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INVENTORY OPTIMIZATION AND PERFORMANCE OF PHARMACEUTICAL FIRMS IN KENYA

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ABSTRACT

Over the past years, pharmaceutical organization have been working towards increasing their market share, improving the level of profitability and at the same time ensuring customers are satisfied with their products. Only few firms achieve the objective through careful implementation of their plans and combined efforts of its workforce while the rest exit. The general objective of this study is to assess the influence of inventory optimization on performance of pharmaceutical firms in Kenya. Specifically, the study sought to evaluate the effect of inventory management systems on Performance of Pharmaceutical Firms in Kenya and to assess the effect of Economic Order Quantity (EOQ) on Performance of Pharmaceutical Firms in Kenya. The study used a descriptive research design. Kenya has 50 registered pharmaceutical manufacturing and distributing firms (Pharmacy and Poisons Board, 2019). The study targeted four managers in every firm. The total target population was therefore 200 management employees. Given the small population of 50 firms, a census approach was adopted targeting all of the firms. Primary data was collected through use of semi structured questionnaires. The study also conducted pilot test to test the validity and the reliability of the data collection instrument. The data collection instrument generated both qualitative and quantitative data. The study used both descriptive and inferential statistics for data analysis with the aid of Statistical Package for Social Sciences (SPSS version 25). Descriptive statistics such as mean, standard deviation, frequency and percentages were used in this study. In relation to inferential statistics, the study used correlation analysis. This was used to establish the relationship between the independent and the dependent variables. Data was then presented in a tables, bar charts and pie charts. The study concludes that inventory management systems have a significant effect on performance of pharmaceutical firms in Kenya. The study also concludes that Economic Order Quantity (EOQ has a significant effect on performance of pharmaceutical firms in Kenya. Based on the findings, this study recommends that the management of pharmaceutical firms in Kenya should give priority to inventory management systems and Economic Order Quantity.

Key Word: Inventory Optimization, Inventory Management Systems, Economic Order Quantity

Background of the Study

Performance involves analyzing the company's performance against the set goals which considers the real outputs compared with intended outputs. It is the accumulated results of all the organization's work activities (Gupta, Shah & Ross, 2019). Performance measurement (PM) is an analytical tool that records measures, shows outcomes and determines the subsequent actions within the organization. The firm measurement of performance can be based on both quantitative and qualitative indicators. Other categories of measurement are financial, non-financial, tangible or non-tangible (Poister, 2018).Generally, most firm tend to focus on their own internal performance that is concern with efficiency and reported in the balance scorecard (BSC) and the financial books such as profits and share value. A well designed performance management system acts as a feedback to management and so significantly contribute to improving the performance of the organization. It allows management to continuously monitoring performance, identify inefficient processes, enhance communication and motivate employees (Ha Chan & Qi, 2017).

The performance of pharmaceutical companies is impacted by an intricate interaction of factors inside the industry, regulatory framework, and global market dynamics. The pharmaceutical industry is distinguished by its substantial research and development endeavors aimed at discovering and introducing novel pharmaceuticals to the market (Marques, Moniz, de Sousa,Barbosa-Povoa & Reklaitis, 2020). Pharmaceutical firms face a hard environment due to the expensive and risky nature of medication development, as well as the strict regulatory demands. Success in this field frequently relies on a company's capacity to innovate, acquire regulatory approvals, and efficiently promote and distribute their products. In addition, pharmaceutical companies encounter obstacles such as the expiration of patents, competition from generic drugs, and healthcare changes that affect pricing and market entry (Gupta, Shah & Ross, 2019).

The financial performance of pharmaceutical corporations is intricately linked to the success of their medication portfolios, with blockbuster drugs playing a pivotal role in revenue generating. Companies that possess the ability to adjust to changes in healthcare trends, take advantage of significant advancements in therapy, and effectively traverse regulatory obstacles are more inclined to attain long-lasting success (Bourgeron & Geiger, 2022). Mergers and acquisitions are frequently employed in the pharmaceutical sector as corporations want to bolster their product development pipelines, broaden their market reach, and improve their research capacities. The performance of pharmaceutical enterprises is also influenced by external events, such as global health crises and changes in healthcare policies. This emphasizes the ever-changing nature of the sector. The sustained performance of pharmaceutical firms relies on their capacity to effectively manage the interplay between innovation, regulatory compliance, and market dynamics (Kukura & Thien, 2019).

Inventory optimization is the process of maintaining the right amount of inventory required to meet demand, keep logistics costs low, and avoid common inventory issues such as stockouts, overstocking, and backorders (Xie & Palani, 2018). Inventory optimization is an ecommerce best practice and strategy that ensures stock control is managed efficiently by implementing tools, technology, processes, and techniques to track inventory in real time, better forecast demand, and optimize storage. Optimizing your inventory can enable you to have the right amount of inventory and decrease the amount of capital being used for production and operation while improving customer experiences. It allows you to correctly forecast the customer demand and deliver on what consumers want and, in the time, they want it in without holding too much inventory (Abu Zwaida, Pham & Beauregard, 2021).

