IMPACT OF MANUFACTURING PLANNING AND CONTROL ON OPERATIONAL PERFORMANCE OF PHARMACEUTICAL FIRMS IN NAIROBI

BY

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DECLARATION

This Research Project is my original work and has not been submitted for the award of degree in any other university

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DEDICATION

This Research Project is dedicated to my family.

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ABBREVIATIONS AND ACRONYMS

ERP	Enterprise Resource Planning
JIT	Just in time
KAM	Kenya Association of Manufacturers
MPC	Manufacturing Planning and Control
MRP	Material Requirements Planning
MRPII	Materials Requirement Planning
TOC	Theory of Constraints
TQM	Total Quality Management
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization

ABSTRACT

Manufacturing Planning and Control systems enhance the achievement of all activities undertaken in a manufacturing firm, whose operations' success lies with well-established planning and control systems .The studies done earlier failed to cover implementation and adoption of these MPC systems in pharmaceutical firms and their effects on their operational performance. The specific objectives of this study were therefore to find out the extent of the implementation of the MPC systems in the pharmaceutical firms, find out the challenges they faced the benefits of implementation and determine the relationship between the MPC system and their operational performance. Descriptive research design was used in the study. The study population was all the 28 registered pharmaceutical manufacturing firms in Nairobi, targeting the respondents from finance, quality and operations or production departments. Questionnaires were used as instruments for data collection. Descriptive statistics such as frequencies, means, percentages and standard deviations were used. Inferential statistics such as regression and correlation analysis was used to analyze the relationship between the study variables. The study found that different aspects of manufacturing planning control systems were adopted and implemented by the firms studied. Manufacturing resource planning systems were adopted and implemented by the organizations to the greater extent (Average mean 4.05), Enterprise resource planning (3.97), Just-In-Time (3.88) and Material requirement planning system(3.83).Benefits of the implementation of MPC systems included reduction in cases of stock outs and easy monitoring of processes from all departments among others while communication barrier, insufficient utilization of labour, resistance to change, seasonal/unstable market for commodities, lack of qualified personnel, inadequate resources, prolonged decision making processes, untimely delivery of raw materials and unreliability of suppliers of materials were the challenges identified by the study. The regression analysis established that Materials Requirement Planning, Manufacturing Resource Planning, Enterprise Resource Planning and Just-in-time systems had an impact on operational performance of pharmaceutical firms in Nairobi. The study recommended that pharmaceutical firms should come up with other strategies of countering the challenges facing adoption and implementation of manufacturing planning and control systems. The main limitation to the study was the time constraint in data collection and trying to beat the deadline for project submission. The study recommended another study be done specifically of the challenges facing the adoption and implementation of manufacturing panning and controls systems in organizations which was not the main focus of this study. This study was done on the impact of manufacturing planning and control systems on pharmaceutical firms in Nairobi, the same study can be done for the same industry for the whole country and better still for another country.

CHAPTER ONE

INTRODUCTION

1.1Background of the Study

Manufacturing companies are committed to ensuring their customers get the best products they can offer using the most efficient systems put in place. Kemunto (2015) stated that manufacturing companies adopt new and emerging strategies that fit their type of business as they try to improve their production. The competitive business world brings about demands that affect the organization internally and externally and how organizations address these issues is what separates them from their counterparts (Harrington, 1995). Firms employ an operations strategy that is in reconciliation with the business strategy by guiding the day to day activities within the firm's internal processes, the operations strategy strategy being the maximization of customer value (Mwololo, 2015).

Firms use the management approach of Total Quality Management (TQM) to ensure the whole organization runs its functions in a manner that will ensure the final product is of the required quality necessary for customer satisfaction. According to Kasongo and Moono (2011) it is an approach aimed at continuously improving the competitiveness, effectiveness and flexibility of the entire organization through total involvement of everyone in the organization led by the management.

Planning and control of activities of the company are essential as the capacity available should be able to be converted into finished products to meet the demand of orders coming in and also be available for future demand for products (Jacobs, Berry, Whybark & Vollman, 2011).Manufacturing firms need to incorporate their supply

chain with the strategies of the firm for better performance of the organization as this impacts positively in the overall performance of an organization and all the competitive priorities (Miguel & Brito, 2011). Manufacturing planning and control being a sub system in the organization, plays a major role in the operation efficiency. Chermack (2011) states that, depending with the existing economic climate, a business's context may change quickly and regularly which results in a need for planning processes which take this new reality and its corresponding complexity and uncertainty into account.

Pharmaceutical Industry in Kenya, comprised of manufacturers who have invested locally, those who import their products, wholesalers and retailers, plays a major role in the healthcare sector. Human life is put at risk as drug quality is compromised due to illegal imports (Opiyo, 2006). The changing environment has also seen the patient who is the consumer, put a premium on convenience and freedom of choice as far as their own medical care is concerned (Murule,2011).Firms can use different strategies as their competitive advantages. According to Murule (2011) a cost leadership strategy is based on lower overall costs than rivals and is designed to produce goods or services more cheaply than competitors by stressing efficient scale of operation. Besides providing products at lower cost, local manufacturers should focus on quality to gain advantage over the cheap imported pharmaceutical products

1.1.1 Manufacturing Planning and Control

Manufacturing Planning and Control (MPC) is a system which brings about efficiency in managing the materials flow, utilizing human resources and equipment, ensuring the internal activities of the firm are coordinated with the suppliers and get feedback from the customers on what is required in the market (Graves,1999). This is confirmed by

Wacker and Hanson (1997) who agree that the manufacturing planning and control system is a subsystem in the organization that plays a major role in supporting the organizations manufacturing strategy giving the organization an opportunity to have a competitive advantage. The MPC system plays a major role in supporting the manufacturing process in a specific environment it has been selected for as the manufacturing function faces different environmental conditions under which it has to perform, noted Newman and Sridharan (1995). Decisions on how production resources will be acquired, utilized and allocated efficiently and effectively to ensure the customer has been satisfied are made by use of the MPC systems the firm uses (Graves, 1999).Arnold, Chapman and Clive (2011) stated that a well-executed MPC system could deliver competitive advantage and often differentiate leading manufacturers from the rest. Chan and Burns (2002) state that there are two major MPC approaches, namely the systems approach and the quantitative approach. In this study the approach which will be used is the systems approach which includes materials requirement planning (MRP), Manufacturing resource planning (MRP11), Enterprise resource planning (ERP) and Just- in- time production (JIT).

Materials Requirement Planning (MRP) is a computer based information system which tries to determine when the master schedule requirements needed for translation into finished products, would be required in what component parts and raw materials within what time (Stevenson, 2013). Manufacturing Resource Planning (MRP II) is an extended version of MRP through which manufacturing functions like production planning and control, human resources management, financial accounting, engineering, purchasing and marketing helps in a decision support system that involves all the departments in the firm (Lyson & Farrington, 2012). Enterprise Resource Planning (ERP) system, integrates the needs of all the functions and departments of a

firm to be served under a single computer system. Just-In-Time Production (JIT) refers to using the minimum resources of people, materials and machinery in meeting the customers' requirements (Lyson & Farrington, 2012).

1.1.2 Operational Performance

Operational performance is the actual achievement level of costs, flexibility, quality and speed as has traditionally been the measurements used (Ferdows & De Meyer, 1990). Firms Operational Performance is the ability of a firms' dedication in ensuring results are achieved through putting in place a strong governance and a good management system (Mwale, 2014). Christomer (1999) noted that the firm would also like to be flexible enough to produce what the customer requires at the shortest time possible and give their customers the best quality products at the minimum costs they can afford. Organizations, however, have to ensure that the operation costs have not been increased as they try to satisfy the customers' needs. This is confirmed by Schuman and Brent (2007) who noted that organizations go out of their way to reduce operation costs while at the same time try to ensure their operations are effective, revenue is collected and the customers are satisfied. According to Chase, Jacobs and Aquilano (2006), different customers are attracted by different attributes where some customers may be sensitive to manufacturing firms flexibility in providing the goods required at the shortest time. The firm should therefore emphasize on flexibility as their performance measure. Attributes of operational performances can have difference measures like cost, delivery, flexibility and quality.

Cost as defined by Lyson and Farrington (2012) is the amount expenditure incurred on a given thing. Cost is a key variable that affects pricing decisions and profits in an organization. Cost reduction efforts should be and ongoing business in organizations in

relations to productivity as this determines the output and final cost of production (Stevenson, 2013).Delivery reliability is the ability of the firm to fulfill an order perfectly (Collier & Evans, 2006).An order delivered meeting all the customers' expectations like delivery date, accurate goods, correct invoice and goods condition is considered as a perfect order. Stevenson (2013) notes that delivery time is the time needed to fill orders. Quick delivery of goods or services to the customer is a competitive advantage organizations use. Flexibility is the ability to respond to changes (Stevenson, 2013). The design features of a product or service might need alterations. A customer might change the volume of products or services required, or the mix of products or services that an organization offers. Collier and Evans (2006) noted that flexibility is the ability to adapt quickly and effectively to changing requirements. Quality, as stated by Stevenson (2013) is when the product or service has the ability to perform according to the customers expectations and requirement all the time. Lyson and Farrington (2012) noted that quality can have different definitions as different customers have different requirements and needs.

