contention that any manageable system is limited in achieving more of its goals by a very small number of constraints, and that there is always at least one constraint. Hence the TOC process seeks to identify the constraint and restructure the rest of the organization around it. Lean can assist in unblocking the bottlenecks through waste elimination, cost reduction and better efficiency to improve performance.

The theory as argued by Simsit et al. (2014) can be applied in manufacturing through optimized production technology (OPT) for investigating bottlenecks in operations. It can

be used in material Resource Planning (MRP), Just In Time (JIT) for inventory control. As it can be seen, TOC focuses on continuous improvement philosophy by dealing with constraints.

2.4 Empirical Literature review

Rahman, Laosirihongthong and Sohal (2009) investigated the extent to which lean management practices are adopted by manufacturing organizations in Thailand and their impact on firms' operational performance. They used survey questionnaire and collected data against 13 lean practices from 187 middle and senior managers belonging to Thai manufacturing firms. Using factor analysis they clustered the lean practices into three higher level constructs namely; just in time (JIT), waste minimization and flow management. They used multiple regression models to investigate the effects of the three lean constructs on operational performance in different categories of firms. The operational performance was measured using four parameters that is quick delivery compared to competitors, unit cost of products relative to competitors, overall productivity and customer satisfaction. They found out that the three lean constructs are significantly related to operational performance.

Ferdoursi (2009) investigated the benefits of implementation of lean manufacturing practices in Bangladeshi garment manufacturing firms on operational performance. He selected nine garment manufacturing companies where he conducted survey with a semi-structured questionnaire and interviews with the respondent. He used purposive sampling to ensure the best possible scenario of lean practices in Bangladesh. The focus of the

study was to investigate the improvement of manufacturing performance through lean practice in the Bangladeshi garment industry. His findings indicated that the selected companies had adopted a wide variety of lean tools and techniques and gained many performance improvements.

Kushwasha (2012) researching on the adoption level of various supply chain management (SCM) practices implemented in paint companies operating in India also collected data. 100 companies targeted and questionnaires sent through email. He used multiple regression to analyzed the data and found out that there is a significant correlation between lean supply chain management practices and operational performance of the manufacturing firms in the country.

Argus and Iteng (2013) also examined the importance of incorporating lean in production in the Malaysian manufacturing firms and its impacts on business operational performance. They tested the implementation of Just in time and technology and innovation use by interviewing senior managers in two hundred and five firms. Using regression analysis they concluded that long term implementation of lean supply results in improvement on business performance.

Locally, Wanjiku (2013) has also researched on lean supply chain management in manufacturing firms in Kenya. She sampled 100 manufacturing firms in Nairobi Kenya collecting data through survey method of data collection using questionnaires and used descriptive statistics to analyze the data. The study established that lean supply chain

management implementation is being done in firms in Kenya though not all practices are fully implemented. Her study however did not cover the entire country but samples firms in Nairobi a gap which this study seeks to close.

Keitany and Riwo-Abudho (2014) researched on the effects of lean production on organizational performance in Kenyan Milling firms. Their study was designed to determine the elements of lean production, effect of lean production systems on product quality, strategies for waste reduction and the challenges of adopting lean production. From the results, they established that flexible manufacturing is a major approach that firms can use to enhance lean production and JIT and Kaizen are other approaches that firms can use to enhance lean production. From the results, they established that firms can improve lean production by adopting latest technology, involving staff, customer involvement, staff motivation to reduce resistance and proper integration of systems in the value chain, thus reducing wastes and increasing organizational performance. One key limitation of their study was that it only looked at a single manufacturing line that is flour milling firms as opposed to the entire manufacturing firms in Kenya.

Farah (2015) has studied lean supply chain management practices and organizational performance in the public water sector in Kenya. He used a census to collect data from 117 water processing firms in Kenya. The data was analyzed using descriptive statistics and found out that the three lean supply chain management used were waste management, standardization process and demand management and have a very significant impact on operational performance.

2.5 Conceptual framework

In the conceptual frame work the independent variables are lean supply chain management practices. This research will be focusing on waste management practices, demand management practices, standardization, cross enterprise collaboration and behavioral practices as independent variables. The dependent variables include procurement cost, manufacturing cost, inventory carrying cost, distribution cost, transportation cost, order fulfillment cycle time, inventory turnover (that is the number of times), on time delivery, frequency of stock out, product rejection rate. These are supposed to be the key indicators for operational performance.

