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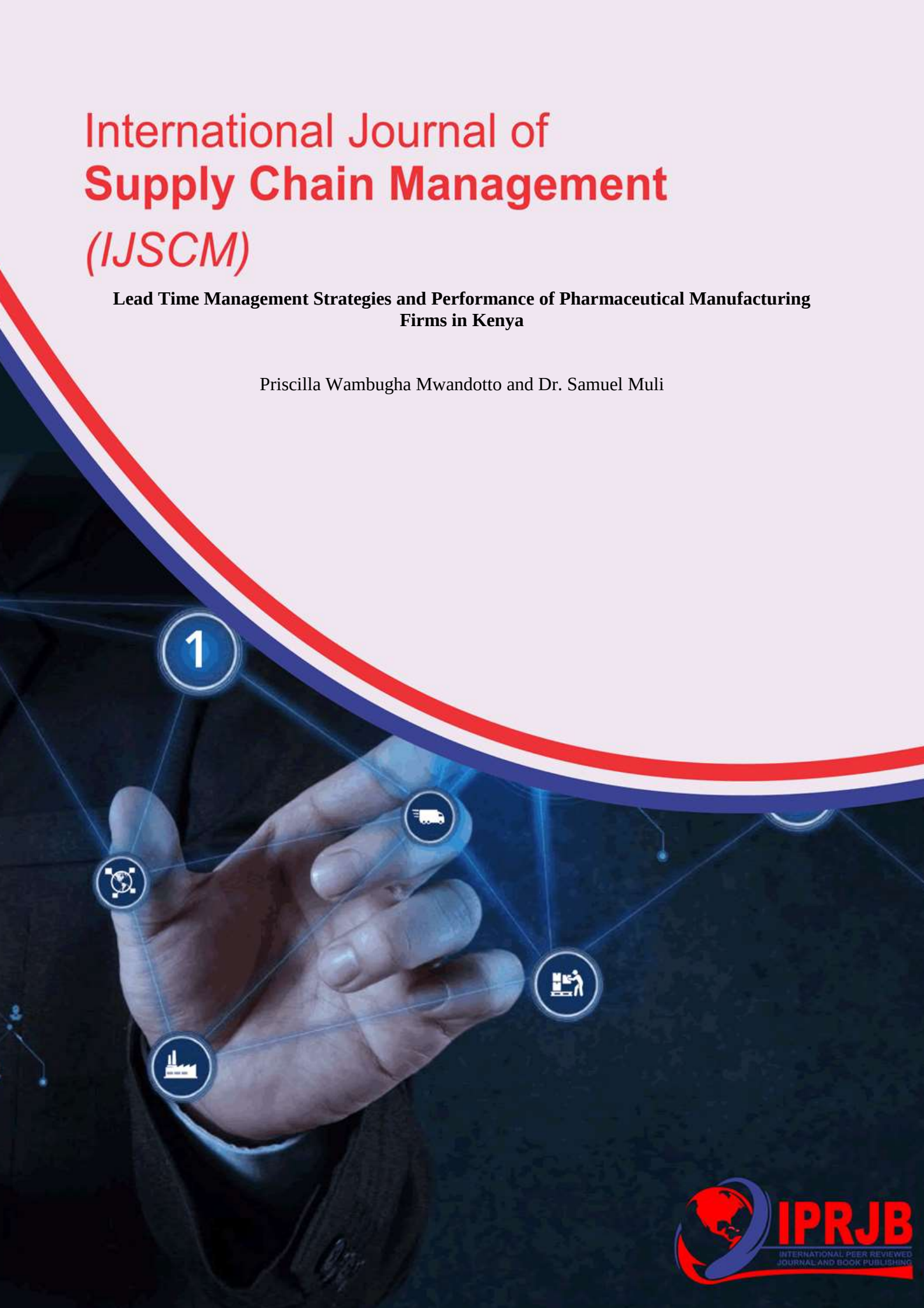

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Lead Time Management Strategies and Performance of Pharmaceutical Manufacturing Firms in Kenya

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Abstract

Purpose: The purpose of this study was to examine the impact of lead-time strategies on performance in pharmaceutical manufacturing firms in Kenya.

Methodology: The study employed a cross sectional survey approach and concentrated on 30 Kenyan registered pharmaceutical companies. Officials working in production, distribution, logistics, and warehouse functions in all pharmaceutical registered enterprises in Kenya would be the unit of observation. The study employed census and purposive sampling methods. The data was obtained through the use of a questionnaire. The pilot data was validated for completeness, consistency, and reliability. The collected data was sorted, coded, and then put into the Statistical Package For social sciences (SPSS version 28). Tables were used to present the study's findings.

Results: The findings revealed that lead time management strategies namely customer integration, supplier rationalization, product standardization, and inventory optimization had a positive significant influence on performance of pharmaceutical manufacturing firms. The study concluded that Pharmaceutical Manufacturing firms in Kenya had implemented the aforementioned lead-time strategies with the aim of improving their firm performance.

Unique Contribution to Theory, Practice and Policy: Supply chain management theory is advanced by studying lead-time methods and pharmaceutical manufacturing performance. It adds to current understanding by providing Kenyan-specific theoretical and empirical insights. The research also advances operations management theory by studying how lead-time strategies affect pharmaceutical manufacturing organizations. It fills a literature gap by providing insights into Kenya's pharmaceutical sector's operations and results. Kenyan pharmaceutical manufacturers may consider the study's lead-time strategy. With the research's insights, managers can improve supply chain operations, lead times, and operational performance. The study's findings can inform government plans to enhance Kenya's pharmaceutical manufacturing industry. By examining lead-time plans and performance, policymakers can target actions to improve the sector's competitiveness, efficiency, and public health. The report underlines the importance of industry standards for pharmaceutical lead time management. The study's findings can help industry groups and regulators set lead-time standards and best practices, improving performance and competitiveness. Scholars, legislators, and businesspeople share knowledge through the project. By spreading research findings through conferences, workshops, and publications, it encourages stakeholders to work together to tackle pharmaceutical production lead-time strategy difficulties and possibilities.

Keywords: *Lead Time Strategies, Customer Integration, Supplier Rationalization, Product Standardization, Inventory Optimization*

INTRODUCTION

Companies that manufacture pharmaceuticals typically use targets as indicators of how well they are performing (Lee, Huang, Hsu, & Hung, 2013). These targets are intended to be achieved over a specified amount of time. The primary goals are to obtain a high profit, produce excellent goods, preserve a significant market share, and most importantly, develop items that are utilized to save the lives of a great number of people all over the world (Waithaka & Waiganjo, 2015). Companies that manufacture pharmaceuticals have been significantly impacted by the global Covid-19 pandemic, which has caused the majority of economic activities to be slowed down as a result of restrictions brought about by the containment as well as cessation of parts of many countries across the globe (Economic survey, 2020).