1.1.3 Pharmaceutical Companies in Nairobi

The pharmaceutical industry, according to Kenya Association of Manufacturers (2015) is comprised of manufacturers, distributors and retailers, most of them based around Nairobi. The country's health sector is estimated to have 4,557 health facilities countrywide, which is supported by all these segments in the pharmaceutical industry. Out of the fifty recognized pharmaceutical manufacturers, approximately thirty are based in Nairobi (KAM, 2015). Appendix 11.

World Health Organization (2010), noted in their report on Kenya Country Profile, that a vibrant pharmaceutical manufacturing industry had been established in Kenya, and had great potential and opportunity to serve the East African as COMESA sub-regions. In the same report, World Health Organization (WHO, 2010) noted that the sustainability of the pharmaceutical manufacturing industry would only be ensured if the challenges of trade liberalization and the challenging local manufacturing environment.

According to United Nations Industrial Development Organization (UNIDO) (2010) the pharmaceutical production can be strengthened by improving efficiency in plant operations as this would reduce production costs. In 2008, 2 per cent of Manufacturing Value Added (MVA) in the Kenyan economy was contributed by the pharmaceutical sector with an employment of 3,389 employees (UNIDO, 2010).

Decrease in customer purchasing power, the increase in importation of generic drugs and donor funding declining, lowering the purchasing power of the government are the biggest challenges faced by local pharmaceutical companies as this increased competition (Ningala,2014) . Ningala (2014) noted pharmaceutical companies have to work extra hard to secure their position in the market place by showing superiority of their products in the disease area they have invested in.

1.2 Research Problem

Manufacturing Planning and Control has been pointed out as one of the pivotal infrastructure among the subsystems in an organization that firmly supports the organizations manufacturing strategy (Wacker & Hanson, 1997).Olhager and Seldin (2007) state that the choice of the MPC approach, primarily at the sales, operations

planning and master planning level, will greatly improve the operational performance of a manufacturing firm.

The pharmaceutical industry in Kenya, according to Kalunda, Nduka and Kabiru (2012) plays a major role in supporting the country's health sector by conducting various activities to finally produce the final product. Howard, Kochhar and Dilworth (1999) noted that the different characteristic of different firms determined which activities would be beneficial to them. Supply chain performance, production flexibility and delivery performance being part of the performance measurements are undertaken by manufacturing pharmaceutical firms to improve their performance (Oketch, 2014). The choice of the MPC systems activities, depends on individual companies (Kalunda, Nduka & Kabiru, 2012).

Newman and Sridhan (1995) studied better execution of activities are enhanced by the MPC system in use and how it relates to the manufacturing environment. The environmental conditions that manufacturing functions face can be characterised by product volume and variety, the competitive priorities and the technological processes. By undertaking a market survey of manufacturing firms in United States of America (USA), they were able to identify key linkages between the MPC systems, the environment in which the firm was dealing and the organization performance. Chan and Burns (2002) did a survey on three supply chain environments in Hong Kong and concluded that the operational performance really is affected by the MPC system used by a firm. They found out that the strengths and weaknesses of an organization can be assessed by getting to find out the uses of the systems in regard to planning and control of manufacture. According to Olhager and Selldin (2007) the products produced and

their market characteristics determine the type of the MPC system to be used, the operations strategy determining the choice.

Locally, studies had been undertaken in different concepts, not concerning the MPC system as a whole but on individual systems in different contexts. Many firms, according to Momanyi (2014) have been driven to the adoption of ERP by their quest for better business positioning in the market. The data collection by means of the questionnaires from a number of manufacturing firms yielded a conclusion of many manufacturing firms having adopted the ERP system, and improvement in their general performance was also noted by the management. Kyengo (2014) in his research on the relationship between manufacturing strategy and operational performance within the metal and allied sector in Kenya, recommended sensitization of manufacturing firms by governing bodies on the formulating strategies which would enable firms have superior operation performance. Mwololo (2015) sought to find out the relationship between operational performance and competitiveness of Kenya manufacturing firms. He came to a conclusion that the level of customer value perception in a firm can improve operational excellence, through analysis of the data he collected by means of questionnaires.

Although a number of studies had been done on the concept and context of Manufacturing Planning and Control and manufacturing firms respectively, these studies have failed to cover the extent to which manufacturing planning and control systems are implemented and their effects on the operational performance of manufacturing pharmaceutical firms in Nairobi. Locally, researchers have not conclusively undertaken research on the MPC systems as a whole but rather on individual ones .This gap therefore led to this study which attempted to answer the

question;" What is the relationship between manufacturing planning and control and the operational performance of pharmaceutical manufacturing firms in Nairobi?"

1.3 Research Objective

The general objective aimed at finding out the relationship between manufacturing planning and control systems and the organizational performance of pharmaceutical firms.

The specific objectives of the study were:

i) To find out the extent of the implementation of manufacturing planning and control systems by pharmaceutical firms in Nairobi.

ii) To determine the benefits of implementation of manufacturing planning and control systems and find out the challenges faced in implementation in pharmaceutical firms in Nairobi.

iii) To determine the relationship between manufacturing planning and Control adoption and the operational performance of pharmaceutical firms in Nairobi.

1.4 Value of the Study

This study will be of benefit to the Pharmaceutical firms as the management will be in a position to note the importance of manufacturing planning and control to their firms. They would ensure that all the processes used in the system are followed for an improved performance of the firm.

The study will be beneficial to both the top and middle level management of manufacturing firms in general .The management need to understand the benefits of implementing the manufacturing planning and control in the firms, the benefits of ensuring all the processes are followed step by step to ensure the efficient performance

of the organization. This will be of importance as the managers will use this to ensure the firm meets its objectives through the laid down strategies.

To the government, the research will be of importance as the government of the day gets its revenue from the companies in the country. It is of importance for the country to have companies that perform well as this will translate to more revenues for the economy. The results can be used by the government to put policies on how they can assist firms in their countries by maybe offering funding or affordable loans to help in implementation of systems in organizations.

The study provides information to other researchers to understand why some firms do not perform well although they seem to be doing everything right. The recommendations from the study assist in making a decision on what they think was not captured, giving them a chance to research more on the topic. This should result in more improvement on how firms use the manufacturing planning and control system.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter highlighted understanding on the various scholars and their findings on the concept of Manufacturing Planning and control, principles and philosophy. The chapter also covered the empirical studies from different scholars on the study topic at hand, the summary of the empirical studies and the conceptual framework.

2.2 Theoretical Literature Review

The study was based on The Theory of Constraints and the Systems Theory.

2.2.1 Theory of Constraints

Theory of Constraints (TOC) is a set of principles that maximizes the use of all activities that would cause a bottleneck in the workstations by increasing total process throughput (Collier & Evans, 2006). TOC is a scheduling approach that simply focuses on bottleneck operations (Stevenson, 2013). These bottleneck operations are described by Jacobs, Berry, Whybark and Vollman (2011) as any resource which has the same as or lower than the required demanded capacity. In his book Operations Management, theory and practice, Stevenson (2013) indicates the TOC approach was developed by Eli Goldratt in 1984. Goldratt reasoned that the bottleneck operations limited the output of the system and therefore organizing the non-bottleneck operations in a better schedule would reduce the period when the bottleneck operations were idle (Stevenson, 2013).According to Collier and Evans (2006) constraints limit the production output to their own capacity therefore determining the production output and causing a constraint in the value stream as described by Melton (2005).

A firm with an operating MPC system has the basic database which is used by the TOC, just like with other applications, and implementing TOC as an extension is a logical extension (Jacobs et, al., 2011). According to Chan and Lin (2008) firms using TOC can achieve reduced lead time, improved operations, fall in inventory and increased return on investment. Constraints limit a manufacturing firm from achieving more of its goal as confirmed by Jacobs et. al., (2011) who found out that that by focusing on constraining resources, TOC scheduling provides improved performance to manufacturing firms. The MPC system needs to provide adequate information regarding the flow of materials for an efficient process. The Theory of Constraints was used in the study as it helps in identifying where constraints could arise and give an insight on how to manage them.

2.2.2 Systems Theory

A system, according to Collier and Evans (2006) is a related group of components that work together to accomplish a task. (Stevenson, 2013) states that the systems approach's main theme is that the whole system consists of different individual parts but the main emphasize is on the interrelationship among its subsystems. This same argument is supported by Bellgran and Safsten (2010) who argue that how different components relate and interplay in a system is what is referred to systems theory. According to Yourdon (1989) various systems are distinguished from the environment through what the system is used for and what comes out of it. The argument for the theory is that an organizations performance is shaped by internal and external factors and to understand it a holistic perspective of systems theory has to be understood.

According to Collier and Evans (2006) an entire system can fail should one process or component in a manufacturing firm for goods fails. This is because the manufactured goods consist of several components that are independent of one another and which are arranged in series but have to work together as a system. Stevenson (2013) notes that the impact of all parts of the system should be taken into account whenever a design, improvement or implementation is being considered. It is of important to achieve overall efficiency and this can only be realized by concentrating on the subsystems. An organization or firm being part of its industry and the society is considered as a system (Koontz & Weihrich, 2009).Systems theory is used as a tool for understanding the different aspects of an organization's department and how they relate to each other. The manufacturing department only makes enough products that the marketing section can handle and this conforms to all departments. All parts of the system must work together. Systems theory refers to this interaction between the subsystems in the manufacturing firms because each enables each other to perform effectively, and this formed the relevance of this theory to this study.

