LEAN SUPPLY CHAIN MANAGEMENT PRACTICES AND SUPPLY CHAIN PERFORMANCE OF PHARMACEUTICAL MANUFACTURING COMPANIES IN KENYA

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF MANAGEMENT SCIENCE, SCHOOL OF BUSINESS IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTERS OF BUSINESS ADMINISTRATION IN THE UNIVERSITY OF NAIROBI

NOVEMBER, 2018

DECLARATION

This project is my original work and has not been presented for a degree in any university.

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DEDICATION

I dedicate this thesis to Joel, Levis, Marios, dad, mom and my siblings.

ACKNOWLEDGEMENT

My unreserved gratitude to the Almighty God for seeing me through the entire process to completion of my Masters Degree

I sincerely thank my family for their encouragement and support during this work.

Am indebted with gratitude to my supervisor Onserio Nyamwange for his immense and immeasurably guidance through on this research work

I acknowledge the assistance of various respondents for supplying me with necessary data by filling in questionnaires.

Lastly, i sincerely thank my colleagues for standing for me at work place during off hours while I was collecting data in the field.

May the Almighty God bless you.

ABSTRACT

This study assesses adoption of LSCM practices by pharmaceutical manufacturing firms in Kenya and their effectiveness towards organizational performance. The study assumed a cross-sectional survey design. Primary data was collected from 20 of the 43 pharmaceutical manufacturing companies listed in the directory of the Kenya Pharmaceutical society. The study adopted a descriptive inferential analysis to examine demographic information of the respondents in the study. Data collected was summarized and interpreted with the aid of Ms. Excel. The study used both Pearson's correlation and Regression analysis to test the relationship and analyze the data using SPSS. The study established that several lean supply chain management practices were applied. Kanban, Visual Management, Five S (5s), Kaizen Strategy Planning practices were highly adopted with a strong correlation to the firm's performance. Consequently, to improve organizational performance, the study recommends that pharmaceutical organizations should adopt lean supply chain management practices.

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LIST OF ABBREVIATIONS & ACRONYMS

3PLs	-	Third Party Service Providers
JIT	-	Just –In –Time
KEMSA	-	Kenya Medical Supplies Agency
LSC	-	Lean Supply Chain
MRP	-	Material Requirement Planning
NVA	-	Non-Value Added
SCM	-	Supply Chain Management
TOC	-	Theory of Constraints
TPS	-	Toyota Production System
TQM	-	Total Quality management
VA	-	Value Added/ Value Addition
VSM	-	Value Stream Mapping

CHAPTER ONE: INTRODUCTION

Entities in the supply web are pressured to mitigate and even production and distribution costs, reduce time taken in the process and quantity supplied for profitability purposes while delivering their obligation to their customers. Borac, Milovanovic and Andjelkovic (2010) observes that embracing supply chain management (LSCM) can help attain this goal. However, Amarela (2017) notes work that the environmental uncertainty affects lean practices. As a result, intricate supply chain atmospheres make it harder to detect, analyze and respond to challenges.

In previous researches, supply web integration, the means upon which manufacturers apply to generate income from production could positively affect the total output. Supply web integration and buyer-supplier collaboration have been the tendency in business norm and operations across industries (Shou and Feng, 2013). They endeavor to demonstrate that supplier activities outcome is relationship oriented while Lacoste and Johnson's (2015) gives a somewhat counter-intuitive finding that the supplier performance is process oriented. This is to say that supply chain integration could influence supplier performance from the process driven perspective. A typical example of the process driven tools is "lean supply chain modeling" (Lacoste and Johnsen, 2015). This is in line with Shou and Feng (2013) observation that lean supply chain modeling and infrastructural manufacturing decisions provides means to advance supply web and therefore, supplier's performance. Their findings collaborate with the observation that there is a shared and recursive influence amid supply network attributes and practices for inculcating lean programs into the supply network. Feng found that supply web attributes may simplify or obscure the use of lean practices. Furthermore, preliminary parity or disparity status of the supply web attributes are not solved and firms can balance on lean strategies to modify it toward more favorable

conditions. In line with this basis, they categorised practices depending on how they encompass lean programs in their supply web into various categories such as "supplier involvement, knowledge transfer, lean program commitment and lean program alignment" (Shou and Feng, 2013).

1.1.1 Lean Supply Chain Practices

Lean supply chain management practice refers to an orderly method whereby value addition to the customer is emphasized through identification and eradication of waste through constant supply of the product at the customer's pull, in pursuance of perfection (Manrodt and Vitasek, 2008). Typically, LSC is a network of entities directly connected by movement of goods and services, monies and data that collectively help lower production cost and eliminate wastage by efficiently availing what is required to meet individual customer's needs (Lysons and Farrington 2006, Manrodt and Vitasek, 2008). Activities involved in a supply chain web entails procuring raw materials and parts, producing, fabricating or assembling the products and parts, inventory storage, dispensing order and tracking, through to the distribution chain and delivery of the product to the final customer (Sanders, 2012).

Various research works and articles (Corbett and Klassen, 2006; Cua, McKone and Schroeder, 2001; Cudney and Elrod, 2011; Demeter and Matyusz, 2011; Pal and Kachhwaha, 2013; Shah and Ward, 2007) have acknowledged lean practices such as value stream mapping (VSM), just-in-time (JIT), human resource management (HRM), total quality management (TQM), vendor development, and total preventive maintenance programs (TPMP) have an impact on operational performance.

Davis and Heineke, 2005; Womack, 1990; and Badurdeen, 2008, identifies lean procurement, lean production and lean transportation as the components of Lean Supply Management.

1.1.2 Organizational Performance

According to Haag, Cummings, McCubbrey, Pinsonneault, and Donovan (2006), performance encompasses completion of a task in line with predetermined ideals. This is to say that general performance determines an organizational endurance. This requires a set of measures for quantifying both the efficacy and usefulness of activities; performance measures should be based on a tactical setting since they have influence people and their activities. They further observe that organizational key dimensions of lean supply network performance standards can be based in respect to quality of products, efficiency in order delivery, price of the product, and supply elasticity. Time is considered an essential measure of lean supply network performance and a source of competitive advantage. Just-in-time (JIT) manufacturing concept propagates that an early or late production or delivery of goods constitutes wastage. Equally, minimization of throughput times is a paramount objective of Optimized Production Technology (OPT) (Haag et al., 2006).

Organizations use the balanced scorecard approach as an instrument for measuring performance. The approach guides managers on how to face shareholders on matters financial perspective, how they can excel in internal business perspective, how to present the business to potential and existing customers, and how they can constantly endeavor to develop and enhance value through innovation and learning. The firm is able to placate its vision and strategy in the defined objectives and measures instead of emphasizing on financial measures that does not offer much direction. According to

Edgeman et al., (2004), a successful strategy must demonstrate quantifiable goals and objectives.

Innovation of the balanced scorecard has ensured that while the strategy retains old financial measures telling the story of past events, where investments in long-term competences and buyer relationships were not critical for success, it has factored in, the path that information technology firms must make to create future value through investing in buyers, providers, wokers, processes, technology and innovation (Halldorsson, Kotzab, Mikkola, Skjoett-Larsen, (2007). The balanced score card is the instrument adapted to aid in measuring effectiveness of lean strategies and the supply network of pharmacological manufacturing entities in Kenya focusing on lean supply network management practices, increase in lean supply chain efficiency, cost leadership, customer satisfaction, waste reduction, best practices and lean supply chain benchmarking (Onyango, 2011).