Because of the lockdown going on around the globe, 76% of the manufacturers have had trouble acquiring their materials locally and/or delivering their products. This has led to a decrease in income as a result of unsatisfied customer demands and also increased lead times (KAM, 2020). Exporters of pharmaceuticals items have not been spared either, with 57 percent of respondents strongly agreeing that they are having challenges in exporting as a result of limited cargo capacity and increasing costs associated with air freight. The pharmaceutical business in Kenya plays a significant part in assisting Kenya's health care system and ensuring that medical supplies and pharmaceutical goods are delivered on time and without interruption to all of the country's hospitals and other health care institutions.

In order for this to occur, there was need to develop closer relationships between the manufacturers of pharmaceuticals and their respective suppliers in order to reduce the lead time, increase product quality, and keep up with the ever-increasing demand for medical items (Lenin, 2014). As a consequence of this, pharmaceutical firms, which are already extremely competitive worldwide, have a pressing need to reduce their lead times. This was competitively differentiate the firms from their rivals, which resulted in a growth in sales as well as an improvement in performance (Waithaka & Waiganjo, 2015).

One of the most important elements determining the performance as well as competitiveness of supply chain networks was lead time (Bianchini, Benci, Pellegrini & Rossi, 2019). Long lead times, on the other hand, remain among the top difficulties for pharmaceutical manufacturing organizations, whether prompted by the desire to enhance speed to respond to market developments (Alzoubi *et al.,* 2022). This has caused to revenue losses as a result of unmet consumer demands, as well as extended lead times and expensive operating costs (KAM, 2020). Furthermore, exporters of pharmaceuticals have not been spared, with 57 percent strongly agreeing that they are experiencing challenges in exporting due to limited cargo capacity and rising air freight costs (Mwamuye & Nyamu 2014). Longer lead times required manufacturers to carry more inventory and face an increased risk of shortages, raising operating expenses (Onikoyi *et al.,* 2017).

Longer lead times also made it more difficult for pharmaceutical manufacturers to introduce new goods or respond to market developments since they have so much inventories in the supply chain pipelines at any given moment (Laurenza, Quintano, Schiavone, & Vrontis, 2018). Because of these factors, the speed to market is jeopardized, and peer competitor firms in the industry may introduce new goods faster and capture more market share, hampered competitiveness as well as performance (Lakdawalla, 2018). Several research on lead-time management on pharmaceutical manufacturing enterprises in Kenya have been conducted (Jepkosgei, 2018). These academics concentrated on the impact of longer lead times on supply

chain practices and performance, and few attempted to address the issue of longer lead times and their relationship with competitiveness as well as performance (McCollum et al., 2019). Furthermore, the majority of studies on the subject have been conducted internationally, regionally, and locally (Lelei, 2021), however there was no distinct structure in terms of local remedies to these problems. Against such a backdrop, the study aims to fill the identified research gap and contribute to the development of a local solution to improve the performance and competitiveness of pharmaceutical manufacturing firms in Kenya. Therefore, the objective of this study was to establish the influence of lead-time management strategies on the performance of the pharmaceutical manufacturing firms in Kenya.

LITERATURE REVIEW

Theoretical Review

Relationship Marketing Theory

Relationship marketing, first introduced by American marketing scholars Berry (1983), is a marketing activity that companies engage in to establish, maintain, and promote productive relationships with clients and consumers. This strategy, known as customer relationship management (CRM), aims to generate recurring customers and increase the lifetime value of a customer. The theory focuses on long-term partnerships with essential suppliers, focusing on the most valuable consumers, developing an understanding of them, cultivating relationships with them, and influencing their perception of the business and its solutions.

CRM examines long-term partnerships with essential suppliers, focusing on a win-win mentality and the distinctive organizational resources of an organization. A company's ability to identify and effectively manage its operations and relations is directly correlated to its competitiveness. This is achieved by creating communication channels, coordinating information flow, and determining stock requirements. To excel in implementing relationship marketing theory, organizations must create a firm client base and examine their profiles and behaviors. They should also investigate the reasons for their customers' purchases, their motivations, and their objectives. Once a company has a solid understanding of their customers, they can collaborate to design a strategic marketing campaign that revolves around their unique interests and behaviors.

The relationship marketing theory is a departure from traditional marketing, which only employed a single sales technique. It views the sale of a product or service as the beginning of a relationship with the customer. Companies can develop loyalty programs, discounts, or free items of value to encourage continued interaction. The goal of relationship marketing content is to get clients one step closer to making a purchase. Oballa et al. (2015) found that when a company starts marketing initiatives that effectively build client loyalty, sales will improve. The idea promotes marketing campaigns that focus on the target customer market, catering to individual demands, and introducing products that can address both present and future needs.

Resource Based Theory

Barney's resource-based theory, first introduced in 1991, posits that a firm must be competitive in the wider business world to achieve success. Strategic resources, such as valuable, scarce, hard to imitate, irreplaceable, and strategic, are essential for long-term success (Kozlenkova, Samaha & Palmatier, 2014). This theory has evolved over time, with companies in Kenya focusing on the few most profitable suppliers who are trustworthy and capable. The resource-based theory emphasizes the uniqueness of a resource, allowing it to better respond to the

changing needs of its environment and increase the likelihood of better performance. However, some academics argue that the resource-based approach refers to the differences in capacities and skills between different organizations, making it impossible for any company to gain a competitive advantage (Olavarrieta & Ellinger, 1997). In reality, businesses and marketplaces are highly distinct from one another, and resources are not transferable between institutions, making it difficult for businesses to replicate their rivals' marketing methods and bring these strategies to the consumer market.

The resource-based theory suggests that businesses should search within their organizations for competitiveness through the utilization of their own resources (Barney, Ketchen Jr & Wright, 2011). By utilizing certain clients and expanding the capacity of those businesses, companies can achieve mutually beneficial outcomes in supply chain operations. A competitive advantage is an edge a company has over its rivals, enabling higher sales or margins and retaining a larger customer base (Wan, Hoskisson, Short, & Yiu, 2011). The classification and categorization of a company's suppliers can help create and attain lasting competitive advantages, allowing companies to rely on their internal resources to achieve their goals rather than seeking external resources.

Deming's Theory

The Deming Theory, also known as the Plan-Do-Study-Act (PDCA) Cycle, is an iterative technique that consists of four steps to improve business processes and find solutions to problems (Anderson, Rungtusanatham, Schroeder & Devaraj, 1995). It was first introduced by physicist and statistician Dr. Walter A. Shewhart in the 1920s. The PDSA Cycle, also known as the Plan-Do-Study-Act, is a methodical procedure that can be used to acquire useful learning and information for ongoing improvements to a product, process, or service. The first step, "Plan," involves creating a theory, setting goals or purposes, establishing success measures, and implementing the plan into action. The next step, "Do," involves implementing the plan, such as manufacturing a product (Petersen, 1999). The next step, "Study," assesses the feasibility of the plan by monitoring outcomes and identifying growth indicators, difficulties, and areas for improvement. The Act step brings the cycle to an end by integrating the learning generated throughout the process.