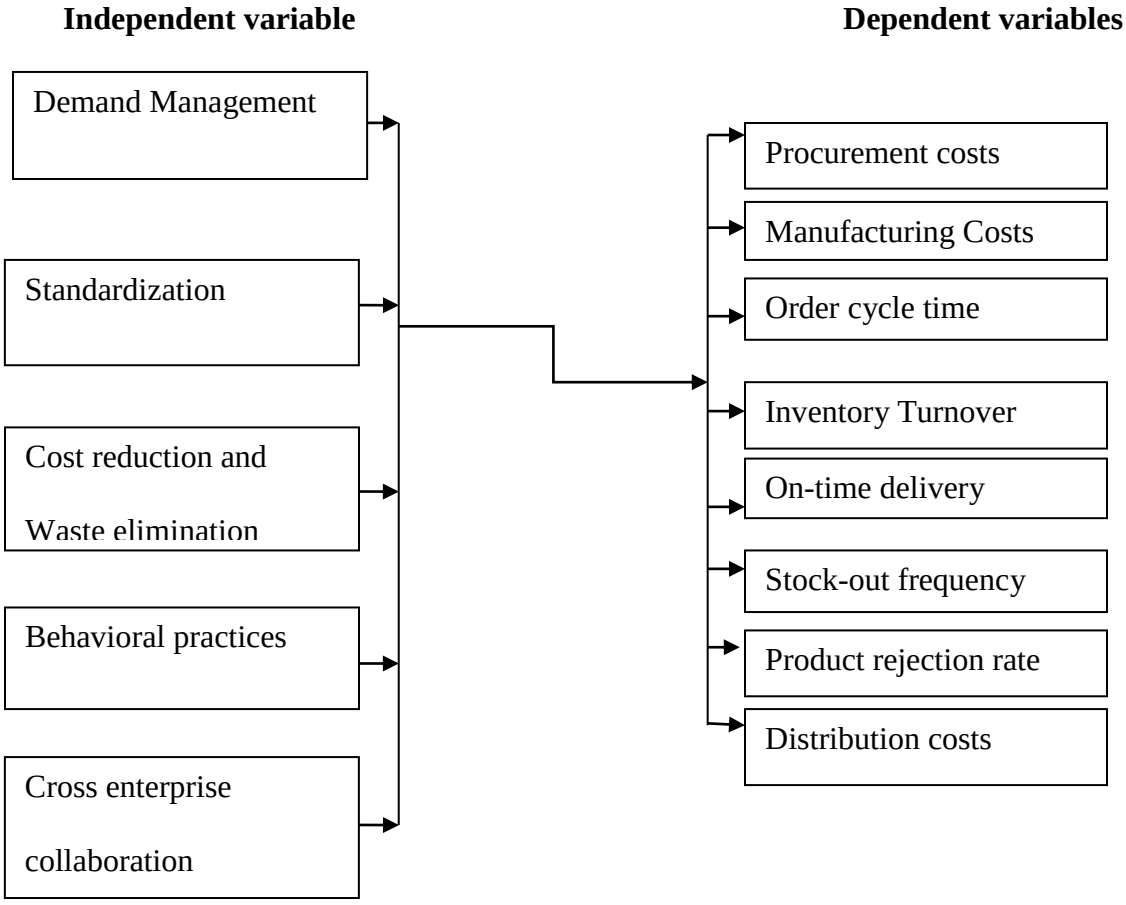


Figure 2.1: Conceptual framework

Source: Author (2016)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology that was used to conduct the study. It covers the research design, the target population, data collection and data analysis.

3.2 Research Design

The purpose of this study was to investigate the implementations of lean supply chain management practices in manufacturing firms in Kenya and their effect on operational performance. A survey approach was used in carrying out this study where the units studied were manufacturing firms in Kenya selected to the criteria described below. According to Mugenda and Mugenda (2003) questionnaires are suitable to obtain important information about the population. Orodho (2004) also argues that this method reaches a large number of subjects able to read and write independently. Since the objective of the study was to seek answers to specific questions from a large number of respondents in the supply chain, a survey approach was deemed to be appropriate.

3.3 Population of Study

The target population for this survey consisted of Kenyan manufacturing firms listed in Kenya Association of Manufacturers (KAM) directory that are in the country. The list comprised of multinationals, local companies and private owned companies. The population targeted was 752 firms. Kenya association of manufacturers has divided the firms into groups namely; energy, electrical and electronics; plastic and rubber; textile

and apparels; food, beverage and tobacco; pharmaceutical and medical equipment; metal and allied; paper and paperboard; motor vehicle assembly and accessories; building construction and mining; chemical and allied and 150 samples were to be collected .Managers from the firms to be interviewed.

3.4 Sampling

The survey population taking into account low response rate and other hurdles (e.g. technical, financial and time) targeted 137 manufacturing firms. The sample size of employees was determined by use of Kombo and Tromp (2006) recommendation that a sample size of 10% to 30% is representative enough for the study population. Therefore the sample size of employees was determined on the basis of 20% recommended by Kombo and Tromp (2006).This sample size was also to take into account unfilled or improperly filled questionnaires expected during field data collection.