1.1.3 Pharmaceutical Industry in Kenya

According to Kenya National Bureau of Statistics (2012), Kenya is currently the regional home for manufacturing and distribution of pharmacological products in the Common Market for Eastern and Southern Africa (COMESA) market, distributing over 50% of the COMESA market. According to a 2005 report by Export Processing Zones Authority, currently, over 60% of the COMESA region's it is projected that 50 of the recognized pharmacological manufacturers and distributors are situated in Kenya with about over "10,000 drug molecules" being legally and procedurally listed with the pharmacy and poison board -in Kenya (EPZA, (2005). These products are grouped as free sales or over the counter, pharmacist dispensable or prescription only, or as pharmacy technologist dispensable.

The pharmaceutical industry business chain is segmented into manufacturers, government agencies, wholesalers, retailers and the final consumer. They all play a crucial responsibility in supporting the country's health sector that has over 4,600 health facilities countrywide (KNBS, 2012).

Pharmaceutical manufacturers function in an intricate atmosphere due to their production processes that involves numerous interconnected steps that use lots of materials from diverse suppliers (Altria and Carleysmith 2009).

All drug supplies to government health facilities countrywide is managed by Kenya Medical supplies Agency (KEMSA). Hence, KEMSA is the principal buyer of pharmaceutical products produced both locally and imported (Mussumba, 2014). KEMSA buys over 40 % of the drugs available in the Kenyan market through an advertised open tendering process and distribute them to the 4,600 healthcare facilities in the entire country.

McFarlane and Sheffi (2003) observes that an entirely distinct "set of objectives, drivers, and constraints become dominant" once a drug has been launched. The main participants in drug supply network include manufacturers, government agencies, research organizations, distributors, hospitals, clinics, pharmacies. This supply network is charged with the distribution of all the drugs from prescription to over-the-counter medicines, generics or biologics and their distinctive handling methods (McFarlane and Sheffi, 2003).

1.2 Research Problem

The influence of lean activities on a business performance is paramount. Companies flexibility and profitability is enhanced through lean practices, implementation tools

and methods. The process of lean implementation entails process focus, pull production, value stream management, quality development, worker empowerment and continuous improvement (Shah and Ward, 2007, Pal and Kachhwaha, 2013). Lean practice endeavors to maximumly gratify customer needs by minimizing wastage. This is observed in the production processes and activities, design, distribution, human resources and inventory sections (Sang, Khairuzzaman, Abdul, Boon and Yew, 2013; Kannan, Selladurai, and Karthi, 2013). Shah and Ward (2003) observe that implementing lean practice instruments and methods help cut such lost endeavors. Initially, knowledge of lean concept and application of its objective through all avenues of partnerships and cooperation is important for the players in the network.

Various research works and articles on lean practices focus on the implementation of systems and their effect on operational performance (Demeter and Matyusz, 2011; Shah and Ward, 2007; Pal and Kachhwaha, 2013; Cudney and Elrod, 2011; Cua, McKone and Schroeder, 2001; Corbett and Klassen, 2006). Minimal research exist on the application of the lean strategy in the supply web and detect the greatest significant instruments and strategies that could assist to realize the intents of lean concept. A study by Onyango (2014) intimates that among government agencies in the ministry of health connects LSCM and organization performance with workplace planning taking the largest effect while problem-solving showed the lowest effect on the firms studied. Research of Azagedan et al. (2013) has found that the atmospheric uncertainty affects lean activities. Hence, intricate atmospheres make hard detecting, analyzing and responding to hitches.

Mutual interactions between lean practices and supply chain integration across the supply chain network were previously studied, but no studies were found that described

the conditions for lean adoption and integration within an intricate pharmaceutical network.

1.3 Research objectives

The study was anchored on the following objectives:

i. To establish the lean practices in the supply chain of the pharmaceutical industry.
ii. To determine lean practices within the supply web in the pharmaceutical supply chain industry performance.

1.4 Value of the Study

The findings of this study will be valuable to both authorities in the academia in contributing in the scholarly work and business strategists and decision makers who endeavor to maximize stakeholders' expectations. The study is essential during the adoption and implementation of the most appropriate lean supply chain management practices in manufacturing firms especially in the pharmaceutical manufacturing industry in ensuring operational efficiency, proper formulation of adequate policies enabling the firm to fully realize its maximum potential using the tiniest existing resources.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this section, the researcher gives an analysis of theories associated to the subject matter of this study, an examination of previous literature related to lean practices, implementation of lean programs to supply networks, empirical literature review and a conceptual framework of the study.

2.2 Theoretical Framework

In this section, the research introduces and explores the Theory of constraints (TOC) and Systems Hypothesis and in respect to this research.

2.2.1 Theory of Constraints (TOC)

TOC theory reflects on maximizing the system's performance (Gupta and Andersen, 2012). Products, inventory and operating costs are the general measures recognized by the TOC theory for assessing company's performance against its own business objectives (Gupta and Andersen, 2012). These three assesses operational efficiency and can be applied in the management of the firm to help attain a constant growth (Gupta and Andersen, 2012). They further stated that TOC's presupposes that a constraint per system diminishes the ability for maximum performance in relation to organizational goals (Gupta and Andersen, 2012). By refining the frailest operating activity, any firm can advance its performance and incline itself towards realizing set goals (Rhee et al., 2010). A new constraint develops once an organization eliminates a previous one, and has moved to a higher production or service level, and another cycle of a new restriction restarts (Gupta and Andersen, 2012). SCM assists a firm to gain a competitive edge by enabling it lower the stock level, order-re-order time, number of backorders, increase

the service dependability, improve customer gratification, lower operation costs and improve overall competitive edge (Talib and Hamid, 2014).

A research by Oglethorpe and Heron (2013) used the Theory of Constraints technique to distinguish and subdue the functional, supply web blockades, and restrictions that happen in the pharmaceutical supply chains, particularly with fewer manufacturers, as they look to penetrate the market over a more extensive geographic territory. According to Oglethorpe and Heron (2013), TOC provides a progression of knowhow within pharmaceutical supply web scrutiny and is done to retain visibility in use. Further, to conquer operational obstructions, Oglethorpe and Heron (2013) identified seven general classes of constraints that are based on: result of nature of market, scale and nature of products; institutional imperatives; supply chain relationships; certification, policy, and legal limitations; employment and skills; and individual convictions and humanoid attribution.

2.2.2Systems Hypothesis

According to Ackoff (1981), a system is an arrangement of more than two interrelated components that operate by at bare minimum every component influencing another factor. Systems hypothesis integrates design, creating connections and their functionalism in harmony with a shared objective (Laszlo, 1995a). Organizational activities in the supply web connections and interphases make the structural segments of this hypothesis. Together, these connections and interphases shape well-knit and interconnected functional attributes that work interactively in realizing an ultimate operation supply chain goal (Bertalanffy, 1968). Flynn (2011) demonstrates that general consequences due to lean activities in the supply chain emanate from the systems theory's aggregate intervention areas, whereby, all network players together

participate in formulating, institutionalizing and usage of lean instruments and procedures. This presents an ideal systematic method to constant development and subsequently performance as every one of these connected operations.