Dr. Deming placed a greater emphasis on "Check" as it involves the execution of a change, regardless of its success (Koskela, Tezel & Patel, 2019). He emphasized the importance of being steered by a theory when learning new knowledge through the process of learning. In contrast, the Check phase of the PDCA cycle focuses on determining if a plan was successful and making necessary adjustments if it was unsuccessful (Moen, 2009). The primary pillars of quality are continuous improvement, managerial engagement, goal formulation, statistical analysis, and communication. To produce goods and services that are "not flawed" and satisfy customer requirements, businesses should understand the interplay between these components and focus on that interplay (Moen & Norman, 2006). Consistency in manufacturing, for example, increases product quality while lowering production costs and improving organizational procedures. Defect prevention, or achieving zero defects, involves enhancing processes to ensure all output is reliably contained within specification boundaries. In summary, the Deming Theory is a valuable tool for businesses to improve their products and services through a methodical and long-lasting approach to quality management (Villalba-Diez & Ordieres-Meré, 2015).

Theory of Constraints

The theory of constraints (TOC) is a managerial philosophy developed by Eliyahu M. Goldratt in 1984, which emphasizes the importance of identifying system constrictions or bottlenecks (Cox III, CIRM & Schleier Jr, 2010). Goldratt referred to the "system constraint" or "bottleneck" as the "system constraint." By utilizing this limitation, businesses can meet financial objectives while satisfying consumers with on-time deliveries (OTIF), preventing stock-outs within supply chains, and shortening lead times (Watson, Blackstone & Gardiner, 2007). The theory has been applied in various business facets, including accounting, performance evaluation, projects management, supply chain management, performance measurement, and production planning and control. The TOC is connected to a broader group of management theories based on continuous improvement, which was introduced by W. Edwards Deming (Gupta & Boyd, 2008). These ideas, such as just-in-time (JIT) production, total quality management (TQM), and employee participation, have been developed as a direct result of Deming's teachings. However, the actual benefits of these ideas have often been less than anticipated, as few firms have implemented them in an organized manner that targets the operational elements that have the most influence (Simatupang, Wright & Sridharan, 2004).

The TOC management concept is built on the basis that a constraint on the company's profitability and cash flow is provided by such a constraint (Naor, Bernardes & Coman, 2013). An organization is analogous to a chain made up of numerous links (resources), and the contribution that one link in the chain makes is determined by how well the other links in the chain perform (Tulasi & Rao, 2012). To achieve its predefined goal, an organization must be effective in synchronizing the many chain linkages it requires to do so. In this research, the theory of constraints is adapted to describe the influence of inventory optimization in the implementation of lead time management strategies in the pharmaceutical and medical equipment sector in Kenya. These strategies aim to reduce the time it takes to get products to market and support various indicators, such as just-in-time, demand forecasting, and stock replenishment (Goldratt, 2017).

The TOC is based on the idea that every sophisticated system, such as manufacturing systems, consists of multiple linked activities, with one of these activities acting as a constraint on the entire system (Golmohammadi, 2015). This theory offers a powerful collection of tools to help organizations achieve their goals of optimizing profits. Utilizing stock replenishment is also considered by the TOC, ensuring timely stock monitoring, automatic computation of replenishing periods, and buffer stock management. The theory of constraints is a powerful tool that can be used to transform the flow of work at a medical facility, ensuring seamless operations without unnecessary disruptions or wasted time (Izmailov, Korneva & Kozhemiakin, 2016). However, it must be implemented with caution and under strict control to ensure the well-being of patients and maintaining acceptable boundaries.

Customer Integration

Strategic alignment and integration with customers emphasize regular client interactions, which are the time during which businesses uncover customer preference and enhance demand projections (Kuokkanen & Sun, 2020). When manufacturers collaborate with their clients, it helps them enhance production schedules and cut down on the number of times those schedules need to be modified. They do this by effectively sharing information with one another and working together to minimize the negative impacts of the bullwhip effect. In addition to this, the exchange of order data and capacity makes it much simpler for manufacturers to adapt their

manufacturing scheduling as well as capacity in beforehand (Ravitch & Carl, 2016). In a similar vein, earlier empirical research (Prajogo & Olhager, 2012) illustrated that there is a positive connection between manufacturers' performance as well as the act of a manufacturing company sharing either levels of inventory or customer needs information with retailers. This demonstrated that customer integration can result to competitive benefits. Again, Zhao, Huo, Sun, and Zhao (2013), revealed that customer integration directly effects competitive capacities in regarding product innovation and better performance by surveying development of new products in manufacturing enterprises. Integration of customers also creates remarkable prospects to leverage the intellectual prowess embedded in collaborative processes, which enables firms to reduce expenses, create so much value for customers, and more quickly detect critical shifts in demand, which enables them to design and carry out optimised responsiveness (Womak *et al.*, 2013).

Supplier Rationalization

Waswa and Juma (2015), state that supplier rationalization is an ongoing process that starts with the elimination of marginal and low-purchase volume suppliers. This is the first step in the process. It is then followed by the substitute of reputable suppliers with better suppliers or the initiation of supplier advancement projects with existing suppliers in order to improve performance, accompanied by the development of supplier evaluation as well as measurement systems in order to identify the best performing suppliers, and then finally by the developmental of long-term relationships. According to research carried out by CIPS (2012), a large number of companies used the same method for supply base rationalization. This method included the major practices such as the 20/80 rule. The Italian economist Vilfredo Pareto is credited with coming up with the rule (1848-1923). The claim of the principle is that in any succession of elements to be regulated, a selected minor difference in terms of the number of elements (20 percent) nearly always accounts for a significant factor in terms of effort. This rule is also known as the ABC analysis (Fink, 2016). The principle is a highly helpful tool in the process of supplier rationalization since it enables the buyer to maximize the return on their investment of time, effort, and resources (CIPS, 2012). According to another finding of the CIPS study, the "20/80 rule" can be understood in the context of sourcing to mean that 20 percent of suppliers are responsible for 80 percent of the value, risk, or expenditures. CIPS (2012), elaborates further that the rationalization procedure finds those few suppliers that account for twenty percent of the total cost and are responsible for the majority of quality issues or risks. These suppliers are then taken into consideration for deletion. According to CIPS (2012), this strategy is typically implemented by businesses where there is a need for a speedy reduction in the number of suppliers.

Product Standardization

In the current manufacturing climate, businesses are actively working to shift their production patterns from mass manufacturing to mass customization in order to cater to the specific preferences of individual customers (Onyeocha *et al.*, 2015). In the meantime, fierce market rivalry, shifting requirements from customers, and the introduction of new machinery have combined to make customer delight and competitive priority the market's top priorities. As a direct consequence of this, businesses are compelled to adopt the competitive priority in place of traditional management practices. Because the level of satisfaction that customers have with a company's products and services is the single most important factor in determining its long-term success, a firm should be allowed to efficiently design, develop, and manufacture goods

that customers will choose over those made available by their rivals (Ameri & Dutta, 2005). As said by Dissanayake and Cross (2018), the term "product standardization" refers to the process of preserving homogeneity of products as well as services offered for sale in different markets or, in other words, setting identical properties for a particular good or a service. This can also be stated as "setting identical parameters for a particular good or a service." For instance, if a certain corporation makes the decision to standardize the product, then that product will be created utilizing the same resources, manufactured utilizing the same techniques, and even offered under same name. The practice of standardizing a product involves the use of certain guidelines, and such regulations should be followed by the company that is willing to standardize the product. The regulations will be appropriate to one organization or to one industry, and they will be conformed at the national level or the global stage (Bratianu & Bejinaru, 2019).