The complexity of procurement nowadays and the high interaction between all its nodes, make the determination of optimal inventory policy so difficult. Adopting local optimization in each site of the supply procurement cannot always have good results (Frontoni, Marinelli,

Rosetti & Zingaretti, 2020). In fact, single echelon inventory management assumes that inventory is located in only one storage point where demand is met and replenishments are added. Actually, inventory is located in many storage points that belong to the same system which made researchers think about integrated approaches and modeling the system as a multi-echelon inventory system (Sebatjane & Adetunji, 2020).

Globally, inventory optimization remain an important aspect of every company as poor inventory system could result in loss of customers and sales while an effective inventory management is able to generate more sales for the company which directly affects the performance of the company (Mohamad, *et al* 2016). Therefore, it should be adequately taken care of because it has to do with profit of the business. A well planned and effective stock management can contribute substantially to a firm annual turnover. The role of inventory optimization is to ensure faster inventory turnover. It increases inventory turnover by ten (10) and reduce costs by 10% to 40%. The so called inventory turnover is not yet right to sell products on the shelves based on the principle of FIFO cycle (Kenneth et al, 2018).

In Africa, inventory optimization has been embraced differently and has yielded differently in various organizations. In Ghana, Prempeh, (2019) established that performance of an organization relies on the effectiveness of inventory optimization. Koumanakos, (2018) revealed that inventory optimization is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods for improved performance Garry, (2017). The scope of inventory optimization also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting (Ahmed, 2016). Inventory management involves the planning, ordering and scheduling of the materials used in the manufacturing process. It exercises management over three types of inventories that is raw materials, work in progress and finished goods. Purchasing is primary concerned with management over the raw materials inventory, which includes; raw materials or semi-processed materials, fabricated parts and MRO items (Maintenance, Repair and Operations)Garry, (2017).

In Kenya, the pharmaceutical industry consists of three segments namely the manufacturers, distributors and retailers (Munene, 2016). All these play a major role in supporting the country's health sector, which is estimated to have about 4,557 health facilities countrywide. Kenya is currently the largest producer of pharmaceutical products in the Common Market for Eastern and Southern Africa (COMESA) region, supplying about 50% of the regions' market. Out of the region's estimated of 50 recognized pharmaceutical manufacturers; approximately 30 are based in Kenya. It is approximated that about 9,000 pharmaceutical products have been registered for sale in Kenya. These are categorized according to particular levels of outlet as free sales /OTC (Over the Counter), pharmacy technologist dispensable, or pharmacist dispensable/ prescription only (Wang & Yip, 018).

Statement of the Problem

Over the past years, pharmaceutical organization have been working towards increasing their market share, improving the level of profitability and at the same time ensuring customers are satisfied with their products. Only few firms achieve the objective through careful implementation of their plans and combined efforts of its workforce while the rest exit. Competition is a natural phenomenon in all aspects of life and we must strive to outdo our rivals. In the agency theory the management is mandated by the organization shareholders to maximize their wealth and profits. This necessitates the strategy formulation and

implementation that leads to the anticipated organization performance. With the much done studies on inventory practices and performance of organization showing as positive relationship; the high failure rate in inventory management indicates its complexity that is dependent on myriad of factors.

Proper inventory optimization practice(s) is one of today's major business success factors as Pharmaceuticals struggle with the challenge of calibrating a sustainable balance between holding inventory, inventory holding costs and demand. Ideally, these firms could want to have standby inventory to immediately execute supply as demand arises. However, this perspective equally raises the question of how economical it will be to undergo holding costs at the expense of unrealized demand. Excessive inventory takes up physical space, drives up storage costs and increases risk of damage, theft, spoilage and loss. Too little inventory also results to poor customer service as customer's needs cannot be met on time. Striking an effective balance between inventory and demand enhances business efficiency, promoting operational performance and competitiveness.

Various scholars have undertaken studies on inventory management practices and operational performance. Internationally, Bett (2018) sought to establish if inventory management practices affect economic performance of SMEs in Bangalore. The study established a significant and positive association between economic performance indicators and inventory management. It was also established that SMEs with sufficient inventory management comparatively perform better. Locally, Kinyanjui (2016) looks at the correlation between performance and inventory management practices among World Food Programme partners. Findings show a high positive correlation with Just-In-Time and Economic Order Quantity contributing more than other practices. However, few scholars have focused on inventory optimization and performance of Pharmaceutical companies in Kenya. The current study therefore sought to fill the existing research gap and address the existing problem by investigating the inventory optimization and performance of pharmaceutical firms in Kenya

General Objective

The general objective of the study is to assess the influence of inventory optimization on performance of pharmaceutical firms in Kenya

Objectives of the Study

i. To evaluate the effect of inventory management systems on Performance of Pharmaceutical Firms in Kenya

ii. To assess the effect of Economic Order Quantity (EOQ) on Performance of Pharmaceutical Firms in Kenya

Theoretical framework

A theory is a well-substantiated explanation or framework that organizes and interprets a set of observations or phenomena. It is a systematic and coherent set of principles or concepts that seeks to explain and predict how and why things happen. In addition, a theoretical review provides the main variables that affect the phenomenon under study and points out the need to consider the effect of these variables under different circumstances (Swanson, 2017). This study was guided by structural contingency theory and systems theory.

