LEAN SUPPLY CHAIN MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE IN PHARMACEUTICAL MANUFACTURING FIRMS IN KENYA

BY

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DECLARATION

This is to state that this research work is my own and that has not been given out for an award of a degree in any other university or institution of learning.

Signature…….. Date……

PATRICK WANYAMA MUSSUMBA
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This study has been presented for examination with my approval as university of Nairobi supervisor.

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Last and not least I owe my deepest gratitude to all family for their financial support, patience and for offering encouragement every step of the way.

DEDICATION

This study is dedicated to my wife and children who have been by my side throughout my study and whose inspirations keep me going.

ABSTRACT

Key objectives of the study were to analyze the adoption of Lean supply chain management practices and how this would impact on organization performance of pharmaceutical manufacturing firms in Kenya. The target population was 42 pharmaceutical manufacturing firms in Kenya as per the Kenya pharmaceutical association directory (KPA, 2012). Due to the fact that the population was small, a cross-sectional and censuses survey was used. Purposive sampling was used to select 168 respondents from production, engineering, operations and procurement sections of the firm. In the study, primary data was collected using a structured questionnaire that was administered by the researcher and his research assistants. The research used descriptive statistical analysis in presentation of standard deviations, mean and percentages and inferential statistical analysis in form of regression and correlation analysis. Quantitative data was analyzed by descriptive statistics using SPSS software. The motivation of the study was due to the role pharmaceutical companies in Kenya plays in supporting attainment of World Health Organization (WHO) goal of health for all across the world and also Kenya Vision 2030. In its findings ,the study revealed and concluded that the relationship was significant , positive and relatively high between LSCM practices and organization performance of pharmaceutical manufacturing firms as R square = 0.594 signifying a variation of 59.4 % in organization performance of pharmaceutical firms as result of intervention of LSCM practices. In general, Just In Time, waste elimination, Value stream mapping, Kaizen, lean logistics had the greatest impact on performance. However, it was also observed in the study that too much intervention beyond a certain level by 3 practices namely, lean inventory, lean procurement and lean production would start generating negative effect and impact on organization performance .Following the findings above, the study recommends that positive LSCM practices be reinforced while optimal level of adoption of the 3 LSCM practices need to be established so that this does not start generating negative performance results. The study only focused on adoption of lean management practices by 42 manufacturing pharmaceutical firms in Kenya though there exists other players in the pharmaceutical industry, The study thus recommends benchmarking of pharmaceutical firms that practice LSCM practices over a period of time and carrying comparative analysis for purposes of further improvement and also inclusion of other players in the pharmaceutical industry.

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LIST OF ABBREVIATIONS

BPR	-	Business Process Reengineering
DRP	-	Demand Requirement planning
FMEA	-	Failure Mode Effect Analysis
FTT	-	First Time Through
HMO	-	Health Management Organizations
JIT	-	Just –In –Time
KEMSA	-	Kenya Medical Supplies Agency
KPI	-	Key Performance Indicators
LSC	-	Lean Supply Chain
MRP	-	Material Requirement Planning
NVA	-	Non-Value Added
OEE	-	Overall Equipment Effectiveness
RBV	-	Resource Based View.
SCM	-	Supply Chain Management
SPSS	-	Statistical Package for Social Sciences
TOC	-	Theory of Constraints
TPS	-	Toyota Production System
TQM	-	Total Quality management
VA	-	Value Added
VSA	-	Value Stream Analysis
WHO	-	World Health Organization.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Attaining Vision 2030 is a dream that Kenya aspires to actualise at all costs and it's the cornerstone to which the Kenya Government has rallied all the sectors of the economy both in public and private sector to push this agenda through. The healthcare sector and more so the pharmaceutical sector stands to plays a big role towards this goal. This cannot be achieved without benchmarking with the best in the world in terms strategies that will fast track this ambition. Embracing Lean supply chain management has proved to be one the best strategies among serious governments and companies across the world with demonstrated tangible and good results.

Borac, Milovanovic and Andjelkovic (2010) in his study suggest that operations in Supply chains by their very nature generate a lot of waste and also tend to have a lot non-value adding processes when tracked in the organization and external across supply value chain .The solution for this firms in managing the non-value add and waste is of course is to implement lean supply chain management. A study done by (Drohomeretski, Costa, Lima, and Wachholtz, (2012) and Cox (1999) indicate that lean supply chain management was ideologies were practiced in the post-war by the automobile and textile industry in Japan. However, within a span of time the concept spread to other industries (Womack & Jones, 1990). Locally, Musyoka (2015) also summarized the same that the best practices in LSCM comprise of waste elimination, Just in Time (JIT), Kanban, flow and pull system, lean inventory, lean procurement, management of customer demand, lean production and process standardization that enables cross enterprise collaboration, cultural change and continuous process flow.

This research work will be anchored by four main theories namely; Theory of Constraints (TOC), Resource-Based View (RBV) theory, systems theory and finally

transactional cost theory. However, the main theory is the TOC which is a technique used in identification of limiting factors also known as constraints that prevent attainment of a goal or a given target and then progressively improving that bottleneck or constraint until it is not the limiting factor again. In Supply chain management the constraint or bottleneck is also considered as the weakest link in the chain (Goldratt, 1984).

Pharmaceutical manufacturing firms are met with challenges of performance in delivery of expected profits and return on investment by shareholders. This has forced managers to strive to implement strategies that will enhance this performance by putting efforts on delivery of efficiency, productivity, increase sales volumes, lower cycle times and lead-times and lower overall costs in all their upstream and downstream processes in supply chain network. Similarly, global and local competition that has drove them to look for appropriate lean management practices and strategies to promote their efficiency and competitiveness. Over the past decade, there has been an increasing emphasis on top class practices and strategies that would result in survival of the ever increasing competition in the market (Collin, 2003). In other words, finding competitive edge is a key aspect for business growth and survival. Many of these firms tend to manage by merging with others, reviewing their prices upon patent expiry, relying on research and development to churn out new molecules and improving quality of product. The overall goal for them all is however is profit maximization and retention of their valuable target who in this case is customer. For long-term success, these firms have ensured that the strategies being adopted should get the involvement and management of distributors, wholesalers, retailers, suppliers and third party service providers (Jaskanwal, Deep & Rajdeep, 2013).

Today, many pharmaceutical enterprises spend most of their budget on purchased goods and services. This therefore means that pharmaceutical organizations must critically check supply chain and what their patients, customers or end-product users are really asking for (Wisner et al., 2006). Lean, six sigma and Kaizen has led to operational and strategic gains for pharmaceutical manufacturing firms (Wafa & Small, 2011). Lean concept is a journey and not a destination and hence a mindset of change must embraced by all, it is a culture that needs to be implanted in the minds of all in the organization and be understood and accepted across all levels of and commitment resources .

1.1.1 Lean Supply Chain Management Practices.

Taiichi Ohno (1988) compares this concept of lean manufacturing to Toyota Production System (TPS). This comprises its management philosophy and practices to rapidly respond and be flexible to its customer's desires. There are key factors essential to achieving supply chain best practices. Many top class organizations have since realized the secret behind the success of lean implementing organizations and have started embracing it in droves as a way of gaining competitive advantage (Fitzgerald, 2002). Key ones include; lean warehousing, lean inventory, lean transportation, Just in Time (JIT), Kanban, outsourcing, strategic lean sourcing, kaizen, producing only what is needed, Value stream mapping, 5S, pokayoke-error proofing, Jidoka-Automation, process control, establishing supplier relationships among many others (Murray, 2016). Agarwal and Shankar (2002), and Musyoka (2015) in their studies seek to highlight what would inform a good lean Supply Chain Management (SCM) to involve all the processes to ensure the customer gets the right product, within the required time, at place required; product of good quality and at gets value at less cost.

Manrodt and Vitasek (2008), in his study explains lean does integrate all the key players in supply operations integrate and create interlinkages from starting point which is suppliers, manufacturers, warehouses, transporters, retailers, and customers and well as good feedback and information flow among them. By examining these linkages waste and activities that don't add value can be identified and done away with. Similarly, by looking and evaluating at the upstream and downstream through continuous improvement initiatives efficiencies and perfections can be achieved. Jaskanwal et al, 2013) further states that the beginning lies with the manufacturer starts working collaboratively with its suppliers, then its customers to meet their requirement, work with its internal process owners and players to manage waste, lower cost, better customer service and manage quality and finally its downstream distribution partners to create a full package of supply chain relationships.

1.1.2 Organization Performance

According to Shabbir (2012), firm's performance is the firms' ability to accomplish its goals efficiently with limited resources. Organizational performance is a measure of how effective and efficient an organization achieves its financial and market oriented goals and objectives Yamin, Gunasekruan and Mavondo (1999). These objectives include increased agility, reduced inventory, increasing productivity, improving market share and organizational profitability (Tan, Kannan & Handfield, 1998). Lean supply chain management ultimately impacts on organization financial performance as well as Return on Investment (ROI)), increase of sales, crude profits, business performance, and organizational effectiveness; and non-financial standards which include market share, innovational performance, corporate responsibility rating, quality improvement, and resource planning, Venkatraman and Ramanujam, (1986).

Scholars usually use the terminology performance to mean wide category of measurements of input and output efficiency and transactional efficiency. According to Larcker (1998), performance is a continuous process. Organizational Performance may also be expressed as an organization capability to attain its goals and objectives by better corporate governance, better management and persistent and continuous rededication to achieving results.

Serra and Ferreira (2010) conclude in his study that lays emphasis on better understanding of performance differences between firms. He goes ahead to underscore that performance of an organization lies on its attainment of market oriented targets and goals on top of the financial parameters and targets. The same would apply for supply chain operations where in the short run the objective supply would be to lower inventory levels ,improve efficiencies, shorten cycle -time, while in the long run the purpose would be to increase profits, enlarge share in the market and lower costs across supply chain operations. Cigolini et al, (2004) indicates that these costs however should not be passed over to other areas of supply chain both upstream and downstream; financial metrics have served as a tool for comparing organizations and evaluating organization's performance overtime. Organizational performance refers to the effectiveness of the organization in fulfilling its purpose.

1.1.3 Pharmaceutical Industry in Kenya

The pharmaceutical market for Kenyan produce is about in the range of Kenya shillings 8-10 billion per year. Kenya Medical supplies Agency manages all drug supplies to government hospital in the country and hence is the biggest purchaser of medicine produced both locally and through importation. It procures about 45 % of the pharmaceuticals in the Kenyan market by advertising through open tendering program and supplies them to hospitals categorized from level 1 to level 6 and

referral hospitals in the country, all giving a total of about 4600 health facilities in the entire country . Kenya produces the largest volume of pharmaceutical in Eastern and Southern Africa region which by proportion constitutes about 40% of the African market. In the recent past about 10,000 drug molecules have been registered by The Kenya pharmacy and poison board -(Export Processing Zones Authority, 2005).