Inventory Optimization

Automatic ordering cuts down on lead time, as stated by Wang *et al.* (2016), because it makes inventory requests in plenty of time to prevent stock-outs, which in turn cuts down on delivery time and costs. When it comes to the most important components, the company can keep a database of alternative suppliers who have the ability to deliver inventory in the event that the primary supplier is unable to do so or runs out of stock. According to further explanations provided by Wang *et al.*, (2016), lengthier lead times frequently result in inefficiencies and the waste of resources. Accordingly, businesses should assess their processing times in comparison to benchmarks in order to identify strategies to improve their lead times. Bringing down the lead time results in an increase in total productivity, which in turn leads to increased revenues and profitability. According to Onyango (2013), businesses that keep inventory on hand for the purpose of using it in production frequently run into instances of stock outs. This occurs when the stock on hand is depleted without any new supply coming in to replace it. Customers frequently experience annoyance as a result of stock outs since they are required to wait for their orders to be fulfilled, while the company experiences an increase in costs as a result of being forced to halt the manufacturing. According to the findings of a research project that was carried out by Naliaka and Namusonge (2015), inventory automation is one of the most effective strategies for businesses to cut down on lead time in the supply chain. Tasks that are often performed manually but can be handled by automation instead, such as placing orders, processing modifications, data entry, and many more tasks. The majority of pharmaceutical companies use inventory management strategies, which are very important to pharmaceutical sectors because the systems are tailored to cut costs, increase profits, and satisfy customer demands. This is accomplished by ensuring that balanced items of stock are maintained at the right quality, quantity, and that they are obtainable at the right time and in the right place. According to Nzuza (2015), the JIT approach is a Japanese philosophy and logic related with assembly that entails having the appropriate things in the appropriate quality and quantity at the appropriate place and at the appropriate time. The utilization of the JIT technique results in an improvement in quality, as well as an increase in both profitability and efficiency. The researcher went on to clarify that the primary goal of the JIT technique is to achieve zero stock while simultaneously preserving the company's profit.

Performance of the Pharmaceutical Manufacturing Firms

The pharmaceutical industry is extremely complicated and involves a wide variety of players, including the actual makers of the drugs, national regulators, the government, wholesalers, and

others (Nzuza, 2015). The health care industry is a massive economic and social sector that serves as a key provider of services to the general public while also employing a big labor force. Shortages of necessary goods and exorbitantly priced treatments are two of the primary factors that contribute to Kenya's poor health care system performance. It was projected that more than one third of Kenya's overall health expenditure went toward the purchase of drugs alone. When compared to pharmaceutical procurement and supply, other important medical supplies and equipment, laboratory inputs, and basic supplies have a lower level of documentation (Kariuki *et al.*, 2014). The efficiency of the supply chains that bring necessary commodities into different sectors and the markets that decide pricing, profitability, market share, customer satisfaction, sales volume and accessibility of the commodities to customers are important key drivers of the health system (Yadav, 2014). The government of Kenya needs to provide opportunities to motivate the local manufacturing of affordable medicine, particularly for simple molecules, in order to improve the performance of the country's health care systems. This will help to drive growth in the country's manufacturing sector and exports to the regional market. Because of the high disease burden and low funding for healthcare, there is an enormous amount of pressure placed on the prices of quality medications. The pharmaceutical sector needs to strengthen its competition in order to improve the cost of medications. This can be accomplished by allowing as many companies with excellent brands as feasible to participate in the market.

This study investigated the relationship between lead time strategies and the performance of performance of pharmaceutical manufacturing firms in Kenya, namely customer integration, supplier rationalization, product standardization, and inventory optimization. The figure below provides an illustration of this;

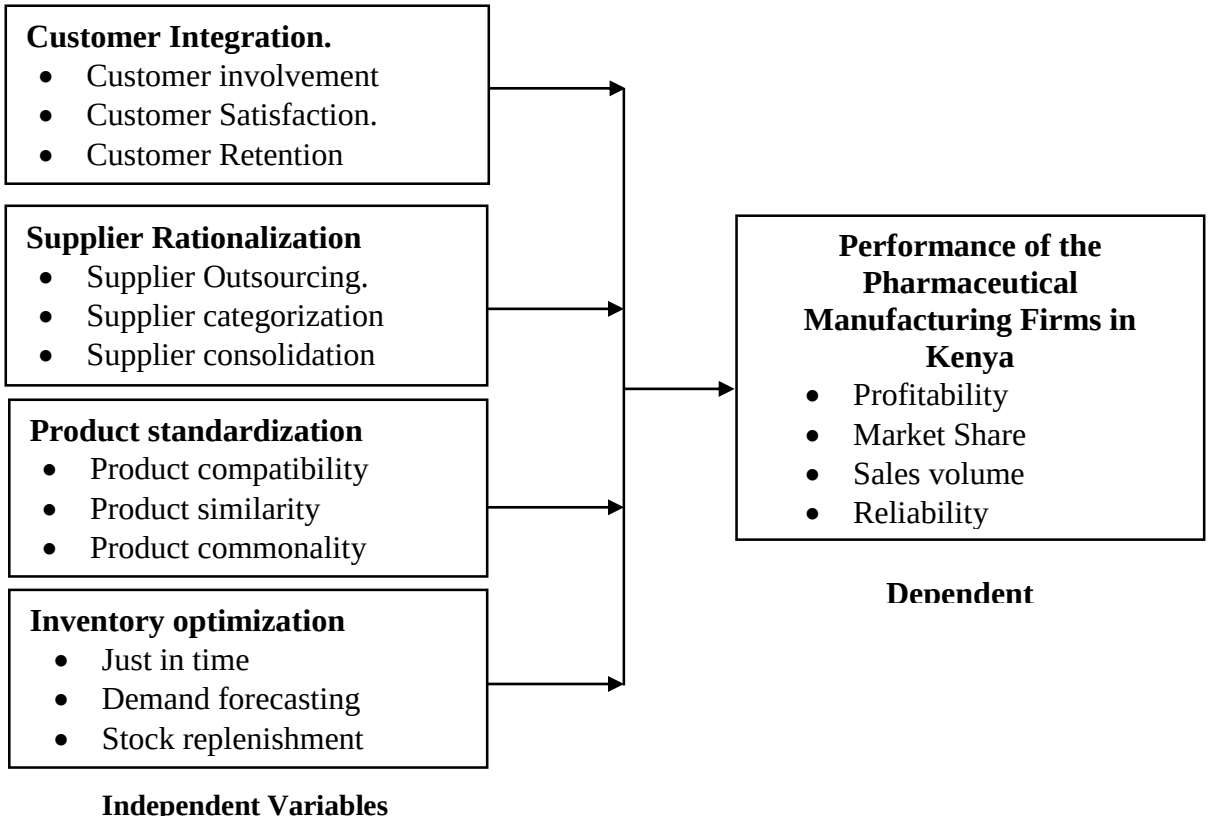

Figure 1: Conceptual Framework

Although a number of research on the influence of lead time management methods in the pharmaceuticals sector in Kenya have been conducted, the majority of those studies have focused on the procurement processes involved in the distribution of pharmaceutical products in Kenya. The researchers came to the conclusion that sourcing is an essential component in the provision of high-quality health care, along with other vital components such as designs, planning, and the selection of suppliers, all of which play an extremely important role in the performance of the organization. Once again, Musau (2018) attempted to determine the influence that the procurement function has on the supply of pharmaceutical items in Kenya. The findings of the study revealed that procurement has an effect on the provision of goods and services.