Structural Contingency Theory

The theory was introduced by Burns & Stalker (1966) and Lawrence & Lorsch(1967). The theory posits that organizations will be effective if managers fit the characteristics of their organization, such as structure, with contingencies in the environment. The theory draws specifically form the contingency theory, which argues that there is no best way to design an organization and that no theory or method can be applied in all circumstances. The heart of

structural contingency theory lies in how a static, state of fit between structures and contingency results in high performance, though challenge this by outlining that, through being static, structural contingency theory fails to deal with organizational change and adaptation.

One of the key tenets of Structural Contingency Theory is the idea that organizations need to structure themselves based on the demands and constraints of their environment. The external environment, including factors like technology, market conditions, and regulatory requirements, is seen as a crucial determinant of organizational structure. For example, in dynamic and uncertain environments, organizations may benefit from flexible and decentralized structures, while stable environments might favor more centralized and formalized structures. Moreover, internal factors, such as the size of the organization, its technology infrastructure, and the skills of its workforce, also play a role in determining the most appropriate structure. Large organizations with diverse functions may find matrix structures beneficial, allowing for both functional specialization and project coordination. In contrast, smaller organizations with simpler tasks might opt for a more centralized and informal structure.

Structural Contingency Theory suggests that organizational structures should be designed to fit the specific demands of the situation at hand. For instance, during periods of rapid technological change, organizations may need to adopt more organic and flexible structures to foster innovation and adaptability. Conversely, in stable environments, a more mechanistic and hierarchical structure might be suitable to ensure efficiency and control. This theory is relevant to the study as it explains how to align the individual parts of the inventory management practices to achieve the best firm performance

Systems Theory

Systems theory was first introduced by biologist Ludwig von Bertalanffy in (1972). The theory holds that a system is a cohesive conglomeration of interrelated and interdependent parts that are either natural or man-made. Every system is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose, and expressed in its functioning. In terms of its effects, a system can be more than the sum of its parts if it expresses synergy or emergent behavior (Drack & Pouvreau, 2018). Changing one part of the system usually affects other parts and the whole system with predictable patterns of behavior. For systems that are self-learning and self-adapting, the positive growth and adaptation depends on how well the system is adjusted with its environment. Some systems function mainly to support other systems by aiding in the maintenance of the other systems to prevent failure (Luhmann, 2018).

A system can be defined as an entity, which is a coherent whole such that a boundary is perceived around it in order to distinguish internal and external elements and to identify input and output relating to and emerging from the entity (Wilkinson, 2019). Broadly, there are two types of system; (a) open system and (b) closed system. Closed system theory originates from classical (Newtonian) physics of closed system thinking whereby few variables are tolerated in an observation so as to minimize the influence by external variables Beven, 2019).

The closed system theory is attributed to Norbert Wiener, a distinguished mathematician and engineer at Massachusetts Institute of Technology (MIT) who developed it in 1949 (Chikere & Nwoka, 2015). Open systems theory has its foundations in biology, particularly Darwin's work on the evolution of the species. The popular version of open systems theory is attributed to Ludwig Von Bertalanffy who in 1964 used the term ‘general systems theory’ to describe the main ideas and to distinguish them from closed systems thinking Chumba, 2018). The fundamental notion of general systems theory is its focus on interactions. The system theory

postulates that a single autonomous element is different from its behaviour when the element interacts with other elements (Hull, 2019).

Whereas closed systems use error-controlled regulation to eliminate external influence, open systems use anticipatory control since it is as a result of interaction with the environment that a system achieves a dynamic stability (Njue, Kyalo, Mulwa, & Mbugua, 2016). System theory is founded upon the principles that the subsystems are; open, focused, interrelated, continuously transforming inputs into outputs, flexible, responds to environment through feedback, brings about the equilibrium to the system and are coherent (Njue et al., 2016). Consistent with this view Ludlow, and Otto (2018) indicate that in open systems there are exchanges of energy, matter, people, and information with the external environment. In closed systems there are no exchanges of information and matter, just exchanges of energy.