2.3 Manufacturing Planning and Control

Manufacturing Planning and Control Systems are tools used to ensure that customer's demands and expectations are met in the present highly competitive manufacturing climate (Stevenson, Hendry & Kingsman, 2005). They advise that the applicability of the planning and control concept is greatly enhanced by the factors such as customer's inquiry stage, company size, degree of customization and shop floor configuration. Any manufacturing organizations operations success lies with well-established planning and control systems both internally and across the supply chain, noted Kehoe and Boughton (2001) in their study on internet based supply chain in relation to

approaches to manufacturing planning and control. Persentill and Alptekin (2000) noted that management objectives should be the guide to the efficient and effective management of materials flow and resource utilization by means of the MPC systems in place.

According to Zijm (1999) various planning and control problems as they arise in the industry are not well looked into by the current MPC systems. These challenges can only be solved by the integration of the technological and logistical planning, capacity planning and materials coordination issues. The idea of technological integration has been supported by Rondeau and Litteral (2001) who agreed that MPC system have evolved over time, using new technologies which have been used to enhance their basic capabilities. The role of MPC systems need to be looked into in relation to the development of information is relayed and communicated , as these systems bring about successful operations of manufacturing organizations (Kehoe & Bonghton, 2001). The achievement of all the activities undertaken in a manufacturing organization together with the competitive priorities of Cost, quality, flexibility and delivery are enhanced by Manufacturing Planning and Control Systems (MPC) (Kotchar, Davies & Kennerly, 1999).

Persentill & Alptekin (2000) noted that there was an increase in competition among firms, there was an increase in different products and the products has a shorter life cycle in todays' manufacturing environment. A good MPC system that allows for flexibility should enable rapid response to demand changes. Persentill and Alptekin (,2000) noted that the MPC strategy chosen should manage the change that occurs in the systems' performance due to the variation that occurs to the product type. The system should not deteriorate but show maximum improvement.

The change in the system performance measures, due to the product type variation with minimum deterioration and maximum improvement. Manufacturing companies require different functions for their MPC systems and it is important to understand the suitable functions of the MPC system so that suitable strategies can be developed for computerised control so as to achieve efficient operations (Howard,Kochhar & Dilworth,1999)

2.4 Operational Performance

Operations performance is the performance of the organization against some prescribed standards (Birech, 2011). Poor operational performance of the firm is a result of systems failing to meet true user requirements due to poor functional specifications of the MPC system as concluded by Kochhar and Kenneley (1998). According to Mitchelmore and Rowly (2010) the performance of an organization can be a dependent or independent variable, but this depends on the viewpoint given to the issue. Firms need to lower their costs of production and provide greater responsiveness to the market, which can be achieved by an effective manufacturing planning and control system (Jacobs et al., 2011).

Hubbard (2009) notes that the operations of a firm should be efficient and effective. Firms have laid down laid down goals and objectives which need to be achieved and the laid down performance measurements ensures the firms is able to attain these. Achievement of these goals is the manifestation of the operational excellence of the firm.A manufacturing firm’s operational performance will greatly improve depending on the choice of MPC approaches, primarily at the sales and operations planning and master planning level (Olhager & Seldin, 2007).The environment in which the manufacturing firm is operating in can be very dynamic, and the choice of the MPC

approaches can have a significant impact of performance, as concluded by Olhager and Seldin (2007).

2.5 Empirical Literature Review

Dattero, Kanet and White (1989) had a study on how to use artificial intelligence techniques to improve the MPC system where they researched on ways to develop a computerized MPC that was free from the problems realized with some of the MPC systems like MRP. The study was to find out how wastages could be avoided by using adequate procedures for controlling inventory and production. They concluded that the idea of economic batch scheduling could be incorporated to ensure a more efficient and superior MPC system, to avoid wastages by the large manufacturing firms which have moved from traditional reorder point system to computerized materials requirement planning systems .This study failed to look into the MPC system as a whole, only taking into account the MRP, which only covers a system in the MPC system.

Manufacturing firms have multi-dimensional strategic objectives and operate in complex environments making it important to select a suitable MPC system to suite their specific environment. A study by Newman and Sridharan (1995) sought to find out the relationship between the manufacturing environment and organizations infrastructure by surveying manufacturing firms located in Midwest region of United States of America. By mapping the four commonly used MPC systems with the environments they are likely to perform in well, the study confirmed that overall performance of the firm would be improved by the choice of an MPC system to be adopted by the manufacturing firm and choosing the MPC system that matches the environment was important. The managers should be concerned with the relationship between the infrastructure support system and the manufacturing environment as this

would determine the performance of the firm. The same study should be undertaken in Kenya and particularly in Nairobi to find out how the environment would determine the choice of MPC system to be used.

The e-commerce solution has configured the MPC systems and the supply chain orientation as the MPC systems no longer only serves the internal manufacturing operations. This has increased the competitive performance of the firms, as determined by the study by Chan and Burns (2002) in which various MPC systems' performances were benchmarked to the different supply chain environments they were subjected to and verified that performance of the MPC system was positively related to organization performance, with a well implemented MPC system leading to a better organization performance. The study was undertaken in Hong Kong on three supply chain modules. According to their findings, they concluded that the performance of the organization was related to the MPC system they adopted .The same study should be undertaken in Nairobi, Kenya taking into consideration the pharmaceutical industry.

A study by Wacker and Sheu (2006) on how effective MPC was on the manufacturing competitiveness, a study done through a collection of data globally from 16 countries, indicated the delivery competitiveness was achieved through MPC. Materials and capacity planning and production activity control were singled out as the most important elements of the MPC system that enhances the manufacturing. Quality, cost, flexibility and new product design were considered as the delivery competitiveness in this study. The study singled out only a few systems, failing to determine how all the MPC systems could be used to bring the firms competitive advantages.

The firms' internal operations need an integration of the customers and suppliers and this can only be done through the support of a good MPC system, according to the study by Rondeau and Litteral (2009). The researchers sought to find out how the evolution of information technology impacts on the MPC system. By analyzing the history of the MPC system, the researchers came to a conclusion that the manufacturing environment has gone global and to maintain and improve the MPC effectiveness, it would be necessary to integrate advanced information technology with the existing MPC systems. The study demonstrates that MPC systems such as ERP and Management information systems play a greater role of this integration for better performance of the organization. This study need to look more into how the evolution of the MPC systems can be implemented and what trainings are required.

The actions of pharmaceutical industry regulators affected the actions Pharmaceutical companies (Murule, 2011). This study was done on manufacturing pharmaceutical firms in Kenya to find out how they responded to the changes in the pharmaceutical industry. The data collection was done by use of questionnaires and the study's conclusion was that manufacturing firms adopted pricing, marketing, strategic alliances, communication and technological strategies so as to manage the competitive environment brought about by the changes in the industry. The study failed to look into how the MPC systems used by the firms affected them.

The ERP systems have been adopted by Manufacturing firms in terms of customer relations, manufacturing management, plant maintenance and scheduling, and procurement management, as noted by Momanyi (2014).The study undertaken was to determine the drivers of ERP adoption by manufacturing firms in Kenya. The use of ERP improves the performance of a firm through better returns, improved data security

and decision making, and reduced cost of production. The local study failed to look into all the MPC systems but only singled out ERP.

According to Nyori and Ogola (2015) new customer demands and emerging technologies are the causes of dramatic changes in the manufacturing processes and system designs .Their study sought to find out about technological advancement and its benefits to the manufacturing firms in Kenya. In their study on the advanced manufacturing technology adoption in the manufacturing companies in Kenya, they found out that the technological adoption formed a good interaction between the technological potential and the manufacturing challenges. The study looked into MRP and ERP as the technological advancement and not the MPC system, as a whole, which is also based on technology, forming the gap.

Best use of human resources improves cost and quality under Just-in-time based quality management (Manese,2014) .In the study on just-In-Time adoption and performance of major oil companies, focusing on simplicity, waste elimination and continuous improvement were identified as factors that would improve JIT .According to Manese (2014) the readiness of the company to implement JIT was important as this determined the model to be developed for it. The studys' conclusion was that intergrating and streamlining all processes in the manufacturing system,establishing goals that require continuous improvement, developing production controllable processes and trying to respond to customer's requirement should be a priority for firms that want to adopt the JIT system as the system had a positive effect on the company's performance.

2.5 Summary of Theories and Empirical Studies

Table 2 1 Empirical studies

Authors	Study	Major Findings	Research Gaps
Dattero , Kanet & White (1989)	Enhancing MPC systems with artificial intelligence techniques	A more superior MPC system could be realized through incorporation of economic batch scheduling.	Looked mostly into the weaknesses of the MRP system instead of the MPC system as a whole and suggest remedies.
Newman and Sridhan(1995)	Relationship between environment and manufacturing performance	Choice of MPC system to be adapted by manufacturing firm depends on the manufacturing environment.	Study should be undertaken in Kenya and particularly in Nairobi where most firms are.
Chan and Burns (2002)	Benchmarking the performance of various MPC systems to the different supply chain environments	The choice of the MPC system adopted and level of implementation had an effect on the performance of the organization.	Study to be undertaken in the pharmaceutical industry in Nairobi, Kenya.
Wacker and Sheu(2006)	Manufacturing Competitiveness achieved through effective MPC systems	MPC systems are important to manufacturing firms in their requirements to achieve manufacturing competitiveness.	Not all MPCS measures were looked into, considering different measures for different industries.
Rodeau and Linderall (2009)	The evolution of the MPC system in relation to the evolving information technology from the reorder point to ERP.	Advanced information technology should be integrated with the current MPC system in place to enhance its competitiveness.	Not enough has been explained on the MPC systems implementation and training in relation to the changing information technology.
Murule (2011)	Strategic response by manufacturing pharmaceutical firms to changes in the industry.	Firms adopt pricing, marketing, alliances, communication and technological strategies.	There was no mention on any manufacturing planning and control system used by the industry.
Momanyi (2014)	ERP system adoption and organization performance	ERP adoption improved organization performance when most of the modules are adopted.	The study did not mention the relationship between ERP with other MPC systems.
Manese(2014)	JIT adoption and performance of major oil companies in Kenya	JIT system as the system had a positive effect on the company's performance.	Study was on oil companies. Same should be on pharmaceutical firms.

