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SUPPLY CHAIN SCALABILITY AND PERFORMANCE OF DISTRIBUTION FIRMS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

In Kenya, distribution firms play a pivotal role in driving the economy by facilitating the movement of goods and services across various regions, ensuring that products reach both urban and rural markets. However, distribution firms in Nairobi City County, Kenya face several challenges that can impact their operations. The general objective of the study was to determine the influence of supply chain scalability on performance of distribution firms in Nairobi City County, Kenya. Specifically, the study sought to determine the influence of flexible warehouse design on performance of distribution firms in Nairobi City County, Kenya and to determine the influence of supplier network on performance of distribution firms in Nairobi City County, Kenya. The study was guided by Contingency Theory and Resource-Based View (RBV). This study used of a descriptive research design. The unit of analysis was the distribution companies and the population of 108 registered firms in Kenya. The target respondents were employees in distribution individual firms with experience in the supply chain and logistics responsibilities. This study therefore targeted supply chain managers and logistics managers. The total target population was therefore 216 respondents. The study's sample size was reached at using Krejcie and Morgan sample size determination formula. The 139 respondents were chosen with the help of stratified random sampling technique. The study's primary data will be obtained using semi-structured questionnaires. The pretesting sample was made of 14 respondents, representing 10% of the sample size. The results from the pilot test were not used in the main study. In addition, the respondents used in the pilot test were excluded from the final study. Descriptive statistics such as frequency distribution, mean (measure of dispersion), standard deviation, and percentages were used. Inferential data analysis was conducted by use of Pearson correlation coefficient, and multiple regression analysis. Inferential statistic was used to make judgments about the probability that an observation was dependable or one that happened by chance in the study. The study results were presented through use of tables and figures. The study concluded that flexible warehouse design has a positive and significant effect on performance of distribution firms in Nairobi City County, Kenya. In addition, the study concluded that supplier network has a positive and significant effect on performance of distribution firms in Nairobi City County, Kenya. Based on the findings, the study recommends that the management of distribution firms in Nairobi City County, Kenya should invest in modular and reconfigurable warehouse infrastructure that allows for quick adaptation to changes in inventory volume, product types, and delivery schedules.

Key Words: Supply Chain Scalability, Flexible Warehouse Design, Supplier Network, Performance of Distribution Firms

Background of the Study

Distribution firms play a crucial role in the supply chain by acting as intermediaries between manufacturers and end consumers (Abeysekara, Wang & Kuruppuarachchi, 2020). They help facilitate the flow of goods from production facilities to various points of sale, such as retailers or wholesalers. One of their key functions is to ensure that products reach the market efficiently and on time, minimizing delays that could lead to stockouts or excess inventory. By managing the transportation and storage of goods, distribution firms ensure that products are available when and where they are needed, helping maintain supply chain stability (Ahmed, Munir & Sameer, 2020). Distribution firms often handle warehousing and inventory management. They store goods in warehouses, track stock levels, and organize shipments, ensuring that products are kept in optimal conditions (Han, *et al*, 2023). They also play a critical role in forecasting demand, which helps both manufacturers and retailers avoid overproduction or shortages. By maintaining efficient inventory systems, distribution firms contribute to reducing costs and improving the overall efficiency of the supply chain.

Distribution firms help companies reach broader markets. They often have established networks and relationships with various retailers and other businesses, enabling manufacturers to expand their reach without the need for building their own distribution infrastructure (Chiyem & Etomi, 2024). This is especially beneficial for smaller manufacturers who may not have the resources to manage large-scale logistics on their own. Through their vast networks, distribution firms help ensure that products are accessible to a wide range of consumers, ultimately driving sales and market growth (Chileshe & Phiri, 2022).

Supply chain scalability refers to a supply chain's ability to adapt and expand in response to changes in demand, market conditions, or operational needs. It involves the capacity to efficiently increase or decrease the flow of goods, services, and information across the supply chain as business requirements grow or contract (Nshimiyimana & Irechukwu, 2023). A scalable supply chain can quickly accommodate higher volumes, introduce new products, expand into new regions, or adjust to disruptions without sacrificing performance or cost-effectiveness. Flexible warehouse design ensures that facilities can be easily reconfigured to accommodate changes in inventory levels, product types, or operational processes (Ofori-Nyarko, 2022). Similarly, a robust supplier network enhances scalability by ensuring that the supply chain can quickly source materials or products from multiple suppliers. A diverse supplier network also provides resilience, minimizing risks of disruptions due to supplier issues or geographic constraints (Ocharo & Shale, 2022).

Diverse transportation networks play a pivotal role in maintaining supply chain flexibility by offering multiple options for moving goods efficiently and cost-effectively across regions or countries. Technology integration further amplifies the scalability and responsiveness of the supply chain (Odedo & Shale, 2024). This study sought to determine the influence of supply chain scalability on performance of distribution firms in Nairobi City County, Kenya.

