



LOGISTICS OPTIMIZATION AND PERFORMANCE OF PHARMACEUTICAL FIRMS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

The general objective of the study was to examine logistics optimization and performance of pharmaceutical firms in Nairobi City County, Kenya. The specific objectives included effect of transport planning and effect of inventory management on the performance of pharmaceutical firms in Nairobi City County. The study was guided by the following theories: The Systems Theory and the logistic Theory. The target population consisted of 100 procurement officers from 80 pharmaceutical firms in Nairobi City County, Kenya; hence, the sample was derived from the populations by use of Neyman allocation sample formulae thus obtaining a sample size of 680 respondents. The study involved collection of data using both primary and secondary data collection method. The primary data was collected through the use of a questionnaire which was self-administered. Qualitative method of data analysis was used in exploring, examining and providing findings regarding the optimization of logistics and performance of pharmaceutical firms in Nairobi City County, Kenya. Analyzed data was presented through use of frequency tabulation table's graphs, bar chart and inferential statistics for easy interpretation of findings. The study revealed that all strategies significantly positively affect firm performance, with inventory management showing the strongest influence ($\beta = 0.370$, $p = 0.000$), followed by transport planning ($\beta = 0.315$, $p = 0.001$). These findings indicate that effective logistics practices, particularly in inventory management, are crucial for enhancing operational efficiency, customer satisfaction, and overall firm performance. The study concludes that integrating advanced technologies, continuous staff training, and regular reviews of logistics processes are essential to maintain competitive advantage. It is recommended that pharmaceutical firms invest in technology-driven logistics solutions, optimize warehouse layouts, and enhance interdepartmental communication to further improve logistics efficiency and firm performance.

Key Words: Logistics Optimization, Transport Planning, Inventory Management, Performance of Pharmaceutical Firms

Background of the Study

Kenya's pharmaceutical business supports the nation's healthcare system by bringing together local producers, franchise importers, international corporations, wholesalers, and retailers. Kenya has about 9,000 recognized pharmaceutical items, divided into categories such as free, over-the-counter sales, pharmacy technologist, dispensable, or pharmacist dispensable. Kenya has about 4758 health institutions. Having access to a large selection of high-quality healthcare goods is essential. Patients and healthcare providers can use medical equipment safely and effectively when it is properly classified and regulated. Because of this diversity, suppliers and manufacturers are more likely to compete, which could result in reduced prices for customers. Strict control protects public health and safety by preventing the distribution of phoney or subpar medications. This ensures that patients receive genuine and effective treatments for their ailments. Additionally, it promotes trust in the healthcare system and encourages people to seek medical help when needed. (Pharmaceutical society of Kenya, 2024)

The state of the market today is becoming more unstable, which puts additional pressure on speed and cost. The globalisation of the market has led to intense rivalry, more demanding customers, shorter product life cycles and time to market, fiercer pricing competition, and more importance placed on response to fluctuating demand. In addition to superior product quality, it appears that the company's overall costs and reaction times, together with its supply chain and logistics operations, are critical success elements and critical tasks that must be optimised to attain cost and service leadership. Furthermore, the company must also focus on enhancing its supply chain flexibility and responsiveness to adapt quickly to changing market conditions. By streamlining operations and improving efficiency in these areas, the company can better navigate the challenges of a volatile market and maintain a competitive edge.

Logistics is the portion of the supply chain process that organizes, carries out, and manages the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to satisfy customer requirements, according to the Council of Logistics Practices (2019).

Businesses must manage their logistics well if they want to satisfy consumer needs, keep expenses down, and stay ahead of the competition. Increasing total operational efficiency and profitability is possible for businesses through the optimization of transportation, warehousing, and inventory systems. Effective logistics management also include cooperating with distributors and suppliers, streamlining supply chain procedures, and putting technology to use to improve visibility and communication. In today's global marketplace, a well-executed logistics strategy can ultimately result in higher customer satisfaction, enhanced brand recognition, and sustained growth for enterprises (Springinkle and Wallenburg, 2018, Mentzer, 2019, Fugate, 2019)

Logistics system is made up of logistics services, information systems and infrastructure/resources. Transportation and storage services, for example, facilitate the flow of goods and materials from the place of origin to the point of consumption and vice versa. More crucial concerns include tracking and tracing, although decision-making modelling and management are often included in information systems. Conversely, infrastructure includes transportation, communications, and warehousing, financial, human, and packaging resources. Efficient logistics systems can help companies reduce costs, improve customer satisfaction, and gain a competitive advantage in the market. By integrating all these components effectively, businesses can streamline their operations and ensure timely delivery of products to customers (Marlow and Casaca, 2018)

According to (Harrison & Hoek, 2018), from its mostly military beginnings, logistics has quickly evolved into one of the most important corporate concerns of our time, demanding the brightest brains and posing difficult management difficulties. They go on to say that marketing, finance, operations, and corporate strategy have all appropriately contributed to logistics in the past. The field of logistics encompasses more than just the organisation; it also involves the supply chain and the intricate task of coordinating the flow of information and commodities between numerous business activities.