Afterwards, Oballah *et al.*, (2015) evaluated the influence of inventory management on the organizational performance of Kenya's Public Healthcare Institutions and found that inventory investment and inventory reduction have a negative impact on organizational performance. This was the conclusion of their study, which examined the impact of inventory management on the organizational performance of Kenya's Public Healthcare Institutions. According to the findings of the study, hospitals should take measures to limit the amount of money lost due to inventory theft associated with pharmaceuticals in order to prevent financial losses. Additionally, in Malawi's public health care delivery system, (Salam *et al.*, 2016) investigated the impact that procurement procedures had on the quality of health care that was provided. According to the findings of the study, the procurement function had a detrimental impact on the delivery of health care due to its failure to guarantee that pharmaceuticals would be easily accessible.

It was proven that frequent stock outs of pharmaceuticals occurred, which had a variety of negative effects on the delivery of healthcare, including the death of patients, the worsening of patients' medical conditions, overcrowding, and the transfer of patients to other medical institutions (Oyamo & Mburu, 2014). In each of these investigations, less focus was placed on developing effective solutions for managing lead times. The researchers did not take into account the lead time that is required once an order is placed, the logistics, and the regulations of the government, or stock outs that are caused by lengthier lead periods. The investigations did not take into account the difficulties of where the products have been sourced or the typical expected delivery periods.

According to Azzi *et al.* (2014), customer satisfaction is another area that has not been investigated thoroughly, but the involvement of customers in the implementation of lead time methods plays a significant part in the distribution of pharmaceutical items and equipment. Consumers get dissatisfied as a result of longer delivery delays and problems with stock outs when lead times are made to be longer than necessary. This can have an effect on the relationship that exists between a company and its customers. Despite this, there is a significant gap in knowledge that needs to be filled through the expansion of academic and practical approaches, as there is only a small amount of published research that directly addresses the lead time management strategies and performance of the pharmaceutical sectors around the world, including in Kenya.

Chimwani, Iravo, and Tirimba (2014) found that there is a lack of research on lead time strategies in the pharmaceutical sector in Kenya. Previous studies focused on the private sector, such as telecommunications, automobile, and Safaricom Kenya Ltd, but few have addressed the connection between longer lead times and competitiveness and performance. The majority

of research has been conducted on a global, regional, and local scale, but there are no obvious local answers to the issue. Several studies have focused on lead time management in supply chains, such as Vivarelli (2015) and Oyamo and Mburu (2014). However, none have addressed the role that lead time management strategies play in determining business success in the pharmaceutical industries. The primary objective of this study is to address these knowledge gaps to improve the efficiency and competitiveness of the pharmaceutical manufacturing industry in Kenya.

Existing studies lack a well-defined theoretical framework to establish the connection between lead time management strategies and firm performance in pharmaceutical manufacturing. The research's focus on Kenyan companies may limit applicability to other industries or geographic settings. Additionally, the study's cross-sectional design may introduce measurement biases and not adequately address potential confounding variables. Most studies on lead time management methods in the pharmaceuticals sector in Kenya have focused on procurement processes involved in the distribution of pharmaceutical products. The researchers concluded that sourcing is essential for providing high-quality healthcare, along with other vital components such as designs, planning, and supplier selection. Oballah et al. (2015) found that inventory management has a negative impact on organizational performance in Kenya's Public Healthcare Institutions, and hospitals should take measures to limit financial losses due to inventory theft associated with pharmaceuticals. Frequent stock outs of pharmaceuticals have negative effects on healthcare delivery, including patient death, worsening medical conditions, overcrowding, and patient transfer. However, less focus has been placed on developing effective solutions for managing lead times, logistics, government regulations, and stock outs caused by longer lead periods.

Customer satisfaction is another area that has not been thoroughly investigated. The involvement of customers in the implementation of lead time methods plays a significant part in the distribution of pharmaceutical items and equipment. Consumers become dissatisfied with longer delivery delays and stock outs when lead times are made longer than necessary, which can affect the relationship between a company and its customers. There is a significant gap in knowledge that needs to be filled through the expansion of academic and practical approaches, as there is only a small amount of published research directly addressing lead time management strategies and performance in the pharmaceutical sectors worldwide, including in Kenya.

METHODOLOGY

The study employed a cross sectional survey approach and concentrated on 30 Kenyan registered pharmaceutical companies. Officials working in production, distribution, logistics, and warehouse functions in all pharmaceutical registered enterprises in Kenya would be the unit of observation. The study employed census and purposive sampling methods. The data was obtained through the use of a questionnaire. The pilot data was validated for completeness, consistency, and reliability. The collected data was sorted, coded, and then put into the Statistical Package For social sciences (SPSS version 28). Tables were used to present the study's findings. The study made use of means, and standard deviations to evaluate descriptive research. Additionally, an inference analysis was done. Tables were used to display the results. Finally, a multiple regression model was fitted to the data of the study.

RESULTS AND DISCUSSIONS

Descriptive Findings of Customer Integration

The findings showed that majority of the respondents neither agreed nor disagreed with the assertion that customers provide our firm with valuable insights and feedback to help improve on lead time management ($\bar{x}$ = 3.1600, SD= 1.37019). For the statement on our firm's collaboration frameworks with customers supports successful involvement in lead time management, most of the respondents agreed ($\bar{x}$ = 3.8800, SD= 1.29266). The majority of participants held the view that we have reduced the risk of delays that can negatively impact customer satisfaction ($\bar{x}$ = 3.4240, SD= .97769). In addition, majority of the respondents neither agreed nor disagreed with the statement that we monitor and address customer feedback and complaints ($\bar{x}$ = 3.1520, SD= 1.40882). Further, the majority of participants neither agreed nor disagreed that the use of automated demand systems has led to customer satisfaction ($\bar{x}$ = 3.2720, SD= 1.38177). Also, majority of the respondents neither agreed nor disagreed with the assertion that our firm's improved customer satisfaction has led to increased customer loyalty ($\bar{x}$ = 3.4920, SD= 1.03094). Finally, majority of the respondents agreed with the assertion that our firm's consistency in delivering high-quality products has increase customer retention rates ($\bar{x}$ = 3.4960, SD= 1.17517). Using a 5-point scale Likert mean of more than ($\bar{x}$ = 3.4) in four out of seven statements, it is clear that a major section of the respondents agreed with the most of the assertions on customer integration. The findings of the study show that customer integration has a positive influence on the performance of pharmaceutical manufacturing firms. These findings mirror those of Afshan and Motwani (2018), who established that companies can gain tremendous insight about the requirements and preferences of their target market by involving customers in the product development process. As a result, they may be able to create goods that more closely satisfy consumer needs, which may raise customer happiness and, ultimately, boost sales and revenue.