2.3 Lean Supply Chain Management Practices

A fundamental stride in execution of Kaizen system is determination of the appropriate devices for use of Kaizen approach in respective organization or industry (Imai, 2012). In view of some published scholarly work, this segment presents data gathered on lean instruments and the examples on the application of these instruments. These entails lean practices systems such as Value Stream Mapping, Visual Management, Total Productive Maintenance, Kaizen, Just–In-Time , Five (5)s, Kanban System Jidoka (Automation), Single Minute Exchange of Die, and Heijunka (Level Scheduling).

Kaizen as an instrument intends to design and strategize the program of ceaseless change and social change of an organization or association. Kaizen is directly identified with the designing and preparation of a firm's value process and streamlines VSM through examination of the present circumstance; summarizing the Kaizen Strategy; improving the Strategic Plan; and follow-up, to enhance knowledge (Kaizen Organization, 2014). This tool primarily focuses on the advancement of a tactical strategy for persistent change by showing how to enhance quality, lower cost, ensure prompt delivery, incentivizing personnel and clarify management duties and backing a constant advancement program bolstered (Kaizen Establishment, 2014).

The Five S is an instrument that intends to add to great state and functionality of all workstations, by tidying and sanctioning (Melton, 2005). This tool is categorised into: sort or seiri – elimination of redundant things; straighten or seiton – placing the items in a manner that is easy to pick them; shine or seiso – tidying the work atmosphere;

standardize or seketsu – preserving the previous phases; and sustain or shitsuke by maintaining all the ideals in an orderly manner (Imai, 2012).

Tenera e Pinto (2014) observes that, primarily, visual management intends to distinguish the working area and helps in communication, to highlight errors and to abstain from committing errors. Advancement of visual management is portrayed as amongst the best Lean instruments and whose effect is swiftly experienced, while its viable adoption in the manufacturing process adds to the speedy growth of the primary pointers of productivity such as safety and value, working as a link amongst workers and the manufacturing process (Murata and Katayama, 2010).

Shingo (1985) propounded the SMED while adopting JIT in Toyota. The principle objective of Taiichi Ohno was smaller production, frequent batches to maintain flow and eradicate inventory. Shingo endeavored to lessen throughput period with the goal of manufacturing smaller consignments without undermining production performance (Ferradas and Salonitis, 2013). Shingo (1985) highlights five SMED methodology steps, namely; observing the present methodology; isolating actions; changing inner activities to exterior; lowering the inner actions; and lastly, lowering the exterior activities. Upon coalescing these steps, Shingo attained unexpectedly optimistic results in lowering turnover period, though complete success was attained upon involving every personnel who participated towards realization of this success were incorporated (Almomani et al., 2013).

Kanban emanated from Toyota Production System as a subsystem with the intent to regulate quantity of stock, stock orders and the constant acquisition of raw materials and parts. Kanban encapsulates a regulatory method that enhances flow of material and

screens the production of the required items in the appropriate quantity and time (Lage Junior e Godinho Filho, 2010).

2.4 Measuring Organizational Performance

Various previous researchers have examined supply chain performance from diverse viewpoints. Wang, Lin, and Liu, (2009) examined supply chain performance in right of product development strategy concentrating on efficiency. Vanichchinchai and Igel (2009) measured supply chain performance in relation to cost, flexibility, responsiveness, and relationship. Ibrahim and Ogunyemi (2012) adopted the measures of flexibility and efficiency to investigate supply network performance. According to Shepherd and Günter (2006); Abdallah, Obeidat, and Aqqad (2014) efficiency and effectiveness are the appropriate measures of supply chain performance.

Efficiency entails utilization of least resources and usually measured in relation to cost and inventory turnover (Abdallah, Obeidat, and Aqqad, 2014; Lee, Kwon and Severance, 2007). Flexibility is an essential measure of supply chain performance generally regarded as a response to environmental uncertainty (Abdallah, Anh, and Matsui, 2016). It refers to the ability of availing products or services to supply the needs of a particular customer (Gunasekaran, Patel, and Tirtiroglu, 2001).

According to Gunasekaran, Patel and Tirtiroglu (2001) supply chain performance measures can either be in fiscal and non-monetary terms. Fiscal measures are necessary for decision making by management while operational measures are essential to lower management and workers for routine business.

Application of various measures in the performance metrics like balanced scorecard approach, fiscal and nonmonetary measures at the strategic, tactical and operational

levels is advisable (Gunasekaran et al., 2001). Supply chain performance can be evaluated at management and operation levels. At the strategic level, supply chain performance measures influence at the top level of executive decisions and it reflects on examination and level of observance of wide-raging policies against organizational objectives. At the tactical level supply chain performance entails resource distribution and evaluating results based on set projections to realize particular results at the strategic level. At operation level, precise information and directions are issued by line managers. At the operational level, measurement standards are appropriate for routine activities and as a result main metrics are time and non-financial.

Non-financial metrics which are most related to time and cost entail order and delivery lead times. Such metrics are necessary for making strategic pronouncements like long-term plans and strategies by top management (Gunasekaran et al. 2001, 2004).

Supply chain performance measures are classified by Shepherd and Günter (2006) into five procedures, namely; planning, sourcing, making, delivering and return or customer gratification, irrespective of whether they assess cost, quality, time, innovativeness and flexibility or if they are numerical or qualitative measures.

2.5 Implementing Lean Programs in Supply Networks

Kenyan pharmaceutical manufacturers work in an intricate atmosphere since their production process entails several unified processes that consumes several materials from distinct providers. Most manufacturers have adopted a lean strategy (Altria and Carleysmith 2009) hence lowering production period and enhanced proficiency in manufacturing and procurement processes.

Research of Azagedan et al. (2013) has discovered that the ecological vulnerability influences lean operations and lean procurement practices. As a result, intricate atmospheres lenders it problematic detecting, diagnosing and reacting to challenges. For instance, in an intricate supply environment, it may be difficult to detect whether the inventory shortfall emanated from defective raw material, a late conveyance from a provider, or an internal procedure problem that happened in the manufacturing process. Intricate atmospheres do enhance the possibility of operational errors. For instance, firms in a more intricate atmosphere have most providers, intensifying possibility or errors in projecting handling and requirements for raw material and in-bound logistics (Azadegan, Patel et al. 2013). The higher volatility and uncertainty levels in changing atmospheres undermines lean activities to harmonize manufacturing process and lessen inventory levels, undermining efficacy of lean activities (Azadegan, Patel et al. 2013). Previous researches define supply chain integration as a modest means that producers use to gain economic rents and that this could influence general performance positively. Supply chain integration can be realized through adoption of; supplier participation, knowledge transfer, lean program commitment and lean program alignment strategies.

Supply chain management through integration is presently taken as a vital instrument for expanding a firm's competitive edge. Supply chain traverse flow and storage of raw material, incomplete inventory production, and finished merchandise at source to the last point of sale (Qrunfleh and Tarafdar 2013). This is to say, a strategic supply chain signifies an array of practices in support of network methodology such as creation of an enabling relationship with providers, eradicating wastage, enabling customization, and exchange of information within the distribution network (Li et al., 2005; Zhou and Benton, 2007; Li et al., 2006; Wong et al., 2005). Such practices constitute paramount methods of integration adopted in the distribution network like

external integration observed through tactical supplier partnership and delivery integration observed through deferment (Frohlich and Westbrook, 2001).