Statement of the Problem

According to Ogero and Ochiri, (2018) and Kithuka, (2023) majority of Kenyan companies outsource 90% of their logistics processes in order to reduce costs and improve efficiency. This allows them to focus on their core competencies and strategic goals, ultimately leading to increased competitiveness in the global market, according to Muoki and Moronge (2021). However, these strategies have led to significant losses and gross mismanagement of logistics, and they are preventing firms from doing better over the long run. Over time, these issues may be lessened, and firms' overall performance can be protected by putting strong risk management procedures into place and making sure that outsourced logistics providers are properly supervised. Furthermore, cultivating solid alliances with trustworthy logistics partners may help promote long-term expansion and success in the international market. Having a reliable network of partners can also facilitate quicker response times and smoother operations in times of crisis. Due to a shortage of experienced personnel and a competitive job market, businesses are outsourcing logistics services to bridge the expertise gap and meet increased demand for qualified candidates (Biederman, 2018)

The pharmaceutical industry in emerging economies like the Asian countries drives economic growth and trade, attracting foreign investment and improving healthcare accessibility. It also fosters knowledge transfer and employment. (Tannoury, & Attieh, 2017). In Kenya, the case is not different. Pharmaceutical sector in Kenyan is expanding rapidly due to government programs and increased local businesses. Kenyan pharmaceutical companies are growing quickly as well, and the core of their business is logistics (Kimunya, & Thogori, 2023, Kithuka, 2023, Noshad, & Awasthi, 2018). In order to determine supplier selection and the performance of pharmaceutical firms in Kenya, Kimunya and Thogori (2023) conducted research. The study ignored the impact of the logistical factors and instead focused on the customer selection criteria in relation to the performance of pharmaceutical companies. In their investigation to ascertain the impact of reverse logistics procedures on the performance of pharmaceutical companies in Nairobi City County, Kenya. Ayeka and Walter (2021) looked at the impact of reverse logistics product collection on the performance of pharmaceutical companies in Nairobi, Kenya, as well as the impact of reverse logistics product receiving processes on pharmaceutical companies in Nairobi, Kenya. However, their study did not candidly explain factors such as effect of transportation, warehousing. Ahmed, Al Bashar, Taher, and Rahman (2024) did a study on innovative approaches to Sustainable Supply Chain Management in the Manufacturing Industry: A Systematic Literature review. The study found out that increased logistics efficiency, effectiveness, and differentiation-reduced expenses, inventory, cash requirements, and improved net margin, asset turnover, return on assets, and overall firm performance. It is for this reason therefore that the study sought to explore the effect of key logistic strategies like transport planning, and effect of inventory management on the performance of pharmaceutical firms in Nairobi City County

Objectives of the Study

The general objective of the study examined logistic optimization and performance of pharmaceutical firms in Nairobi City County, Kenya

Specific Objectives

1. To investigate the effect of transport planning on performance of pharmaceutical firms in Nairobi City County, Kenya
2. To determine the effect of inventory management on the performance of pharmaceutical firms in Nairobi City County

LITERATURE REVIEW

Theoretical Framework

Systems Theory

Systems theory emphasizes the arrangement and relationships between parts, rather than dividing an entity like the human body into elements. It suggests that the behavior of a system is independent of the properties of its elements (Ahrne & Brunsson, 2019). Systems theory is a useful framework for managing complex systems, allowing for the recognition of subsystems' proper functions and the integrated nature of business systems. It helps dissolve complexity and recognizes the nature of complex challenges. Business systems are part of larger systems, constantly changing and being created, operated, revised, and eliminated. The major tenets of systems theory include openness to the environment, purpose, interrelated subsystems, input-transformation-output process, feedback, and equifinality.