Table 1*:* Descriptive Statistics of Customer Integration

Statements	Mean	Std. Deviation
Customers provide our firm with valuable insights and feedback to help improve on lead time management.	3.1600	1.37019
Our firm's collaboration frameworks with customers supports successful involvement in lead time management.	3.8800	1.29266
We have reduced the risk of delays that can negatively impact customer satisfaction.	3.4240	.97769
We monitor and address customer feedback and complaints	3.1520	1.40882
The use of automated demand systems has led to customer satisfaction.	3.2720	1.38177
Our firm's improved customer satisfaction has led to increased customer loyalty.	3.4920	1.03094
Our firm's consistency in delivering high-quality products has increase customer retention rates.	3.4960	1.17517

Descriptive Findings of Supplier Rationalization

The descriptive findings in Table 2 illustrated that most of the respondents agreed with the statement that we have categorized our suppliers based on criticality of the products they supply to us ($\bar{x}$ = 3.8960, SD= 1.26251). In addition, the majority of participants neither agreed nor

disagreed with the view our organization has developed close relationships with few key suppliers ($\bar{x}$ = 3.4720, SD= 1.24029). Moreover, most of the respondents agreed with the statement that we consider supplier innovation when categorizing our supply base ($\bar{x}$ = 3.5040, SD= 1.27396). Besides, many of the respondents agreed with the statement that we consider the geographical location of a supplier when categorizing our supply base ($\bar{x}$ = 3.7200, SD= 1.30508). Further, most of the respondents neither agreed nor disagreed with the statement that we rationalize our supply base based on our total spend on particular category of items ($\bar{x}$ = 3.1360, SD= 1.09503). Also, majority of the respondents agreed with the assertion that we consider reputation and supplier capability when categorizing our supply base ($\bar{x}$ = 3.6400, SD= 1.23393). Additionally, majority of the respondents neither agreed nor disagreed with the view that our organization considers product improvement when rationalizing the supply base ($\bar{x}$ = 3.2320, SD= 1.21904). Lastly, the majority of participants neither agreed nor disagreed with the view that we have scheduled times for handling items from different category suppliers ($\bar{x}$ = 3.2960, SD= 1.28906). Using a five-point scale Likert mean more than ($\bar{x}$ = 3.4) in five out of eight statements, it is clear that a major section of the respondents agreed with the all the statements on supplier rationalization. The findings of the study show that supplier rationalization has a positive influence on the performance of pharmaceutical manufacturing firms. These findings mirror those of Luthubua (2014), who revealed that companies can take advantage of economies of scale and bargain better rates and terms with their suppliers by decreasing the spectrum of suppliers they utilize. This may aid in lowering buying expenses and enhancing supply chain effectiveness. Additionally, rationalizing your suppliers can result in better partnerships with them as well as better performance. Companies can establish stronger bonds with their vendors and work more productively to better quality as well as delivery performance by working with fewer suppliers. This can enhance product quality and uniformity while lowering supply chain risk.

Table 1*: D*escriptive Statistics of Supplier Rationalization

Statements	Mean	Std. Deviation
We have categorized our suppliers based on criticality of the products they supply to us.	3.8960	1.26251
Our organization has developed close relationships with few key suppliers.	3.4720	1.24029
We consider supplier innovation when categorizing our supply base	3.5040	1.27396
We consider the geographical location of a supplier when categorizing our supply base	3.7200	1.30508
We rationalize our supply base based on our total spend on particular category of items	3.1360	1.09503
We consider reputation and supplier capability when categorizing our supply base	3.6400	1.23393
Our organization considers product improvement when rationalizing the supply base	3.2320	1.21904
We have scheduled times for handling items from different category suppliers	3.2960	1.28906

Descriptive Findings of Product Standardization

The descriptive findings in Table 3 illustrated that most of the respondents neither agreed nor disagreed with the statement that we take into consideration industry standards when making products ($\bar{x}$ = 2.8400, SD= 1.01123). Plus, many respondents neither agreed nor disagreed with the statement that we roll out variety reduction programs to control the range of products we produce ($\bar{x}$ = 3.0080, SD= 1.07385). In addition, the majority of participants agreed with the argument that we conduct procedure audit to ensure products meet the standards ($\bar{x}$ = 3.4320, SD= 1.27213). Moreover, most of the respondents agreed with the statement that we adhere to the set policies and procedures when standardizing our products ($\bar{x}$ = 3.6720, SD= 1.24289). Further, many of the respondents neither agreed nor disagreed with the statement that we take into consideration proper marketing strategy when making our products ($\bar{x}$ = 3.0000, SD= 1.00000). Finally, the majority of participants held the view that we follow certification regulations to make products safe for consumers ($\bar{x}$ = 3.4960, SD= 1.22885). Using a five-point scale Likert mean more than ($\bar{x}$ = 3.4) in three out of six statements, it is clear that a major section of the respondents agreed with the all the assertions on product standardization. The findings of the study show that product standardization has a positive influence on the performance of pharmaceutical manufacturing firms. These findings mirror those of Nahm et al. (2012), who revealed that companies can take advantage of economies of scale and lower production costs by creating standardized products. As companies are able to utilize comparable product requirements across markets, standardization can also make supply chain management simpler and lower the complex nature of regulatory requirements.

Table 32: Descriptive Statistics of Product Standardization

Statements	Mean	Std. Deviation
We take into consideration industry standards when making products	2.8400	1.01123
We roll out variety reduction programs to control the range of products we produce	3.0080	1.07385
We conduct procedure audit to ensure products meet the standards	3.4320	1.27213
We adhere to the set policies and procedures when standardizing our products	3.6720	1.24289
We take into consideration proper marketing strategy when making our products	3.0000	1.00000
We follow certification regulations to make products safe for consumers	3.4960	1.22885

Descriptive Findings of Inventory Optimization

The descriptive findings in Table 4 illustrated that most of the respondents neither agreed nor disagreed with the statement that We use JIT philosophy to meet our customer orders ($\bar{x}$ = 3.4840, SD= 1.09827). However, many of the respondents agreed with the statement that with the practice of JIT, lower stock is held in our organization ($\bar{x}$ = 3.4560, SD= 1.17435). In addition, the majority of participants agreed with the argument that there is less variance between the forecasted and actual demand ($\bar{x}$ = 3.4400, SD= 1.20081). Further, many of the respondents neither agreed nor disagreed with the statement that we use vendor managed inventory system to aid in stock replenishment ($\bar{x}$ = 3.1200, SD= 1.12594). Moreover, most of the respondents neither agreed nor disagreed with the statement that our suppliers are able to track the stock levels from their side ($\bar{x}$ = 2.9360, SD= .98982). In addition, majority of the

respondents neither agreed nor disagreed with the assertion that we utilize automated demand forecasting systems ($\bar{x}$ = 3.1120, SD= 1.20627). Finally, the majority of participants held the view that we have implemented auto generated stock levels in managing our inventory ($\bar{x}$ = 3.7200, SD= 1.16120). Using a five-point scale Likert mean more than ($\bar{x}$ = 3.4) in four out of seven statements, it is clear that a major section of the respondents agreed with the all the assertions on inventory optimization. The findings of the study show that inventory optimization has a positive influence on the performance of pharmaceutical manufacturing firms. These findings mirror those of Davis (2015), who revealed that companies can free holding costs and lower storage expenses by lowering their inventory levels. Profitability and capital flow may both benefit from this. Additionally, inventory optimization can result in increased client satisfaction and fewer stock outs. Businesses can increase customer happiness and loyalty by maximizing inventory levels as well as ensuring that the right merchandise are provided at the right time. Sales and income may rise as a result of this.