There has been an influx of many pharmaceutical companies into the market, either as direct investment, indirect investments, licensing (franchising) holding (Ronoh, 2002). In 2007 there were 144 registered pharmaceutical distributors and manufacturers. 42 are involved in manufacturing while the rest are purely distributors, operating as franchisees, for both local and international firms (Kenya Medical Directory, 2006/2007). The pharmaceutical industry in Kenya is mainly through imports though a few firms manufacture locally.

Traditionally, the European Union has been the source of most drugs. But since the downturns of the economy in early 1990s, Asia, China and Latin America have become alternative sources especially India (Ronoh, 2002). These new entrants have posed a serious competitive challenge to the multi-national companies: most have had to use other models of doing business in order to remain competitive in the Kenyan market. Most original branded products have been exposed to generics that are cheaper and within reach of the better part of the Kenyan population. In-fact many multi-national companies have pulled out of Kenya due to the entry of generics.

1.2 Research Problem

World Health Organization (WHO) strategic goal is to achieve universal healthcare and eradication of diseases in the entire world by helping every individual have a better life, stay healthier, do more and live longer. The pharmaceutical industry plays

a bigger role towards attainment of this goal. However, the pharmaceutical industry continues to face numerous challenges such high costs of research and development and well as managing its operations due to meltdown in world economy and stiff completion within themselves rendering this ambition a mirage. In order to survive and deliver to WHO goal, this industry needs to adopt new strategies such Lean and Kaizen philosophy in its supply chain and other operations of the firm to attain expected performance.

Borac et al., (2010), the methodology and philosophy of Lean SCM practices is now widely being incorporated in many organizations as a vessel to sail above current stiff competition and strategic survival for firms and entire supply chain operation network (Winsner, Keah & Choon, 2009). Firms that have embraced LSCM practices have proof checked their supply practices and operations extensively over and over through value Straem Mapping (VSM) of their key production process, procurement system, distribution channel, process efficiency and capacity to recognize where improvements efforts or initiatives can be channeled.

Wong et al. (2009) dwelt on lean production application in the electronic/electric sector in Malaysia purposely to investigate the lean implementation and various issues associated with it. These studies undertook an outlook into 14 key lean areas namely; Defects, production output, transportation, scheduling, work organization, stocks/inventory, capacity, material handling, quality, employees, layout, procurement process, customers, product development, culture, tools and techniques. The study shows that a wide range of organizations in the electrical engineering sector are devoted to implementing lean manufacturing: with a number of them being aggressive lean implementers but the findings have mixed results.

Kisombe and Ondiek, (2012) carried out a study lean manufacturing tools and techniques among industries that produce sugar in Kenya. The study examined the extent to which lean manufacturing tools and techniques were adopted by the manufacturing firms in the sugar industry and the impact it would have specifically on factory time efficiency. The finding links the lean tools and techniques to time efficiency to some extent but have variations among three groups of sugar firms adopting the concept. The study also indicates that the lean tools and techniques are implemented in a piecemeal manner and not holistic and hence partial benefits are realized. The study was limited to outcome on time efficiency and no other performance metrics on financial and non-financial performance of these sugar manufacturing firms. The study suggests more research to be carried out on more lean practices in other areas of the economy.

Onyango (2014) carried out a study among state corporations in the health ministry and which were practicing LSCM and linked that to business performance. The study links lean supply chain management and organization performance with workplace organization having the biggest effect and problem solving having the smallest effect on the six government corporations under study. It is not conclusive however on what effects it would have on different health sectors and especially the private healthcare firms and the pharmaceutical sector which are driven with a profit mindset in order recover costs spent on research and drug discovery. It further recommends further study to be done to involve employees and various organizations that gives support to state corporations in the health and hence important in the network.

Wafukho (2011) locally carried out research work in the manufacturing. He looked at effectiveness of lean sigma strategy on continuous improvement. However, his study is only limited to GlaxoSmithKline pharmaceutical Company and does not explore

what could be happening in the entire pharmaceutical manufacturing firms in Kenya. While many researchers have studied lean in manufacturing industry, agile and lean supply chain management practices, others have discussed in general supply chain management linking it to environment and information technology.

Musyoka (2015) undertook a study on LSCM practices and performance of companies that were manufacturing on large scale in Kenya, while Weru (2015) did the same but narrowed down the context to Nairobi, Kenya. These studies successfully linked organizational performance to lean concept and further indicated that organizations sought lean with the anticipation for reduced cost, increased profitability and long term survival. The recommendations included a proposal for incorporation of lean thinking in the organizations' strategy. In summary these studies have produced or delivered mixed results and also dwelt on manufacturing firms in general and not pharmaceutical firms and hence the argument consideration that the two require different approaches on lean thinking. Weru, (2015 Studies have shown that lean management in supply chain operations has been popular in the manufacturing area with minimum focus on how these practices have helped in improving organizational performance in the pharmaceutical industry. Similarly, the outcome has delivered mixed results. Given the fact that pharmaceutical industry in Kenya has witnessed massive expansion compared to other countries in the region, the main question worth asking is: is lean supply chain operations and management practices applied in Kenyan pharmaceutical firms more than the other countries in the region? There is therefore a need to inquire the link between LSCM p and organizational performance in this sector. This study therefore attempted to answer the following research questions: What are the lean key supply chain management practices that have been adopted by pharmaceutical companies in Kenya? What

impact do lean key Supply chain management practices have on organization performance of these pharmaceutical firms?

1.3 General Objectives

General objective in the study was to examine the influence of LSCM practices on organizational performance among pharmaceutical manufacturing organizations in Kenya.

1.3.1 Specific Objectives

The specific objectives were to:

i. To determine the lean supply chain management practices that have been adopted by pharmaceutical manufacturing companies in Kenya;

ii. To determine the impact of lean the supply chain management practices on organization performance in pharmaceutical manufacturing companies in Kenya.

1.4 Value of the Study

The study examined various lean supply chain management practices used in the pharmaceutical sector. Therefore it will be of great value to the pharmaceuticals players in this industry. More knowledge is going to be shared among academic professional and other scholars especially in the field LSCM. It will benefit managers in this industry and other related industry, the study give important information on lean strategy and lean supply chain management practices essential for superior performance in the organization. The study would also help researchers, scholars and other practitioners to increase their knowledge on LSCM.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The entire chapter gave an overview of literature on the concept under the study. The chapter focuses on Lean (LSCM) practices, organization performance, link between lean practices and organizational performance and the challenges facing implementation of LSCM practices. The section also presents the theory that guides the study. This chapter included a review of the various studies that have been conducted by various researchers and the extent to which lean supply chain is practiced, its impact on organizational performance as well as challenges in its adoption. This chapter also provides the research gaps identified and the relationship between lean supply chain and organizational performance.

2.2 Theories underlying the Study

There are four theories that anchored this study. Theory of constraints, porters theory of competitive advantage, resource based view of the firm and systems theory.

2.2.1 Theory of Constraints (TOC)

Goldratt (1984) conceived the Theory of Constraints (TOC). Over the period, TOC has continued to transform and has undergone metamorphosis and is currently regarded as one of the best techniques that has shaped supply chain operations. It is on this theory than lean and kaizen borrows widely. This Theory of Constraints is a technique of identification of limiting factors which also referred as constraints that will hinder attainment of set targets and deliberately undertaking continuous improvement initiatives until it's not anymore a rate limiting factor. It is also described as bottlenecks in supply chain operations. The nature of constraint could be physical, procedure, paradigms, policy, markets or equipment. Its anchored on a well-researched hypothesis' that supply chain operations is composed of many

interlinked chain of processes one out of this processes may pose as constraint or bottleneck on the whole system or chain. This explains the common analogy in science which states that the chain is a strong as its weakest link. There is a concerted effort therefore of continuous identification of constraints and bottlenecks and fixing by providing solutions. In case the constraint has eliminated, it's possible that a new constraint might arise. Finding and eliminating the new constraint is the new priority and the cycle repeats itself.

2.2.2 The Transaction Cost Theory

Ronald Coase, (1937) an economist describes about the nature of transactional cost of the firm. In summary, this theory explains the make versus the buy decisions for firms. The theory would account for the actual costs of information search, cost of bargaining, policing cost, decision costs, coordination costs, contracting costs among other costs. All this costs are taken on board when making decisions and not just market prices. The general purpose and key aspect of any company or business is to produce and harness within the conditions of a competitive market all factors of production available within the firm at a lower cost than what the real market would provide. Coase concludes by saying that the size of the firm is highly depends on the costs of using the price mechanism, and on the costs of organization of other business inventors (entrepreneurs). By combining the two factors its possible to determine the number of products a firm can produces and by how much of each. This relates closely to what the lean supply chain lays its foundation on.

2.2.3 Resource-Based View of the Firm

Resource-based view theory was developed by Penrose in 1959 with a view to map organizational competitiveness to a particular source (Barney, 1991). The theory of Resource-Based View (RBV) states that a firm's overall performance is affected by

firm specific resources and capabilities (Peteraf, 1993). This point of view implies that, when dealing with RBV, organizational resources are allocated unevenly within the industry (Barney, 1996). He further indicates that an organization's resources are its assets and strengths. Consequently, such resources are controlled by an organization, enabling it to plan and implement strategic actions that promote its organizational effectiveness and efficiency. According to Jambekar (2008), RBV focus on organizational performance and its respective internal characteristics.

2.2.4 Systems Theory

Ackoff (1981) defines a system as a set of more than two interrelated elements that function as a whole by at least each element affecting one other element. Systems theory incorporates design, developing of links and how they work in unity towards a common goal (Laszlo, 1995a). Organizational operations supply chain links and interphases form the system components to this theory. These interphases together form well-knit cross-linked operations designs that work interactively in attaining the ultimate supply operation chain objective (Bertalanffy, 1968). Flynn, (2011) indicates that overall results of a lean operations supply chain is attributed to the system theory's total intervention areas, in which all chain operators together contribute to formulate, institutionalization and implementation of lean tools and techniques. This gives a perfect scientific approach to continuous improvement and consequently performance as each of these linked activities.

2.3 Lean Supply Chain Management Practices

It's a system and process of continuous improvements geared towards satisfaction and adding value to the customer Manrodt and Vitasek (2008).The aspects involves looking for ways to minimize or eliminate seven different types of waste altogether and making value or benefits flow only at the pull of the customer by producing only

what the customer wants and not what is pushed to him. The early advocates to this concept trace its origin in 1920's by Henry Ford by applying process of continuous flow to his motor vehicle assembly. It also encompassed cost reduction by improvement of Quality, improved cycle time, improved lead-times and throughput and overall turnaround time to get the product out faster from the line and to the market. Henry Ford's production has evolved to be identified as the most superior production process before some Japanese managers at Toyota come up with the Toyota Production System (TPS) after visiting Ford in the 1950s. Toyota later made a realization that optimization of entire supply chain from the customers, through to suppliers and distributions, feedback and communication to final customer is critical to the success and performance of the organization.

Lean operation supply chain management is and end to end process that involves linking upstream activities with downstream activities resulting in a smooth flow of product, services, finances, information all working together to lower costs and create efficiency and meet customer (Wee & Wu, 2009). All Lean adopting organizations work in improving their supply chain identifying and eliminating the waste in its processes and generate higher value (LaSalle, Manrodt and Vitasek, 2010).