As discussed by various scholars the „physics" of a system limits its achievements, and the possible emergence of stability and control problems may lead to the system's performance malperformance. The second principle of the systems theory states that supply chains offer the opportunity to outsource functions to other organizations by adopting new techniques such as vendor-managed inventory, as a way to streamline its operations. The third principle indicates that supply chains are not monolithic organizations artifacts but can be broken down into a number of smaller subsystems. Furthermore, organizations should realize that although information systems and supply chains are artificial constructs, and, therefore, are not living systems; this does not mean that they are static. Furthermore, organizations should realize that although information systems and supply chains are artificial constructs, and, therefore, are not living systems; this does not mean that they are static. This theory is relevant to this study as the four general principles of the theory are applied to information systems considered with respect to Inventory management.

Conceptual Framework

Conceptual framework refers to a diagrammatic set of interrelated ideas on a particular phenomenon and it's characterized by cause and effect relationships which helps interpret more and hence making it easily understandable. This makes it more straightforward and also easily predictable (Svinicki, 2019). It is a diagram that explains the relationship between dependent and independent variables.

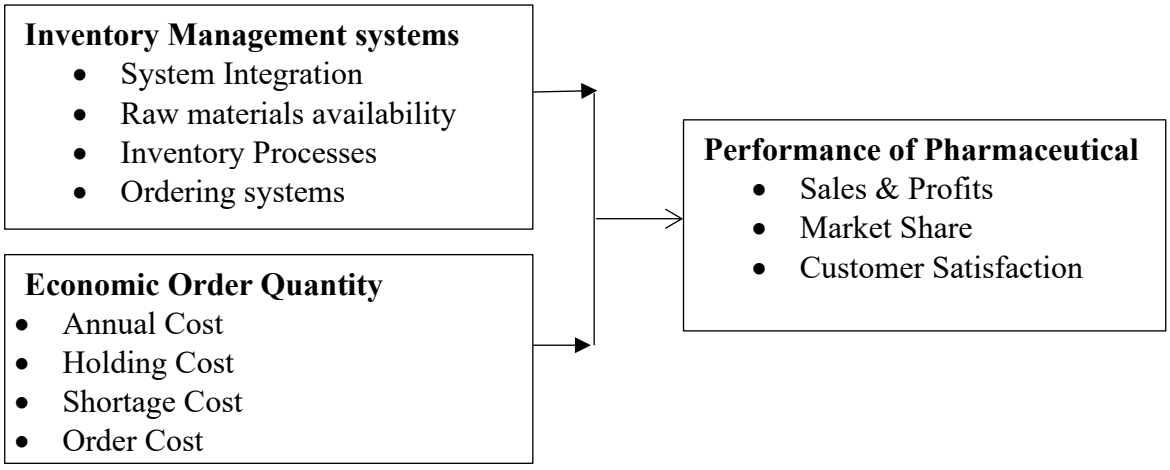

Figure 2. 1: Conceptual Framework

Inventory Management systems

Inventory management systems play a pivotal role in the efficient operation of businesses by overseeing various aspects such as system integration, raw materials availability, inventory processes, and ordering systems. Mawonde and Demberere (2022) study indicated that

system integration is a critical component of inventory management, as it ensures seamless communication between different elements of the system. This integration often involves connecting inventory management software with other business systems, such as accounting, sales, and supply chain management. Through this integration, businesses can achieve real-time visibility into their inventory levels and make informed decisions.

Raw materials availability is a key concern in inventory management, especially for manufacturing businesses. The system needs to monitor the availability of raw materials and trigger reorder points to prevent stock- outs. By leveraging data and analytics, businesses can optimize their raw material inventory levels, reducing carrying costs while ensuring uninterrupted production. The inventory processes within a management system involve the tracking, monitoring, and control of goods throughout the supply chain. This includes receiving, storing, picking, and shipping items. Automation plays a crucial role in streamlining these processes, minimizing errors, and improving overall efficiency. Barcode scanning, RFID technology, and automated order fulfillment systems are examples of tools integrated into inventory processes for enhanced accuracy and speed, Ouma and Mwangangi, (2018).

Economic Order Quantity

Economic Order Quantity (EOQ) is a vital inventory management model that helps businesses to determine the optimal order quantity for a particular product. The EOQ formula takes into account various costs associated with inventory management, including annual holding costs, order costs, and shortage costs. Korir, Kaitany and Sang, (2021) study asserts that annual holding cost is a significant component of the EOQ model. Holding costs are incurred due to the expenses associated with storing and maintaining inventory. These costs include warehouse space, insurance, security, and other expenses related to keeping the goods in stock. The EOQ model aims to find the order quantity that minimizes these holding costs by balancing the cost of holding too much inventory against the cost of ordering too frequently.

Order cost is another crucial factor considered in the EOQ model. Order costs are incurred every time a business places an order for replenishing its inventory. These costs include expenses such as order processing, transportation, and supplier-related costs. The EOQ model seeks to minimize total costs by finding the optimal order quantity that minimizes the frequency of orders, thus reducing the associated order costs. Shortage costs are also a consideration in the EOQ model, although they are typically considered separately from holding and order costs. Shortage costs arise when demand exceeds the available inventory, leading to potential sales losses, customer dissatisfaction, or backordering costs. While the EOQ model primarily focuses on minimizing holding and order costs, it indirectly helps in managing shortage costs by optimizing inventory levels, Kowo and Vareckova, (2023).