Distribution firms in Nairobi City County, Kenya, play a pivotal role in the nation's economy by facilitating the movement of goods across various sectors, including retail, manufacturing, and energy (Muthoni & Mose, 2023). These companies are integral to the supply chain, ensuring that products reach consumers efficiently and reliably. The logistics and distribution sector in Nairobi is diverse, encompassing both local and international players. Companies like Naivas Limited, Kenya Wine Agencies Limited (KWAL), and Kenya Pipeline Company (KPC) are prominent examples (Wambua, 2024). Naivas, headquartered in Nairobi, is the largest supermarket chain in Kenya, with over 100 outlets nationwide. KWAL, established in 1969, is a leading manufacturer, importer, and distributor of wine, spirits, and non-alcoholic beverages, with a distribution network throughout Kenya's urban centers. KPC operates a

pipeline system for transporting refined petroleum products from Mombasa to Nairobi and other towns, playing a crucial role in the energy distribution network (Ocharo & Shale, 2022).

The performance of these distribution firms is influenced by several factors, including transport optimization, warehouse management, and logistics outsourcing. Studies indicate that route and load optimization significantly enhance the efficiency of distribution operations (Muthoni & Mose, 2023). Implementing real-time route monitoring and adjustment systems, leveraging technologies like GPS tracking and predictive analytics, can lead to improved performance. Additionally, effective warehouse management practices, such as standardized receiving and inspection processes and the adoption of warehouse technology, positively impact firm performance (Wambua, 2024).

Statement of the Problem

Distribution firms in Kenya face several challenges that impacts their operations. These challenges are influenced by both local factors and global trends in the logistics and supply chain sectors (Adhiambo & Osoro, 2024). Delivery efficiency remains a major challenge for distribution firms in Nairobi due to the city's notorious traffic congestion and inadequate infrastructure. Nairobi's traffic congestion has a direct impact on delivery times, making it difficult to meet delivery deadlines. A report from the Nairobi City County government reveals that traffic congestion costs businesses approximately 3.4% of Kenya's Gross Domestic Product (GDP) annually (Muthoni & Mose, 2023). The average vehicle in Nairobi spends around 4 hours per day stuck in traffic, which significantly reduces delivery speed. Furthermore, in a 2021 study by the Kenya National Bureau of Statistics (KNBS), 43% of businesses in Nairobi reported that delays in transportation directly impacted their overall efficiency (Wambua, 2024). Poor road conditions in certain parts of the city, especially in informal settlements or peri-urban areas, further exacerbate the situation. Distribution firms often face higher transportation costs due to these delays, with some companies reporting that logistics costs can make up to 30% of their total operational expenses (Ocharo & Shale, 2022).

The cost of distribution is another significant challenge faced by logistics firms in Nairobi. One of the key drivers of high costs is fuel, which constitutes a major portion of a firm's operating expenses. For instance, in 2023, Kenya experienced a 20% increase in fuel prices, which had a substantial impact on logistics companies (Odedo & Shale, 2024). According to a 2022 survey by the Kenya Transporters Association (KTA), fuel and vehicle maintenance account for up to 40% of total logistics costs in Kenya, making it a key cost burden for firms. Moreover, the cost of labor has also increased, with the Kenya National Bureau of Statistics reporting an annual inflation rate of around 9% in the labor market, which directly affects wages and employee costs in the logistics sector (Adhiambo & Osoro, 2024). Labor costs in Nairobi’s logistics industry have risen by about 10-15% in recent years, as skilled labor becomes more competitive and expensive. These rising costs, combined with the volatility of fuel prices, have forced many distribution firms to either increase their prices or reduce service quality to maintain profitability, leading to reduced market share in some cases (Muthoni & Mose, 2023).

The logistics sector in Nairobi is highly competitive, with both local and international firms vying for market share. According to a report by the Kenya Private Sector Alliance (KEPSA), Kenya’s logistics and transport sector is expected to grow at a compound annual growth rate (CAGR) of 6.4% between 2020 and 2025, driven largely by e-commerce and increased demand for fast, reliable deliveries (Wambua, 2024). However, the rapid growth of e-commerce has also placed significant pressure on distribution firms to enhance their services and offer faster delivery times, especially in the last-mile delivery segment. A study by the Communications Authority of Kenya (CAK) indicated that the number of active mobile money users increased to 32.9 million in 2023, and this growth in mobile money adoption has fueled the rise of e-commerce, with more customers demanding quick and affordable deliveries (Odedo & Shale,

2024). In response, logistics firms are investing heavily in technology such as GPS tracking, route optimization software, and real-time delivery updates to maintain a competitive edge. However, these technological investments can be costly (Ocharo & Shale, 2022). According to a survey by Deloitte, 60% of logistics companies in Kenya reported that investing in technology is one of the most significant challenges they face, with many firms struggling to keep up with the necessary digital advancements required to stay competitive in an increasingly digital economy (Adhiambo & Osoro, 2024).