Proportionate Stratified sampling design was used as the sampling strategy in order to cover all the industry firms. The population was divided into 12 strata which are : energy, electrical and electronics; plastic and rubber; textile and apparels; food, beverage and tobacco; pharmaceutical and medical equipment; metal and allied; paper and paperboard; motor vehicle assembly and accessories; building construction and mining; chemical and allied; plastic and rubber; and leather products and footwear. The samples were collected as per the table below;

Table 3.1: Sampling schedule

Sampling schedule Group (strata)	Strata size	Targeted Sample size
Energy, electrical and electronics	80	16
plastic and rubber	75	15
Textile and Apparels	49	10
Timber wood	20	4
Metal and allied	40	8
Food, beverage and tobacco	150	30
Pharmaceutical and medical equipment	40	8
Paper and paperboard	56	11
Motor vehicle assembly and accessories	17	3
Building construction and mining	75	15
Leather products and foot wear	15	3
Chemical and allied.	95	19
Total	752	137

Source: Author (2016)

3.5 Data Collection

The study made use of primary and secondary data. Data was collected using questionnaires. The questionnaires were structured to contain open and closed ended questions. Closed ended questions were used to enable the collection of quantitative data for analysis using a Likert-scale, while the open ended questions were used to enable the researcher to collect qualitative data on the respondent's view of lean supply chain management practices. It comprised of four sections; Section one was designed to collect data which will describe general information of the company, Section two designed to

address the implementation , section three gathered data relating to the effect of lean supply chain management practices on operational performance of the firms, and four addressing the challenges of LM implementation. A 5 point Likert scale was used to determine impacts of lean manufacturing implementation in the manufacturing firms in Kenya.

3.6 Data Analysis

The data collected was edited to identify and remove errors made by respondents and to ensure completeness consistency, no omissions and then coded. Coding is expected to organize and reduce research data into manageable summaries (Keasworth and Harding, 1992).In order to determine the extent to which firms in the manufacturing sector use lean supply chain management practices, descriptive statistics including percentages, mean, frequencies and standard deviation were used in the analysis. The study also employed inferential statistics to establish the relationship between lean supply chain management practices and operational performance in the manufacturing firms in Kenya.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the results from the study. The analysis was done on 104 questionnaires that collected were received after sending them to the field. The response rate was about 76% which is considered to be sufficient for the study. The high response rate can be attributed to face to face questionnaire administration and the follow-up using phone calls and emails. Some of the respondents were not able to return their questions despite the follow-ups. The study was to examine the impact of lean management practices on operational performance and therefore correlation and regression analysis was done on the scale typed questionnaire using Statistical Package for Social Scientists (SPSS). A total of 95 questionnaires were used in the analysis.

Pearson correlation analysis was used to compare the relationship between individual variables that were being investigated. Regression analysis was also conducted to test the effect independent variables on dependent variables.

4.2 Respondents Number of years served in the organization

The respondents were asked how long they have stayed in the organization in order to assess how well they knew organization and to test the validity of the questions. The years were categorized as 0 to 2 years, 2 to 5 years, 5 to 6 years and above 10 years in the organization. From the response, it was noted that in organizations sampled 36.8% of the

employees had been in the organization between 2 to 5 years followed by those who had been for more than ten years. The table below shows the findings;

Table 4.2: Years in the organization

Years in the firm	Frequency	Percent
0-2 yrs	15	15.7
2-5 yrs	35	36.8
5-6 yrs	17	17.8
Over 10 yrs	28	29.5
Total	**95**	**100.0**

Source: Research data (2016)

4.3 Respondents level of education

The respondents were also asked to indicate the highest level of education they have attained. This was also crucial to ascertain the validity of the data collected. The education level was categorized in terms of diploma, undergraduate degree and master level. A greater percentage of the respondent had undergraduate degree constituting 54%, followed by masters that were 27% and then a few diploma holders. The table below shows the distribution of the education levels of the respondents:

Table 4.3: Level of education

	Frequency	Percent
Diploma	17	18.2
Undergraduate	52	54.5
Masters	21	27.3
Total	**95**	**100.0**

Source: Research data (2016)

4.4 Organization's annual turnover

The study also sought to determine the annual turnover of the company which the respondent worked for. They were categorized as below one million USD, between one million to 3 million USD and a turnover of over 3 million USD and from the findings that are indicated in the table below shows that majority of the companies have an annual turnover of more than USD 3,000,000 at 54% and a good number also have annual gross turnover of more than USD 1,000,000 and a few with less than USD 1,000, 000.The table below represents the distribution of the sampled organization's turnover.

Table 4.4: Annual gross turnover

Turnover in USD	Frequency	Percent
<1,000,000	9	9.1
1000,000 - 3,000,000	60	36.4
> 3,000,000	26	54.5
Total	**95**	**100.0**

Source: Research data (2016)

4.5 Respondents Knowledge of lean supply chain management practices

The questionnaires also tested the respondent's knowledge of lean supply chain management practices. The respondents were asked to say yes or no on whether they had knowledge on lean supply chain management practices and it was established that over 80 % of the respondents and their colleagues had good knowledge of the topic of study and therefore were suitable to answer the questionnaire. The table below represents the respondents' level of lean understanding.