Empirical Review

Inventory management systems and organizational Performance

Mawonde and Demberere (2022) conducted research on the effect of inventory control systems on organizational performance in the mining sector of Zimbabwe**.** The aim of this study was to determine the effect of inventory control systems on organizational performance in the mining sector of Zimbabwe. A quantitative survey approach was used and a sample of 203 mining companies was used for data analysis. The findings of the study were that, inventory control systems have both positive direct and positive indirect effect on organizational performance.

Ouma and Mwangangi, (2018) did a research on influence of inventory management systems on performance of soft drinks manufacturing firms in Kenya. This study examined the influence of inventory management systems being the independent variable on the

performance of soft drinks manufacturing firms being the dependent variable. The specific objectives of the study assessed the influence of Material Requirement Planning in firm's performance, determine the influence of Just in Time on firm's performance, and examine the influence of vendor managed inventory on firm's performance and to explore the influence of bar coding on firm's performance. The research used descriptive research design. The target population for the study was 455 employees in the soft drink manufacturing firms in Kenya. Questionnaires were administered for data collection. It was established that most of the inventory management systems indicators have positive impact on performance of the firm.

Rutagira and Awichi, (2020) carried out a statistical analysis of inventory management systems on organizational performance. The main purpose of the study was to investigate the effect of physical distribution management on organizational performance by Rutungu Distributors Ltd, Kampala (U). The study assessed the relationship between order processing and organizational performance in Rutungu Distributors Ltd in an attempt to establish the relationship between storage and organizational performance in the organization. It also sought to find out the relationship between other aspects of inventory management on organizational performance within the company. The research used a case study design approach which was correlational considering both quantitative and qualitative approaches in the data collection, presentation, and analysis. The population of the study was several categories of employees of the company. Findings from the study depicted that there is a positive significant relationship between order processing and organizational performance.

Cherotich and Ngugi, (2019) investigated the influence of inventory management practices on performance of fast-moving consumer goods manufacturers in Nairobi county, Kenya. This study sought to establish the influence of inventory management practices on performance of fast-moving consumer goods manufacturers in Nairobi County, Kenya. This study adopted a descriptive research design for the purpose of accessing the study's general intent. The target population was 51 fast moving consumer goods manufacturers in Nairobi County. Primary data was collected through the administration of questionnaires to respondents. From the study findings it was found that lead time, top management support, supplier evaluation and e-procurement and performance of fast-moving consumer goods manufacturers have an association.

Economic Order Quantity (EOQ) and organizational Performance

Korir, Kaitany and Sang, (2021) studied economic order quantity stock control technique and performance of selected level five hospitals: an evidence of Kenya. The paper main focus was to establish the relationship between Economic Order Quantity stock control technique and performance of selected level five hospitals in south rift region, Kenya. Questionnaires were used for data collection. The study findings revealed that economic order quantity had a positive statistical relationship with performance of the level five hospitals.

Kowo and Vareckova, (2023) sought to determine the correlate of inventory management and organizational performance. The aim of the study was to determine the effect of economic order quantity performance on operational costs and also to examine the effect of production costs on sales turnover. The paper adopted a survey method. The total population of the study consists of 201 employees of Honeywell Flour Mills Plc Ikeja Lagos Nigeria. Primary data was collected by use of questionnaires. The study found out that Economic order quantity significantly affects the operational cost.

Rao and Mangal, (2018) studied economic order quantity – a tool for inventory management – a case study. The purpose of this model is to decide order quantity and reorder point. This research goes throughout the process of analyzing the company's current forecasting model and recommends an inventory control model. In this work, it has been concluded that by

opting EOQ model, the number of orders, ordering cost, total annual cost, carrying cost, order size, average inventory and EOQ has been reduced to a great extent.

Athumani and Salome, (2019) undertook research on the impact of inventory management on organization performance of Tanzania public sectors: a case of National Food Reserve Agency (NFRA). The main objective of the study was to determine the impact of inventory management on organization performance of Tanzania public sectors. The study was guided by four objectives; to assess the techniques of inventory management, competence possessed by the staff, to determine the challenges faced in managing the inventories, and to determine the technology used on effective implementation of inventory management system in Tanzania public sectors. The descriptive aspect of the research design was used and the primary data was collected by the use of questionnaires. The findings revealed that, the respondents agreed that Economic Order Quantity Model is used in decision making when NRFA is in need of acquiring the materials thus enhancing performance.

RESEARCH METHODOLOGY

Research Design

The study used a descriptive research design. According to Mugenda and Mugenda (2018), a descriptive survey research design entails identifying pre-existing relationships with variables without trying to change the environment. The descriptive research approach, according to Bulmberg, Cooper, and Schindler (2018), aims to ascertain the "what, where, and how" of a certain occurrence.