Just-**In**- Time**:** Just-In- Time (JIT) is a methodology or process by which flow process is created and where the required products, inventories and component parts are distributed to the point of consumption at the time of needed and only in the quantities needed (Plenert, 2010). In this methodology, inventories do not pile in the manufacturing area or the warehouses where they are not needed. Emphasis of JIT is advocating for nil stocks and inventories and is based on flow, pull manufacturing, management of waste, creating effective supplier relationship, Total quality control and engaging support of top management (Pheng & Chuan, 2001). Just in time system

works best where suppliers and the organization as well as the customer are closer together and not limited by challenges of geographic distance, Levy (1997).

Waste Elimination: Lean identifies that there are seven types of waste categorized under following categories, namely level of defects, over production, Transportation, waiting time, inventory levels, motion and processing time. The major objective of lean supply chain management is dealing and managing the seven types of waste across the entire operations value chain (Cudney & Elrod, 2011). It can therefore be summarized that major processes tied around management of LSCM is containing the constant headache of waste minimization. Shah and Ward (2007) suggests that waste can be eliminated by producing only what is required and when required, reducing the number of defects from the production line, holding optimal level of inventory, elimination of time wasting activities, elimination of non value adding activities, optimization of distribution and transport systems and manufacturing/machining process, adoption of new technology, better organization of operations and process workflow.

Creating flow -Pull and push system**:** Disorganized working areas results in mistakes delays and even accidents, while an organized work area helps to ensure production flows smoothly and overall process and system improvement (Julien & Tjahjono, 2009). Work area arrangement and organized housekeeping supports 5S, a powerful tool in implementation of lean since it results in creation of space previously occupied by unnecessary inventory, time is saved looking around for things, less movement and transport and reduced waiting time. A pull system allows storage of only what is required and this is immediately produced and pulled out at the demand of the customer and inventory can only be replenished when the customer pulls through an order. A push system is closely managed and avoided at all costs and

buffer stock is maintained for quick reaction and flexibility because of unforeseen challenges.

Kanban: This is generally called the two card system. Wambua (2015) notes that it is a simplified but most effective control system that supports and make Just In Time (JIT) supply chain operations work. Rules guiding the Kanban process suggest that production or processing can only commence only when a Kanban card is released to authorize the process. Determined number containers of buckets containing prescribed small quantities are filled in advance and stored in Kanban area ready to be issued out as soon as the card is given out by the process controller. As soon as one standard bucket is pulled out for representing a customer order, another card is issued to replenish what has been sold and the cycle repeats itself creating an endless and seamless process (Wisner et al., 2005).

Kaizen: This is the relentless pursuit of continuous improvement involving, services, products, systems, processes by the entire organization through a number of small changes but which cumulatively result in big savings in costs, productivity, increased agility in supply chain operations. (Plenert, 2010) Continuous improvement should follow a well-defined and structured approach and incorporate problem solving tools such as the Deming Wheel, which is sometimes called the Plan-Do-Check-Act cycle). The Deming wheel provides a good model for conducting continuous improvement activities. The data is collected and the performance target set in the plan phase. Counter measures are implemented in the Do phase. Evaluation and measuring results of counter measures are performed in the Check phase. The improvement is standardized and applied to other parts of the organization in the Act phase.

Problem Search and Solving: (Julien & Tjahjono, 2009) supports the idea of benchmarking and building a value stream map to ascertain a current state of affairs for the organization. This process current state mapping involves Continuous search for problems, identification of the root cause and prescribing solutions to the problems. The lean methodology has tools such as the fishbone, 6M, reality tree and 5 whys to identify problems within a system. Relentless identification major sources of issues and getting solutions in lean technique involves gathering large volumes of data on levels of inventory, levels of waste, storage capacity, machine down time, purchasing lead-times, production lead-times, distribution channels and costs, equipment and process efficiencies, working times, cycle time and First, orders in Time and in full, Right firsts time, Right Time Through (FTT). In summary therefore, through the use of kaizen and lean in the supply chain then organizations can be able to identify problems before they happen and prevent them or control and prevent their occurrence**.**

Effective Relationship- Alliances with suppliers: (New & Ramsay, 1997) argues Considering this issue of relationship as way organizations can drive and give a life line to there their supply chain. Major consideration is close and collaborative relationships by all players in the supply operations value stream creation and has emerged as one of the fundamental differentiation factor of lean approach. World class companies work closely with logistics partners, Third Party Logistics (3PL) providers suppliers and others long after their contracts and service level agreements have been signed. In business terms, this is often referred to as supplier relationship management. However this does not involve dictating to supply chain partners on how things should be done but open communication and feedback process involving all the players contributing to create a win situation (New & Ramsay, 1997).

Production /ordering at the beat of the customer**:** Shah & Ward, 2007) This is based on production or ordering of only want the customer requires and when he wants them. No production to stock pile and wait for customer order. The old systems has thus been replaced with lean management that takes the approach where supply and manufacturing is ordered and dictated by the customer in the right quantity, right quality, right place and the right cost and this helps prevent waste, costs and excess inventory. By avoiding the push demand strategy and adopting the demand pull strategy ensures that we produce as per customer demand and at time of requirement.

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Lean Procurement: E-sourcing and collaborative sourcing: Kallrath and Maindi, (2016) suggests use of E-sourcing technique that eliminates the human aspect of procurement by use computer software that manages the procurement function. Baily, (2008) defines as business to business purchase and sale of products through use of internet and involves e-tendering-invoicing-payment, electronic data interchange and

enterprise resource planning. This strategy in sourcing is a major pillar of success in supply operations value stream as eliminates paperwork, bureaucratic processes, time wasting, added costs due to corruption and overall process efficiency.

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Lean transportation /logistics: Increasing Logistics Agility. Learner transportation system (Cooper, 2000) will involve such practices as cross docking, right sizing, multi-shop truck loads, backhauling, automated transportation and pooling of orders. This will also involve creating agility. Agility is all about increasing speed to market and thus to the customer who greatly needs the goods or service. Managing local and international logistics is not a walk in the park. However at the end of the day what is an expected low cost in distribution anticipating risks and optimizing through consolidation or outsourcing to third parties who have made it their core business and will do it efficiently at the lowest cost.

2.4 Lean Supply management Practices and Organizational Performance

Going by Ganesan and Harrison, (1999) a lean supply chain management practices are techniques employed within an interlink and network of processes that link the functions of procurement , transforming of raw materials to finished products of value

and the distribution of these finished products to the final customers at the lowest cost. Laming, (1996), product or service will have commercial viability and benefits to firm if value is added faster than the cost of availing to the market.

Many empirical studies have looked at the relationship between LSCM and organizational performance (Lee, Lee & Schniederjans, 2011; Zacharia, Nix & Lusch, 2009; Chong, Chan, Ooi & Sim, 2010; Wong & Wong, 2011). Organizations that incorporate lean techniques into their key business activities, owned them and made it as its culture can expect to post good results. According to an Ross, (2010) study on LSCM practices, business enterprises using a lean SCM initiative over delivered in key performance indicators and more specifically relating to overall costs and strategy integration. The outcomes of lean supply chain are tabulated as Key Performance Indicators (KPIs) as a dashboard report for constant management review. The outcomes determine the success or failure of the organization. Key outcome elements include: Cost, Gross Margin, and return on investments, alignment to strategy, risk management and business process compliance. Wong and Wong, (2011Many in his study draws a relationship between LSCM and performance of the organization. (Lee, Lee & Schniederjans, 2011; companies that have incorporated lean methodology into their critical business processes and customized them to own them and their supply chain cultures should expect rip many fruits and experience exponential growth. In his study, Ross, (2010) a study on lean supply chain management, all firms embracing Lean operations strategy outperform their counterparts that do not practice them and their core performance indicators on increased sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high service levels, Chong, Chan, Ooi & Sim, 2010;).

Demirbag, Koh, Tatoglu and Zaim (2006). Performance rating can be done also using both monetary and non-monetary terms. Monetary measures and goals involves profit, return on what was investment, increased sales and growth, firms productivity, general efficiency. York and Miree, (2004) The non-monetary side, the measures would be better goodwill, corporate social responsibility, innovation, increased market share, quality improvement, innovativeness and resource management.

2.5 Conceptual Framework

A conceptual framework, according to Orodho (2009) is a diagrammatic representation of interrelation between study variables. In the context of this proposal study, the anticipated interrelationship is depictured in Figure 2.1.

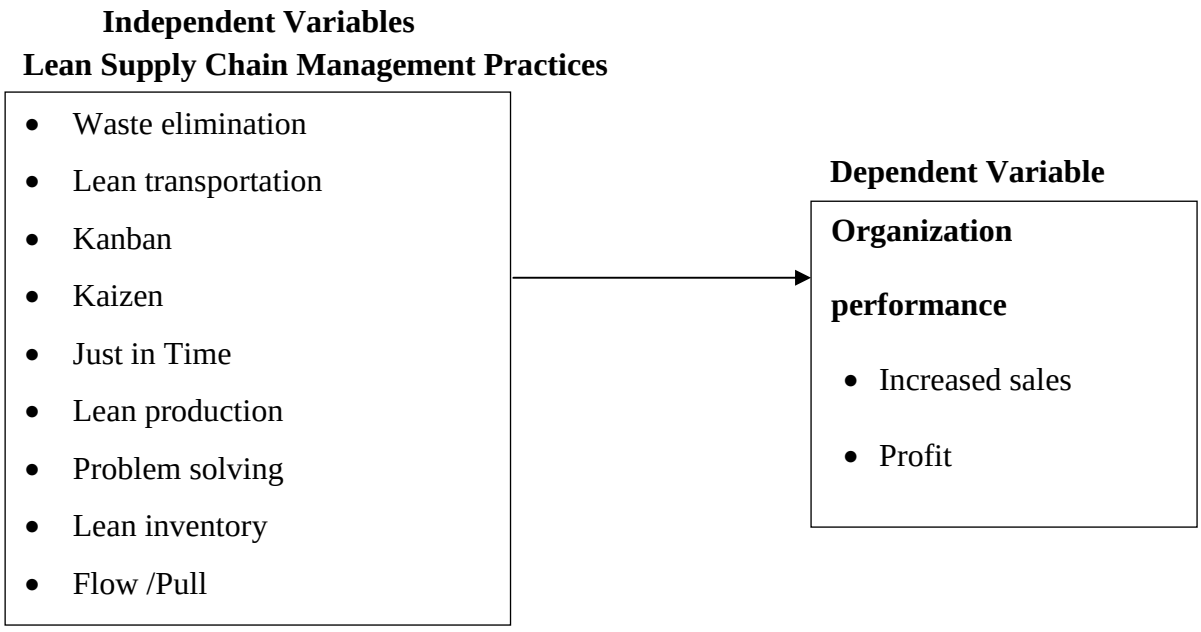

Figure 2.1: Conceptual Framework

Source: Author (2017).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The chapter summarizes and gives the methodology used to carrying out the study. Therefore it encompasses research design, target population, collection of data and analysis of data.