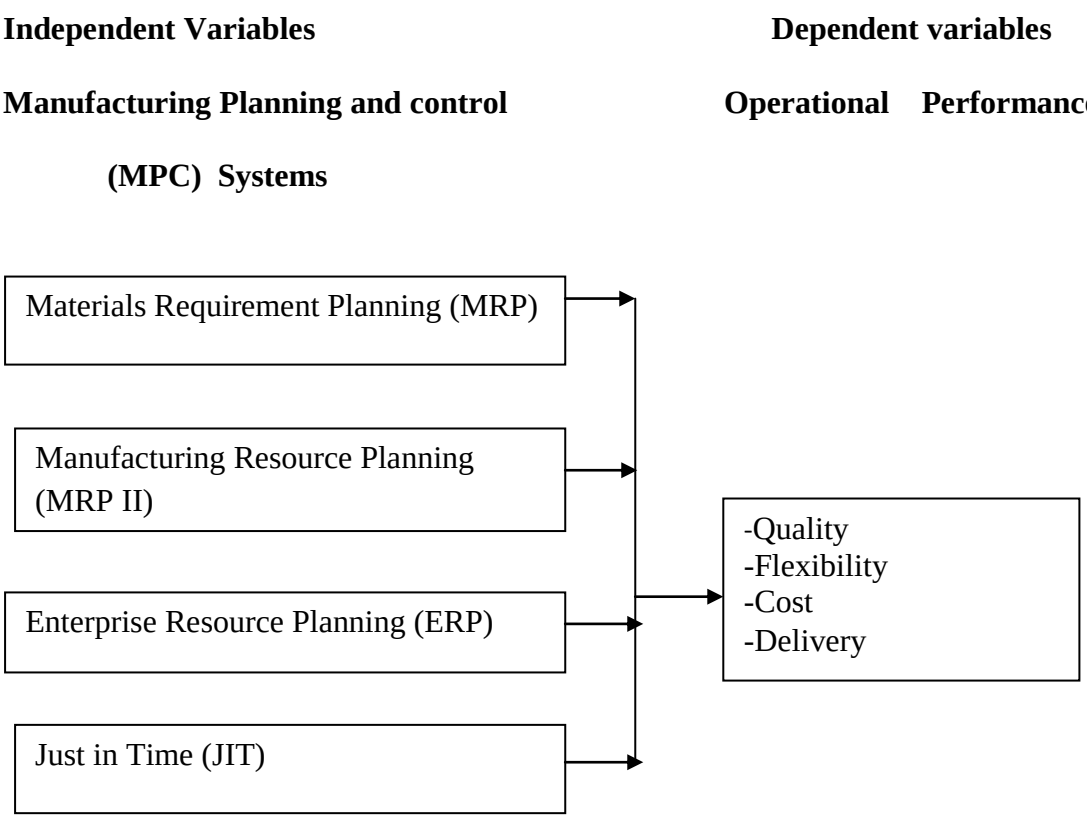
Source: Author, (2017)

2.6 Conceptual Framework

In this study, four manufacturing planning and control systems were used for measuring the independent variables being. Manufacturing planning and control (MRP)

Materials Requirement Planning (MRPII), Enterprise Resource Planning(ERP)and Just in Time (JIT) and the dependent variable operational performance of manufacturing pharmaceutical firms in Nairobi. The implementation of the above could help improve the operational performance of pharmaceutical manufacturing firms in terms of quality, flexibility, cost and delivery time.

The Conceptual model is shown in figure 2.1 below.



Source: Researcher, (2017)

Figure 2.1 Conceptual Model

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section looked into research design, target population, data collection and data analysis techniques.

3.2 Research Design

The study used descriptive design. Descriptive studies answer questions of what, who, when, where and how topics are used (Cooper & Schindler (2006). According to Ghauri and Gronhaug (2005) the problem is structured and well understood in descriptive design, and confirmed by Mugenda and Mugenda (2008) who agree that a clear picture of how situations really are is received through a descriptive report research design. The descriptive design assisted in determining the relationship between manufacturing planning and control and the operational performance of pharmaceutical manufacturing firms in Nairobi.

3.3 Population

In this study, all the 28 registered pharmaceutical manufacturing firms in Nairobi were targeted as the population, as provided by Kenya Association of Manufacturers (KAM, 2016).Appendix 11. According to Sekaran (2005) a group of individuals, objects or items from which samples can be taken for measurement, or elements with at least one thing in common is referred to as population. The number of registered firms is small and therefore a census survey was used.

3.4 Data Collection

The study used both primary and secondary data which was collected through the use of questionnaire as the data collection instrument (Appendix 1). The use of a questionnaire was arrived at as it is accurate and efficient in nature. The questionnaire had both open and closed ended questions, giving the respondent a chance to express their views on the open ended questions and to give the precise answers required by the researcher on the closed ended questions. The questionnaire was dropped at the firms and picked after a week. There was a follow up to find out if any assistance was required by the respondents having any difficulties in filling up the questionnaires. The questionnaire adopted a Likert scale format in which the weakest response was represented by 1 and the strongest response represented by 5. It was divided into four sections as follows: Section A looked into the background in relation to the demographic information of the management staff working in the pharmaceutical manufacturing firms. Section B was investigating what MPC systems had been adopted and implemented Section C handled and the problems faced and benefits in implementation and section D investigated the link between the operational performance and the adoption of the MPC systems.

The target respondents were the head of departments from the operations or production department, finance department and quality control department, or their equivalent in the pharmaceutical manufacturing firm. The researcher believed data collected through these departments gave a clear picture of the relationship between the MPC systems in the pharmaceutical manufacturing firms as the independent variable and quality, cost, flexibility and delivery as the dependent variable, on analysis.

3.5 Data Analysis

Table 3.1 Summary of Data Collection and Data analysis

Objective	**Data Collection**	**Data analysis**
General/ Demographic Information	Section A of the questionnaire	Descriptive statistics
MPC systems have been adopted and implemented	Section B of the questionnaire	Descriptive statistics
Challenges and benefits of MPC adoption and implementation.	Section C of the questionnaire.	Descriptive statistics
The relationship between the adoption of manufacturing planning and control systems and the operational performance of pharmaceutical industries.	Section D of the questionnaire.	Correlation and regression analysis

Source: Researcher (2017)

Data collected was analyzed through the use of SPSS statistical tool. The following regression model was used:

$Y = B_0+B_1X_1+B_2X_2+B_3X_3+B_4X_4+e$

B_0= constant

B_1, B_2, B_3,B_4 = regression coefficients

Y= Operation performance

X_1=Materials requirement planning

X_2 = Manufacturing resource planning

X_3= Enterprise resource planning

X_4= Just in time

e = Error term

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings of the study based on its objectives. It begins with the presentation of the response rate and the demographic information of the respondents interviewed.

4.2 Response Rate

The study targeted 84 respondents from 28 pharmaceutical firms out of which 62 responded giving a response rate of 74%. This conforms to a 50% acceptance rate as rated by Mugenda and Mugenda (1999) as sufficient and representative.

4.3 Demographic Characteristics of the Respondents

The study captured the demographic information of the respondents and their history with the targeted firms. Among the information gathered included: gender, age bracket, level of education, designation, the department where the respondents worked in, period of service within the firm and period of operation by the firm.

4.3.1 Respondents Distribution by Gender

The findings of the study on gender distributionshowed that 68% of the respondents interviewed were male while 32% were female.

This somehow shows the industry employs more men than women. The findings are as presented in Table 4.1below.

Table 4.1 Respondents Distribution by Gender

	Frequency	Percentage
Male	42	68
Female	20	32
Total	62	100

Source: Researcher (2017)

4.3.2 Respondents Distribution by Age

Table 4.2 Respondents Distribution by Age

	Frequency	Percentage
Between 21-35 years	36	58.1
Between 36-50 years	26	41.9
Total	62	100

Source: Researcher (2017)

4.3.3 Respondents Distribution by Level of Education

The study , on determining the respondents level of education, revealed that 21% had postgraduate qualifications ,53.2% had bachelors degrees and 25.8% had diplomas from middle level colleges. This could explain why the researcher had no difficulty in having the questionnaires filled as not much help was requested for in filling them up. The findings are as presented in Table 4.3 below

Table 4.3 Respondents Distribution by Level of Education

	Frequency	Percentage
Middle level college	16	58.1
Undergraduate	33	41.9
Postgraduate	13	100
Total	62	100

Source: Researcher (2017)

4.3.4 Respondents Distribution by Departments

In establishing the departments where the respondents work within their firms, the study showed that 37% were from the production department, 32% were from finance department and that 31% were from the quality control department. This therefore showed that the data generated for this study on manufacturing planning and control were generated from the relevant department making the information more reliable. The findings are as presented in Table 4.4 below

Table 4.4 Respondents Distribution by Departments

	Frequency	Percentage
Quality Control	19	58.1
Finance	20	41.9
Production	23	100
Total	62	100

Source: Researcher (2017)

4.3.5 Respondents Distribution by Designation

The findings of the study showed that 32.3% of the respondents interviewed were finance managers, 31.6% were quality control managers, 19.4% were production managers and 17.7% were operations managers. This distribution gives credibility of the data collected as it shows it was collected from the heads of the relevant departments .The findings are as presented in table 4.5 below.