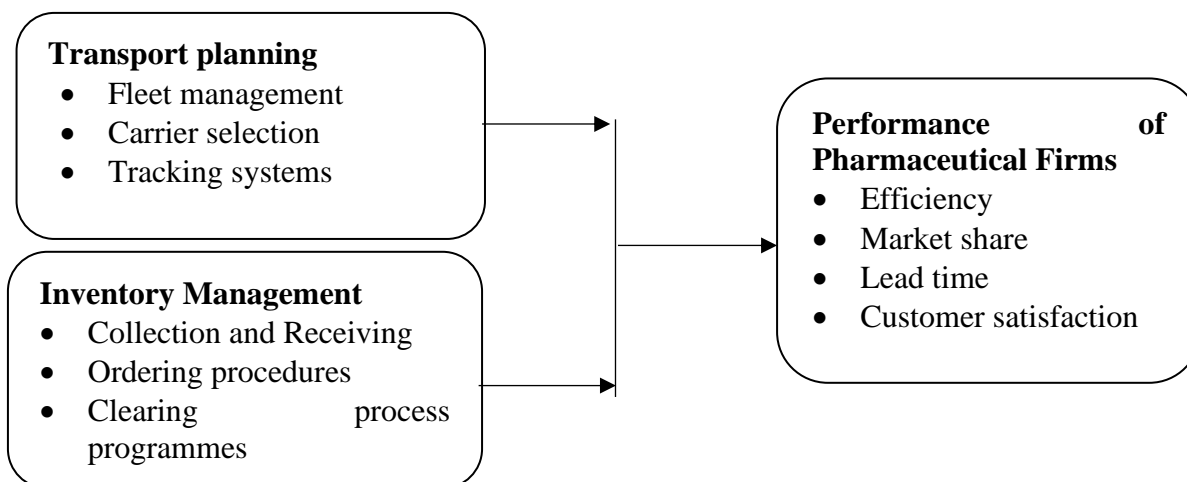
Phatak, & Sople, (2018) emphasizes that modern logistics is based on a systems approach, focusing on efficiency and effectiveness in sequential activities to achieve customer satisfaction at reduced costs. The logistics mix, which includes warehousing, information flow, inventory management, packaging, and transportation, is crucial for sustainable supply chains. This theory helps decision-makers understand industrial logistics systems and their operation, emphasizing modeling and performance measurement in a global supply chain. Performance analysis helps develop decision support systems for supply chain design, planning, and management.

Logistic Theory

The logistics theory, Mentzer's logistics theory, developed in 1988, focuses on scheduling, coordinating, and managing the flow of materials from extraction to consumption to meet stakeholder needs and interests. In the oil industry, logistics involves delivering the correct product or service to the right consumer at the right time and location while adhering to safety regulations and financial constraints. This involves managing supply chains, transportation, storage, and distribution procedures. Effective implementation of logistics strategies requires a comprehensive understanding of market demands, technological developments, and regulatory requirements. By integrating process optimization and data analytics, businesses can improve operational effectiveness and gain a competitive advantage. This theory is relevant to the study due to its explanation of scheduling, coordination, and material flow, an essential aspect of the logistic processes.

Conceptual Framework

A conceptual framework is a presentation method used by researchers to illustrate relationships between variables, serving as a theoretical model for their research (Orodho 2019, Kothari 2018)



Independent Variables

Dependent Variable

Figure 2. 1: Conceptual Framework

Transport Planning

A company's transportation mode and method are crucial for a sustainable supply chain, requiring managers to consider factors like cost and transit time, make informed decisions, negotiate prices, and evaluate trans-organisational performance. Additionally, efficient transportation can improve customer satisfaction by ensuring timely deliveries. Moreover, it can also reduce overall operational costs and enhance the company's competitive advantage in the market. Furthermore, efficient transportation can lead to increased flexibility in responding to changing market demands. Ultimately, a well-managed transportation system can contribute to the overall success and profitability of the company. By continuously optimizing transportation strategies, businesses can stay ahead of competitors and adapt to evolving market conditions. (Zhang, 2017, Ireton, 2018). The process of choosing a carrier consists of two parts: choosing the mode to utilise and then the conveyance within that mode. Options for the mode of transportation include trucks, rail, air, or marine freight. After the mode has been decided upon, the particular carrier within that mode needs to be picked according to criteria including price, dependability, and service options. When choosing a carrier, it's critical to thoroughly consider their qualifications and track record. Furthermore, taking into account elements like regional coverage and transit times may assist guarantee that the selected carrier fulfils the shipment's particular requirements. Businesses may choose a carrier that best suits their needs for transportation by doing extensive research and comparing various ones. In the end, choosing the best carrier is essential to guaranteeing the timely and economical delivery of products to their destination. (Akrofi, Ansah, Nuertey, & Tufour, 2017) These choices are frequently made in tandem with outsourcing to outside logistics companies. International expansion is a significant problem for sustainable supply chains since global transportation from sources and markets throughout the world results in greater prices and longer transit times. These difficulties can be mitigated by engaging in activities related to international trade, such as offering sufficient transportation and storage, clearing goods through customs, and making timely and reasonably priced deliveries to foreign countries (Noshad, & Awasthi, 2018).