3.2 Research Design

This study adopted a cross- sectional survey design. By design, Cross sectional design survey is based on making observations made at one particular point in time. In particular, when the data being collected has a broader in scope for example, involving more than one group or a number of cases (Easterby-Smith, Thorpe Jackson & Lowe, 2008). Cross-sectional surveys give a chance to assess links and inter-relationships between variables and sub-groups in a population. It can thus test a hypothesis of a casual impact of variable A on variable B (Blalock, 1972).Such study was used successfully for example Krosnick and Kinder (1990) tested the performance of president Ronald Regan on handling of Nicaragua crisis. Krosnick and Kinder suspected that news coverage, might have primed Americans attitude towards US involvement in Nicaragua thus increased the impact of these attitudes on evaluation of President Ronald Regan and job performance. They took advantage of the 1986 national survey and split the investigators into groups, one before the survey and other after the survey and as expected, job performance of the president on Nicaragua crisis was more profound and evident with the second group. This study collected data from several pharmaceutical manufacturing firms in Kenya in the month of November 2017.

3.3 Population

Targeted population for this survey consisted of 42 pharmaceutical companies listed in the Kenya Pharmaceutical society directory (KPA, 2016) that are listed as local manufacturers. The study targeted supply chain managers, engineering managers, finance managers and production managers given the fact that they run and own the key processes in the supply network and directly engage with employees. The study used census sampling method. According to Saunders, Lewis and Thornhill (2012) census sampling method is the total enumeration of all the population under study. As such, the benefit of census is that it allows gaining a vast knowledge on the subject matter especially in cases where the population is small in number. Being a census, the study thus included all the supply chain managers, engineering managers, production managers, and the finance managers from the 42 firms. This brings the sample size therefore to be 168 respondents.

3.4 Methods of Data Collection

The study used questionnaire method to directly collect primary data from the sampled 168 managers. The study targeted supply chain managers, engineering managers, finance managers and production managers. The questionnaire was self-administered by the researcher and supported by research assistants. Questionnaires was utilized to gather quantitative data on biographical information of the managers; organizational performance; lean supply chain management practices; extent and impact and reasons on why adopt lean supply chain management by pharmaceutical production firms. The questionnaires were self-administered by the researcher over a period of two weeks. The significance of this method was that it would enable the researcher to draw short simple questions, which are closed ended, and which also

require short and precise answers from the respondents, (Tsai, Lin, & Sai, 2001). The questionnaire used for data collection is found in Appendix 3.

Supply chain managers are desired in this study because they are the ones responsible for supply chain function of the organization. On the other hand, engineering managers they are responsible for the design and layout of production as well overall machine efficiency and availability. Production managers are targeted because they supervise transformation of raw materials to finished products. Finally, finance managers are included in the study because they have the information concerning financial performance in the organization.

3.5 Data Analysis and Presentation

Descriptive inferential statistics was used to analyze demographic information of study respondents, and lean practices employed by the pharmaceutical manufacturing firms. The influence of lean supply chain practices on organizational performance of pharmaceutical firms was analyzed through regressions. The regression analysis methodology is the frequently and widely used data analysis technique in measuring linear relationships between two or more variables (Oso & Onen, 2009). It was emphasized that in using this technique, researcher would be able to elucidate which independent variable influences organizational performance among pharmaceutical firms. That is, the lean practice which has the highest influence on organizational performance. In addition, regression analysis also helps to find the variable that is most significant in influencing organizational performance.

These variables were tested from the common multiple regression model of the formula:

$Y_i = a_i + biX_{ij} + \mathcal{C}i$

Defined as;

Y_i = performance of organization when measured on a scale of 1 to 5

a_i = Constant performance when lean practices are not employed (a_1 ……..α_6)

b_i = Coefficients of the predictors (just in time; Kaizen; lean inventory; lean production; Kanban/pull system; lean logistics)

x_i = Independent variable (lean supply chain management)

x_1 is just in time

x_2 is Kaizen

x_3 is lean inventory

x_4 is lean production

x_5 is Kanban/pull system

x_6 is lean logistics

x_7 is lean procurement

x_8 is value stream mapping

x_9 is 5S

$\mathcal{C}$ =Margin term. Change in organizational performance not caused by the predictors.

Partial regression coefficient denotes the change in dependent variable by change of one unit of independent variable.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction to Data Analysis

The chapter gives the outcomes of the study based on the research questions. The outcomes were arrived on the basis of the objectives of the study as explored using questions that were specific in the questionnaire. A total of 168 staff working in pharmaceutical companies listed in the Kenya Pharmaceutical society directory were asked to respond to the study topic by use of a questionnaire. A total of 168 questionnaires were administered to 168 sampled respondents who included supply chain managers, engineering managers, finance managers and production managers. 140 (83%) responded in time for data analysis. This rate was considered appropriate to derive the inferences regarding the objectives of the research.

4.2 General information

The research was seeking the general information of the respondents and organizations in relation to respondents position in the company, education level, years of experience, age bracket, and respondent's designation in the organization, firm ownership and annual turnover of the companies.

4.2.1 Position of Respondent

The respondents were requested to indicate their position in the organization and results presented in Table 4.1.

Table 4. 1: Position of Respondent:

	Frequency	Percentages
Finance manager	46	33
Engineering /Environment safety manager	39	28
Head, Supply Chain	34	24
Head of Operations	21	15
Total	140	100

Source: Research data, (2017)

In the outcome, majority 33% of the respondents were finance managers, 28% of the respondents were environment safety manager. From the outcomes, majority 24% of the respondents were head of supply chain, 15% of the respondents were head of operations. This implied that data was collected and generated from all targeted and intended group of respondents who were the process owners as well as implementers and hence creates confidence on the outcome and findings.

4.2.2 Years of being in current in position in this organization

The study investigated the number of years in which respondents had been in current the position in the organization and results tabulated in Table 4.2.

Table 4. 2: Years of being in current in position in this organization

	Frequency	Percentages
5-10 years	53	38
Less 5 years	34	24
Over 15 years	28	20
10- 15 years	25	18
Total	140	100

Source: Research data, (2017)

From the findings, most 38% of those interviewed had shown to be in that current position in the organization for 5-10 years. Most 24% of those interviewed indicated that they had been in current the position in the organization for less than 5 years, 20% of the respondents indicated over 15 years while 18% of those interviewed had been in current the position in the organization for 10 to 15 years. This implies that data on the influence of lean supply chain management practices on organizational performance among pharmaceutical manufacturing companies was collected from respondents with a great experience of more than 5 year and would have a bearing on quality of data collected.

4.2.3 Educational level

The interviewees were required to show their standard of education attained and results tabulated in Table 4.3.

Table 4. 3: Standard of Education Attained

	Frequency	Percentages
Under graduate	57	41
Graduate	36	26
Diploma	27	19
Doctorate	20	14
Total	140	100

Source: Research data, (2017)

From the outcome, majority 41% of the interviewee had under graduate standard of education, 26% of the interviewee had graduate standard of education while 19% of the respondents had diploma standard of education while 14% of the respondents had doctorate level of education. This implies that data was collected more from those who had more than diploma standard of education and would hence not have major

understanding and interpreting and had a good grasp of the subject matter and give the required information that was reliable and credible.

4.2.4 Age bracket of the organization

The interviewee was required to indicate the age of the organization and the outcomes tabulated in Table 4.4.

Table 4.4: Age bracket of the organization

	Frequency	Percentages
Over 15 years	58	41
10-15 years	39	28
5 -10 years	29	21
Less 5 years	14	10
Total	140	100

Source: Research data, (2017)

From the outcomes, majority 41% of the interviewee indicated that the age of the organization was over 15 years with age having impact on performance, 28% of the organizations were aged from 10 to 50 years, 21% of the organizations were aged from 5 to 10 years, while 10% of the interviewee indicated that the age of the organization was less than 5 years. This implied that age had an impact on performance since it meant more time to go through the learning curve, learn the mistakes and perfect the Lean supply chain management practices.

4.2.5 Firm ownership

Table 4. 4: Firm ownership

	Frequency	Percentages
Local owned	83	59
Foreign owned	39	28
All the above	18	13
Total	140	100

Source: Research data, (2017)

Respondents were requested to best indicate way to explain ownership of their firm. From the outcomes, majority 59% of the interviewee showed that their firms were local owned, 28% of the respondents indicated that their firms were foreign owned while 13% of the respondents indicated that their firms were local and foreign owned. This implied that locally owned manufacturing firms were equally striving to implement lean supply chain management practices at greater percentage in order to survive and gain competitive advantage.

4.2.7 Annual turnover (ksh)

Table 4. 5: Annual turnover (ksh)

	Frequency	Percentages
51 to 1 billion	56	40
Less than 50 million	43	31
Over 1 billion	41	29
Total	140	100

Source: Research data, (2017)

Respondents were requested to indicate what the annual turnover was by their company (ksh). From the outcomes, majority 40% of the interviewee gave feedback that the company had an annual turnover of 51 to 1 billion, majority 31% of the respondents indicated that the company had an annual turnover of less than 50 million while 29% of the respondents indicated that the company had an annual turnover of over 1 billion. This implied that all the firms had significant turnover and hence

would go at great length to implement such strategies as Lean LSCM practices to protect their bottom lines.

4.2.8 Number of employees in company

The interviewees were required to show the number of employee in their company.

Table 4. 6: Number of Employees in Company

	Frequency	Percentages
Between 501-1000	29	21
Between 1001-2000	27	19
Greater than 2000	24	17
Between 100-200	21	15
Between 201-300	15	11
Between 301-500	14	10
Less than 100	10	7
Total	140	100

Source: Research data, (2017)

From the outcome, majority 21%, of those interviewed showed that their company had between 501 to 1000 numbers of employees. 19%, of those interviewed showed that their company had between 1001 to 2000 number of employees. 17%, of those interviewed showed that their company had more than 2000 number of employees. From the findings, 15%, of the interviewees showed that their company had between 100 to 200 numbers of employees. 11%, of the interviewee showed that their company had between 201 to 300 numbers of employees. 10%, of the respondents indicated that their company had between 301 to 500 numbers of employees while 7%, of the interviewee showed that their company had less than 100 numbers of employees. This implied that majority of the firms had a significant labor cost

component in their operations and hence will have an interest in Lean management to manage the labor cost components which take up a good part of company resources.

4.2.9 Products dealt with in the company

The interviewees were required to indicate the kind of products the company deals with.

Table 4. 7: Products dealt with in the company

	Frequency		% of Yes
	Yes	No	
Tablets	126	14	90
Capsules	123	17	88
Liquids/syrups	129	11	92
Ointments	95	45	68
Infusions	80	60	57
Creams	122	18	86
Vet products	77	63	55

Source: Research data, (2017)

From the majority 92%, 90%, 88% and 86% of the interviewee indicated that the organization dealt with liquids/syrups, tablets, capsules and creams products. From the findings, majority 68%, 57% and 55% of the interviewee indicated that the organization dealt with ointments, infusions and vet products. This will help in prioritization on critical products categories where to focus most effort since they contribute more to the organization.