Table 4.5 Respondents Distribution by Designation

	Frequency	Percent
Finance Manager	20	32.3
Production Manager	12	19.4
Operations Manager	11	17.7
Quality Control Manager	19	30.6
Total	62	100.0

Source: Researcher (2017)

4.3.6 Duration of Service in the Organization

The indication of the duration served by the respondents in their respective firms showed that, 25.8% had served for over 16, years 33.9% for 9-15 years, 27.4% had served in their firms for 2-8 years and 12.9% had served for a period less that 5 years. This information shows that a bigger percentage of those who filled up the questionaires had worked longer in these firms and therefore the information given was very much the reality on the ground.The findings are as presented in Table 4.6 below.

Table 4.6 Duration of Service in the Firm

	Frequency	Percentage
Less than two years	8	12.9
2 -8 Years	17	27.4
9-15 years	21	33.9
Over 16 years	16	25.8
Total	62	100

Source: Researcher (2017),

4.3.7 Ownership of the Firm

The respondents were asked to indicate the ownership of their firms. The study found that 68% of the firms studied were locally owned while 32% were foreign firms. This information is important as the study was on the pharmaceutical firms in Nairobi and therefore a bigger percentage of data collected from local manufacturers gives a clear picture of the local situation. The findings are as presented in Table 4.7 below.

Table 4.7 Ownership of the organization

	Frequency	Percentage
Multinational	20	32
Local	42	68
Total	62	100

Source: Reseacher (2017)

4.3.8 Years of operation by the Firm

In establishing the years of operation by the firms studied, the findings revealed that 72.6% of the firms had operated in the Kenyan economy for a period between 16-30 Years, 16.1% for a period between 1-15 years and that 11.3% had operated for a period of more than 30 years. This data shows the data collected was sufficient as it was collected from firms that had operated for long therefore understood the systems used well, benefits and challenges. The findings are as presented in Figure 4.7 below.

Table 4.8 Years of operation by the Firm

	Frequency	Percentage
1 -15 years	10	16.1
16 -30years	45	72.6
31 and above years	7	11.3
Total	62	100

Source: Researcher (2017)

4.4 The extent of the implementation of Manufacturing Planning and Control systems by pharmaceutical firms in Nairobi.

In assessing the extent to which different aspects of manufacturing and control systems were being implemented in the organization studied**,** the respondents were given different statements asked to indicate the extent to which each was being implemented in their organizations. A five point likert scale of 1-5 was adopted where: 1-represented 'No extent at all', 2 -'Little extent', 3- 'Moderate', 4-'Great extent' and 5-'Greater extent'.

'No extent at all' was therefore interpreted as an equivalent of mean score ranging from 0.0 to 1.0, 'Little extent' with mean score ranging from 1.1 to 2.0, 'Moderate' with a mean score ranging from 2.1 to 3.0, 'Great extent' with a means score ranging from 3.1 to 4.0 and 'Greater extent' with a means score ranging from 4.1 to 5.0. A standard deviation more than one (> 1) was used as an indication that there significant differences in the responses given by the respondents.

4.4.1 Extent of adoption and Implementation of Materials Requirement Planning (MRP) System

One of the manufacturing planning and control systems the researcher considered was materials requirement planning system.In establishing the extent of adoption and implementation of materials requirement planning system, the respondents were asked the extent to which different statement on MRP were applied in their firms. The findings are as presented in Table 4.9 below.

Table 4.9 Extent of adoption and Implementation of Materials requirement Planning (MRP) System

Statements on Materials Requirement Planning system	N	Mean	Std. Deviation
There is timely delivery of finished goods to the customer	62	4.10	.740
There is budgeting and planning for production in terms of raw materials, human resources, capital and equipment requirements	62	4.08	.929
Planning for required materials for manufacturing is done as per order size being produced	62	3.69	.841
Right materials required for production are available on time	62	3.66	.867
Inventory holding levels have decreased therefore decreasing the capital cost	62	3.63	.814
Mean	**62**	**3.83**	**0.84**

Source: Researcher (2017)

The findings on Table 4.9 above shows that there was timely delivery of finished goods to the customer (Mean 4.10) and that there was budgeting and planning for production in terms of raw materials, human resources, capital and equipment requirements (Mean 4.08) were realized to a greater extent. It was also found that planning for required materials for manufacturing was done as per order size being produced (Mean 3.69), right materials required for production are available on time (Mean 3.66) and inventory holding levels have decreased therefore decreasing the capital cost (Mean 3.63) were realized to a great extent. An average mean of 3.83 was realized on adoption and implementation of material requirement planning system, an indication that it is practiced to a great extent. The responses given by the respondents had no significant difference as showed by a standard deviation less than one (<1) across all indicators used.

4.4.2 Extent of adoption and Implementation of Manufacturing Resource planning System

The other MPC system in study was manufacturing resource planning. In establishing the extent of adoption and implementation of manufacturing resource planning system, the respondents were asked the extent to which different statement on its application and relevance were applied in their organizations. The findings were as presented in Table 4.10 below.

Table 4.10 Extent of adoption and Implementation of Manufacturing Resource Planning System

	N	Mean	Std. Deviation
There is a master production schedule encompassing all drugs	62	4.18	.713
Materials required for production are determined through the production schedule put in place.	62	4.11	.603
Equipment and personnel are allocated as per the requirement per department.	62	4.08	.635
Business Processes are standardized and automated leading to improvements in cost control and revenue	62	3.97	.768
The production capacity is allocated according to individual orders.	62	3.89	.770
Mean	**62**	**4.05**	**0.70**

Source: Researcher (2017)

The findings on Table 4.10 above shows that there was a master production schedule encompassing all drugs (Mean 4.18), that materials required for production were determined through the production schedule put in place (Mean 4.11) and that equipment and personnel are allocated as per the requirement per department (Mean 4.08) were realized to a greater extent. The study also found that business processes are standardized and automated leading to improvements in cost control and revenue

(Mean 3.97) and that the production capacity is allocated according to individual orders (Mean 3.89) were realized to a great extent. An average mean of 4.05 was realized on adoption and implementation of manufacturing resource planning system, an indication that it is practiced to a greater extent. The responses given by the respondents had no significant difference as showed by a standard deviation less than one (<1) across all indicators used.

4.4.3 Extent of adoption and Implementation of Enterprise Resource Planning (ERP) System

In establishing the extent of adoption and implementation of enterprise resource planning (ERP) system, the respondents were asked the extent to which different statement on its application and relevance were applied in their firms. The findings are as presented in Table 4.11 below.

Table 4.11 Extent of adoption and Implementation of Enterprise Resource Planning (ERP) System

	N	Mean	Std. Deviation
There is quality management of raw materials	62	4.11	.655
Increased coordination between the departments	62	4.05	.734
Enhanced decision making	62	4.03	.809
Inventory management is easier	62	3.98	.757
Budget planning and projections is efficient	62	3.89	.749
There is a customer relationship management system	62	3.87	.713
Management reports are prepared	62	3.85	.698
Mean	**62**	**3.97**	**0.73**

Source: Researcher (2017)

The findings on Table 4.11 above show that there was quality management of raw materials (Mean 4.11), increased coordination between the departments (Mean 4.05), enhanced decision making (Mean 4.03) were realized to a greater extent. It was also found that inventory management was easier (Mean 3.98), budget planning and projections was efficient (Mean 3.89), there was a customer relationship management system (Mean 3.87) and that management reports were prepared (Mean 3.85) were realized to a great extent. An average mean of 3.97 was realized on adoption and implementation of enterprise resource planning (ERP) system, an indication that it was practiced to a great extent. The responses given by the respondents had no significance diffeence as showed by a standard deviation less than one (<1) across all indicators used.

4.4.4 Extent of adoption and Implementation of Just-In-Time (JIT) Production System

In establishing the extent of adoption and implementation of Just-In-Time production system, the respondents were asked the extent to which different statement on its application and relevance were applied in their firms. The findings are as presented in Table 4.12 below.

Table 4.12 Extent of adoption and Implementation of Just-In-Time (JIT) Production System

	N	Mean	Std. Deviation
The processing of products uses the minimum processes needed	62	4.13	.640
Processes are planned well in advance to avoid idleness and waiting	62	4.02	.799
The layout plan minimizes movement from one point to the next	62	4.02	.713
There is a reduction in finished products defects and a test for this.	62	3.97	.746
Efficient work methods are used to minimize unnecessary productions	62	3.90	.783
Production is planned as per order or demand.	62	3.89	.943
Placing orders only when materials are required and ready to be used in production	62	3.65	1.026
Inventory is held for only what is required for both raw materials, work in progress and finished products	62	3.45	.918
Mean	**62**	**3.88**	**0.82**

Source: Researcher (2017)

The findings on Table 4.12 above shows that the processing of products uses the minimum processes needed (Mean 4.13), that the processes are planned well in advance to avoid idleness and waiting (Mean 4.02) and that the layout plan minimizes movement from one point to the next (Mean 4.02) were realized to a greater extent. It was also found that there was a reduction in finished products defects and a test for this (Mean 3.97), efficient work methods were used to minimize unnecessary productions (Mean 3.90), production was planned as per order or demand (Mean 3.89), placing orders were done only when materials are required and ready to be used in production

(Mean 3.65) and that inventory was held for only what was required for both raw materials, work in progress and finished products (Mean 3.45) were practiced to a great extent. An average mean of 3.88 was realized on adoption and implementation of Just-In-Time production system, an indication that it was practiced to a great extent. There was significant difference in the responses given on placing orders only when materials are required and ready to be used in production with a standard deviation more than one (>1).