Tactical supplier relationship is the lasting bond between a firm and its providers, that affect tactical and operational competences of companies involved in helping them realize substantial constant benefits (Li, Rao et al. 2005).

2.6 Empirical Literature Review

In a study regarding lean business and supply chain performance of Kenyan pharmaceutical manufacturers and distribution network, Onyango (2011) observes that Global Benchmarking, Electronic inventory management, TQM practices, ICT integration in the supply chain, Innovation and creativity, Satisfactory customer services, zero waste tolerance, JIT delivery services were related to Performance of Pharmaceutical companies in Kenya with a 70% variation. Onyango (2011) further observes that those practices were linearly related with Performance of Pharmaceutical companies in Kenya.

In a study by Wainaina (2009) regarding SCM key practices in Kenyan private manufacturing firms, it was found that lean firms encounter challenges such as inefficient monitoring and control of provider's delivery time and commitments, lack of integration and partnership in the distribution network, poor inventory review due to lack of constant checks, lack of a defined line of responsibility within the SCM, poor marketing strategy, inability to recognize and understand production and management constraints, and poor capacity planning.

Bolo (2009) studied on designated tactical variables on firm's performance and found out that various challenge such as resistance to change by management and inadequate

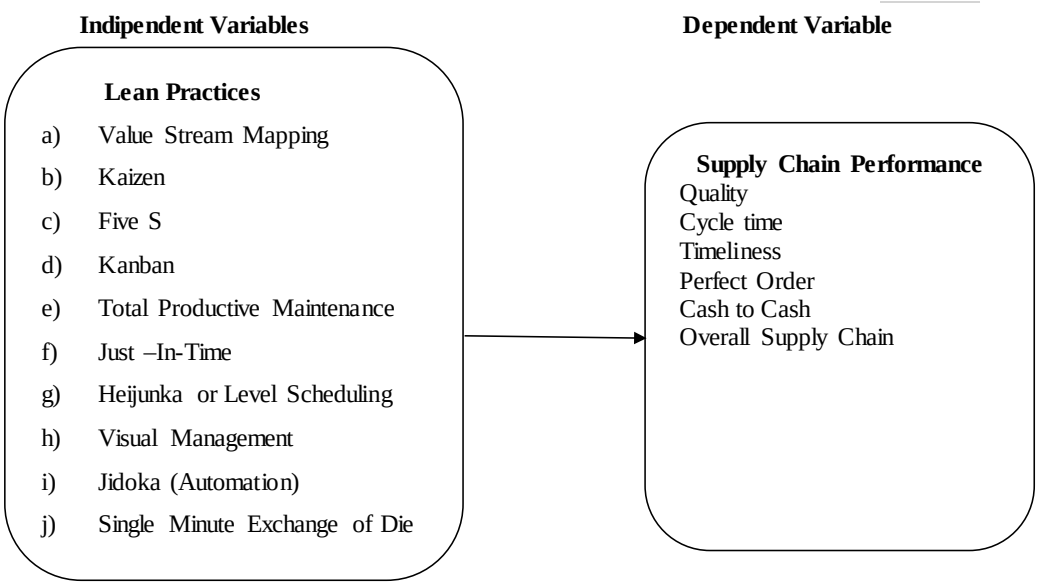
technology to support the concept were key hindrances of the practice. Supply chain management practices primarily reflecting on customer service management, supply chain integration, geographic proximity, information sharing and JIT capabilities (Bolo, 2009). Other researchers such as Simone and Kleiner (2004) focused on outsourcing, tactical provider relationships, exchange of information, product modularity and customer relationship supply practices in creating at supply chain responsiveness. Locher (2007), Schonberger (2007) and McManus (2007) also intimate that "sustained relationship, cooperation, exchange of information, process integration and supply chain leadership are key determinants of lean supply chain practices of competitive companies.

Kamaru (2012) did a study on application of Lean supply chain practice in projects relating to construction of urban roads and revealed that companies were keenly emphasizing on customer, creating paths for waste reduction, practicing continuous improvement in their processes and adopting JIT techniques in inventory management. Benefits accrued from implementation of lean supply chain practices include cost reduction, waste elimination and profit maximization.

2.7 Conceptual Framework

A research by Bortolotti et al (2016) posits that there is a shared and recursive effect amid supply chain attributes and practices for spreading the scope of lean programs to the supply network. Based on this research and other case studies we designed the conceptual framework below.

Figure 2.1: Conceptual Framework



Source: Researcher, 2018

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Here, you find the design applied for research, the population of target in the research, data collection method and the process for analyzing findings.

3.2 Research Design

The research adopted a cross-sectional survey. It aims at evaluating the effectiveness in the application of lean practices and supply chain performance of Kenyan manufacturing pharmaceutical firms. This kind of a survey gives room to assess connections and interrelationships among variables and sub-groups in a population (Easterby-Smith, Thorpe Jackson and Lowe, 2008). Dillon, Madden, and Firtde (1994) observes that survey research intends to define and clarify particular attributes of a pre-specified set of individuals, households, institutions or objects. The study is descriptive and endeavors to find out what, where and how of a phenomenon and data will be collected from a sample selected to represent a larger population (Hines, 2004)

3.3 Population

This survey targeted a population of the 43 pharmaceutical manufacturing companies listed in the directory of the Kenya Pharmaceutical society (KPA, 2016). The study concentrated on those that are tasked in running and controlling of the crucial processes in the supply web and engage with employees such as supply chain managers, and production managers or those responsible for supply chain function of the organization, directly.

3.4 Sampling design

Mugenda and Mugenda (2013) observes a 10% to 30% sample size is a good representation of the target population when the population is below 10,000. Due to limited resources (in relation to time and effort) for the researcher and to present accurate and fair aspect of the population characteristics, the study used random sampling method and targeting all the supply chain managers, and production managers or those responsible for supply chain function of the organization from the 13 firms a 30% sample size selected from the sampling frame.

3.5 Data Collection

A questionnaire was used to gather primary information directly from a sample of 48 managers. The researcher targeted distribution managers, production managers and their assistants as well and those responsible for supply chain function of the organization. The questionnaire was administered by the researcher supported by research assistants through drop and pick method.

3.6 Data Analysis

The researcher adopted a descriptive inferential analysis to examine demographic information of the respondents in the study, and lean practices applied by the pharmaceutical manufacturing companies. This technique helped the researcher to clarify which practices with the highest influence on organizational performance that will help in spreading the scope of lean programs to supply networks. Data collected was summarized and interpreted with the aid of Ms. Excel and results presented in graphical format.

Table 3.1 Summary

Objective		Data Collection	Analysis
i.	To establish the lean practices in the supply chain of the pharmaceutical company.	Primary Data: Questionnaires	Inferential Analysis
ii.	To determine lean practices within the supply web in the pharmaceutical supply chain performance.	Secondary Data: Previous Literature	Regression Analysis & Correlation

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

In this chapter, the researcher presents the analysis of data collected from respondents and interpretation of the same according to the purpose of the study. The analysis of the findings is presented in both qualitative and quantitative format. The chapter is structured in line with the structure of the questionnaire. This chapter further presents a discussion on what was observed from the findings.