Target Population

Kenya has 50 registered pharmaceutical manufacturing and distributing firms (Pharmacy and Poisons Board, 2019). The study targeted four managers in every firm. These managers were selected based on their areas, supply chain manager, marketing manager, quality control manager and the operation manager in each firm selected to form part of the target population giving us a total target respondents of 200.

Sample Size and Sampling Technique

Sample refers to a part of or fraction of population that is being investigated upon. It can also be defined as a group of individuals who are engaged or participating in a study (Wilson, 2010). In this research study, because the target population is a small, a census survey was used; no sampling was done. Where it is economically viable, Kothari (2011) advises doing a census study instead of a sample one since it produces more accurate data and minimizes sampling errors. The study aims to achieve a 95% confidence level and 5% margin of error. Given the small population of 50 firms, a census approach was adopted targeting all of the firms.

Data Collection Instruments

This research used questionnaires to collect primary data. According to Patton *et. al (*2016), a questionnaire is appropriate in gathering data and measuring it against a particular point of view. It provides a standardized tool for data collection. Structured questions were used to collect primary data from the field. Questionnaires were preferred because they are effective data collection instruments that allow respondents to give much of their opinions pertaining to the research problem (Dempsey, 2017).

Data Collection Procedure

The process of data collection started after drafting of the final data collection instruments and receipt of permission from all the relevant authorities. Before embarking on data collection, relevant approvals were obtained. An introductory letter from the JKUAT, introducing the researcher to relevant authorities for field data collection was first obtained. This letter was used to obtain the research permit from the National Commission for Science,

Technology, and Innovation (NACOSTI). In addition, the researcher sought permission from firms in order to be allowed to collect data.

This researcher also trained two research assistants who were involved in the data collection exercise. They used the drop and pick later technique where respondents were allowed two weeks to fill in the questionnaires. Where need be, respondents were provided additional time to fill the questionnaires. Each research assistant administered questionnaires to the selected respondents. The research assistants were advised to drop the questionnaires and agree on the date of collection with the respondents.

Pilot Study

A pilot test was conducted to assess the questionnaire's validity and reliability of the data that was collected. According to Copper and Schindler (2017), a pilot test is conducted to detect weaknesses in the design and instrumentation and provide a proxy data for selection of probability sample. According to Leedy and Ormrod (2019), a pilot study is an excellent way to determine the feasibility of the study.

The subjects participating in the pilot study were not included in the final study to avoid survey fatigue. Twenty questionnaires were piloted that represented 10% of the target population.

Data Analysis and Presentation

The study collected quantitative data from closed- ended questions. The analysis involved both the descriptive and inferential statistics using the Statistical Package for Social Sciences (SPSS) version 24. The collected data was further analyzed using multi linear regression to determine the relationship between the dependent and independent variables.

DATA ANALYSIS AND FINDINGS

Descriptive Statistics

Inventory Management Systems and Organization Performance

The first specific objective of the study was to determine the effect of inventory management systems on performance of pharmaceutical firms in Kenya. The respondents were requested to indicate their level of agreement on various statements relating to inventory management systems and performance of pharmaceutical firms in Kenya. A 5 point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 1.

From the results, the respondents agreed that the pharmaceutical firm employs an advanced inventory management system to monitor and control stock levels (M= 3.932, SD= 0.497). In addition, the respondents agreed that the firm's inventory management system integrates technology such as barcoding or RFID for real-time visibility (M= 3.918, SD= 0.805). The respondents further agreed that the pharmaceutical firm uses its inventory management system for demand forecasting and planning (M= 3.878, SD= 0.991).

The respondents agreed that the inventory management system triggers reorder points to ensure timely replenishment of pharmaceutical products (M= 3.715, SD= 0.393). The respondents also agreed that the firm employs risk mitigation strategies within the inventory management system to prevent stock-outs or excess inventory (M= 3.695, SD= 0.714). Moreover, the respondents agreed that the pharmaceutical firm's inventory management system facilitates collaboration with suppliers for optimized stock levels (M= 3.599, SD= 0.409).

Table 1: Inventory Management Systems and Organization Performance

	Mean	Std. Deviation
The pharmaceutical firm employs an advanced inventory management system to monitor and control stock levels.	3.932	0.497
The firm's inventory management system integrates technology such as barcoding or RFID for real-time visibility.	3.918	0.805
The pharmaceutical firm uses its inventory management system for demand forecasting and planning.	3.878	0.991
The inventory management system triggers reorder points to ensure timely replenishment of pharmaceutical products.	3.715	0.393
The firm employs risk mitigation strategies within the inventory management system to prevent stock-outs or excess inventory.	3.695	0.714
The pharmaceutical firm's inventory management system facilitates collaboration with suppliers for optimized stock levels.	3.599	0.409
Aggregate	**3.790**	**0.635**

Economic Order Quantity and Organization Performance

The second specific objective of the study was to determine the effect of Economic Order Quantity (EOQ) on performance of pharmaceutical firms in Kenya. The respondents were requested to indicate their level of agreement on various statements relating to economic order quantity and performance of pharmaceutical firms in Kenya. A 5 point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 2.