Table 4.5: Respondents Lean Supply chain management knowledge

Lean Knowledge	Frequency	Percent
No	17	18.2
Yes	78	81.8
Total	**95**	**100.0**

Source: Research data (2016)

Below is the other company employee's knowledge of lean supply chain management practices

Table 4.6: General company Lean Supply chain management knowledge

Lean Knowledge	Frequency	Percent
No	9	9.1
Yes	86	90.9
Total	**95**	**100.0**

Source: Research data (2016)

4.6 Lean Supply Chain Management Practices

The respondents were asked the extent to which lean supply chain management practices are implemented on a 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3= Moderate extent, 2= to a little extent and 1 = to a very little extent. Mean for the various indicators of each of the practices were run on SPSS and the results below indicate summary of the findings for each of the practice.

4.6.1 Implementation of demand management practices

The table presents the extent to which individual demand management practices are implemented using 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3= Moderate extent, 2= to a little extent and 1 = to a very little extent. The mean scores show the extent to which the respondents agreed with the factors while the standard deviation show the variance in responses. The table below shows the level of implementation.

Table 4.7 Demand Management

Demand management Practices	N	Min	Max	Mean	Std. Deviation
Products pulled	95	3	5	4.27	.647
point of sales data	95	3	4	3.82	.405
End user quality specification	95	2	5	4.00	.894
demand forecasting	95	3	5	3.73	.647
Investment on Collaborative demand planning	95	3	5	4.00	.775
communication of demand forecast	95	3	5	4.09	.701
customer order management	95	3	5	4.36	.674
sales and operational planning	95	3	5	3.82	.603
Demand Average	**95**	**3.50**	**4.25**	**4.0114**	**.21253**

Source: Research data (2016)

From the analysis, the product pulled had a mean of 4.27 and a standard deviation of .647, point of sales data calculated a mean of 3.82 and a standard deviation of .405 which established that there were little variations from the mean. Also noted from the respondents was that a significant majority of the respondents indicated that investment

on collaborative planning had a significant influence on demand management due to the mean calculated of 4.00 and standard deviation of .775 which indicated little variations from the mean. The study established that proper demand management entails a demand pull of materials that ensures that only materials needed are used in manufacturing enabling efficiency and effectiveness in operations performance in the firms and by ensuring that customers are consistently satisfied by proper order management as suggested by Womack, Jones and Roos (2007).

4.6.2 Implementation of standardization practices

Data was also collected for the extent to which standardization practices are implemented. The study established that continuous product flow had a mean of 3.45. The standard deviation calculated of 0.688 indicated little variations from the mean value. Also noted was the implementation of quality assurance that had the highest mean of 4.18 with the variation from the mean being calculated at 0.603. The values were however noted to rise to 5 and have lows of up to 2. Value stream mapping was noted to have a mean of 4.09 with a standard deviation of .831 indicating little variation from the mean. On average standardization was estimated at 3.7424 with the standard deviation of 0.18803 indicating little variation from the mean. Standardization is important for continuous product flow as suggested by Mandrot and Visatek (2008) and to achieve this there must be both equipment and material standardization and this will ensure there is a value stream perspective that looks across the chain to identify the interconnected chain activities from suppliers through the organization and customers to ensure customers and ensure optimization at every step The table below shows the extent of implementation.

Table 4.8: Standardization

Standardization practices	N	Min	Max	Mean	Std. Deviation
Continuous product flow	95	2	4	3.45	.688
Material standardized	95	3	5	3.91	.539
Process standardized	95	2	5	4.00	.775
Value stream mapping done to eliminate waste	95	2	5	4.09	.831
Quality assurance done	95	3	5	4.18	.603
Assembly line standardized	95	1	5	3.82	1.250
continuous improvement	95	3	5	3.91	.539
Standardization Average	**95**	**3.50**	**4.00**	**3.7424**	**.18803**

Source: Research data (2016)

4.6.3 Implementation of cultural practices

The respondents were also asked on the extent to which the cultural practices are implemented in their organization and ranked the level of implementation on a 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3=Moderate extent, 2= to a little extent and 1 = to a very little extent. The table shows the extent of implementation. On cultural practices the aspect that is mostly implemented is broadening work experience to ensure employee satisfaction however a very good number of the respondents did not believe that all the management fully understands the lean supply chain management concept and can implement it to yield good operational performance. It had the least mean average of 3.45. This is consistent with Liker (2004) who contends

that cultural change from committed leaders forms the base for lean and that active improvement guiding, inspiring and motivating people of manufacturing unit's core value streams, builds a transformational force that will drive change and performance.

Table 4.9: Cultural practices

	N	Min	Max	Mean	Std. Deviation
Management lean understanding	95	2	4	3.45	.688
LSC adoption by management	95	3	5	3.91	.539
Employee need satisfaction	95	2	5	4.00	.775
employee incentive	95	2	5	4.09	.831
Employee morale boosting	95	3	5	4.18	.603
employee training	95	1	5	3.82	1.250
continuous improvement	95	3	5	3.91	.539
Cultural Average	**95**	**3.50**	**4.00**	**3.7424**	**.18803**

Source: Research data (2016)

4.6.4 Cost reduction practice implementation

The respondents were also asked on the extent of implementation of cost reduction practices. They were asked to rank it on a 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent.