4.2 General Information

In this section, the research sought to gather information regarding the respondent(s) and organization(s) in relation to respondents' position in the company, duration held that position, education level and products the company deal in.

All the respondents held positions appropriate in handling supply chain process of the respective firm. As a result, the researcher is guaranteed of the appropriate answers to the questionnaire in that all respondents understood the questions under study.

Table 4.1: Respondents' Position in the firm

Position	**Frequency**	**Percentage**
Production Manager	4	20%
Warehouse and Supply Chain Manager	5	25%
Supply and Distribution Manager	6	30%
Sales Manager	5	25%
Total	**20**	**100%**

Source: research data.

The respondents were asked about the duration they have held their respective positions at the organization. About 50% indicated they have held it between three to six years with 30% having held it for over six years. Only a 20% had held their respective positions for less than 3 years.

Respondents indicated their highest attained education level to assess the validity of the responses presented. The distribution of respondents' highest education level attained is shown in Table 4.3 below.

Table 4.3: Respondents Education level distribution

Education Level	**Frequency**	**Percentage**
Diploma Certificate	4	20%
undergraduate degree	12	60%
Master's degree	4	20%
Total	**20**	**100%**

Source: research data.

Most respondents were undergraduates. At 60% of the respondents while diploma and master degree holders represented 20% each of the respondents. This is consistent with Odago (2016) findings where undergraduate was the majority with 54.5%, Masters holders at 27.3% and Diploma holders were the least with at 18.2%.

From the findings, it was observed that all firms produce both branded and generic drugs. These products are further grouped as either free sales or over the counter, pharmacist dispensable or prescription only, or as pharmacy technologist dispensable.

4.3 Lean Supply Chain Practices

In this section, the research sought to gather information regarding the respondent(s) and organization(s) in relation to respondents' position in the company, duration held that position, education level and products the company deal in.

The respondents were asked if their organization has adopted any lean practice in the supply chain. LSC practices such as VSM, Kaizen, JIT, Five S, Kanban System, TPM, Automation, SMED, Level Scheduling and Visual Management were presented as possible options.

Table 4.4: Adoption of Lean Supply Chain Practices

Lean Supply chain Tool	Frequency	Percentage
VSM	18	90%
JIT	16	80%
Kaizen	20	100%
Kanban	16	80%
Visual Management	3	15%
5s (Sort, Straighten, Shine, Standardize and Sustain)	20	100%

Source: research data.

From the findings, it was observed that more than 60% of the respondents has adopted lean tools such as Kaizen (100%), 5s (100%), JIT (80%), Kaban (80%) and Total Productive Maintenance (60%). This is consistent with the findings of Mussumba (2014) who found that application of the Kaizen, flow-pull system, five s, lean production and waste elimination was at a great extent as demonstrated with a "mean of 4.92, 4.90, 4.88 and 4.72 with standard deviation of 0.85, 0.88, 0.75 and 0.65" respectively.

The respondents were asked about the duration, in years, the firm has been practicing lean supply chain practices. It was observed that over 50% of the respondents indicated

that their firm has practiced leans methods for more than 3 years with over 30% having had over 6 years of practice. The distribution is shown in Table 4.5 below.

Table 4.5: Duration of practicing lean methods in the organization

Years	**Frequency**	**Percentage**
>3	4	20%
3-6	10	50%
<6	6	30%
Total	**20**	**100%**

Source: research data.

4.4 Application of the lean supply chain management practices tools and procedures

The researcher also endeavored to know how the organizations have applicated lean supply chain management practices tools and procedures. The respondents also indicated the extent the firm applied the LSCP tools and procedures on a Likert scale of 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.

The following results were realized.

Table 4.6: Application of the lean supply chain management practices tools and procedures

LSC Practices	**Mean**	**Standard Deviation**
Kanban	0.849	1.1619
Visual Management	0.693	0.9487
FIVE S (5s)	1.697	1.0724
Kaizen Strategy Planning	0.447	0.4472

Source: research data

The researcher found out that Five s (mean= 1.697, Sd = 1.0724) Kanban (mean= 0.849, Sd = 1.1619) and Visual Management (mean= 0.693, Sd = 0.9487) to be the most widely adopted LSCM practices. This is consistent with the observation of Bezemer-Sarac (2017) that a typical lean application entails a preliminary value stream mapping (VSM) which outlines the process of improvement. It is then followed by organizing of the premises which could involve flexible work structures most especially the Five S. later, other specific Lean Manufacturing Practices tools are applied as relevant.

4.3.4 Lean Manufacturing Practices implementation impact on organization performance

In this section, the respondent rated on a Likert Scale the nature and degree upon which adoption of Lean management practices has impacted organization performance.

The following results were realized.

Table 4.7. Lean Manufacturing implementation impact

Lean Manufacturing implementation impact	Mean	StDev
Reduction in Work-in-progress	0.19	0.261
Low production cost	0.19	0.261
Stock/Inventory reduction	0.13	0.057
Reduced Lead- time	0.13	0.057
Reduced Set -up time	0.13	0.057
Productivity improvement	0.19	0.261
Waste elimination/reduction	0.19	0.261
Quality improvement -Product and service	0.19	0.261
Improved Sales volume	0.17	0.057
Enhanced Profitability improvement	0.17	0.057
Increased return on investment	0.18	0.179
Reduced Labor	0.13	0.057
Enhanced material flow and through put	0.13	0.057
Increase in company market share	0.17	0.057
To gain competitive advantage	0.17	0.084

Source: research data.

With a standard deviation of about 5 point, the researcher found reduction in Work-in-progress, low production cost, productivity improvement, waste elimination/reduction, quality improvement -Product and service to be the most predominant aspect that has been highly impacted by the adoption of LSCM practices.

This is in consonance with the findings of the Aberdeen group (2006) that observed that most manufacturing entities to be use lean practices within the supply network to enhance operational performance and lower operating cost. According to Industry Week (2010), lean organization augments the movement of goods and services to its clientele. It delivers value to customer by lowering lead times enhancing quality, eradicating waste and lowering the overall.

4.5 Supply Chain Performance

4.4.1 Rating the supply chain performance measures as in the following categories in respect to your organization.

Table 4.8. Plan Category

	Ineffective		**Effective**	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Cost-based measures	3.8000	2.0494	16.2	0.5477
Time-based measures	6.6	3.8471	13	4.5826
Flexibility measures	5.6000	0.5477	14.4000	0.5477

Source: research data.

It was realized that planning for supply chain performance is cost effective, should be timely and flexible. This is observed with a high mean of 16.2, 13 and 14.4 respectively. According to Supply Chain Council (2004), the objective of this process is balancing the demand with resources capabilities. It also determines business rules to measure and improve supply chain efficiency. The rules are relating to inventories,

transportation, replenishment, distribution, assets and regulatory compliance. Finally, it aligns the supply chain plan with the business fiscal plan (Supply Chain Council, 2004).