From the results, the respondents agreed that the pharmaceutical firm incorporates the Economic Order Quantity (EOQ) model to optimize order quantities and minimize holding costs (M= 3.943, SD= 0.986). The respondents further agreed that The EOQ model is regularly reviewed and adjusted based on changes in demand patterns and market conditions (M= 3.926, SD= 0.840). In addition, the respondents agreed that the EOQ model is an integral part of the pharmaceutical firm's overall inventory management strategy (M= 3.846, SD= 0.879). The respondents also agreed that the firm uses EOQ principles to establish reorder points and ensure timely replenishment (M= 3.831, SD= 0.904).

The respondents agreed that the pharmaceutical firm considers the impact of EOQ on supplier relationships and negotiation strategies (M= 3.816, SD= 0.789). In addition, the respondents agreed that EOQ principles are applied to manage perishable pharmaceutical products and reduce the risk of product expiration (M= 3.796, SD= 0.937). The respondents further agreed that performance metrics related to EOQ, including inventory turnover and carrying costs, are consistently monitored (M= 3.689, SD= 0.876). Furthermore, the respondents agreed that the pharmaceutical firm integrates EOQ considerations into its risk management strategies for inventory (M= 3.634, SD= 0.687).

Table 2: Economic Order Quantity and Organization Performance

	Mean	Std. Dev.
The pharmaceutical firm incorporates the Economic Order Quantity (EOQ) model to optimize order quantities and minimize holding costs.	3.943	0.986
The EOQ model is regularly reviewed and adjusted based on changes in demand patterns and market conditions.	3.926	0.840
The EOQ model is an integral part of the pharmaceutical firm's overall inventory management strategy.	3.846	0.879
The firm uses EOQ principles to establish reorder points and ensure timely replenishment.	3.831	0.904
The pharmaceutical firm considers the impact of EOQ on supplier relationships and negotiation strategies.	3.816	0.789
EOQ principles are applied to manage perishable pharmaceutical products and reduce the risk of product expiration.	3.796	0.937
Performance metrics related to EOQ, including inventory turnover and carrying costs, are consistently monitored.	3.689	0.876
The pharmaceutical firm integrates EOQ considerations into its risk management strategies for inventory.	3.634	0.687
Aggregate	**3.810**	**0.862**

Performance of Pharmaceutical Firms in Kenya.

The respondents were requested to indicate their level of agreement on various statements relating to performance of pharmaceutical firms in Kenya. The results were as presented in Table 3. From the results, the respondents agreed that operational efficiency is a key focus area for the pharmaceutical firm, with on-going efforts to optimize processes and resource utilization (M= 3.875, SD= 0.875). The respondents further agreed that the firm actively monitors its market performance, including market share and customer satisfaction (M= 3.853, SD= 0.745). Moreover, the respondents agreed that innovation and adaptability are prioritized to stay competitive in the dynamic pharmaceutical industry (M= 3.802, SD= 0.617). The respondents agreed that employee performance and satisfaction are crucial aspects, with a focus on workforce productivity and engagement (M= 3.752, SD= 0.708). The respondents also agreed that the pharmaceutical firm places importance on corporate social responsibility, incorporating sustainability practices and ethical standards (M= 3.691, SD= 0.756). Further, the respondents agreed that strategic alignment is emphasized, ensuring that the firm's strategies align with its mission, vision, and overall goals (M= 3.652, SD= 0.567).

Table 3: Performance of Pharmaceutical Firms

	Mean	Std. Dev.
Operational efficiency is a key focus area for the pharmaceutical firm, with ongoing efforts to optimize processes and resource utilization.	3.875	0.875
The firm actively monitors its market performance, including market share and customer satisfaction.	3.853	0.745
Innovation and adaptability are prioritized to stay competitive in the dynamic pharmaceutical industry.	3.802	0.617
Employee performance and satisfaction are crucial aspects, with a focus on workforce productivity and engagement.	3.752	0.708
The pharmaceutical firm places importance on corporate social responsibility, incorporating sustainability practices and ethical standards.	3.691	0.756
Strategic alignment is emphasized, ensuring that the firm's strategies align with its mission, vision, and overall goals.	3.652	0.567
Aggregate	**3.771**	**0.711**

Inferential Statistics

Inferential statistics in the current study focused on correlation and regression analysis. Correlation analysis was used to determine the strength of the relationship while regression analysis was used to determine the relationship between dependent variable (performance of pharmaceutical firms in Kenya) and independent variables (inventory management systems and Economic Order Quantity (EOQ).