Cost reduction and waste management is another very vital lean supply chain management practice that was also tested in the questionnaires. On it, firms consistently seeking to minimize waste while sustaining on the customers wad more weight with a mean average of 4.27 while sharing of the benefits of the lean supply activities such as waste reduction was viewed to be the least practiced aspect with a mean average of 3.18. The last practice used in the research is cross enterprise collaboration. On this implementation of customer alliances operating under principles of shared rewards and risks is the least in the sampled organizations. Developing written contracts between participating firms was viewed as the most implemented aspect of the practice with a mean average of 4.36.The mean average for cross enterprise collaboration is 3.50. The study findings were noted to be in line with Aquilano et al., (2005) who noted that cost is another vital measure of operational performance. They include distribution costs, manufacturing costs and transportation cost. The goal of lean is to use practices such as just in time to drive all inventory queues to zero, thus minimizing inventory investment and shortening lead time

The table below represents results on the level of implementation of waste management practices in the manufacturing firms.

Table 4.10: Cost reduction & waste elimination

	N	Min	Max	Mean	Std. Deviation
waste elimination	95	4	5	4.27	.467
JIT	95	2	4	3.36	.674
cost monitoring	95	3	5	4.09	.539
benefit sharing	95	2	4	3.18	.751
Value stream mapping	95	3	4	3.82	.405
Outsourcing	95	3	5	4.18	.751
Cost Reduction	**95**	**3.50**	**4.00**	**3.8182**	**.13853**

Source: Research data (2016)

4.6.5 Cross enterprise collaboration practices

The last lean construct tested in the study was the level of implementation and impact of cross enterprise collaboration on operational performance in the manufacturing firms in Kenya. Its level of implementation was also tested on 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent. It was noted from the data collected that use of written contracts is broadly implemented in most of the firms practicing lean with a mean average of 4.36. Classification of customers in terms of their profitability is least regarded as important and has an average of 2.91. This is in sync with studies by Kushwaha (2010) who noted that collaboration can be achieved through proper application of technology, true

partnerships and to help the supply chain determine how well to meet demands of the markets and improve on performance.

Table 4.11: Cross enterprise collaboration

	N	Min	Max	Mean	Std. Deviation
Teams	95	2	5	3.55	.820
customer value	95	3	5	4.00	.775
information system linkage	95	1	5	3.45	1.128
Customer alliances rewards and risk	95	2	4	3.00	.775
customer relationship profitability	95	2	4	2.91	.701
common policy	95	3	4	3.55	.522
Written contract	95	4	5	4.36	.505
Cross enterprise collaboration average	**95**	**3.00**	**4.00**	**3.5455**	**.31827**

Source: Research data (2016)

4.7 Correlation between lean supply chain management practices and operational performance

Inferential statistics for the lean supply chain management practices constructs and operational performance was also done. Correlation measures the strength of relationship between two variables. The correlation coefficient which is denoted by letter 'r' ranges between -1 to 1 and it is said that if Y increases and X decreases then there is a negative correlation and vice versa. The closer the values to 1 the stronger the correlation. It also shows the direction of the relationship is positive. In this study correlation analysis was done to relate all the independent variable to operations performance.

Correlation analysis was done to test the relationship between individual lean supply chain management practices and operational performance. The table below shows the correlation matrix for the various variables.

Table 4.7: Correlation matrix for lean supply chain management practices and operational performance.

		Demand Average	cultural Average	Standardization Average	Cost Reduction	Cross enterprise collaboration average	Operation Performance
Demand Average	Pearson Correlation	1	.338	.523	.572	.433	.825**
	Sig. (2-tailed)		.309	.098	.066	.184	.002
	N	95	95	95	95	95	95
cultural Average	Pearson Correlation	.338	1	.757**	.651*	.308	.713*
	Sig. (2-tailed)	.309		.007	.030	.357	.014
	N	95	95	95	95	95	95
Standardization Average	Pearson Correlation	.523	.757**	1	.779**	.520	.731*
	Sig. (2-tailed)	.098	.007		.005	.101	.011
	N	95	95	95	95	95	95
Cost Reduction	Pearson Correlation	.572	.651*	.779**	1	.330	.677*
	Sig. (2-tailed)	.066	.030	.005		.322	.022
	N	95	95	95	95	95	95
Cross entreorise collaboration average	Pearson Correlation	.433	.308	.520	.330	1	.596
	Sig. (2-tailed)	.184	.357	.101	.322		.053
	N	95	95	95	95	95	95
Operation Performance	Pearson Correlation	.825**	.713*	.731*	.677*	.596	1
	Sig. (2-tailed)	.002	.014	.011	.022	.053	
	N	95	95	95	95	95	95

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

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

The Pearson correlation coefficient between demand management practices and operational performance is 0.825 and is the highest which indicates a strong positive correlation and significant. This is in agreement with study conducted by Farah (2015) on lean management practices in the water sector in Kenya. Correlation analysis was also done between cultural practice and operational performance and the relationship is moderately strong and significant. Correlation done between cost reduction practices and operational performance also shows a moderately strong correlation that is 0.677 and is significant. The other correlation analysis that was done was between standardization practices and operational performance and yielded a slightly stronger correlation with operational performance than waste reduction and significant. Cross enterprise collaboration yielded the weakest correlation with operational performance though significant as compared to the rest. Its correlation coefficient was 0.596.