4.3 Adoption of Lean Supply Chain Management Practices

Table 4.10 shows the interviewee feedback on the extent to which the organization adopted lean manufacturing practices.

Table 4.9: Adoption of Lean supply chain management Practices in the Companies

Principle/Tool	Mean	Standard deviation
Flow-pull system	4.92	0.85
Kaizen & 5s	4.90	0.88
Waste elimination	4.84	0.75
Lean production	4.72	0.65
Problem solving	4.65	0.53
Lean inventory	4.55	0.58
Just In Time	4.51	0.53
Supplier relationships/alliances	4.36	0.35
Kanban – Information Transparency	4.21	0.30

overall mean: 4.63 Maximum mean: 4.92 Minimum mean: 4.21

Source: Research data, (2017)

Table 4.9.1 Summary Ranking by Mean: Adoption of Lean supply chain management Practices in the Companies.

Lean LSCM practice	Order of mean by ranking
Flow-pull system	4.92
Kaizen & 5,s	4.90
Waste elimination	4.84
Lean production	4.72
Problem solving	4.65
Lean inventory	4.55
Just In Time	4.51
Supplier relationship/Alliances	4.36
Kanban	4.21

***overall mean:** 4.63 **Maximum mean:** 4.92 **Minimum mean:** 4.21*
Source: Research data, (2017)

From the outcomes, majority of the interviewee showed that there was adoption of the flow-pull system, Kaizen & 5s, waste elimination and lean production to a very good extent as shown by mean of 4.92, 4.90, 4.88 and 4.72 with deviation standard of 0.85, 0.88, 0.75 and 0.65. From the outcome, majority of the interviewee showed that there was adoption of problem solving, lean procurement, and lean inventory and just in time to a very good extent as shown by mean of 4.65, 4.58, 4.55 and 4.51 with standard deviation of 0.53, 0.49, 58 and 0.53. Most of the interviewee showed that there was adoption of Supplier relationships/alliances and Kanban – Information Transparency in the organization showed by mean of 4.36 and 4.21 with standard deviation of 0.35 and 0.30.

4.4 Components of lean supply chain management practices

The study sought the components of lean supply chain management practices and results presented in Table 4.11.

Table 4. 8: Components of Lean Supply Chain Management Practices

Supply Chain Lean Management practice	Mean	Stad Dev
Lean procurement practice		
There are order management systems in place	4.64	0.73
The company gives suppliers feedback on quality and delivery	4.41	0.67
Supply driven by demand - pull system	3.94	0.38
The company procures by use of pull system	3.16	0.51
Lean manufacturing practice		
Overall equipment efficiency (OEE) – Measurement of capacity utilization of every equipment and its availability all the time with minimal breakdowns.	4.26	0.47
Plant layout –Equipment positioned in the factory in a manner that reduces movement in the factory facility.	4.12	0.48
There are quality control systems in place	4.07	0.45
There are waste management systems in place	3.61	0.69
There are proper systems that guide startups and shutdowns during manufacturing process.	3.19	0.64
Total production maintenance (TPM) involves basic maintenance activities such as inspection, cleaning, lubrication and fixing of loose parts of the machines.	3.13	0.33
Lean transportation practice		
There is a vehicle management system in place.	3.27	0.70
The company has a packing policy to ensure optimum transportation mechanisms	3.18	0.82
Transportation applies a push and pull mechanism	2.43	0.49
Lean customer practice		
Production is based on customer requirements	4.50	0.38
There is effective communication channels to and from customers	4.42	0.58
The company involves customers in respective decisions	2.36	0.56
Lean supplier practices		
All suppliers are determined through procedures and approvals	4.25	0.17
Suppliers are involved in their respective decision by the company	3.53	0.31
There are integrated systems for supplier management	3.17	0.38

overall mean: 3.66 Maximum mean: 4.64 Minimum mean: 2.36

Source: Research data, (2017)

Table 4.9.1 Summary Ranking by Mean: Components of Lean Supply Chain Management Practices

Lean LSCM practice	Order of mean by ranking
Lean procurement Practice	4.04
Lean customer service	3.76
Lean Manufacturing Practice	3.73
Lean supplier practice	3.65
Lean transportation practice	2.96

overall mean: 3.66 Maximum mean: 4.64 Minimum mean: 2.36

Source: Research data, (2017)

The outcomes show that lean procurement practice as a lean supply chain management practice was practiced as well as order management as shown by a mean of 4.64 with a deviation standard of 0.73. The results showed that companies provide suppliers with feedbacks on quality and delivery to a good extent as shown by a mean of 4.41 with a deviation standard of 0.67 demands driven supply chain through use of pull system to a great extent as indicated by a mean of 3.94 with a standard deviation. Further results on lean procurement, the results showed that the company procures by used of pull system to a moderate extent as shown by a mean of 3.16 with deviation standard of 0.51.

The findings on lean manufacturing practice, the results showed that there was overall equipment efficiency (OEE) as a measurement of capacity utilization of every equipment and its availability all the time with minimal breakdowns to a great extent as shown by a mean of 4.26 with deviation standard of 0.47, equipment and equipments are positioned in the factory in a manner that reduces movement within the facility improving factory layout to a great extent as shown by a mean of 4.12 with deviation standard of 0.48 and that there are quality control systems in place as indicated by a mean of 4.07 and deviation standard of 0.45. The outcome further

shows that there were waste management systems in place to a great extent as a mean of 3.61 with a standard deviation of 0.69. The interviewees could not agree that there are proper systems that guide startups and shutdowns during manufacturing process to a moderate extent as shown by a mean of 3.19 with a deviation standard of 0.64 while use of total production maintenance (TPM) involves basic maintenance activities such as inspection, cleaning, lubrication and fixing of loose parts of the machines as shown by a mean of 3.13 and deviation standard of 0.33.

The transportation practices showed that there was a vehicle management system in place to a moderate extent as indicated by a mean of 3.27 with a standard deviation of 0.70, company institute packing policy to ensure optimum transportation mechanisms to a moderate extent as indicated by a mean of 3.18 with a standard deviation of 0.82, that that transportation applies a push and pull mechanism to a less extent as indicated by a mean of 2.43 with a standard deviation of 0.49.

The results on lean customer practice showed that production is based on customer requirements to a very good extent as shown by a mean of 4.50 with a standard deviation 0.38. The results further showed that due to lean customer service, the companies experienced effective communication channels to and from customers to a great extent as shown by a mean of 4.42 with a deviation standard of 0.58 and that the company involved customer in respective decisions to a less extent as indicated by a mean of 2.36 with a standard deviation of 0.36.

The results on lean suppliers practices, all suppliers were determined through procedures and approvals to a great extent as shown by a mean of 4.25 with a standard deviation of 0.17, suppliers being involved in their respective decision by the company to a moderate extent as shown by a mean of 3.53 with deviation standard of

0.31 and that there are integrated systems for supplier management to a less extent as indicated by a mean of 3.17 with a deviation standard of 0.38.

4.5 Attributes of Lean Supply Chain Management practices

Attributes of the lean manufacturing practices adopted by firms as presented in Table

Table 4. 10: Attributes of the lean manufacturing practices adopted by firm

Lean Supply Chain management practices attributes	Mean	Std Dev
Waste Elimination		
Reduced lead -time	4.77	0.79
Quality of output	4.74	0.75
Production smoothing	4.01	0.76
Reduced production cycle time	3.90	0.93
Waste reduction	3.87	0.72
Just In Time		
Enhanced quality of output	4.64	0.59
Reduced errors	4.57	0.75
Waste reduction	4.56	0.32
Reduced lead time	4.53	0.35
Reduced manufacturing costs	4.50	0.36
Reduced inventory	4.18	0.65
Short setup time	4.10	0.72
Demand driven production	4.07	0.51
Reduced changeover time	3.67	0.69
Flow and pull production	3.60	0.51
Kanban - Information Transparency		
Smooth information transmission	4.87	0.78
Increase production process transparency	4.45	0.43
Reduced cost of information processing	3.72	0.63
Kaizen & 5S		
Reduced errors	4.51	0.71
Enhanced quality of output	4.50	0.44
Waste elimination	4.09	0.79
Production smoothing	3.86	0.76
Five (5) Ss		
Sweeping/seiso	4.70	0.78
Self discipline	4.61	0.63
Standardization/seiketsu	4.51	0.76
Simplifying	4.16	0.59
Sorting/seiton	3.88	0.73

Overall mean: 4.13 Maximum mean: 4.87 Minimum mean:3.6
Source: Research data, (2017)

The research sought the attributes of lean manufacturing practices adopted by pharmaceutical manufacturing companies and results tabulated in table. From the outcomes, interviewees showed that lean supply chain management was attributed to waste elimination which resulted to reduced lead time to a very good extent as shown by a mean of 4.77 with a deviation standard of 0.79, improve in quality of output to an extent that is large as shown by a mean of 4.74 with a deviation standard of 0.75. The respondents also indicated that waste elimination resulted into smooth production in the companies at an extent that is large as shown by a mean of 4.01 with a deviation standard of 0.76, reduction in production cycle time to an extent that is large with a deviation standard of 0.93 and that it lead to reduction in wastes to an extend that is large as shown by a mean of 3.87 with a deviation standard of 0.72.

The attribute on just in time led to enhancement of quality output to an extent that is great as shown by a mean of 4.64 with a deviation standard of 0.59, reduced errors to a very good extent as shown by a mean of 4.57 with a deviation standard 0.75, led to reduction in lead time to a very good extent as shown by a mean of 4.53 with standard deviation of 0.35 and reduction in manufacturing costs to a very good extent as shown by a mean of 4.50 with a deviation standard of 0.36. Just in time was also fund to eliminate waste to a good extent as shown by a mean of 4.45 with a deviation standard of 0.43, reduction in inventory time, shorten set up time and to demand driven production to a good extent as shown by a mean of 4.18, 4.10 and led with a deviation standard of 0.65, 0.72 and 0.51 respectively. Further just in time is attributed to flow and pull production in pharmaceutical company to good extent as shown by a mean of 3.60 with a deviation standard of 0.54.

The outcomes showed that attributes based on Kanban - Information Transparency led to smooth information transmission to a very great extent as shown by a mean of

4.87 with a standard deviation of 0.78, increase production process transparency to a great extent as indicated a mean of 4.45 with a standard deviation of 0.43 and that its reduces cost of information processing to a great extent as indicated by a mean of 3.72 with a standard deviation of 0.63. This implied that information transparency as an attribute of a supply chain management practice that influence pharmaceutical manufacturing companies performance.

The attribute of Kaizen & 5S led to reduction in errors in manufacturing process to a good extent as shown by a mean of 4.51 with a deviation standard of 0.71, enhance quality output to a very great extent as shown by a mean of 4.50 with a deviation standard of 0.44. The results on attribute of Kaizen further shows that it led to smooth production to a good extent as indicated by a mean of 0.86 with a standard deviation of 0.76. This implied that Kaizen attributes influence performance of pharmaceutical manufacturing companies.