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (inventory management systems and Economic Order Quantity (EOQ)) and the dependent variable (performance of private hospitals in Kenya). Pearson correlation coefficient range between zero and one, where by the strength of association increase with increase in the value of the correlation coefficients.

Table 4: Correlation Coefficients

		Organization Performance	Inventory Management Systems	Economic Order Quantity (EOQ).
Organization Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	192		
Inventory Management Systems	Pearson Correlation	.826**	1	
	Sig. (2-tailed)	.002		
	N	192	192	
Economic Order Quantity (EOQ).	Pearson Correlation	.871**	.278	1
	Sig. (2-tailed)	.000	.076	
	N	192	192	192

The results revealed that there is a very strong relationship between inventory management systems and performance of pharmaceutical firms in Kenya (r = 0.826, p value =0.002). The relationship was significant since the p value 0.002 was less than 0.05 (significant level).The findings are in line with the findings of Cherotich and Ngugi, (2019) that there is a very strong relationship between inventory management systems and organization performance.

The results also revealed that there was a very strong relationship between Economic Order Quantity (EOQ) and performance of pharmaceutical firms in Kenya (r = 0.871, p value =0.000). The relationship was significant since the p value 0.000 was less than 0.05 (significant level). The findings are in line with the results of Korir, Kaitany and Sang, (2021) who revealed that there is a very strong relationship between Economic Order Quantity (EOQ) and organization performance.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (inventory management systems and Economic Order Quantity (EOQ)) and the dependent variable (performance of pharmaceutical firms in Kenya)

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922	.850	.851	.10428

a. Predictors: (Constant), inventory management systems and Economic Order Quantity (EOQ)

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.850. This implied that 85% of the variation in the dependent variable (performance of pharmaceutical firms in Kenya) could be explained by independent variables (inventory management systems and Economic Order Quantity (EOQ))

Table 6: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	141.081	2	70.54	1836.9	.000[b]
	Residual	7.254	189	.0384		
	Total	148.335	191			

a. Dependent Variable: performance of pharmaceutical firms in Kenya

b. Predictors: (Constant), inventory management systems and Economic Order Quantity (EOQ).

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 1836.9 while the F critical was 2.420. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of inventory management systems and Economic Order Quantity (EOQ) on performance of pharmaceutical firms in Kenya

Table 7: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.239	0.061		3.918	0.000
	Inventory Management System	0.357	0.098	0.356	3.643	0.002
	Economic Order Quantity (EOQ)	0.375	0.099	0.376	3.788	0.001

a Dependent Variable: Performance of pharmaceutical firms in Kenya.

The regression model was as follows:

$Y = 0.239 + 0.357X_1 + 0.375X_2 + \varepsilon$

The results revealed that inventory management systems has significant effect on the performance of pharmaceutical firms in Kenya, $\beta 1=0.357$, p value= 0.002). The relationship was considered significant since the p value 0.002 was less than the significant level of 0.05. The findings are in line with the findings of Cherotich and Ngugi, (2019) that there is a very strong relationship between inventory management systems and organization performance.

In addition, the results revealed that Economic Order Quantity (EOQ) has significant effect on the performance of pharmaceutical firms in Kenya, $\beta 1=0.375$, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings are in line with the results of Korir, Kaitany and Sang, (2021) who revealed that there is a very strong relationship between Economic Order Quantity (EOQ) and organization performance.

Conclusions

Further, the study concludes that inventory management systems have a significant effect on performance of pharmaceutical firms in Kenya. The study findings revealed that system

integration, raw materials availability, inventory processes and ordering systems influences performance of pharmaceutical firms in Kenya

The study also concludes that Economic Order Quantity (EOQ has a significant effect on performance of pharmaceutical firms in Kenya. The study findings revealed that annual cost, holding cost, shortage cost and order cost influences performance of pharmaceutical firms in Kenya

Recommendations

Further, the study found that inventory management system has a significant effect on performance of pharmaceutical firms in Kenya. This study therefore recommends that the management of pharmaceutical firms in Kenya should implement effective systems integration, effective inventory processes, ordering systems and raw materials availability for smooth flow of operations.

The study also found that Economic Order Quantity has a significant effect performance of pharmaceutical firms in Kenya. This study therefore recommends that the management of pharmaceutical firms in Kenya should ensure effectiveness annual cost, holding cost, shortage cost, and order cost to improve efficiency.

Suggestions for Further Studies

This study focused on the influence of inventory optimization on performance of pharmaceutical firms in Kenya. Having been limited to pharmaceutical firms in Kenya, the findings of this study cannot be generalized to firms in other sectors. This study therefore recommends further study on the influence of inventory optimization on performance of firms in other sectors in Kenya

In addition, the study found that the independent variables (inventory management systems and Economic Order Quantity (EOQ)) could only explain 85.7% of performance of pharmaceutical firms in Kenya. This study therefore suggests further research on other factors affecting performance of pharmaceutical firms in Kenya.

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