Durach, Blesik, von Düring, and Bick (2021) assert that supply chain security is crucial as it affects how businesses run. By choosing carriers who prioritise security, safeguarding

shipment methods, adhering to package security regulations, and supplying background information on key persons, logistics managers may limit these effects. They should also modify inventory management plans, deal with transportation issues, and change relationships with suppliers and consumers. By putting these techniques into practice, supply chain risks including theft, counterfeiting, and tampering may be reduced. Furthermore, it is vital to uphold transparent communication with all relevant parties to guarantee the efficient implementation and sustenance of security protocols. Logistics managers may prevent security breaches and preserve the chain's integrity by routinely carrying out risk assessments and keeping up with industry best practices. Logistics managers may proactively address vulnerabilities and reduce the impact of security breaches on their operations by regularly analysing and adjusting security measures.

Inventory management

Effective inventory management is critical to a company's logistics operations. Optimizing storage space, cutting expenses, and guaranteeing on-time client deliveries are all made possible by effective inventory management (Acquah, 2024, Mohamed, 2024 & Chan, et al 2024). Additionally, it aids in averting stock outs and overstock scenarios, which enhances client delight and boosts revenue for the company. Moreover, accurate demand forecasting and efficient supply chain operations are made possible by good inventory management. (Ajayi, Olutokunbo, Obafemi, & Araoye, 2021). Businesses can reduce the risk of losses from theft, damage, or obsolescence by putting proper inventory control methods in place. Effective inventory management is essential for improving a company's overall performance and competitiveness in the fast-paced market of today. To keep ahead of the competition and satisfy customers' ever-changing needs, firms must constantly assess and enhance their inventory management systems. This may entail using technology—like inventory management software—to automate procedures and obtain up-to-date knowledge on stock levels. Just-in-time inventory solutions are another option that companies should think about if they want to lower carrying costs and boost supply chain productivity (Chan et al, 2024, Ajayi eFFFFt al, 2021, Inegbedion, Eze, Asaleye, & Lawal 2019)

Firm Performance

Firm performance is a critical measure of a company's success, reflecting how effectively it achieves its goals, manages resources, and maintains competitiveness in the market. In the context of logistics and supply chain management, firm performance is directly influenced by the efficiency of transportation management, and inventory control. These operational aspects are interconnected and significantly affect the overall performance by optimizing costs, enhancing customer satisfaction, and ensuring timely deliveries. Firm performance is often evaluated through a combination of financial and non-financial metrics, providing a holistic view of how well a company is performing in its logistical operations (Tseng, Islam, & Karia, 2019).

Operational efficiency is a key determinant of firm performance. It involves the optimization of logistics processes to reduce waste, streamline workflows, and enhance productivity. Companies that achieve high operational efficiency often benefit from lower costs, faster service delivery, and improved customer satisfaction. This efficiency can be attained through the implementation of advanced technologies, such as automation and artificial intelligence, which enhance decision-making and operational accuracy. According to Ivanov and Dolgui (2020), leveraging these technologies allows firms to respond quickly to changes in market demand, adjust logistics strategies in real time, and maintain a high level of service quality, ultimately boosting overall performance.

Cost management plays a crucial role in enhancing firm performance, particularly in logistics and supply chain operations. Effective cost management strategies help companies control expenses related to transportation, warehousing, and inventory, thus directly impacting profitability. The adoption of lean logistics practices, such as reducing excess inventory and optimizing transport routes, can lead to significant cost savings. Sarkis, Zhu, and Lai (2019) emphasize that by minimizing logistics costs without compromising service levels, firms can achieve a stronger financial position and gain a competitive edge in the market. Moreover, cost-efficient logistics operations contribute to sustainable supply chain management, aligning with broader corporate goals of environmental responsibility.

Market responsiveness, or the ability to adapt quickly to changes in customer demand and market conditions, is another critical factor influencing firm performance. Agile supply chains enable companies to meet varying customer needs with minimal delay, enhancing customer satisfaction and loyalty. According to Dubey et al. (2019), responsiveness is facilitated by real-time data analytics and flexible logistics networks that allow firms to anticipate market shifts and adjust their operations accordingly. Firms that are highly responsive can better manage disruptions, such as supply shortages or unexpected demand spikes, thereby maintaining consistent performance even in volatile market environments.

Customer satisfaction is a vital component of firm performance, especially in the context of logistics and supply chain management. Efficient logistics operations that ensure timely and accurate deliveries are key to maintaining high levels of customer satisfaction. Firms that invest in advanced logistics technologies, such as real-time tracking and automated order processing, can provide enhanced service quality, leading to improved customer experiences. According to Dey et al. (2020), high levels of customer satisfaction translate into repeat business, positive word-of-mouth, and a stronger market position, all of which contribute to overall firm performance.