4.4.5 Extent of adoption and Implementation of manufacturing planning and control systems

The table below shows the final extent of adoption and implementation of all the manufacturing planning and control systems.

Table 4.13 Extent of adoption and Implementation of manufacturing planning and control systems

	N	**Mean**	**Std Deviation**
Manufacturing resource planning	62	4.05	0.7
Enterprise Resource Planning	62	3.97	0.73
Just in time	62	3.88	0.82
Materials Requirement Planning	62	3.83	0.84
Total Mean	**62**	**3.93**	**0.775**

Source: Researcher (2017)

The findings on Table 4.13 above shows that manufacturing resource planning has been adopted and implemented at a greater extent (Mean 4.05), Enterprise resource planning follows at a great extent(Mean 3.97), Just in time is next at a great extent (mean 3.88) and finally manufacturing requirement planning adopted and implemented

at a great extent (Mean 3.83).The overall adoption of all the manufacturing planning and control systems in pharmaceutical firms is to a great extent(Mean 3.93).the responses given by the respondents had o significant difference as showed by a standard deviation less than one (<1) across all indicators used. This means that manufacturing planning and control systems are adopted and implemented in the pharmaceutical firms in Nairobi.

4.5 Benefits and Challenges of the implementation of manufacturing planning and control systems in pharmaceutical firms in Nairobi.

Pharmaceutical firms in Nairobi realize benefits in adoption and implementation of manufacturing planning and control systems in their firms and they also have challenges they encounter in this.

4.5.1 Benefits of the adoption and implementation of Manufacturing Planning Control in firms

To determine the benefits of the adoption and implementation of manufacturing planning control systems in the firms, the respondents were asked the extent to which different statements on the benefits of MPC were realized in their organizations. The findings are as presented in Table 4.14 below.

Table 4.14 Benefits of the adoption and implementation of Manufacturing Planning Control in firms

	N	Mean	Std. Deviation
Reduction in cases of stock outs	62	4.13	.614
Easy monitoring of processes from all departments	62	4.05	.838
Improved communication between the departments	62	3.98	.614
Easy monitoring of products from raw materials to finished products	62	3.95	.734
Easy communication with suppliers and customers	62	3.90	.900
Reduction of backlog processes	62	3.85	.903
Materials received when required and on time	62	3.82	.933
Easier management of processes	62	3.68	.825
Mean	**62**	**3.92**	**0.80**

Source: Primary Data (2017)

The findings on Table 4.14 above shows that reduction in cases of stock outs (Mean 4.13) and easy monitoring of processes from all departments (Mean 4.05) were realized to a greater extent. The findings also revealed that improved communication between the departments improved delivery time to customers (Mean 3.98), easy monitoring of products from raw materials to finished products (Mean 3.95), easy communication with suppliers and customers (Mean 3.90), reduction of backlog processes (Mean 3.85), materials received when required and on time (Mean 3.82) and easier management of processes (Mean 3.68) were realized to a large extent. An average mean of 3.92 was realized on the benefit of MPC, an indication that its implementation benefits firms to a great extent. There was no significant difference in the responses given by the respondents as showed by a standard deviation less than one (<1) across all indicators used.

4.5.2 Challenges facing the adoption and implementation of Manufacturing Planning Control in firms

To find out the challenges facing the adoption and implementation of manufacturing planning and control in the organizations studied, the respondents were asked to mention the challenges. From the responses given by the respondents, the following challenges were mentioned: communication barrier between parties such as departments, insufficient utilization of labour, resistance to change from traditional methods of doing things, seasonal/unstable market for commodities, lack of qualified personnel, inadequate resources, prolonged decision making processes, untimely delivery of raw materials, unreliability of suppliers of materials leading to holding buffer stock resulting to high working capital requirement.

4.5.3 Effect of the implementation of Manufacturing Planning Control on Operation Performance

To measure the impact of MPC on organization performance, the respondents were asked to the extent to which different performance indicators were realized in their organizations. The findings are as presented in Table 4.15 below.

Table 4.15 Effect of the implementation of Manufacturing Planning Control on Operation Performance

	N	Mean	Std. Deviation
Improved production output	62	4.18	.736
Manufacturing flexibility	62	4.08	.775
Improved delivery time to customers	62	3.85	.698
Improved sales revenue	62	3.63	.891
Increased return on investment	62	3.52	.805
Reduced production cost	62	3.40	.757
Mean	**62**	**3.78**	**0.78**

Source: Primary Data (2017)

The findings on Table 4.15 above shows that improved production output (Mean 4.18) and Manufacturing flexibility (Mean 4.08) were realized to a greater extent. The study also found that improved delivery time to customers (Mean 3.85), improved sales revenue (Mean 4.08), increased return on investment (Mean 3.85) and reduced production cost (Mean 3.40) were realized to a great extent. An average mean of 3.78 was realized on the effect of MPC on organization performance, an indication that its implementation impacts on the firms' performance to a great extent. There was no significant difference in the responses given by the respondents as showed by a standard deviation less than one (<1) across all indicators used.

4.6 The relationship between manufacturing planning and Control adoption and the operational performance of pharmaceutical firms in Nairobi.

Correlation and regression analysis were done to test on the relationship between the variables studied. Correlation analysis was done to test of the association between the study variables. This showed the direction and strength of the associations. On the other hand, regression analysis was done to show the strength of the independent variables in explaining the dependent variables. The percentage of performance was explained by indicators such as material requirement planning, manufacturing resource planning, enterprise resource planning and just in time.

4.6.1 Correlation Analysis

The correlation coefficient values range between -1 and +1. A perfect positive linear correlation between two variables is indicated by a correlation coefficient of +1 whereas a correlation of -1 shows a negative linear correlation between two variables. The findings from correlation analysis were as presented in Table 4.16 below

Table 4.16 Correlation Analysis

Correlations						
		Operation performance	Materials requirement planning	Manufacturing resource planning	Enterprise resource planning	Just in time
Operation performance	Pearson Correlation	1	.387**	.547**	.131	.086
	Sig. (2-tailed)		.002	.000	.000	.000
	N	62	62	62	62	62
Materials requirement planning	Pearson Correlation	.387**	1	.359**	.538**	.767**
	Sig. (2-tailed)	.002		.004	.000	.000
	N	62	62	62	62	62
Manufacturing resource planning	Pearson Correlation	.547**	.359**	1	.205	.254*
	Sig. (2-tailed)	.000	.004		.110	.046
	N	62	62	62	62	62
Enterprise resource planning	Pearson Correlation	.131	.538**	.205	1	.647**
	Sig. (2-tailed)	.000	.000	.110		.000
	N	62	62	62	62	62
Just in time	Pearson Correlation	.086	.767**	.254*	.647**	1
	Sig. (2-tailed)	.000	.000	.046	.000	
	N	62	62	62	62	62
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Source: Primary Data (2017)

The findings from correlation analysis on Table 4.16 above shows that operation performance was positively associated with material requirements planning with r = 0.387 and p value of 0.000, an indication that it is statistically significant with p value less than 0.05 (< 0.05). The findings further show that was a positive correlation between operation performance and manufacturing resource planning with r = 0.547 and a p value of 0.000 (statistically significant). It was also found that operation

performance had a positive relationship with enterprise resource planning with r = 0.131 and p value of 0.000. The findings finally revealed that operation performance had a positive relationship with Just-In-Time with r =0.086 and p value of 0.000. The p values obtained are therefore indications that there were significant positive relationships between the variables studied.

4.6.2 Regression Analysis

Multiple regression analysis was done to test on the extent to which the variables studied impacted on the operation performance of the organizations. The independent variable studied included: material requirement planning, manufacturing resource planning, enterprise resource planning and just in time while the dependent variable was operation performance.

Multiple regression model presented below was used:

$Y = B_0+B_1X_1+B_2X_2+B_3X_3+B_4X_4+e$

B_0= constant

B_1, B_2, B_3,B_4 = regression coefficients

Y= Operation performance

X_1=Materials requirement planning

X_2 = Manufacturing resource planning

X_3= Enterprise resource planning

X_4= Just in time

e = Error term

Table 4.17 Regression Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T / Z	Sig. (P value)
		B	Std. Error	Beta		
1	(Constant)	.307	.464		.661	.511
	Materials requirement planning ($X_{1)}$	.908	.112	.943	8.141	.000
	Manufacturing resource planning ($X_{2)}$	.677	.115	.453	5.912	.000
	Enterprise resource planning ($X_{3)}$	.205	.084	.228	2.428	.018
	Just in time($X_{4)}$	.664	.106	.776	6.279	.000
a. Dependent Variable: Operation performance						

Source: Primary Data (2017)

Table 4.17 above presents the beta coefficients of all independent variables versus the dependent variable.