Cost related measures reflected on sales, value-added productivity, profit, cost of goods sold, rate of return on investment. Time-based measures reflect on total Supply network response time, order fulfillment and delivery time, product development cycle time, percentage reduction in production time. While quality-related measures reflect on exactness of projection methods, fill rate, order flexibility, apparent effectiveness of departmental relations, elasticity and innovativeness measures (Fattori & Gotti, 2016).

Table 4.9. Source Category

	Ineffective		**Effective**	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Quality-based measures	3.7500	0.9574	16.25	0.9574

Source: research data.

Findings on this category shows a highly effective quality-based measure (mean=16.25 and StDev= 0.96). According to Supply Chain Council (2004), this category includes all the processes related to the goods or service purchasing necessary to satisfy the demand through an effective buyer-supplier collaboration level, supplier decline rate, degree of supplier's blemish-free deliveries, extent of mutual planning cooperation resulting to enhanced quality.

At this level, the firm identifies and selects the suppliers, describes the supplier network, supplier agreements and negotiation, and supplier performances (Fattori & Gotti, 2016).

Table 4.10. Make Category

	Ineffective		Effective	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Cost-based measures	2.4000	0.5477	17.6	0.5477
Time-based measures	5	0	5	0
Flexibility measures	5.3333	0.5774	0.4444	0.5774

Source: research data.

At this category, it was observed that measures related to cost and timeliness are rated highly effective (mean = 17.6 & 5) while flexibility is ineffective (5.3). This category is related to the manufacturing and the production of products (Fattori & Gotti, 2016). It also includes the definition of the production strategy, staging product and releasing, production activities, quality control, packaging, and the management of the production chain, tools and facilities, and transportation (Supply Chain Council, 2004).

Table 4.11. Delivery Category

	Ineffective		Effective	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Cost-based measures	4.0000	0.8165	16	0.8165
Time-based measures	5.3333	0.5774	14.6667	0.57735
Quality measures	5.3333	1.1547	14.6667	1.1547
Flexibility measures	4.0000	0.0000	16.0000	0.0000

Source: research data.

Findings on cost, time, quality and flexibility-based measures relating to delivery of products rated high (16, 14.6667, 14.6667, 16.0000 respectively). Supply Chain Council (2004) observes that This entails order management, warehousing, transportation and distribution of products.

Table 4.12. Return on Investment Category

	Ineffective		Effective	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
Cost-based measures	3.7500	1.7078	16.25	1.7078

Source: research data.

Findings on return on investment cost-based measures indicate that firms took effective measures. This category manages the activities related to the return of packaging, containers or defective product. The return involves the return inventory, management of business rules, assets, regulatory requirements and transportation (Supply Chain Council, 2004).

4.6 Correlation Analysis between lean supply chain management practices and organizational performance

In this study, an inferential statistics analysis for the lean supply chain management practices paradigms and organizational performance of the pharmaceutical manufacturing entities was done to relate Value Stream Mapping, Kaizen, Just-In-Time, Kanban, Five S and Visual Management (independent variables) to organizational performance (dependent variable). Correlation assesses the strength of connection between two variables. The correlation coefficient ranges between -1 to 1. An increase in Y and decrease in X indicates a negative correlation and vice versa. The closer the values are to 1 the stronger the correlation. It also indicates that the relationship is positive.

Table 4.13. Correlation Analysis

		VSM	JIT	Kaizen	Kanban	Five S	VM	P
VSM	Pearson Correlation	1	.761**	.607**	.749**	.663**	.878**	.869**
	Sig. (2-tailed)		0.000	0.005	0.000	0.001	0.000	0.000
JIT	Pearson Correlation	.761**	1	.900**	.963**	.894**	.900**	.907**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000
Kaizen	Pearson Correlation	.607**	.900**	1	.901**	.960**	.795**	.771**
	Sig. (2-tailed)	0.005	0.000		0.000	0.000	0.000	0.000
Kanban	Pearson Correlation	.749**	.963**	.901**	1	.892**	.908**	.918**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000
Five S	Pearson Correlation	.663**	.894**	.960**	.892**	1	.821**	.799**
	Sig. (2-tailed)	0.001	0.000	0.000	0.000		0.000	0.000
VM	Pearson Correlation	.878**	.900**	.795**	.908**	.821**	1	.962**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000
P	Pearson Correlation	.869**	.907**	.771**	.918**	.799**	.962**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	

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

The Pearson correlation coefficient between Visual Management practices and organizational performance is 0.962 and is the highest which indicates a significant strong positive correlation. There exists a moderately strong and significant Pearson correlation coefficient between Kaizen and Value Stream Mapping (VSM) at .607 and between Five S and VSM at .663. all other variables indicated a strong and significant positive correlation.

4.7 Regression Analysis between lean supply chain management practices and organizational performance

Regression analysis was done using SPSS to determine how well the independent variable affects the dependent variable. This was conducted to test the connection amid the lean supply chain management practices and organizational performance.

Table 4.14: Regression Model Parameters

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.975[a]	.950	.928	.31826

a. Predictors: (Constant), VSM, JIT, Kaizen, Kanban, VM, Five S

Source: Research data

The R2 which tells the goodness of fit is .950. This is interpreted to mean that Value Stream Mapping, Visual Management, Just-In-Time, Kanban, Kaizen, and Five S can explain up to 95% of changes in the organization's performance while the remaining 5% are due to chance. The standard error is an indication of the deviation from the best line of fit and in this case very low showing a good fit.

Table 4.15: Analysis of Variance of the Regression

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	25.233	6	4.206	41.519	.000[b]
	Residual	1.317	13	.101		
	Total	26.550	19			

The researcher used the Analysis of Variance (ANOVA) to assess the significance of relation prevailing between the objectives; hence, the model's significance. The ANOVA results is to say that the model has a less than 0.1 likelihood of giving incorrect estimation; this point to the meaning of the model and therefore can reliable predict the dependent variables.

Table 4.16: Significance of Independent Variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	756	.501		911	.002
	VSM	.685	.221	.116	.835	.004
	JIT	.158	.261	.154	.608	.003
	Kaizen	849	.266	242	936	.002
	Kanban	.697	.283	.369	1.402	.001
	VM	.595	.231	.548	2.577	.001
	5s	.842	.268	.037	.158	.003

The table above shows the regression coefficients of independent variables. The following regression model was established:

From the findings, the study found that:

a) holding Kanban, Value Stream Mapping, Visual Management, Kaizen, Just-In-Time and Five S at zero organizational performance becomes .756;
b) when Kanban, Visual Management, Kaizen, Just-In-Time and Five S are constant, a part increase in Value Stream Mapping results in a .685 increase in organizational performance;

c) when Value Stream Mapping, Kaizen, Kanban, Visual Management and Five S are constant, a part increase in Just-In-Time results in a 0.158 increase in organizational performance;

d) holding Value Stream Mapping, Just-In-Time, Kanban, Visual Management and Five S constant, a part increase in Kaizen would result in a .849 increase in organizational performance;

e) when the Value Stream Mapping, Just-In-Time, Kaizen, Visual Management and Five S are constant, a part increase in Kanban would result in a 0.697 increase in organizational performance,

f) when Value Stream Mapping, Just-In-Time, Kaizen, Kanban and Five S are held constant, a part increase in Visual Management would result in a .595 unit increase in the organizational performance, and;

g) when the Value Stream Mapping, Just-In-Time, Kaizen, Kanban and Visual Management are constant, a part increase in Five S would amount to a 0.842 increase in organizational performance of the pharmaceutical manufacturing firms in Kenya.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter is a summary of the research findings, a conclusion to the objectives of this study and recommendations based on the results of the findings and for further study. The intent of this study was to evaluate the effectiveness in the application of lean practices and supply chain performance of Kenyan manufacturing pharmaceutical firms.