The alignment of logistics strategies with broader business objectives is essential for optimizing firm performance. Strategic alignment ensures that logistics decisions support the company's goals, such as cost reduction, market expansion, or service differentiation. Integrated logistics strategies, which include collaborative planning with suppliers and the use of shared information systems, enhance the synchronization of supply chain activities. As noted by Tortorella et al. (2020), strategic alignment allows firms to leverage their logistics capabilities to drive business success, improve operational coherence, and achieve superior performance outcomes.

Measuring firm performance requires a balanced approach that incorporates both financial and operational metrics. Financial metrics, such as return on investment (ROI), profit margins, and cost-to-serve, provide insights into the economic impact of logistics decisions. Operational metrics, including order fulfillment rates, delivery times, and inventory turnover, offer a view of how effectively logistics processes are managed. Dutta and Bose (2021) suggest that a comprehensive performance measurement framework helps firms identify areas of improvement, set strategic priorities, and monitor the impact of logistics innovations on overall performance.

The integration of advanced technologies in logistics, such as predictive analytics, Internet of Things (IoT), and blockchain, has significantly transformed firm performance. These technologies provide enhanced visibility into supply chain operations, improve decision-making accuracy, and foster greater collaboration among supply chain partners. For instance, predictive analytics allows firms to forecast demand more accurately, optimize inventory levels, and reduce costs associated with stockouts or overstocking. According to Queiroz et al. (2021), technological integration not only streamlines logistics operations but also strengthens the firm's competitive position by enabling faster and more reliable service delivery.

Empirical Review

Adebayo et al (2020) emphasizes the significance of logistics infrastructure investment in pharmaceutical firms in West Africa. The study found that enhanced warehousing and transportation networks improved supply chain efficiency, inventory management, and product delivery. East Africa, particularly Kenya, has also been a focal point for research on logistics optimization in the pharmaceutical sector. According to a study by Nyaga, Whipple, and Lynch (2020), pharmaceutical firms that implemented advanced logistics practices, such as real-time inventory management systems and collaborative logistics partnerships, experienced substantial improvements in their operational performance. The study emphasized that these firms were better able to navigate the challenges posed by the region's infrastructure and regulatory environment, resulting in enhanced customer satisfaction and financial performance.

According to a study by Tumusiime and Karamagi (2021), firms that implemented real-time tracking systems and demand forecasting tools were better equipped to manage the complexities of Uganda's distribution landscape. The study revealed that these technological innovations allowed firms to optimize their delivery routes, reduce transportation costs, and improve delivery accuracy. As a result, pharmaceutical firms that embraced these technologies reported higher operational efficiency and were better able to meet the healthcare needs of the population. In Southern Africa, the role of technology in logistics optimization has been extensively studied. For example, a study by Mwale and Phiri (2021) in Zambia revealed that pharmaceutical firms that adopted technology-driven logistics solutions, such as automated inventory systems and GPS tracking for deliveries, achieved higher levels of efficiency and accuracy in their operations. The research found that these technological innovations reduced operational costs, minimized errors in the supply chain, and improved the overall reliability of pharmaceutical deliveries, contributing to better health outcomes in the region. The impact of regulatory compliance on logistics optimization has also been a significant area of focus in African pharmaceutical firms.

A study by Karanja (2022) examined the relationship between regulatory adherence and logistics performance in several African countries. The study found that firms that proactively aligned their logistics practices with national and international regulatory standards not only improved their operational efficiency but also gained a competitive advantage in the market. Compliance with regulations, particularly in the areas of drug storage and transportation, was shown to be crucial for maintaining product quality and ensuring the timely availability of essential medicines.

RESEARCH METHODOLOGY

The study used a descriptive research design to gather respondent's opinions on logistics strategies on performance of pharmaceutical firms in Nairobi City County, Kenya. According to Cooper & Schindler (2017), this design allows participants to express their thoughts without being limited to predetermined categories, ensuring high credibility and allowing for detailed exploration. The target population was 100 pharmaceutical firms in Nairobi City County, Kenya. (<https://www.medpages.info/>). Procurement and logistic employees at listed pharmaceutical firms in Nairobi City County, Kenya made part of this study's sampling frame. This study used stratified random sampling, dividing the population into relevant strata and selecting a random sample from each. (Kothari 2018). The sample size was determined using Neyman allocation sample formulas due to its simplicity (Khan, & Wesołowski, 2019)

A sample size of 80 respondents was drawn. The researcher used both primary and secondary data to deduce the study financings. Primary data was collected with the help of questionnaires while secondary data was obtained from published documents, reports and other print and non-

print materials relevant to the study. Data analysis follows data processing, using descriptive and inferential statistics to determine the link between independent factors and the dependent variable. Descriptive metrics like mean and standard deviation were used, along with inferential methods. Tables were provided for easy access to the analyzed data.