4.8 Regression analysis between lean supply chain management practices and operational performance

Regression analysis is conducted to determine how well the independent variable explains the dependent variable. The regression was conducted to test the relationship between the lean supply chain management practices and operational performance.

The table below presents SPSS output for the regression of lean supply chain management practices with operational performance variables.

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.947[a]	.896	.827	.04705

a. Predictors: (Constant), Cost Reduction, Demand Average, cultural Average, Standardization Average, cross enterprise collaboration

Source: Research data (2016)

The R^2 which tells the goodness of fit is 0.89.This is interpreted to mean that the independent variables in the model can explain up to 89.6% of changes in the dependent variable while the remaining 10.4% are due to chance. The standard error is an indication of the deviation from the best line of fit and in this case very low showing a good fit.

Table 4.9: Regression analysis between lean supply chain management practices and operational performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.108	.721		.192	.854
	Demand Average	.778	.201	.603	3.872	.012
	cultural Average	.380	.143	.503	2.656	.045
	Standardization Average	.457	.209	.068	2.710	.042
	Cost Reduction	.420	.281	.015	2.908	.036
	Cross entreorise collaboration average	.163	.110	.220	3.481	.034

Source: Research data (2016)

Table 4.9 shows that the regression coefficients of independent variables. The following regression model was established:

From the findings, the study found that holding Demand average, Cultural average, standardization average, cost reduction and cross enterprise collaborative average at zero operational performance becomes .108. Additionally, when Cultural average, standardization average, cost reduction and cross enterprise collaborative average are constant, a unit increase in Demand average would lead to a .778 increase in operational performance.

When Demand average, standardization average, cost reduction and cross enterprise collaborative average are constant, a unit increase in Cultural average would lead to a 0.380 increase in operational performance. Holding Demand average, Cultural average, cost reduction and cross enterprise collaborative average constant, a unit increase in standardization average would lead to a .457 increase in operational performance. Also noted is that when the Demand average, Cultural average, standardization average and cross enterprise collaborative average are constant, a unit increase in cost reduction would lead to a 0.420 increase in operational performance and lastly it was noted that when Demand average, Cultural average, standardization average and cost reduction are held constant, a unit increase in cross enterprise collaborative average would lead to a .163 unit increase in the operational performance of the manufacturing firms.

Table 4.10: Analysis of Variance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.145	5	.029	14.5	.004[a]
	Residual	.178	89	.002		
	Total	.323	94			

a. Predictors: (Constant), Cost Reduction, Demand Average, cultural Average, Standardization Average, cross enterprise collaboration

b. Dependent Variable: Operation Performance

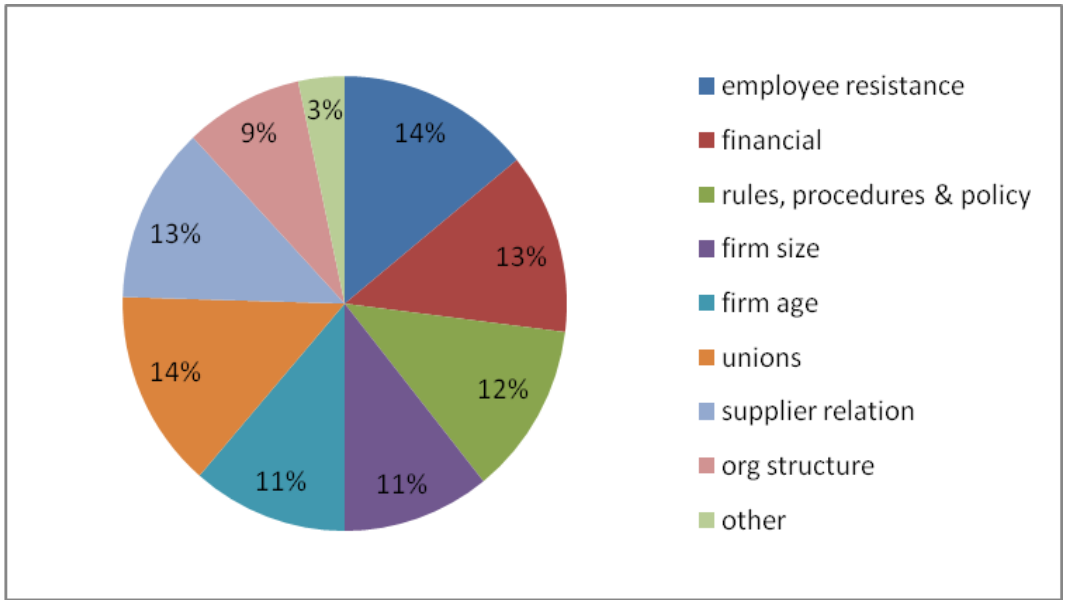
Source: Research data (2016)

Analysis of Variance (ANOVA) was used to test the significance of relation existing between variables; thus, model's significance. The ANOVA results presented in Table 4.8.3 shows that the regression model has a margin of error of p = .004. This indicates that the model has a probability of less than 0.1 of giving false prediction; this point to the significance of the model and therefore can reliable predict the dependent variables.