The regression model written as:

($Y = B_0+B_1X_1+B_2X_2+B_3X_3+B_4X_4+e$) now becomes:

$Y= 0.307+0.908X_{1+}0.677X_2+0.205X_3+0.664X_4$

The Beta Coefficients in the regression show that all the variables tested have positive relationship with operation performance. A unit increase in material requirement planning would lead to an increase in operation performance by 0.908; a unit increase in manufacturing resource planning would lead to an increase of operation performance by 0.677; a unit increase in enterprise resource planning would lead to an increase in operation performance by 0.205 and a unit increase in just in time would lead to an increase in operation performance by 0.664.All the variables test therefore were statistically significant with p-values less than 0.05(P values are $X_{1=}$ 0%, $X_{2 =}$ 0% , $X_{3 =}$ 1.8% and $X_{4 =}$ 0%)

Using Z statistics for alpha = 5%, Z critical = 1.96%

All Z values are higher (X_1=8.141, X_2=5.912, X_3=2.428 and X_4=6.279)hence this shows that all the four independent variable are significant.

Table 4.18 Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.842[a]	.709	.689	.747
a. Predictors: (Constant), Just in time, Manufacturing resource planning, Enterprise resource planning, Materials requirement planning				

Source: Primary Data (2017)

The findings on Table 4.18 above shows that, R Square was 0.709 and R was 0.842 at 0.05 level of significance. The coefficient of determination indicates that 70.9% of the variation in operational performance of pharmaceutical firms in Nairobi can be explained in Material requirement planning, Manufacturing resource planning, Enterprise resource planning and Just in time. The remaining 29.1% can be explained by other variables which were not in the study and chase variations. It can therefore be deduced from the R square and adjusted R values that above average variation between the study variables can be explained by the model.

Further Analysis of Variation (ANOVA) was done to test the overall system as presented on Table 4.19 below.

Table 4.19 ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F /Z	Sig. P value
1	Regression	77.562	4	19.390	34.746	.000[b]
	Residual	31.809	57	.558		
	Total	109.371	61			
a. Dependent Variable: Operation performance						
b. Predictors: (Constant), Just in time, Manufacturing resource planning, Enterprise resource planning, Materials requirement planning						

Source: Primary Data (2017)

Using Z statistics, for alpha = 5%, numerator df= 4 and denominator df=57

F critical = 2.54

The results on Table 4.19 above show that the P value significance of F statistics is 0.000, which is less than 0.05 and the value of F (34.746) being significant at 5% confidence level. This implies that data was significant for making conclusion that is the predictors variable. The regression analysis indicates that the significant P-value of F-statisics is less than 0.05 at 0.000.This implies that the independent variables(Just in time, Manufacturing resource planning, Enterprise resource planning, Materials requirement planning) actually explain operational performance which means that the model is significant.

4.7 Discussion of Findings

This section compares the study findings from both theoretical and empirical literature review. The results confirm that manufacturing planning and control systems adopted have a positive effect on the operational performance of pharmaceutical firms. Manufacturing planning and control systems were adopted and implemented to a great extent (Mean 3.93) as noted form the findings.In line with these findings, a study by Chan and Burns (2002) revealed that the adoption of e-commerce solution has

configured the MPC systems and the supply chain orientation as the MPC systems no longer only serves the internal manufacturing operations. This situation has forced firms to adopt different manufacturing planning control systems in their operations to remain relevant and competitive.

4.7.1 Findings on materials requirement planning systems

Material requirement planning system was adopted and implemented by the organizations studied to a large extent (Average mean 3.83).This conforms to the findings by Dattero, Kanet and White (1989) that the large manufacturing firms had moved from traditional reorder point system to computerized materials requirement planning systems. They had concluded that the idea of economic batch scheduling could be incorporated to ensure a more efficient and superior MPC system, to avoid wastages. This conforms to the findings by the study in which timely delivery of finished goods to customers and budgeting, planning for production in terms of raw materials, human resources, capital and equipment requirements have been applied to a greater extent (Mean 4.10 and 4.08 respectively).

4.7.2 Findings on manufacturing resource planning systems.

Manufacturing resource planning system was adopted and implemented by the organizations to a greater extent (Average mean 4.05).This is in consistence with the finding of Wacker and Sheu (2006) on how effective MPC was on the manufacturing competitiveness singling out materials and capacity planning and production activity control as the most important elements of the MPC system that enhances the manufacturing. Quality, cost, flexibility and new product design were considered as the delivery competitiveness in this study. The researcher identified master production schedule encompassing all drugs and allocation of equipment and personnel as per the

requirements per department as the most effective measure put in place by most firms with a mean of 4.18 and 1.08 respectively.

4.7.3 Findings on enterprise resource planning systems

Enterprise resource planning was adopted and implanted by the firms studied to a large extent (Average mean 3.97). Increased coordination between departments (mean 4.05), quality management of raw materials (mean 4.11) and enhanced decision making (mean4.03) are among some of the improvements the firms realize after ERP implementation. The same findings were as per the study by Momanyi (2014) who noted that the ERP systems had been adopted by manufacturing firms in terms of customer relations, manufacturing management, plant maintenance and scheduling, and procurement management.

4.7.4 Findings on Just in time systems

Just-In-Time was adopted and implemented by the organizations studied to a large extent (Average mean 3.88). This confirms that the JIT system in place enables processing of products using minimum processes needed and the processes planned well in advance to avoid idleness and waiting. This conforms with the conclusion on the study by Manese (2014) who noted that focusing on simplicity, waste elimination and continuous improvement were identified as factors that would improve JIT. Intergrating and streamlining all processes in the manufacturing system, establishing goals that require continuous improvement, developing production controllable processes and trying to respond to customer's requirement should be a priority for firms that want to adopt the JIT system as the system had a positive effect on the company's performance.

The study was supported by the theory of constraints and the systems theory, which the researcher used to compare the study findings with to find out how close the findings were to the theories.Theory of Constraints is a scheduling approach that simply focuses on bottleneck operations (Stevenson, 2013). The Theory of Constraints was used in the study as it helps in identifying and managing manufacturing constraints .The MPC system needs to provide adequate information regarding the flow of materials for an efficient process. Collier and Evans (2006) noted that the production output was determined by the constraints which limited the production output to their own capacity causing a constraint in the value stream. According to Chan and Lin (2008) firms using TOC can achieve reduced lead time, improved operations, fall in inventory and increased return on investment. Constraints limit a manufacturing firm from achieving more of its goal. These findings are consistent with the findings of this study as timely delivery of finished goods to the customers (mean 4.10),keeping a master production schedule encompassing all drugs (mean 4.18),quality management of raw materials(mean 4.11) and using of minimum processes needed (mean 4.13) were the main achievements realized in using the manufacturing planning and control systems. This means the constraints in production were overcome to realize these.

A system, according to Collier and Evans (2006) is a related group of components that work together to accomplish a task. (Stevenson, 2013) states that the systems approach's main theme is that the whole system consists of different individual parts but the main emphasize is on the interrelationship among its subsystems. This argument is supported by the average mean of 3.93 for the adoption and implementation of the manufacturing planning and control systems in the pharmaceutical firms. This show a great extent of adoption and implementation. This same argument is supported by Bellgran and Safsten (2010) who argue that how

different components relate and interplay in a system is what is referred to systems theory.

The findings from regression analysis revealed that 70.9% of the variations on operation performance can be explained by material requirement planning, manufacturing resource planning, enterprise resource planning and just in time. The remaining 29.1% can be explained by other variables which were not in the study. This was an indication that the variables studied were strong predictors of operation performance with the organizations studied. These findings are in line with that of Chan and Burns (2002) who found that the performance of the organization was related to the MPC system they adopted. On the same note, Jacobs *et al*., (2011) found that organizations need to lower their costs of production and provide greater responsiveness to the market, which can be achieved by an effective manufacturing planning and control system. Olhager and Seldin (2007) further notes that the environment in which the manufacturing firm is operating in can be very dynamic, and the choice of the MPC approaches can have a significant impact of performance.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to find out the relationship between manufacturing planning and control systems and the organizational performance of pharmaceutical firms. The previous chapter presented the findings and discussion of the study findings. This chapter therefore presents the summary of the study findings, conclusions and the study recommendations.

5.2 Summary of Findings

The study found that different aspects of manufacturing planning control were adopted and implemented by the organizations studied. Material requirement planning system was adopted and implemented by the organizations studied to a large extent (Average mean 3.83). Manufacturing resource planning system was adopted and implemented by the organizations to a greater extent (Average mean 4.05). It was also found that enterprise resource planning was adopted and implanted by the organizations studied to a great extent (Average mean 3.97) and that Just-In-Time was adopted and implemented by the organizations studied to a great extent (Average mean 3.88).

The study found that the benefits of the implementation of manufacturing planning control systems included: reduction in cases of stock outs (Mean 4.13) and easy monitoring of processes from all departments (Mean 4.05) among others. On the other hand, some of the challenges facing the adoption and implementation of manufacturing planning control in the organizations studied included: communication barrier between parties such as departments, insufficient utilization of labour, resistance to change from

traditional methods of doing things, seasonal/unstable market for commodities, lack of qualified personnel, inadequate resources, prolonged decision making processes, untimely delivery of raw materials, unreliability of suppliers of materials leading to holding buffer stock resulting to high working capital requirement.