5.2 Summary of the Findings

In this research, the researcher endeavored to evaluate effectiveness in the application of lean practices and supply chain performance of Kenyan manufacturing pharmaceutical firms. The researcher adopted a cross-sectional survey to establish the lean activities in the supply network of the pharmaceutical industry; and to determine lean practices within the supply web in the pharmaceutical supply chain industry performance. This kind of a survey gave room to assess connections and interrelationships among variables and sub-groups in the population (Easterby-Smith, Thorpe Jackson and Lowe, 2008).

The research sought to gather information regarding the respondent(s) and organization(s) in relation to respondents' position in the company, duration held that position, education level and products the company deal in. those interviewed were supply chain managers, and production managers or those directly responsible for supply chain function of the organization. About 50% indicated they have held their respective positions for a period between three to six years with 30% having held it for over six years. Only a 20% had held their respective positions for less than 3 years. Most respondents were undergraduates at 60% while diploma and master degree

holders were at 20%. Over 50% of the respondents indicated that their firm has practiced leans methods for more than 3 years with over 30% having had over 6 years of practice.

All firms under study produce both branded and generic drugs. These products are further grouped as either free sales or over the counter, pharmacist dispensable or prescription only, or as pharmacy technologist dispensable. The supply network is charged with the distribution of all the drugs from prescription to over-the-counter medicines, generics or biologics and their distinctive handling methods (McFarlane and Sheffi, 2003).

After assessing various pharmaceutical manufacturing firms, it was established that though lean supply network ethos has taken root in the pharmaceutical production sector in Kenya even though not all lean are practices well implemented. Majority of the lean supply practices applied by these firms entail Kaizen (100%), 5s (100%), JIT (80%), Kaban (80%) and Total Productive Maintenance (60%).

The study established that by adopting LSCP, firms endeavored to lessen production cost, stock/Inventory levels, lead- time, set -up time, improve productivity, eliminate wastage, improve quality of product and service, improve sales volume, enhance profitability, increase return on investment, reduce labor, enhance material flow and throughput, increase in company market share and to gain a competitive advantage.

In rating the supply chain performance measures, the researcher classified the supply chain performance measures into five supply chain procedures, namely; planning, sourcing, making, delivering and return or customer satisfaction, irrespective of whether they assess cost, quality, time, innovativeness and flexibility or if they are numerical or qualitative measures in line with Shepherd and Günter (2006).

5.3 Conclusions

Looking at the findings from the research, it suffices to say that a most of the pharmaceutical manufacturing companies have implemented lean supply chain management practices like Kaizen, 5s, JIT, Kaban and Total Productive Maintenance. The study shows that firms adopted such lean practices with the intent to lessen production cost, stock/Inventory levels, lead- time, set -up time, improve productivity, eliminate wastage, improve quality of product and service, improve sales volume, enhance profitability, increase return on investment, reduce labor, enhance material flow and throughput, increase in company market share and to gain a competitive advantage.

Supply chain performance measures can be classified into five supply chain procedures, namely planning, sourcing, making, delivering and return or customer satisfaction. According to the Supply Chain Council (2004), plan category includes the demand planning the and supply chain management. This process intends to balance the demand with resources capabilities. It also determines business rules to measure and improve supply chain proficiency. The rules relate to inventories, transportation, replenishment, distribution, assets and regulatory compliance. Finally, it aligns the supply chain plan with the business fiscal plan (Supply Chain Council, 2004).

Supply Chain Council (2004) observes that the source category entails all the processes related to the goods or service purchasing necessary to satisfy the demand. It identifies and selects the suppliers, describes the supplier network, supplier agreements and negotiation, and supplier performances. While make category relate to the manufacturing and the production of products. This step also includes the definition of

the production strategy, production process, packaging, quality control, staging product and releasing, and the management of the production network, equipment and facilities, and transportation (Supply Chain Council, 2004). Delivery category entails order management, warehousing, transportation and distribution of products while return investment category is concerned with managing the activities related to the return of packaging or substandard product. The return involves the management of business policies, return inventory, resources, carriage and regulatory requirements (Supply Chain Council, 2004).

In these five categories, supply chain performance measures reflect on the efficiency and effectiveness of costing, quality, timeliness, innovativeness and flexibility in their quantitative or qualitative measures. This is in consistence with Vanichchinchai and Igel (2009) who measured supply chain performance in relation to cost, flexibility, responsiveness, and relationship. Ibrahim and Ogunyemi (2012) adopted the measures of flexibility and efficiency to investigate supply chain performance. Researchers such as Shepherd and Günter (2006); Abdallah, Obeidat, and Aqqad (2014) observed that efficiency and effectiveness are the appropriate measures of supply chain performance. In a nutshell, adoption of lean suppl chain practices by manufacturing pharmaceutical companies in Kenya enhanced their productivity upon efficient and effective utilization of least resources as observed by Abdallah, Anh, and Matsui (2016). This is observed in their ability to respond to environmental uncertainty such as availing products or services to supply the needs of a particular customer as opined by Gunasekaran, Patel, and Tirtiroglu (2001).

5.4 Recommendations

Even though manufacturing firms have adopted lean supply chain practices, the researcher recommends that it is essential they invest in enhancing employee skill and knowledge acquisition in lean supply chain management practices. This study further recommends setting of a world class benchmarking position in adopting a lean strategy that will enable the firm compete globally, lowering production period and enhancing proficiency in their respective manufacturing and procurement processes. To enhance the efficacy of lean activities, the study recommends supply chain integration to be realized through adoption of supplier participation, knowledge transfer, lean program commitment and lean program alignment strategies.

5.5 Limitations of the study

Though all the respondents submitted their responses, the main challenge experienced throughout the study was the concealment of some information by some respondents. The study was also limited in scope as it only interviewed the organizational decision makers in the supply chain. It would be more informative if the scope was extended to capture all the stakeholders in the supply chain. This was limited by time and financial constraints.

5.6 Suggestions for Further Study

The researcher suggests that for future studies, future researchers should explore challenges facing adoption and efficient implementation of Lean Supply chain practices in the pharmaceutical industry and other industries in Kenya. The researchers should further explore on the preferred and highly adopted lean supply chain management practices. Possible effects of technology and innovation in the adoption of lean supply

chain management practice in the pharmaceutical manufacturing sector should also be explored.

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APPENDIX II: INTRODUCTION LETTER

July 26, 2018.

Dear Sir/Madam,

RE: COLLECTING OF RESEARCH DATA FOR MASTER OF BUSINESS ADMINISTRATION

I am a postgraduate student pursuing a Master of Business Administration in the School of Business at the University of Nairobi. As a partial fulfillment of the requirements for the award of the MBA degree, I am carrying out a research on "*lean practices and supply chain performance of Pharmaceutical Manufacturing companies in Kenya'*. I, therefore, kindly request for information regarding lean supply chain practices in your organizational.