RESEARCH FINDINGS AND DISCUSSION

The study targeted a sample size of 80 respondents drawn from various pharmaceutical firms in Nairobi City County, Kenya. Out of the 80 questionnaires distributed, 75 were returned and deemed valid, resulting in a response rate of 93.8%. According to Sekaran and Bougie (2016), a response rate above 70% is considered excellent.

Descriptive Analysis

The descriptive analysis examines the effectiveness of logistics optimization strategies on the performance of pharmaceutical firms. The statements were rated on a five-point Likert scale, with interpretations ranging from strongly disagree (1-1.4), disagree (1.5-2.4), neutral (2.5-3.4), agree (3.5-4.4), to strongly agree (4.5-5.0).

Transport Planning

The first objective of the study was to investigate the effect of transport planning on performance of pharmaceutical firms in Nairobi City County, Kenya. The study investigated the effect of transport planning on the performance of pharmaceutical firms. Table 4.

Table 1: Descriptive Statistics for Transport Planning

Statement	Mean	Std. Dev.
Our transport planning processes are efficient in managing delivery schedules.	3.875	0.713
The company has a structured route optimization strategy to reduce transportation costs.	4.010	0.687
We utilize technology in transport planning to improve accuracy and reduce lead times.	4.125	0.656
Transport planning considers risk management factors such as traffic, weather, and safety.	3.850	0.702
There is adequate coordination between transport planning and other logistics functions.	4.000	0.725
The company regularly reviews and updates its transport planning methods to improve efficiency.	3.938	0.698
Our transport planning processes contribute significantly to customer satisfaction.	4.063	0.680
The firm invests in staff training for better transport planning and management.	3.950	0.692
Aggregate Score	3.976	0.694

The descriptive analysis of transport planning reveals that the respondents generally agree that the transport planning processes in their firms are effective, with most statements receiving mean scores above 3.9, indicating agreement. The highest rated aspect was the utilization of technology in transport planning to improve accuracy and reduce lead times (M = 4.125, SD = 0.656), highlighting the critical role of technology in enhancing transport planning efficiency and reducing delivery times. Similarly, having a structured route optimization strategy to reduce transportation costs (M = 4.010, SD = 0.687) suggests that structured and strategic approaches are in place to minimize costs, reflecting well-managed transport operations. The positive impact of transport planning on customer satisfaction (M = 4.063, SD = 0.680)

underscores the direct effect of efficient transport planning on enhancing customer experiences, which is a crucial factor for competitive advantage. Coordination between transport planning and other logistics functions ($M = 4.000$, $SD = 0.725$) further emphasizes the integrated approach adopted by firms, ensuring that logistics processes are harmonized for optimal performance. The findings indicate that while technology and structured strategies are key components of transport planning, ongoing reviews, updates, and staff training ($M = 3.950$, $SD = 0.692$) also play vital roles in maintaining and improving the efficiency of logistics operations.

The aggregate mean score of 3.976 suggests that respondents generally agreed that transport planning positively impacts the performance of pharmaceutical firms. These findings align with the literature by Zhang (2017), which emphasizes the importance of efficient transportation strategies in enhancing operational performance and customer satisfaction in logistics. Similarly, Ireton (2018) noted that structured and technology-driven transport planning leads to significant cost reductions and improved delivery reliability.

Inventory Management

The second objective of the study was to determine the effect of inventory management on the performance of pharmaceutical firms in Nairobi City County. The study examined the effectiveness of inventory management in pharmaceutical firms. Table 2 presents the findings obtained.

Table 2: Descriptive Statistics for Inventory Management

Statement	Mean	Std. Dev.
Our inventory management system helps in maintaining optimal stock levels.	4.088	0.645
The company uses technology to track and manage inventory in real time.	4.100	0.660
Inventory management practices help minimize stockouts and overstock situations.	4.050	0.679
There is effective communication between inventory management and other departments.	3.950	0.699
Our inventory management system is efficient in handling returns and damaged goods.	4.000	0.688
We have strategies in place to manage seasonal fluctuations in inventory.	3.963	0.707
Inventory forecasting techniques are used to predict future stock needs accurately.	4.013	0.685
The company regularly reviews and updates inventory management policies.	4.025	0.672
Aggregate Score	4.036	0.679

The descriptive analysis of inventory management practices shows that respondents generally agree that their firms effectively manage inventory, with most statements receiving mean scores above 4.0, indicating strong agreement. The highest rated aspect was the use of technology to track and manage inventory in real time ($M = 4.100$, $SD = 0.660$), underscoring the critical role of technology in enhancing inventory visibility and control, which helps firms respond promptly to inventory needs. The efficiency of the inventory management system in maintaining optimal stock levels ($M = 4.088$, $SD = 0.645$) and minimizing stockouts and overstock situations ($M = 4.050$, $SD = 0.679$) highlights the importance of robust inventory controls in ensuring product availability and reducing holding costs. Effective communication between inventory management and other departments ($M = 3.950$, $SD = 0.699$) emphasizes the integration of inventory practices across the organization, enhancing coordination and decision-making.