Further results showed that the Five (5s) attributes led to sweeping to a good extent as shown by a mean of 4.70 with a standard deviation of 0.78, self discipline to a good extent as shown by a mean of 4.61 with a deviation standard of 0.63 and led to standardization to a very great extent as shown by a mean of 4.51 with a deviation standard of 0.76. The attribute of 5s also led to sorting to a good extent as shown by a mean of 3.88 with a deviation standard of 0.73. This implied that lean supply chain management practice led to 5s in pharmaceutical manufacturing companies in Kenya.

4.6 Influence of Lean Manufacturing practices organizational performance

The research sought to explore the extent to which lean supply chain management practice in manufacturing influence organizational performance among the pharmaceutical companies and results tabulated in Table 4.13.

Table 4.11: Influence of Lean Manufacturing practices organizational performance

Lean Manufacturing implementation impact	Mean	Standard Deviation
Quality improvement -Product and service	4.83	0.46
Waste elimination/reduction	4.67	0.66
Increased return on investment	4.58	0.56
Increase in overall sales levels	4.56	0.32
To gain competitive advantage	4.52	0.53
Stock/Inventory reduction	4.51	0.51
Low Manufacturing cost	4.50	0.71
Improvement in product quality	4.40	0.44
Set -up time reduction	4.36	0.32
Reduced Lead- time	4.19	0.71
Labor requirement reduction	4.17	0.60
Sales volume improvement	4.04	0.53
Increase in company market share	3.89	0.74
Enhanced material flow and through put	3.65	0.65

Overall mean: 4.33 Maximum mean: 4.83 Minimum mean: 3.65
Source: Research data, (2017)

Table 4.12.1 Summary ranking by Mean: Influence of Lean Manufacturing practices organizational performance

Lean LSCM practice	Order of mean by ranking
Quality improvement -Product and service	4.83
Waste elimination/ reduction	4.67
Increased return on Investment	4.58
Increase in sales Volume	4.56
Stock /Inventory reduction	4.51
Low manufacturing cost	4.50
Improvement in product quality	4.40
Set -up time reduction	4.36
Reduced Lead- time	4.19
Labor requirement reduction	4.17
Sales volume improvement	4.04
Increase in company market share	3.89
Enhanced material flow and through put	3.65

***overall mean**: 4.33 **Maximum mean**: 4.83 **Minimum mean**: 3.65*
Source: Research data, (2017)

Source: Research data, (2017)

From the results, lean supply chain management practices quality improvement, waste elimination/reduction and increase in return in investment influence performance among pharmaceutical companies to a good extent as shown by a mean of 4.83, 4.67 and 4.58 and deviation standard of 0.71, 0.66 and 0.56 respectively. The study also found that lean supply chain management lead to increase in overall sales levels to a

good extent as shown by a mean of 4.56 with a deviation standard of 0.32, increase in stock/inventory production as shown by a mean of 4.51 with a deviation standard of 0.51 and decrease in manufacturing cost as shown by a mean of 4.50 with standard deviation of 71.

The outcomes also shows that LSCM practices led to increase in quality production to a good extent as shown by a mean of 4.40 with standard deviation of 0.44, Set -up time reduction to a good t extent as indicated by a mean of 4.36 with deviation standard of 0.32, reduce lead time to a great extent as indicated by a mean of 0.19 with a standard deviation of 0.71 and reduce labor requirement to a great extent as indicated b y a mean of 4.17 with deviation standard of 0.60. Further results shows that lean supply chain management practices led to increase in sale volumes to a good extent as shown by a mean of 4.17, increase in market share as shown by a mean of 3.89 and deviation standard of 0.74, reduce work in progress in the companies as shown by a mean of 3.86 with a deviation standard of 0.88 and enhanced material flow to a great extent as shown by a mean of 3.65 with a deviation standard of 0.65. This implied lean supply chain management practices improve performance among pharmaceutical companies in Kenya.

4.7 Pearson Correlation analysis

Pearson Moment Correlation analysis was done to examine the direction and the strength of the relationship. This would help in evaluating whether there exists any relationship the study variables before further inferential, regression analysis. The criterion employed was that Correlation Coefficient of 0. 7 and above was strong, 0.4- and less than 0.7 was assigned moderate 0 and less than 0.4 weak. The correlation coefficient was also used to test whether there existed were if the correlation

coefficient if more than 0.9 (r>0.9) there exist high multi collinearity which may led to unreliable regression model.

Table 4.12: Pearson Moment Correlation matrix.

		Organizational Performance
Just in time	Pearson Correlation	.5071*
Kaizen	Pearson Correlation	.4982 *
Lean inventory	Pearson Correlation	.7403*
Lean production	Pearson Correlation	.7881**
Pull system	Pearson Correlation	.7176 *
Lean logistics	Pearson Correlation	.7295**
Lean procurement Lean logistics	Pearson Correlation	.7041**
Value stream mapping	Pearson Correlation	.7207*

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Source: Research data, (2017)

From the analysis, the reults shows that there existed a moderate, significant positive correlation between just in time and organizational performance as r=0.5071, with correlation significant at 0.05. Correlation results showed that there existed a moderate, significant positive correlation between Kaizen and organizational performance as r=0.4982, with correlation significant at 0.05. The correlation results also shows that there exist a positive relationship between lean inventory and organizational performance as indicated by r=0.7403 significant at 0.05.

The correlation results predicted that there exist a significant and negative relationship between lean production and organizational performance as r=0.7881 significant at

0.05. The findings also shows that there exists a positive relationship between pull system and organizational performance as r=0.7176 significant at 0.05. This depicts that increase in pull systems would increase performance in pharmaceutical companies.

The correlation results showed that there exists a positive relationship between lean logistics and organizational performance as r=0.7295 significant at 0.01. This depicts that increase in lean logistics would increase performance in pharmaceutical companies. The correlation results predict significant and negative relationship between lean procurement and organizational performance as r=0.7041 significant at 0.01. This depicts that increase in lean procurement would decrease performance in pharmaceutical companies.

The correlation results further predict significant and positive relationship between value stream mapping and organizational performance as r=0.7207 significant at 0.01. This depicts that increase in value stream mapping would increase performance in pharmaceutical companies.

4.7 Regression Analysis

4.7.1 Model Summary

Table 4.13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.779[a]	.594	.526	.56895

Predictors: (Constant), Just in time, Kaizen, Lean inventory, Lean production, Pull system, Lean logistics, lean procurement and Value stream mapping

Dependent: Organizational Performance

Source: Research data, (2017)

The model summary in Table 4.14 was used to test whether there existed significant variation between independent variables and dependent variable. It was also used to test the proportion variation of independent variables on dependent variable. R squared 0.594 shows that there existed a variation of 59.4% in organizational performance of pharmaceutical due to change in lean supply chain management practices that included just in time, Kaizen, lean inventory, lean production, pull system, lean logistics, lean procurement and value stream mapping. Adjusted R squared is called the coefficient of determination and show proportion change in dependent variable due to change in independent variable. This depicts that there was proportion variation of 52.6% of organizational performance due to the influence of LSCM.

4.7.2 ANOVA

Table 4.14: ANOVA (2Fs)

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.560	8	1.195	15.838	.001[b]
	Residual	66.155	131	.505		
	Total	74.715	139			

a. Predictors: (Constant), enterprise resource planning, inventory management systems, supplier relationship management system and record management system

b. Procurement performance

Source: Research data, (2017)

The study established that there existed a significant goodness of fit of the model $Y_i = a_i + biX_i$. Based on the outcomes, in Table 4.15 the results show the F_{1Cal} =15.838> $F_{2\ Cri}$ = 8, P=0.001<0.05. This implies that there was a goodness of fit of the model fitted for this study.

4.7.3 Beta Coefficient Analysis

Table 4.15: Coefficient Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.510	.359		9.779	.000
	Just in time	.4628	.037	.415	12.508	.001
	Kaizen	.5003	.045	.317	11.114	.004
	Lean inventory	-.4298	.61	-.493	7.046	.003
	Lean production	-.4328	-. 575	-.5893	7.527	.002
	Kanban/pull system	.7320	.136	.7154	5.0137	.000
	Lean logistics	.4875	.0764	.4581	6.3819	.007
	Lean procurement	-.5815	-.0638	-.6416	9.1143	.0152
	Value stream mapping	.8254	.1025	.8056	8.0529	.000

Predictors: (Constant), Just in time, Kaizen, Lean inventory, Lean production, Pull system, Lean logistics, lean procurement and Value stream mapping

Dependent: Organizational Performance

Source: Research data, (2017)

From the results on table 4.16, $\beta_{0=}$ 3.510 represented the constant which predicted organizational performance while lean supply chain management practices were constant at zero (0). Regression results revealed that just in time has significance and positive influence on organizational performance as indicated by β_1=0. 0.4628,

p=0.001<0.05.The implication is that an increase in just in time lead to increase in pharmaceutical companies' performance by $\beta 1_{=}$ 0.4628.

Regression results revealed that Kaizen predict a significance and positive on performance as shown by β_2= 0.5003, p=0.004<0.05. This depicts that an increase in application of Kaizen would lead to an increase in organizational performance among the pharmaceutical companies by β_2=0.0.5003.

From the regression results, the study revealed that there existed a significant negative relationship between lean inventory and performance of pharmaceutical companies as shown by β_3= -0.4298, p = 0.003<0.05. This depicts that an increase lean inventory would lead to decrease in performance of pharmaceutical companies by β_3= .4298.

Regression results also shows that there existed a significant negative relationship between lean production and performance of pharmaceutical companies as shown by β_4= -0.4328, p = 0.003<0.05. This depicts that an increase lean production would lead to decrease in performance of pharmaceutical companies by β_4= -.4328.

The regression outcomes also shows that there existed a significant relationship between Kanban and organizational performance as indicated by β_5= 0.7320, p=0.000>0.05. This depicts that an increase in Kanban, pull system would led to an increase in performance in pharmaceutical companies by β_5= 0.7320.

Regression results also shows that there is relationship that is positive between lean logistics and performance of pharmaceutical companies as indicated by β_6= 0.4875, p = 0.007<0.05. This depicts that an increase lean logistics would lead to increase in performance of pharmaceutical companies by β_6= .4875.

The results further shows that lean production has a negative relationship with organizational performance as shown by β7= .5815,p=0.0152.. This depicted that lean production would result into low performance among the pharmaceutical companies.

Further regression results also shows that there existed a significant positive relationship between value stream mapping and performance of pharmaceutical companies as shown by β_8= 0.8254, p = 0.000<0.05. The implication is that an increase value stream mapping would lead to increase in performance of pharmaceutical companies by β_8= 0.8254

4.8 Discussion of findings

The study found that pharmaceutical companies had adopted waste elimination flow-pull system, Kaizen & 5s and lean production to a very great extent. The companies had also adopted problem solving, lean procurement, and lean inventory and just in time to a very good extent. Further the pharmaceutical companies had adopted Supplier relationships/alliances and Kanban – Information Transparency in the organization to a good extent. The results are supported by Wong and Wong (2011) companies adopt LSCM practices into their critical organization processes, owned them and institutionalized them in their supply chain culture would realize great results.