Finally, on the relationship between manufacturing planning and Control adoption and the operational performance of pharmaceutical firms, the findings from correlation analysis showed that operation performance was positively associated with material requirements planning with r = 0.387 and p value of 0.000, an indication that it is statistically significant with p value less than 0.05 (< 0.05). There was also a positive correlation between Operation performance and manufacturing resource planning with r = 0.547 and a p value of 0.000 (statistically significant). It was further found that operation performance had a positive relationship with enterprise resource planning with r = 0.131 and p value of 0.000. The correlation findings finally revealed that operation performance had a positive relationship with Just-In-Time with r =0.086 and p value of 0.000. The findings from regression analysis revealed that 70.9% of the variations on operation performance can be explained by material requirement planning, manufacturing resource planning, enterprise resource planning and just in time. The remaining 29.1% can be explained by other variables which were not studied. This was an indication that the variables studied were strong predictors of operation performance with the organizations studied.

5.3 Conclusions

Based on the findings of the study, the following conclusions were made: That the organizations studied have adopted and implemented manufacturing planning controls systems to a great extent (Mean 3.93) .

The study also concludes that the organization have benefited from the adoption and implementation of manufacturing planning control systems by reducing cases of running out of stock and by making it easy to monitor of processes from its departments.

It can also be concluded that communication barrier, insufficient utilization of labour, resistance to change, seasonal/unstable market for commodities, lack of qualified personnel, inadequate resources, prolonged decision making processes, untimely delivery of raw materials and unreliability of suppliers of materials were among the challenges facing the adoption and implementation of mmanufacturing planning control in the organizations studied.

The study finally concluded that there was a strong relation between the variables studied such as material requirement planning, manufacturing resource planning, enterprise resource planning and just in time and operation performance as they explained up 70.9% of the relationship.

5.4 Recommendations of the Study

The following recommendations were made based on the study findings. Pharmaceutical firms should put more effort in adopting and implementing aspects such as material requirement planning, enterprise resource planning and just in time which needs more to be done.

The study also recommends pharmaceutical firms should come up with other strategies of countering the challenges facing adoption and implementation of manufacturing planning and control systems. Specifically, the organizations should improve on communication within and across its departments and adopt change.

5.5 Limitations of the Study

The study covered the 28 pharmaceutical manufacturing registered firms in Nairobi which are in different locations. Due to the constraint of time, the researcher had to work extra hard in following up on the respondents through phone calls and emails. Getting time off duty to do a personal follow up was a big hindrance and this is the reason why not all questionnaires delivered to the respondents were delivered back. The researcher had to try and balance the work situation with beating the deadline for submission which in itself was not easy. Given enough data collection period, the researcher believes more data would have been collected.

5.6 Suggestions for Further Research

This study sought to finding out the relationship between manufacturing planning and control systems and the organizational performance of pharmaceutical firms.

It is therefore recommended that another study be done specifically on the challenges facing the adoption and implementation of manufacturing panning and controls systems in organizations which was not the main focus of this study. This study was done on the impact of manufacturing planning and control systems on pharmaceutical firms in Nairobi, the same study can be done for the same industry for the whole country and better still for another country.

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APPENDICES

APPENDIX I: QUESTIONAIRE

This is a research aimed at understanding the relationship between Manufacturing Planning and control Systems in your organization and the operational performance. Your participation will be highly appreciated. This is for academic use and your contribution will not be shared anywhere else.

SECTION A: DEMOGRAPHICS

1. Kindly indicate your department……

2. What is your designation…….

3. What is your organization type? Locally owned ( ) Multinational ( )

   Any other, specify…….

4. Gender

   Male…….. ( )
   Female……... ( )

5. Age Bracket

   Below 20( ) 21- 35( ) 36-50( ) 51 and above ( )

6. Please tick where appropriate .How many years have you worked with the firm?

   Less than two years ( ) 2-8 ( ) 9-15( )
   Over 16 ( )

7. What is your highest level of education?

   Primary level ( ) Secondary ( ) Middle level ( ) Undergraduate. ( )
   Postgraduate ( ) Others, please specify……

8. The firm has been in operation for how long?

Firms operation in years	Tick
0-15	
16-30	
31 and above	

SECTION B: THE EXTENT OF MPC SYSTEMS ADOPTION AND IMPLEMENTATION

(Reply with the use of the scale of 1 to 5 where 1 is no extent - 2 is little extent -3 is Moderate extent - 4 is great extent and 5 is Greater extent)

9. Indicate the extent to which the firm has adopted and implemented Materials

Requirement Planning (MRP) System.

THE EXTENT OF MRP ADOPTION AND IMPLEMENTATION	**1**	**2**	**3**	**4**	**5**
There is budgeting and planning for production in terms of raw materials, human resources, capital and equipment requirements					
There is on time availability of the right materials required for production					
Planning for required materials for manufacturing is done as per order size being produced					
There is timely delivery of finished goods to the customer					
There is decrease in capital cost due to decreased inventory holding levels					

10. Indicate the extent to which the firm has adopted and implemented Manufacturing Resource Planning (MRP II) System.

THE EXTENT OF MRPII ADOPTION AND IMPLEMENTATION	**1**	**2**	**3**	**4**	**5**
There is a master production schedule encompassing all drugs					
Equipment and personnel are allocated as per the requirement per department.					
Materials required for production are determined through the production schedule put in place.					
The production capacity is allocated according to individual orders.					
Business Processes are standardized and automated leading to improvements in cost control and revenue					

11. Indicate the extent to which the firm has adopted and implemented Enterprise Resource Planning (ERP) system

THE EXTENT OF ERP ADOPTION AND IMPLEMENTATION	**1**	**2**	**3**	**4**	**5**
There is a customer relationship management system					
Budget planning and projections is efficient					
Management reports are prepared					
Inventory management in easier					
There is quality management of raw materials					
Increased coordination between the departments					
Enhanced decision making					

12. Indicate the extent to which the firm has adopted and implemented Just In Time Production (JIT) System

THE EXTENT OF JIT ADOPTION AND IMPLEMENTATION	**1**	**2**	**3**	**4**	**5**
Inventory is held for only what is required for both raw materials ,work in progress and finished products					
Production is planned as per order or demand.					
Placing orders only when materials are required and ready to be used in production					
There is a reduction in finished products defects and a test for this.					
Processes are planned well in advance to avoid idleness and waiting					
The layout plan minimizes movement from one point to the next					
The processing of products uses the minimum processes needed					
Efficient work methods are used to minimize unnecessary productions					

SECTION C: CHALLENGES FACED IN IMPLEMENTING MPC SYSTEMS

13. Please list down challenges faced in adoption and implementation of the MPC systems:

(i)……

(ii)……

(iii)……

14.To what extent has the firm benefited in implementation of the manufacturing planning and control system?

(Reply with the use of the scale of 1 to 5 where 1 is no extent - 2 is little extent -3 is Moderate extent - 4 is great extent and 5 is Greater extent)

Benefits of Implementation	**1**	**2**	**3**	**4**	**5**
Improved communication between the departments					
Easy monitoring of products from raw materials to finished products					
Easy communication with suppliers and customers					
Reduction in cases of stock outs					
Materials received when required and on time					
Easy monitoring of processes from all departments					
Reduction of backlog processes					
Easier management of processes					

SECTION D: MANUFACTURING PLANNING AND CONTROL SYSTEMS AND OPERATIONAL PERFORMANCE

15. To what extent has the adoption and implementation of the manufacturing planning and control systems affected the organizational performance?

(Reply with the use of the scale of 1 to 5 where 1 is no extent - 2 is little extent -3 is Moderate extent - 4 is great extent and 5 is Greater extent)

PERFORMANCE INDICATORS	**1**	**2**	**3**	**4**	**5**
Improved production output					
Reduced production cost					
Improved sales revenue					
Increased return on investment					
Improved delivery time to customers					
Manufacturing flexibility					

16. What is the level of capacity utilization as a percentage of installed capacity?.....

17. Are you producing in full capacity? Yes ( )

If no, state reasons. …….....

18. What is your production cost as a percentage of revenue per annum?……

19. What is your inventory holding cost as a percentage of total inventory per annum?.....

20. Kindly give your view on how you think the management would use the manufacturing systems to improve the performance of the organization in relation to the

……

……

APPENDIX 11: LIST OF PHARMACEUTICAL MANUFACTURERS IN NAIROBI

1. Alpha Medical Manufacturers Ltd
2. Autosterile (EA)
3. Bayer East Africa Ltd
4. Benmed Pharmaceuticals Ltd
5. Beta Healthcare International
6. Biodeal Laboratories Limited
7. Biopharma Limited
8. Cosmos Limited
9. Dawa Limited
10. Elys chemical Industries Limited
11. Gesto Pharmaceuticals Limited
12. Glaxo Smithkline Kenya Limited
13. KAM Industries limited
14. Laboratory & Allied Limited
15. Manhar Brothers (k) Limited
16. Medisel Kenya Ltd
17. Medivet Products Limited
18. Norvatis
19. Novelty Manufacturing limited
20. Osschemie (k) Limited
21. Pharm Access Africa Limited
22. Pharmaceutical Manufacturing Co. (k) Limited
23. Questa Care Limited
24. Regal Pharmaceuticals Limited
25. Surgilinks Ltd
26. Skylight Chemicals Limited
27. Universal Corporation Limited
28. Vetcare Kenya Limited

Source: KAM Directory (2016)