4.9 Challenges on lean supply chain management practices implementation

Data collected on the challenges of lean supply chain management practices implementation was analyzed and the chart presented below was generated.

Figure 4.1: Challenges on lean supply chain management practices implementation chart



Source: Research data (2016)

From the figure it can be noted that union resistance and financial challenges present the greatest difficulty in the implementation lean supply chain management practices.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter gives a summary of the major findings, discussions, conclusions and recommendations from the research. It also addresses the implications of the findings to other academic scholars, firm managers, consultants and government heads on the field of supply chain management. It also highlights the study limitations and potential areas of future research.

The main objective of this research was to establish the extent, effects and the challenges of implementation of lean supply chain management practices on operational performance on the manufacturing firms in Kenya.

5.2 Summary of the Findings

This study investigated lean supply chain management practices implementation and their effects on operational performance of manufacturing firms in Kenya. Closely related research had not fully addressed the lean implementation in the country and there were other research findings which were conflicting on lean management practices effects on operational performance and this study sought to close the gaps. In order to address the gaps, three objectives were developed which are addressed in this document. Based on the data collected, the summary of the major findings are as follows;

It was confirmed empirically from the study that lean supply chain management practices have a strong positive correlation (r = 0.89) with operational performance at a

significance level less than 0.01.Lean supply chain management practices can only explain 89% of the changes in operational performance which is fairly good. The remaining 11 % could be due to other factors and not lean supply chain.

5.3 Conclusion

The study established that the main lean supply chain management practices implemented in the manufacturing firms in Kenya include demand management, waste management, cross enterprise collaboration, cultural practices and standardization. Demand management is the most widely implemented practice across the country manufacturing firms as indicated from the average. It is followed by waste elimination. Demand management has very high positive Pearson correlation coefficient. Cross enterprise collaboration is the least implemented and also have very minimal impact on operational performance indicated from the low correlation coefficient. It can also be deduced from the study that employees especially at management level are well conversant with lean management practices.

Also based on the data collected during the study, it was concluded that there is a strong positive relationship between lean supply chain management practices and operational performance of the manufacturing firms in Kenya and have yielded great benefits for the firms that have properly implemented them.

Lastly, it was also deduced from the study that though the practices have been implemented, there has been challenges in implementation with main ones being union and employees resistance.

5.4 Recommendation

From the findings of this study, it is recommended that lean supply chain management practices should be adopted by manufacturing firms who have not appreciated it and for those that have partially implemented it, and then management should engage more resources to ensure that key practices such as demand management and waste management are fully implemented to ensure great operational performance.

Management for companies that have had a lot of resistance on lean management practices from employees and the union should seeks for creative and good ways of gaining employees acceptance of the lean initiatives so that the firms can realize full benefits of lean supply chain management practice implementation.

The government in its pursuit for vision 2030 should engage more training institution, academicians and consultants through the ministry of Industrialization to have lean way of working in Kenyan firms to build on its effort to realizing the vision of having the country fully industrialized by driving its firm's operational performance.

5.5 Limitations of the study

This study sought to assess the impact of lean supply chain management practices and their impacts on operational performance in Kenyan firms. Mack et al (2005) have argued that in stratified sampling entails categorizing the subjects in a pre-identified criteria based on the research problem however during the actual research response from a particular identified strata may fail completely. This is the same challenge experienced on the questionnaires distributed.

Secondly, due to the vast region to be covered by the study and resource limitation some questionnaires had to be sent by email and follow up on them was a challenge. Thirdly, there was no similar research locally conducted in African countries on lean supply chain management practices for on operational performance in an entire country. The only available studies were restricted to a particular industry or to a particular factory except for Western countries .This made it difficult to do comparison at the regional level on the study findings.

5.6 Suggestions for Further Research

Lean supply chain is a broad topic that may not be exhausted in one single study though the purpose of this study was accomplished. There are other very rich and exciting areas on the same topic that still need a deep dive. One such area is extending the research to cover not the impact of the lean supply chain management practices to organizational performance in the country.

Another area is increasing the number of variables being tested in the study. The research looked at 8 dependent variables as the indicator of operational performance, but this might not be an exhaustive list for the operational performance. The same also applies to the independent variables. Also the time line under consideration for performance improvements, this study considered a three year period since the implementation of the lean supply chain management practices. A different study that looks at a longer period for example five years may be necessary to get even better information to add to the research on lean supply management practices and operational performance practices in Kenya.