The results showed that lean supply chain management practices led to quality improvement, waste elimination/reduction and increase in return in investment influence performance among pharmaceutical companies to a good extent (Mean 4.83, 4.67 and 4.58) respectively. The results indicated that lean supply chain management lead to increase in overall sales levels to a great extent (Mean= 4.56), The findings were supported by York and Miree, (2004) that supply chain

management practices led to better goodwill, increase corporate social responsibility, enhanced innovativeness, increased market share, quality improvement and resource management.

Further findings indicated that lean supply chain management practices increase in quality production to a good extent (M=4.40), Set -up time reduction to a good extent (M=4.36), reduce lead time to a good extent and reduce labor requirement to a good extent. Further, lean supply chain management practices led to increase in sale volumes to a great extent (M=4.17), increase in market share; reduce work in progress in the pharmaceutical companies in Kenya. The findings concurred with Ross, (2010) that Lean SCM practices results into overall cost efficiency, strategy integration, reductions in inventory, assets, and product development costs, increasing product quality, channel flexibility, and customer service and risk management.

From the analysis, the reults showed that there existed a moderate, significant positive correlation between just in time and organizational performance as r=0.5071, with correlation significant at 0.05. Correlation results showed that there existed a moderate, significant positive correlation between Kaizen and organizational performance as r=0.4982, with correlation significant at 0.05. The correlation results also indicated that there exist a significant and positive relationship between lean inventory and organizational performance as indicated by r=0.7403 significant at 0.05.

The correlation results predicted that there exist a significant and negative relationship between lean production and organizational performance (r=0.7881), there exists a significant and positive relationship between pull system and organizational

performance (r=0.7176) and that there exists a significant and positive relationship between lean logistics and organizational performance (r=0.7295).

The correlation results predict significant and negative relationship between lean procurement and organizational performance as r=0.7041 significant at 0.01. This implied that increase in lean procurement would decrease performance in pharmaceutical companies.

The correlation results further predict significant and positive relationship between value stream mapping and organizational performance as r=0.7207 significant at 0.01. This implied that increase in value stream mapping would increase performance in pharmaceutical companies.

Regression results revealed that just in time has significance and positive influence on organizational performance as shown by β_1=0. 0.4628, p=0.001<0.05.This would depict that an increase in just in time lead to increase in pharmaceutical companies' performance. The findings were supported by Chong, Chan, OoiOoi and Sim, (2010) who fund that lean operations strategy increased sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high customer service levels in manufacturing companies.

Regression results revealed that Kaizen predict a significance and positive on performance as indicated by β_2= 0.5003, p=0.004<0.05. This implied that an increase in application of Kaizen results in increase organizational performance among the pharmaceutical companies .The outcomes were supported by Demirbag, Koh, Tatoglu and Zaim (2006) who found that lean supply chain management practices results into increase in profit, increase on return on investment, increased sales and growth, firms productivity and improve company efficiency.

From the regression results, the study revealed that there existed a significant negative relationship between lean inventory and performance of pharmaceutical companies as shown by β_3= -0.4298, p = 0.003<0.05. The implication is that an increase lean inventory would lead to decrease in performance of pharmaceutical companies by β_3= .4298.

Regression results also shows existence of a significant negative relationship between lean production and performance of pharmaceutical companies as indicated by β_4= -0.4328, p = 0.003<0.05. The implication is that an increase lean production would lead to decrease in performance of pharmaceutical companies.

The regression outcomes also showed existence of a significant relationship between Kanban and organizational performance as indicated .This depicts that an increase in Kanban, pull system would led to an increase in performance in pharmaceutical companies. The outcomes concurred with Ooi and Sim, (2010) that LSCM led to high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

Regression results also shows existence of a relationship that is positive between lean logistics and performance of pharmaceutical companies as showed by β_6= 0.4875, p = 0.007<0.05. This implied that an increase lean logistics would result to an increased performance of pharmaceutical companies.

The results further show that lean production has a negative relationship with organizational performance. This also depicts that lean production would result into low performance among the pharmaceutical companies.

The outcomes revealed that there existed a significant positive relationship between value stream mapping and performance of pharmaceutical companies as shown by β_8= 0.8254, p = 0.000<0.05. This depicts that an increase value stream mapping would lead to increase in performance of pharmaceutical companies. The findings concurred with Ross, (2010) that lean supply chain management lead to increased sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high service levels

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter gives the summary of findings, conclusion and recommendations of the study. This study sought to establish the impact of lean LSCM practices on organization performance in pharmaceutical manufacturing companies in Kenya.

5.2 Summary of Findings

The study established that pharmaceutical companies had adopted flow-pull system, Kaizen & 5s, waste elimination and lean production to a very great extent. The results also revealed that pharmaceutical companies had adopted problem solving, lean procurement, and lean inventory and just in time, Supplier relationships/alliances and Kanban – Information Transparency in the organization to a great extent in an effort to achieve better organizational companies.

The results showed that lean supply chain management practices adopted by pharmaceutical manufacturing companies influence quality improvement, waste elimination/reduction, increase in stock/inventory production and decrease in manufacturing cost by a large margin. Findings are consistent with Kocakulah, Austill &shenk, (1998) which summarizes lean thinking as concentrating internally with cost reduction and externally on customer satisfaction

The research found out that lean supply chain management practices influence Set -up time reduction, reduce lead time and reduce labor requirement to a great extent. The study also revealed that lean supply chain management practices led to overall cost efficiency and strategy integration.

By analyzing correlation matrix, the study indicates that there exist significant correlation that is positive between just in time and organizational performance (r=0.5071), that there was a moderate positive and significant correlation between Kaizen and organizational performance (r=0.4982), and that there was an established positive relationship between lean inventory and organizational performance (r=0.7403). Further correlation results indicated that there exists a significant and positive relationship between pull system and organizational performance (r=0.7176) and that there exists a significant and positive relationship between lean logistics and organizational performance (r=0.7295) as well as positive relationship between value stream mapping and performance of the organization (r=0.7207).

However, there exist a partial negative relationship between lean production and organizational performance (r=0.7881), and that there is negative relationship between lean procurement and organizational performance (r=0.7041), the correlation results further predict positive and significant link between value stream mapping and performance organization (r=0.7207) hence increase in value stream mapping would increase performance in pharmaceutical companies.

Regression results revealed that just in time has significance and positive influence on organizational performance (β_1=0. 0.4628) hence adoption of just in time lead to increase in pharmaceutical companies' sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high customer service levels in manufacturing companies.

Regression results revealed that Kaizen predict a significance and positive on performance (β_2= 0.5003) hence increase in application of Kaizen would lead to an increase in increase in profit, increase on return on investment, increased sales and growth, firms productivity and improve company efficiency.

However, the study established that lean production predict negative performance of pharmaceutical companies (β_4= -0.4328) hence increase lean production would lead to decrease in performance of pharmaceutical companies. From the regression results, the study revealed existence of a significant negative relationship between lean inventory and performance of pharmaceutical companies as indicated by β_3= -0.4298, p = 0.003<0.05. The implication is that an increase lean inventory would lead to decrease in performance of pharmaceutical companies (β_3= .4298). lean inventory results in low performance in pharmaceutical manufacturing companies.

From the regression results, that study revealed that Kanban significantly predict organizational performance in pharmaceutical companies (β_5= 0.7320). Lean logistic make the companies to concentrate on the core function improving organizational performance achieving high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

The study found that lean logistics significantly predict improvement in performance of pharmaceutical companies (β_6= 0.4875) hence increase in increase lean logistics would lead to increase in performance of pharmaceutical companies.

.The study again shows that there existed a positive and significant link between value stream mapping and performance of pharmaceutical companies (β_8= 0.8254). Lean supply chain management lead to increased sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

5.3 Conclusion

Given the outcomes from the study, it can be concluded that a large portion of pharmaceutical companies had adopted lean supply chain management practices such as flow-pull system, Kaizen and 5s, lean procurement, lean inventory and just in time, Supplier relationships/alliances and Kanban – Information Transparency in the organization to a great extent in an effort to achieve better organizational companies.

The study concluded that lean supply chain management practices adopted by pharmaceutical manufacturing companies influence quality improvement, waste elimination/reduction, increase in stock/inventory production and decrease in manufacturing cost, improve overall cost efficiency, strategy integration and risk management. This is consistent with Womack et al, (1990) in whose argument indicates that firms can improve performance by adopting lean production approach championed by Toyota.

From the results the study concluded that just in time has significance and positive influence on organizational performance and that adoption of just in time lead to increase in pharmaceutical companies' sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high customer service levels in manufacturing companies.

From the regression results the study concluded that Kaizen predict a significance and positive on performance and that increase in application of Kaizen would lead to an increase in increase in profit, increase on return on investment, increased sales and growth, firms productivity and improve company efficiency.

The study concluded that lean production and lean inventory predict negative performance of pharmaceutical companies and that increase lean production would

lead to decrease in performance of pharmaceutical companies. From the regression results, the study revealed that there existed a significant negative relationship between lean inventory and performance of pharmaceutical companies.The implication is that an increase lean inventory would lead to decrease in performance of pharmaceutical companies, lean inventory results in low performance in pharmaceutical manufacturing companies.

From the regression results, the study concluded that Kanban significantly predict organizational performance in pharmaceutical companies influencing achievement of high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

The study concluded that lean logistics significantly predict improvement in performance of pharmaceutical companies as increase in increase lean logistics would lead to increase in performance of pharmaceutical companies as the company's focus on core functions to improve performance level.

.The study further concluded that existed a significant positive relationship between value stream mapping and performance of pharmaceutical companies that Lean value stream mapping results into increased sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

5.4 Recommendations

The study recommend that management in pharmaceutical manufacturing companies should adopt lean supply chain management practices such as flow-pull system, Kaizen and 5s, lean procurement, lean inventory and just in time, Supplier relationships/alliances and Kanban – Information Transparency in the organization to achieve better organizational companies. This is because the study confirmed that lean supply chain management practices by pharmaceutical manufacturing companies would lead to quality improvement, waste elimination/reduction, increase in stock/inventory production and decrease in manufacturing cost, improve overall cost efficiency, strategy integration, reduced stock levels and increased working capital, increased quality and risk management.

The study recommend that the companies should implement Just in Time to increase sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high customer service levels in manufacturing companies. From the regression and conclusion, the study recommend that management in pharmaceutical companies should implement Kaizen as this would lead to an increase in increase in profit, increase on return on investment, increased sales and growth, firms productivity and improve company efficiency.

The study recommends that management in pharmaceutical should be eliminate lean production and lean inventory to achieve performance at pharmaceutical companies and as increase lean production and inventory would lead to decrease in performance of pharmaceutical companies. From the regression results, the study concluded that Kanban significantly predict organizational performance in pharmaceutical companies

influencing achievement of high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

The study recommend that management should enhance lean logistics and adopt value stream mapping to significantly achieve improvement in performance of pharmaceutical companies , increased sales volumes, increased profit, high quality, efficiency, productivity, inventory reduction, overall costs and high service levels.