The information you provide is purposely meant for this study and will solely be used for academic purposes. Your organizational identity will remain confidential. I hereby undertake not to make any reference to your organization's name in any presentation or report stemming from this research.

Considering that filling the questionnaire is time consuming and I will greatly appreciate your assistance. I will also highly appreciate additional of any other relevant information in form of suggestions and comments that you shall find appropriate to make my research findings more conclusive, relevant and reflective of the study.

Thanks in advance.

Yours faithfully,

GRACE MUTHONI KIUNDU
D61/5799/2017
University of Nairobi
MBA Student

APPENDIX III: RESEARCH QUESTIONNAIRE

SECTION ONE: GENERAL INFORMATION

1. Respondent's job cadre

   a) Head of Sales ( )

   b) Head, Business Development ( )

   c) Head, Supply Chain ( )

   d) Head of Operations ( )

   e) Finance manager ( )

   f) Engineering /Environment safety manager ( )

2. **Duration on the position held in this organization**

less than 5 years ( ) 5 -10 years ( ) 10-15 years ( ) Over 15 years ( )

3. Education background

   a) PhD ( )

   b) Masters/Post-graduate ( )

   c) Graduate ( )

   d) Undergraduate ( )

   e) Diploma ( )

   f) Certificate ( )

   g) Others (specify)…….....

4. Which products does your company deal in?

   a) Tablets [ ]

   b) Capsules [ ]

   c) Liquids/syrups [ ]

d) Ointments [ ]

e) Infusions [ ]

f) Creams [ ]

g) Vet products [ ]

SECTION TWO: ADOPTION OF LEAN SUPPLY CHAIN PRACTICES

i. How long has your organization adopted lean practices?

a) less 5 years ( )

b) 5 -10 years ( )

c) 10-15 years ( )

d) Over 15 years ( )

ii. Which among the lean practices listed below is adopted in your organization.

Kindly tick where appropriate

	Lean Supply chain Tool	**Tick where appropriate**
1	Single Minute Exchange of Die (SMED)	
2	Kaizen	
3	Visual Management	
4	Heijunka (Level Scheduling)	
5	Just In Time-(JIT)	
6	Kaizen (Continuous Improvement)	
7	Jidoka (Automation)	
8	Value Stream Mapping	
9	TPM (Total Productive Maintenance)	
10	Kaban	
11	5s (Sort, Straighten, Shine, Standardize and Sustain)	

iii. To what extent does your organization apply the following tools and procedures 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.

Kanban control	**5**	**4**	**3**	**2**	**1**
· stock levels					
· production orders					
· the supply of components					
· raw materials					
Single Minute Exchange of Die (SMED)					
· preserving the existing methodology					
· unravelling the interior and peripheral activities					
· altering internal activities to external					
· lowering the internal activities					
· lowering the external activities					
· lowering changeover times					
· gaining the commitment of all employees involved					
Visual Management					
· Enhance ability to highlight anomalies					
· visually identify the area of work					
· rapid increase of safety					
· rapid increase of value and yield					
· linking employees and production system					
FIVE S (5s)					
· removing unnecessary items					
· arranging the items so they can be easily picked					
· cleaning the workstation					
· standardizing production activities					
· keeping all the standards in order					
Kaizen Strategy Planning (KSP)					
· analyzing of the current business situation					
· quantifying the present business state					
· identification of the enhancement proposals					
· establishment of a task control room					
· reflection of the lessons learned in order to enhance knowledge					
· prioritization of the proposed initiatives					

·	a tactical plan for constant advancement					
·	methods to enhance quality, cost, delivery, motivation indicators					
·	defined role of leadership					
·	support of a continuous advancement program					

iv. 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**
1	Reduction in Work-in-progress					
2	Low production cost					
3	Stock/Inventory reduction					
4	Reduced Lead- time					
5	Reduced Set -up time					
6	Productivity improvement					
7	Waste elimination/reduction					
8	Quality improvement -Product and service					
9	Improved Sales volume					
10	Enhanced Profitability improvement					
11	Increased return on investment					
12	Reduced Labor					
13	Enhanced material flow and through put					
14	Increase in company market share					
15	To gain competitive advantage					

SECTION THREE: MEASURING SUPPLY CHAIN PERFORMANCE

1. **How do you rate the supply chain performance measures as in the following categories in respect to your organization?**

Tick [√] where appropriate.

PLAN CATEGORY

Cost-based measures	**Ineffective**	**Effective**
i. sales		
ii. profit		
iii. rate of return on investment		
iv. value-added productivity		
v. cost of goods sold and		
Time-based measures		
i. total SC response time		
ii. order lead-time		
iii. order fulfillment lead-time		
iv. product development cycle time		
v. percentage decrease in time to produce a product		
Quality based measures		
i. accuracy of forecasting techniques		
ii. fill rate		
iii. apparent efficacy of departmental relations		
iv. order flexibility		
v. flexibility and innovativeness measures		

SOURCE CATEGORY

quality-based measures	**Ineffective**	**Effective**
i. buyer-supplier relationship level		
ii. extent of supplier's blemish-free deliveries		

iii. supplier rejection rate		
iv. extent of mutual planning cooperation leading to improved quality		

MAKE CATEGORY

Cost-based measures	Ineffective	Effective
i. total value of resources		
ii. production cost		
iii. stock investment		
iv. stock obsolescence		
v. work in process		
time-based measures		
i. projected process cycle time		
ii. production lead-time		
iii. time required to produce an item or set of items		
flexibility measures		
i. production flexibility		
ii. capacity flexibility		
iii. volume flexibility		

DELIVERY CATEGORY

Cost-based measures	Ineffective	Effective
i. total logistics cost		
ii. distribution cost		
iii. delivery costs		
iv. transport cost per unit of volume		
Time based-delivery measures		
i. delivery lead-time		
ii. average lateness of orders		
iii. percent of on-time deliveries		
Quality measures		

i.	delivery performance		
ii.	delivery reliability		
iii.	quality of delivered goods		
flexibility measures			
i.	delivery flexibility		
ii.	transport flexibility		

RETURN ON INVESTMENT CATEGORY

Cost-based measures		**Ineffective**	**Effective**
i.	customer satisfaction		
ii.	level of customer perceived value of product		
iii.	customer complaints		
iv.	product quality		

Thanks in advance

APPENDIX III: MAJOR PHARMACEUTICAL MANUFACTURING FIRMS IN KENYA

1. Bayer East Africa Limited
2. Aventis Pasteur EA
4. Beta Healthcare.
5. Alpha Pharmaceuticals Ltd
6. Cosmos EA Ltd
7. Dawa Pharmaceuticals Ltd.
8. GlaxoSmithKline PLC
10. HighChem EA Ltd.
11. Elys pharmaceuticals Ltd
12. Manhar Brothers (Kenya) Ltd.
15. Novartis Rhone Poulenic Ltd.
16. Diversey Lever Kenya.
17. Regal pharmaceuticals
18. Phillips Pharmaceuticals Ltd.
19. Harley's limited- Nairobi.
20. Laboratories and Allied-Nairobi.

Source: Kenya Pharmaceutical Association (2018)