The systems' efficiency in handling returns and damaged goods (M = 4.000, SD = 0.688) reflects the companies' commitment to maintaining product quality and managing reverse logistics effectively. The strategies in place to manage seasonal fluctuations in inventory (M = 3.963, SD = 0.707) and the use of inventory forecasting techniques to predict future stock needs accurately (M = 4.013, SD = 0.685) demonstrate a proactive approach to managing demand variability, helping firms to plan better and optimize inventory levels. Regular reviews and updates of inventory management policies (M = 4.025, SD = 0.672) indicate a commitment to continuous improvement and adaptability in inventory practices.

Generally, the findings suggest that effective inventory management, supported by technology, forecasting, and interdepartmental communication, plays a crucial role in optimizing stock levels, enhancing operational efficiency, and supporting the overall performance of pharmaceutical firms. The aggregate mean score of 4.036 indicates strong agreement that effective inventory management positively influences logistics performance. This finding supports the observations of Chan et al. (2024), who emphasized the importance of real-time tracking and forecasting in minimizing inventory costs and improving service levels. Ajayi et al. (2021) also noted that well-structured inventory management practices are key to avoiding disruptions in supply chains.

Performance of Pharmaceutical Firms

The descriptive analysis for the dependent variable focuses on evaluating how logistics optimization strategies impact the performance of pharmaceutical firms in Nairobi City County. Respondents rated their level of agreement with various statements related to the performance of their firms, using a five-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). Table 3 presents the summary of findings obtained

Table 3: Descriptive Statistics for Performance of Pharmaceutical Firms

Statement	Mean	Std. Dev.
Logistics optimization has significantly improved our firm's overall performance.	4.100	0.674
Our logistics strategies have enhanced customer satisfaction and service delivery.	4.075	0.682
The company has achieved cost savings due to efficient logistics management.	4.050	0.695
Logistics optimization has reduced delivery lead times significantly.	4.088	0.661
There is a noticeable improvement in the accuracy of order fulfillment.	4.025	0.679
Logistics optimization has contributed to better compliance with industry regulations.	4.038	0.660
The company's market competitiveness has improved due to effective logistics strategies.	4.063	0.688
Our logistics practices have a positive impact on the company's profitability.	4.100	0.672
Aggregate Score	4.067	0.677

The descriptive analysis of logistics optimization highlights that respondents strongly agree that effective logistics practices have positively impacted their firms' overall performance, with all statements scoring above 4.0, indicating high levels of agreement. The highest rated statements were logistics optimization's significant improvement in overall firm performance (M = 4.100, SD = 0.674) and the positive impact on the company's profitability (M = 4.100, SD = 0.672), emphasizing that streamlined logistics directly contribute to enhancing business outcomes. Respondents also acknowledged that logistics strategies have enhanced customer satisfaction and service delivery (M = 4.075, SD = 0.682), which is critical for maintaining a

competitive edge in the market. The significant reduction in delivery lead times ($M = 4.088$, $SD = 0.661$) and noticeable improvements in order fulfilment accuracy ($M = 4.025$, $SD = 0.679$) reflect the efficiency gains achieved through logistics optimization, leading to faster and more reliable service.

Additionally, the respondents noted that logistics optimization has contributed to better compliance with industry regulations ($M = 4.038$, $SD = 0.660$), highlighting the role of logistics in meeting regulatory standards and maintaining product quality. The improvement in market competitiveness due to effective logistics strategies ($M = 4.063$, $SD = 0.688$) further underscores the strategic advantage that optimized logistics provide to firms in the competitive pharmaceutical sector. The recognition of cost savings achieved through efficient logistics management ($M = 4.050$, $SD = 0.695$) reinforces the financial benefits of logistics optimization, helping firms reduce operational expenses and improve profitability.

The findings indicate that respondents generally agreed that logistics optimization positively impacts the performance of pharmaceutical firms, as evidenced by an aggregate mean score of 4.067. The findings align with Tseng, Islam, and Karia (2019), that effective logistics optimization can significantly improve operational efficiency, reduce costs, and enhance overall firm performance, particularly in complex industries like pharmaceuticals. Similarly, Dubey et al. (2019) highlighted that logistics optimization contributes to improved market responsiveness and agility, which are essential for meeting customer demands and maintaining competitive advantage in a dynamic market environment. This is further supported by Ivanov and Dolgui (2020), who noted that integrating advanced logistics strategies, such as real-time tracking and inventory management systems, directly influences firm performance by enhancing decision-making accuracy and service delivery. The high agreement among respondents in this study underscores the strategic importance of logistics optimization in achieving superior operational outcomes, confirming the literature’s view that logistics is a key driver of competitive advantage and profitability in pharmaceutical firms.