5.5 Limitations

The study had a limitation of scope since it only focused on 42 manufacturing firms that were locally based. It did not consider pharmaceutical firms that operated solely as distributing agents of mother companies abroad but which practiced LSCM practices in other areas of their processes. The study also did not go into details in benchmarking performance between firms after certain intervals of time. Finally, a challenge of limited access to information from few companies citing confidentiality to information or limited time to respond to the questionnaire.

5.6 Suggestion for Further Studies

The main objective of the study was to establish impact of lean the supply chain management practices on organization performance in pharmaceutical manufacturing companies in Kenya. The study recommend that a further study should be carried out to determine the influence of LSCM on organization performance of pharmaceuticals firms which operate solely as distributing agents and link them with their mother companies abroad.

A further comparative research should be carried out comparing performance among lean practicing pharmaceuticals companies over time. A further study should be carried out to understand the challenges affecting adoption of lean the supply chain management practices among pharmaceutical manufacturing companies.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER

Dear Sir/ Madam,

RE: RESEARCH IN YOUR FIRM:

I am a student currently undertaking Master of Business and Administration course at The University of Nairobi (UON). I am undertaking a research project in partial fulfillment of the academic requirements and my study topic is entitled, *Lean practices in Supply Chain Management and organization performance in Pharmaceutical Manufacturing companies in Kenya*. Your reputable organinization has been chosen to form part of the research work. I am humbly requesting if you would take a few minutes from your hectic program and schedule to answer the questions as per the attached questionnaire.

Your feedback will be handled with outmost confidentiality it deserves. The Study outcomes of this research can be made available to your organization at the end of the research and upon request within 7 working days.

Your support and assistance will greatly be appreciated.

Yours faithfully,

Patrick Wanyama Mussumba

MBA student –The University of Nairobi

APPENDIX II: INTRODUCTION LETTER FROM UNIVERSITY OF NAIROBI

UNIVERSITY OF NAIROBI

SCHOOL OF BUSINESS

KISUMU CAMPUS

Telegrams: "Varsity" Nairobi
Fax: 4181650
Kisumu, Kenya
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Email: nixono@uonbi.ac.ke

P.O Box 19134-40123
Kisumu, Kenya

Date: 10th November 2017 REF: **UON/CHSS/SOB – KSM/D61/72871/2014**

TO WHOM IT MAY CONCERN

RE: PATRICK WANYAMA MUSSUMBA- REGISTRATION NO: D61/72871/2014

The above named student is in the Master of Business Administration degree program. As part of requirements for the course, he is expected to carry out a study on **"Procurement and Supply Chain Management Practices and Organizational Performance in Pharmaceutical Manufacturing Firms in Kenya."**

He has identified your organization for that purpose. This is to kindly request your assistance to enable him complete the study. The exercise is strictly for academic purposes and your assistance will be greatly appreciated.

Thanking you in advance.

Sincerely,

10 NOV 2017

DR NIXON OMORO
ASSISTANT COORDINATOR, SoB, KISUMU CAMPUS

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APPENDIX III: RESEARCH QUESTIONNAIRE

The research objective is targeted at gaining knowledge of the extent of implementation and impact of Lean supply chain management practices in pharmaceutical manufacturing firms in Kenya. All the feedback in the questionnaire will be used for academic intensions and will be handled with outmost confidentiality it deserves.

Sincere thanks and will appreciate your support and assistance.

SECTION ONE: COMPANY GENERAL INFORMATION

1. Position of Respondent

   ( ) Head, Supply Chain ( ) Head of Operations ( ) Finance manager

   ( ) Engineering /Environment safety manager

2. How long have you been in this position in this organization? ( ) less 5 years ( ) 5 -10 years ( ) 10-15 years ( ) Over 15 years

3. How would place your educational level

   ( ) Under graduate ( ) Graduate ( ) Doctorate ( ) Diploma

   Others (specify)…….....

4. Age of the organization ( ) less 5 years ( ) 5 -10 years ( ) 10-15 years ( ) Over 15 years

5. What is the best way to explain ownership of your firm: Kindly tick appropriately in the space provided.

   Local owned ( ) Foreign owned ( ) All the above ( )

6. What is the annual turnover by your company (ksh)

   Less than 50 million ( ) 51 to 1 billion ( ) Over 1 billion ( )

7 What are the employee numbers in your company

   [ ] less than 100 [ ] Between 100-200 [ ] 201-300 [ ] 301-500

   [ ] 501-1000 [ ] 1001-2000 [ ] Greater than 2000

7. Which products does your company deal with

   [ ] Tablets [ ] capsules [ ] liquids/syrups [ ] ointments

   [ ] infusions/ [ ] Creams [ ] vet products

SECTION TWO: THE EXTENT OF ADOPTION OF LEAN MANUFACTURING PRACTICES

1) Show the extent of adoption by your company for each of the following Lean Manufacturing Practices. At a scale of 1 to 5 where 5 = to a very great extent, 4 = large extent, 3 = moderate extent, 2 = small extent, 1 = very small extent),

	Principle/Tool	**5**	**4**	**3**	**2**	**1**
1	Waste elimination					
2	Just In Time-(JIT)					
3	Flow-pull system					
4	Supplier relationships/alliances					
5	Kanban – Information Transparency					
6	Kaizen & 5s					
7	Lean production					
8	Lean inventory					
9	Problem solving					
10	Lean procurement					
	Any other (please indicate					

2. To what level does your organization apply the following components of lean supply chain management practices? ***Use Likert scale 1=to a very great extent, 2=to a great extent, 3=to a moderate extent, 4=to a small Extent, 5=does not affect at all, and tick [√] where appropriate.***

Lean Supply Chain Management practice	**1**	**2**	**3**	**4**	**5**
Lean procurement practice					
The company procures by use of pull system (only when there is an anticipation of use)					
The company gives suppliers feedback on quality and delivery					
There are order management systems in place					
supply process driven by demand- use of pull system					
Lean manufacturing practice					
There are waste management systems in place					
There are quality control systems in place					
There are proper systems that guide startups and shutdowns during manufacturing process.					
Total production maintenance (TPM) involves basic maintenance activities such as inspection, cleaning, lubrication and fixing of loose parts of the machines.					
Plant layout –Equipments are positioned in the factory in a manner that reduces movement within the production facility.					
Overall equipment efficiency (OEE) – Measurement of capacity utilization of every equipment and its availability all the time with minimal breakdowns					
Lean transportation practice					
There is a vehicle management system in place					
The company has a packing policy to ensure optimum transportation mechanisms					

Transportation applies a push and pull mechanism					
Lean customer practice					
Production is based on customer requirements					
There is effective communication channels to and from customers					
The company involves customers in respective decisions					
Lean supplier practices					
All suppliers are determined through procedures and approvals					
Suppliers are involved in their respective decision by the company					
There are integrated systems for supplier management					

6. Any other lean practice(s) involved by the company

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SECTION THREE: IMPACT OF LEAN MANUFACTURING IMPLEMENTATION AND ORGANIZATION PERFORMANCE.

1) Below are variables of the Lean Manufacturing practices adopted by companies. Kindly rank by ticking in the prescribed box the level of your understanding on following attributes as per the ratings; 5 = to a very great extent, 4 = Large extent, 3 = Moderate extent, 2 = Small extent, 1 = Very small extent

Waste Elimination	**5**	**4**	**3**	**2**	**1**
Waste reduction					
Reduced production cycle time					
Reduced lead -time					
Quality of output					
Production smoothing					
Just In Time					
Reduced inventory					
Short setup time					
Reduced changeover time					
Reduced manufacturing costs					
Waste reduction					
Flow and pull production					
Enhanced quality of output					
Demand driven production					
Reduced errors					
Waste elimination					
Enhanced quality of output					
Reduced lead time					
Any other (please indicate)					
Kanban - Information Transparency					
Reduced cost of information processing					
Smooth information transmission					
Increase production process transparency					

Kaizen & 5S					
Production smoothing					
Waste elimination					
Enhanced quality of output					
Reduced errors					
Any other (please indicate)					
Five (5) Ss					
Standardization/seiketsu					
Simplifying					
Sorting/seiton					
Sweeping/seiso					
Self discipline					
others (kindly show)					

2) Kindly rank by ticking in the prescribed box the nature and the extent to which the Lean Manufacturing practices implementation has impacted your organization performance by use of the ratings as shown; 5 = To Avery great extent, 4 = Large extent, 3 = Moderate extent 2
= Small extent 1 = Very small extent

Lean Manufacturing implementation impact	**5**	**4**	**3**	**2**	**1**
Reduction in WIP					
Stock/Inventory reduction					
Reduced Lead- time					
Quality improvement -Product and service					
Productivity improvement					
Waste elimination/reduction					
Low production cost					
Reduced Set -up time					
Enhanced Profitability improvement					
Improved Sales volume					
Reduced Labor					
Enhanced material flow and through put					
Increased return on investment					
Increase in overall sales levels					
Increase in company market share					
Improvement in product quality					
To gain competitive advantage					

APPENDIX IV

MAJOR PHARMACEUTICAL MANUFACTURING FIRMS IN KENYA

Source: research data, Kenya Pharmaceutical Association (2017)

1. Bayer East Africa Limited
2. Aventis Pasteur EA
3. Didy Pharmaceutical
4. Beta Healthcare.
5. Alpha Pharmaceuticals Ltd
6. Cosmos EA Ltd
7. Dawa Pharmaceuticals Ltd.
8. GlaxoSmithKline PLC
9. Eli-Lilly Pharmaceuticals
10. HighChem EA Ltd.
11. Ivee Aqua EPZ Ltd.
12. Mac's Pharmaceutical Ltd.
13. Elys pharmaceuticals Ltd
14. Manhar Brothers (Kenya) Ltd.
15. Novartis Rhone Poulenic Ltd.
16. Diversey Lever Kenya.
17. Novelty Manufacturers Ltd.
18. Pfizer pharmaceuticals
19. PMC Kenya Ltd
20. Pharmaceutical Products Limited
21. Regal pharmaceuticals
22. Phillips Pharmaceuticals Ltd.
23. Universal Pharmaceutical Ltd.
24. Aqua EPZ Limited.
25. Mac's Pharmaceutical Ltd.
26. Pfizer SA pharmaceuticals
27. Manhar Brothers (Kenya) Ltd.
28. Novartis Rhone Poulenic Ltd – Nairobi.

29. Novelty Manufacturers Ltd
30. Pharmaceutical Manufacturing Co (K) Ltd – Nairobi.
31. Regal Pharmaceutical Ltd.
32. Universal Pharmaceutical.
33. Globe Pharmacy-Nairobi.
34. Harley's limited- Nairobi.
35. Pharmaceutical Products Limited.
36. High-tech Pharmaceuticals- Nairobi.
37. Infusion Ltd-Nairobi.
38. Jaskam and Company-Nairobi
39. KAM Industrial Limited-Nairobi.
40. Laboratories and Allied-Nairobi.
41. Comet Healthcare Limited-Nairobi
42. Concepts (Africa) Limited-Nairobi.