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APPENDIX I: QUESTIONNAIRE

University of Nairobi

School of Business

Department of Management Science

Research Questionnaire

Dear respondents, this questionnaire is for data gathering on the lean supply chain management practices and operational performance in the manufacturing firms in Kenya. The research is purely for academic purpose and will only be used for that purpose. So, your genuine, frank and timely response is important for the success of this study. Therefore, I kindly request you to respond to each items of the question very carefully

General Instructions

- You can write your name or choose not to.
- The questionnaire has three sections , please try and complete all the sections
- Please tick where appropriate and write your answer where there is no option as applicable.

Section I (General Information)

1. What is the name of your organization?

……

2. What is your position in the organization?

……

3. For how long have you worked in your organization?

Under 2 years ☐ 2–5 years ☐ 6–10 years ☐ over 10 years ☐

4. What is your level of education?

Primary ☐

Secondary ☐

College ☐

Undergraduate ☐

Master ☐

Doctorate ☐

5. Which industry is your organization? Please tick one from the list

energy, electrical and electronics ☐

plastic and rubber ☐

textile and apparels ☐

food, beverage and tobacco ☐

pharmaceutical and medical equipment ☐

metal and allied ☐

paper and paperboard ☐

motor vehicle assembly and accessories ☐

building construction and mining ☐

Chemical and allied ☐

Other (Specify)……

6. What is the estimated annual gross turnover for your organization in USD.

< $ 1,000,000 ☐

$1,000,001- 3,000,000 ☐

> $3,000,000 ☐

7. Do you have knowledge about lean supply chain management? Yes ☐ No ☐

8. Do your colleagues know about lean supply chain management? Yes ☐ No ☐

SECTION 2 Lean Supply Chain Management Practices Implementation

8. To what extent has your firm implemented the following lean supply chain management practices (please tick appropriately using a1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3= Moderate extent, 2= to a little extent and 1 = to a very little extent.)

Lean Supply Chain Management Practices	1	2	3	4	5
Demand Management					
Products are pulled only by the customer in our firm					
Data from point of sale is delivered upstream in the supply chain					
End user quality specification are key in our production					
Periodic demand forecasting is done by our firm.					
There is investment by the firm on collaborative demand planning					
Demand forecast results is communicated to all the players in the chain					
The firm manages product supply and customer orders to ensure there is a match.					
The firm conducts sales and operational planning					
Standardization					

Our firm continuously strives to maintain continuous product flow					
Materials are standardized across the supply chain to reduce complexity					
Process are standardized across the supply chain to reduce complexity					
Value stream mapping is done to eliminate the waste associated with processes and to improve value delivery					
Quality assurance is used all the time					
Assembly line standardized so that no unique components needed					
Cultural practices					
Management understands the concept of lean supply chain practices					
Management have adopted the lean supply chain management practices					
Work experience broadened to enhance employee need satisfaction					
The firm has incentives for boosting employees morale					
All employees fully trained on new ways on lean practices					
The company embraces the culture of continuous improvement					
Cost reduction and Waste elimination					
Firm consistently seeks to eliminate waste while sustaining value for the customer					

Raw materials are supplied just in time (JIT) when needed in our firm					
Expenditures keenly monitored to ensure no unnecessary costs incurred					
Benefits of lean supply chain waste reduction are shared equitably across all the participating supply chain partners in our firm.					
Value stream mapping to identify sources of waste in the chain done regularly					
Outsourcing of non-core activities done					
Cross enterprise collaboration					
Use of teams with a broad perspective of the supply chain is implemented.					
Added value is looked at from the customers perspective					
Adequate information system linkage exists with customers					
Customer alliances operate under principles of shared rewards and risks					
Customer relationships are evaluated on the basis of their profitability					
Common set of policies are shared by members of the lean supply chain					
There is a written contract between the parties in the supply chain					

Source: Researcher (2016)

SECTION 3: Impact of lean supply chain management practices on operational performance

9. How would you rate changes in the following operational performance in the last 3 years if you have been implementing lean supply chain management practices? (Please tick appropriately using 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3= Moderate extent, 2= to a little extent and 1 = to a very little extent.)

Operational performance	5	4	3	2	1
Procurement costs have gone down					
Inventory levels have reduced adequately.					
Manufacturing costs have gone down.					
Order fulfillment cycle time has improved					
Inventory turnover has improved					
On-time-delivery has greatly improved.					
The number stock-out has reduced					
The product rejection rate has gone down					
Transportation costs has gone down					
Our customers are more satisfied than before.					

SECTION 4: Challenges of lean supply chain implementation

10. What would you consider to be greatest impediment to implementation of lean supply chain management practices?(Please tick appropriately using a scale of 1 to 5 Likert scale with 5= to a very great extent, 4= great extent, 3= Moderate extent, 2= to a little extent and 1 = to a very little extent.)

Challenges of lean supply chain management Practices	5	4	3	2	1
Resistance to change by employees					
Financial resources					
Organizations Rules, procedures and policies					
Size of the firm					
Age of the firm					
Unions					
Lack of robust and professional relationships with suppliers					
Organization structure					
Other challenges (specify)					

11. Any other information that would be useful to this study

……

……

……