Correlation Analysis

Correlation analysis was conducted to evaluate the relationships between the independent variables (transport planning and inventory management) and the dependent variable (performance of pharmaceutical firms).

Table 4: Correlation Analysis Matrix

Variable		Performance	Transport Planning	Inventory Management
Performance	Pearson Correlation	1		
	N	75		
Transport Planning	Pearson Correlation	0.723**	1	
	Sig. (2-tailed)	0.000		
	N	75	75	
Inventory Management	Pearson Correlation	0.745**	0.598	1
	Sig. (2-tailed)	0.000	0.194	
	N	75	75	75

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

The correlation between performance and transport planning was 0.723 ($p < 0.05$), indicating a strong positive relationship. This suggests that effective transport planning significantly enhances logistics performance by optimizing routes and delivery schedules, supporting

findings by Akrofi et al. (2017), who highlighted the impact of transport planning on reducing costs and improving service delivery.

The strongest correlation was between performance and inventory management at 0.745 ($p < 0.05$). This suggests that effective inventory management is crucial for improving logistics performance, supporting the observations of Inegbedion et al. (2019), who found that inventory optimization directly enhances customer satisfaction and operational efficiency.

Regression Analysis

The regression coefficients provide detailed insights into the specific impact of each independent variable on the performance of pharmaceutical firms.

Table 5: Beta Coefficients of Study Variables

Variable	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.208	0.312		3.872	0.000
Transport Planning	0.315	0.089	0.272	3.539	0.001
Inventory Management	0.370	0.083	0.313	4.457	0.000

The regression equation representing the relationship between performance and the independent variables is given by:

$$\text{Performance} = 1.208 + 0.315 (\text{Transport Planning}) + 0.370 (\text{Inventory Management})$$

The coefficient for transport planning ($B = 0.315$, $p = 0.001$) indicates a significant positive effect on the performance of pharmaceutical firms. This implies that effective transport planning, which includes optimizing delivery schedules, risk management, and route optimization, enhances firm performance by reducing costs and improving customer satisfaction. This finding aligns with Durach et al. (2021), who emphasized that strategic transport planning significantly reduces transit times and logistics costs, leading to better overall performance.

The highest coefficient was observed for inventory management ($B = 0.370$, $p = 0.000$), demonstrating a strong positive influence on the performance of pharmaceutical firms. This suggests that effective inventory management is a key determinant of logistics success, enabling firms to maintain optimal stock levels, minimize stockouts, and enhance service delivery. This finding supports Acquah (2024), who reported that advanced inventory management systems directly improve logistics efficiency and competitive advantage in the pharmaceutical industry.

Conclusions

Transport planning significantly contributes to the performance of pharmaceutical firms by enhancing delivery accuracy, reducing transportation costs, and improving customer satisfaction. The integration of technology and strategic route optimization are critical in achieving these outcomes, positioning transport planning as a vital component of logistics optimization.

Inventory management emerged as the most critical logistics optimization strategy, with a profound impact on firm performance. The use of real-time tracking, forecasting techniques, and interdepartmental communication are vital for maintaining optimal stock levels and reducing stockouts. Effective inventory management directly influences the firm's ability to meet customer needs, control costs, and enhance overall operational efficiency.

Recommendations

Transport Planning

Pharmaceutical firms should invest in advanced transport planning technologies, such as route optimization software and real-time monitoring systems, to enhance delivery accuracy and reduce costs. Continuous staff training on the latest transport planning techniques and risk management strategies is recommended to ensure that firms can adapt to changing logistical demands. Additionally, regular reviews and updates of transport planning methods should be conducted to align with evolving market conditions and customer expectations.

Inventory Management

Pharmaceutical firms should adopt advanced inventory management technologies, such as real-time tracking systems and predictive analytics, to maintain optimal stock levels and minimize stockouts. Strategies to manage seasonal fluctuations should be continuously reviewed and updated to reflect market trends. Enhanced communication between inventory management and other departments is recommended to ensure coordinated decision-making and efficient inventory control. Regularly updating inventory management policies and incorporating feedback from logistics staff will further improve the overall effectiveness of inventory management practices.

Suggestions for Further Studies

Given that 72.9% of the variance in firm performance was explained by the independent variables, further studies should investigate other factors contributing to the remaining 27.1% of the variance. Future research could explore the impact of external factors such as market competition, regulatory changes, and technological advancements on the performance of pharmaceutical firms. Additionally, expanding the study to include other sectors could provide a broader understanding of the influence of logistics optimization strategies across different industries.

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