Table 3: Descriptive Statistics of Inventory Optimization

Statements	Mean	Std. Deviation
We use JIT philosophy to meet our customer orders	3.4840	1.09827
With the practice of JIT, lower stock is held in our organization	3.4560	1.17435
There is less variance between the forecasted and actual demand	3.4400	1.20081
We use vendor managed inventory system to aid in stock replenishment	3.1200	1.12594
Our suppliers are able to track the stock levels from their side	2.9360	.98982
We utilize automated demand forecasting systems	3.1120	1.20627
We have implemented auto generated stock levels in managing our inventory	3.7200	1.16120

Descriptive Findings of Performance of the Pharmaceutical Manufacturing firms in Kenya

The descriptive findings in Table 5 illustrated that most of the respondents agreed with the statement that reduced lead times have led to increased profitability of our firm in the last three years ($\bar{x}$ = 3.6000, SD= 1.18458). In addition, many of the respondents agreed with the statement that we prioritize customer satisfaction to increase our market share. ($\bar{x}$ = 4.0160, SD= 1.17077). Besides, the majority of participants held the view that real-time monitoring tools, have enabled our firm to improve on reliability and responsiveness ($\bar{x}$ = 3.5840, SD= 1.17215). Moreover, most of the respondents agreed with the statement that shorter lead times have enabled our firm to meet dynamic customer demand more quickly ($\bar{x}$ = 3.6480, SD= 1.29051). Further, many of the respondents agreed with the statement that the adherence to ISO standards has enabled our organization produce products with minimum defects ($\bar{x}$ = 3.8960, SD= 1.12037). Nevertheless, the majority of participants neither agreed nor disagreed with the view that the use of automated demand systems has led to timely responding to customer's dynamic demand ($\bar{x}$ = 3.1520, SD= 1.04770). Plus, many of the respondents agreed with the statement that JIT has enabled our organization to increase its profitability ($\bar{x}$ = 3.5120, SD= 1.34174). Finally, the majority of participants held the view that the use of automated demand systems has led to timely responding to customer's dynamic demand ($\bar{x}$ = 3.4400, SD=

1.11731). Using a five-point scale Likert mean more than ($\bar{x}$ = 3.4) it is clear that a major section of the respondents agreed with the all the statements on performance of pharmaceutical manufacturing firms in Kenya. Thus, the study revealed that profitability, market share, sales volume, and reliability had a positive influence on performance of pharmaceutical manufacturing firms. These findings mirror those of Endri, Lisdawati, Hakim and Sugianto (2020), who established that profitability is a crucial indicator of a company's financial success and of the overall strength and viability of the enterprise. A successful pharmaceutical manufacturing company is able to increase its R&D spending, grow its business, and recruit and keep top talent. This could encourage innovation, expand market share, and boost client happiness. Moreover, according to Moosivand, Ghatari and Rasekh (2019), market share is an additional crucial variable that can affect how well pharmaceutical manufacturing companies' function. A larger market share may be a sign that a company is outperforming its rivals in terms of client acquisition and revenue production. The company may become a market leader as a result, and its image and brand recognition may also improve. Also, another significant element that can affect how well pharmaceutical production companies perform is sales volume. Higher sales volumes can be a sign that a company's goods are in high demand and that it is successfully satisfying its customers' needs. Profitability can rise and revenue development may be aided by this. Finally, Abdirahman & Tarique (2020), noted that in the pharmaceutical manufacturing sector, reliability is important because it can impact the goods' efficacy and safety. Customers and healthcare professionals are more likely to have favorable opinions of a company that produces dependable, high-quality products. This could boost sales volume and boost consumer loyalty.

Table 54: Descriptive Statistics of Performance of the Pharmaceutical Manufacturing firms in Kenya

Statements	Mean	Std. Deviation
Reduced lead times have led to increased profitability of our firm in the last three years.	3.6000	1.18458
We prioritize customer satisfaction to increase our market share.	4.0160	1.17077
Real-time monitoring tools, have enabled our firm to improve on reliability and responsiveness.	3.5840	1.17215
Shorter lead times have enabled our firm to meet dynamic customer demand more quickly.	3.6480	1.29051
The adherence to ISO standards has enabled our organization produce products with minimum defects.	3.8960	1.12037
The use of automated demand systems has led to timely responding to customer's dynamic demand.	3.1520	1.04770
JIT has enabled our organization to increase its profitability.	3.5120	1.34174
The use of automated demand systems has led to timely responding to customer's dynamic demand.	3.4400	1.11731

Correlation Analysis

The strength of the relationship between the independent variables and the dependent variable was large. Customer integration (r = .706, large), supplier rationalization (r = .680, large), product standardization (r = .733, large), and inventory optimization (r = .611, large). The findings obtained for customer integration are in line with those of Wu, Wang, Wang, and Zhao

(2021), who established that there was a positive correlation between customer integration and firm performance. In addition, the findings obtained for supplier rationalization are in line with those of Luthubua (2014), who revealed that there was a positive correlation between supplier rationalization and performance of firms. Further, the findings obtained for product standardization are in line with those of Nahm *et al.* (2012), who established that there was a positive correlation between product standardization and firm performance. Finally, the findings obtained for inventory optimization are in line with those of Kazungu and Ochiri, (2019), who revealed that there was a positive correlation between inventory optimization and performance of firms.

Table 6: Correlation Analysis Findings

		Performance	Customer Integration	Supplier Rationalization	Product Standardization	Inventory Optimization
Performance	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	125				
Customer Integration	Pearson Correlation	.706**	1			
	Sig. (2-tailed)	.000				
	N	125	125			
Supplier Rationalization	Pearson Correlation	.680**	.636**	1		
	Sig. (2-tailed)	.000	.000			
	N	125	125	125		
Product Standardization	Pearson Correlation	.733**	.781**	.856**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	125	125	125	125	
Inventory Optimization	Pearson Correlation	.611**	.551**	.449**	.578**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	125	125	125	125	125

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

Regression Analysis Findings

The results in Table 7 present the model summary used of the regression model in expounding the study phenomena. Inventory optimization, supplier rationalization, customer integration, and product standardization were found to be suitable variables in influencing the performance of pharmaceutical manufacturing firms in Kenya. This is affirmed by the Adjusted R Square of 62.8%. This means that Inventory optimization, supplier rationalization, customer integration, and product standardization explain 62.8% of the variations in the dependent variable which is performance of pharmaceutical manufacturing firms in Kenya. The findings further indicate that the model is used to link the relationship of the variables was suitable.

Table 7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.800[a]	.640	.628	.43521

a. Predictors: (Constant), Inventory Optimization, Supplier rationalization, Customer Integration, Product Standardization

ANOVA[a]

The findings in Table 8 show the analysis of variance in the study. The findings show that the overall model was statistically significant as reinforced by a p value of .000 which was less than the critical p value of 0.05. In addition, the findings showed that the independent variables are key predictors of performance in pharmaceutical manufacturing firms. This was affirmed by an F statistic of 53.403 and the stated p value of .000 which was less than the conventional probability of 0.05 significance level.

Table 8: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.460	4	10.115	53.403	.000[b]
	Residual	22.729	120	.189		
	Total	**63.189**	**124**			

a. Dependent Variable: Performance

b. Predictors: (Constant), Inventory Optimization, Supplier rationalization, Customer Integration, Product Standardization

The findings from Table 9 showed that customer integration had a positive and significant influence on performance of pharmaceutical manufacturing firms (r = .272). The findings also demonstrated that supplier rationalization had a positive and significant influence on performance of pharmaceutical manufacturing firms (r = .228). The findings further recognized that product standardization had a positive influence on performance of pharmaceutical manufacturing firms (r = .094). Finally, inventory optimization was revealed to have a positive and significant influence on performance of pharmaceutical manufacturing firms (r = .256). Therefore, the overall regression findings showed that there was a positive and significant relationship between lead time management strategies and the performance of pharmaceutical manufacturing firms Kenya. Consequently, an increase in the lead-time management strategies' facets would lead to a corresponding increase in the performance of Kenyan pharmaceutical manufacturing firms.

Performance = 0.462 + 0.281Demand Management + 0.312Process Standardization + 0.688Lean Customer Practices + 0.068Lean Transport

Table 9: Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.743	.211		3.522	.001
	Customer Integration	.272	.081	.302	3.373	.001
	Supplier Rationalization	.228	.087	.281	2.628	.010
	Product Standardization	.094	.118	.108	.792	.430
	Inventory Optimization	.256	.069	.256	3.728	.000

a. Dependent Variable: Performance

To this end, the optimal model was;

$Y=\beta_0+\beta_1 X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\varepsilon$

$Y = 0.743 + 0.256X_1 + 0.272X_2 + 0.228X_3 + 0.094X_4$

Where; Y= Performance of Pharmaceutical Manufacturing Firms.

β_0=constant

β_i is the coefficient for X_i (i = 1, 2,3,4)

X_1 = Inventory Optimization

X_2 = Customer Integration

X_3 = Supplier Rationalization

X_4 = Product Standardization

$\beta_1\ \beta_2\ \beta_3\ \beta_4$ = Regression coefficients

ε = error term

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The foremost goal of the research was to find out how lead time management techniques influenced the performance of Kenyan pharmaceutical manufacturing companies. The study came to the conclusion that customer integration significantly improved company performance. It is important to draw the conclusion that customer integration is supported by company management and influences the performance of pharmaceutical manufacturing firms in Kenya because the study found a strong correlation between customer integration and the performance of pharmaceutical manufacturers. The research came to the conclusion that supplier rationalization influenced the performance of Kenyan pharmaceutical manufacturing companies. The Pearson product moment correlation coefficient, which showed that the influence was significant and positive, helps to explain this. As a consequence, supplier rationalization helped pharmaceutical companies perform better. The research further came to the conclusion that supplier rationalization, supplier categorization, and supplier consolidation are all essential components and, as such, have an impact on the performance of Kenyan pharmaceutical manufacturers.

On the other hand, the research came to the conclusion that product standardization significantly improved the performance of pharmaceutical manufacturing companies. The performance of pharmaceutical manufacturers was found to be strongly correlated with product standardization; as a result, the research came to the conclusion that product standardization influenced pharmaceutical manufacturers' performance in Kenya. The study's results indicated that product standardization had been adopted by Kenyan pharmaceutical companies for efficient performance. The research came to the conclusion that product compatibility, similarity, and commonality are crucial elements of product standardization and, as such, influence the performance of Kenya's pharmaceutical manufacturing firms. The research came to the conclusion that inventory optimization significantly improved the performance of Kenyan pharmaceutical manufacturing companies. This is because inventory optimization and company performance had a close correlation. The study also found that Kenyan pharmaceutical producers have adopted inventory optimization. Similarly, the research found

that for efficient performance, Kenyan pharmaceutical manufacturing companies had implemented inventory optimization. The research comes to the conclusion that demand forecasting, stock replenishment, and just-in-time delivery are crucial elements of inventory optimization and, as such, have an influence on the performance of Kenya's pharmaceutical manufacturing companies.

Recommendations

According to the research, pharmaceutical manufacturing companies should choose, identify, and execute the best customer integration strategies in order to increase performance. Through the use of customer advisory boards, customer data integration, and integrated problem-solving techniques, managers in particular should support customer integration. Supply chains for the manufacture of pharmaceuticals must include customer integration because it can help ensure that the goods satisfy both consumer demands and legal requirements. This will help pharmaceutical companies keep and strengthen their market position, which will lead to better performance. Pharmaceutical businesses can make sure that their products satisfy consumer demands, legal requirements, and quality standards while also promoting innovation and streamlining the supply chain by collaborating closely with their clients. The research also recommends that pharmaceutical companies enhance supplier rationalization in order to meet their needs for production capacity. In order to cut expenses, enhance risk management, and improve supplier performance, managers should primarily rationalize their suppliers. Similar to this, the research advises businesses to enhance their supplier rationalization standards in order to boost performance. Pharmaceutical companies can optimize their supply chains and gain a market advantage by carefully choosing and collaborating with a smaller number of vendors.

The research recommends that pharmaceutical manufacturing firms enhance their product standardization. Managers in pharmaceutical production firms should therefore come up with plans for product standardization. Therefore, product standardization can aid pharmaceutical businesses in enhancing productivity, quality consistency, regulatory compliance, adaptability, and supply chain cooperation. Pharmaceutical businesses can improve their supply networks and gain a market advantage by standardizing their products. It is also postulated that pharmaceutical production firms improve their inventory optimization methods. Therefore, regardless of market shifts and dynamics, businesses should increase the visibility of their inventories and their responsiveness to market requirements. This will help the businesses increase organizational efficiency by helping them decrease stock outs and ensure a smooth production flow. In order to better the performance of their companies, the study advises managers of pharmaceutical manufacturing companies to devise strategies to dealing with issues like lack of flexibility, complex products, special patient needs, and intellectual property issues. As a result, the success of pharmaceutical manufacturing supply networks depends on inventory optimization. Pharmaceutical businesses can cut costs, boost productivity and flexibility, boost customer happiness, cut waste, and improve supply chain visibility by optimizing inventory levels.

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