A scalable supply chain allows a firm to efficiently adapt to fluctuations in demand, optimize its operations, and expand its reach without significant increases in costs. This adaptability helps firms maintain competitiveness by enhancing their responsiveness to market changes, reducing lead times, and improving customer satisfaction (Muthoni & Mose, 2023). Various studies have been conducted in different parts of the world on supply chain scalability and firm performance. For instance, Ocharo and Shale (2022) investigated on supply chain scalability and firm performance. Odedo and Shale (2024) researched on supply chain scalability and performance of distribution firms and Adhiambo and Osoro (2024) examined on supply chain scalability and performance of large food and beverage processors. However, none of these studies focused on flexible warehouse design, supplier network, diverse transportation networks and technology integration on performance of distribution firms in Nairobi City County, Kenya. To fill the highlighted gaps, the current study sought to determine the influence of supply chain scalability (flexible warehouse design, supplier network, diverse transportation networks, technology integration) on performance of distribution firms in Nairobi City County, Kenya.

Objectives of the Study

General Objective

The general objective of the study was to determine the influence of supply chain scalability on performance of distribution firms in Nairobi City County, Kenya

Specific Objectives

i. To determine the influence of flexible warehouse design on performance of distribution firms in Nairobi City County, Kenya
ii. To determine the influence of supplier network on performance of distribution firms in Nairobi City County, Kenya

Theoretical Review

Contingency Theory

Contingency Theory, developed by Fred E. Fiedler (1967) often associated with leadership and organizational management, proposes that there is no one-size-fits-all approach to leadership or management practices. Instead, the effectiveness of leadership styles, organizational structures, and management strategies depends on the specific context in which they are applied (Yamagishi & Imada, 2020). This theory suggests that different situations require different kinds of leadership and management approaches for optimal performance. At its core, Contingency Theory asserts that various factors in the external environment and within the organization itself interact to determine the most effective leadership style or management practice. These factors can include the organization's size, its industry or sector, the complexity of its tasks, its culture, the skills and personalities of its employees, and the external environment such as market conditions or regulatory requirements (Jama, Okoumba & Mafini, 2023).

One of the key principles of Contingency Theory is the idea of fit or match between the leader's or manager's style and the situational demands. For example, in a highly uncertain and rapidly changing environment, a more flexible and adaptive leadership style may be more effective than a rigid, authoritarian approach (Asha & Noor, 2020). Similarly, in organizations with complex tasks that require specialized knowledge and expertise, leaders who can facilitate collaboration and empower their teams may be more successful than those who rely solely on hierarchical authority. Contingency Theory also emphasizes the importance of understanding the unique characteristics of each situation and tailoring leadership and management practices accordingly (Kibe & Ngugi, 2020). This flexibility allows leaders and managers to adjust their strategies based on the specific challenges and opportunities they face, thereby enhancing organizational effectiveness and performance. Critically, Contingency Theory challenges the notion of a universally "best" or "ideal" leadership style. Instead, it encourages leaders and managers to be adaptive and responsive, continuously evaluating and adjusting their approach to align with the evolving needs of the organization and its environment (Kibet & Anaya, 2024). By considering the contingency factors and adapting their practices accordingly, leaders can optimize their effectiveness and contribute to the overall success of their organizations (Yamagishi & Imada, 2020). This theory was used to determine the influence of flexible warehouse design on performance of distribution firms in Nairobi City County, Kenya.

Resource-Based View (RBV)

The Resource-Based View (RBV) theory founded by Barney (1991) is a strategic management framework that focuses on the internal resources and capabilities of a firm as sources of competitive advantage. At its core, RBV posits that a firm's unique bundle of resources and capabilities can enable it to achieve sustainable competitive advantage and superior performance in the marketplace (Prahinski & Bentoh, 2021). Unlike traditional strategic management approaches that primarily focus on external factors such as market dynamics and industry structure, RBV emphasizes the importance of internal factors in determining a firm's success. RBV theory entails identifying and leveraging a firm's distinctive resources and capabilities to create value and achieve strategic objectives. Resources can include tangible assets such as physical infrastructure, financial capital, and technology, as well as intangible assets such as human capital, intellectual property, organizational culture, and reputation (Chinomona, 2020). These resources are considered valuable if they enable the firm to exploit opportunities or neutralize threats in the external environment. Capabilities, on the other hand, refer to the firm's ability to effectively deploy and utilize its resources to perform specific activities and achieve desired outcomes (Kosgei, 2020). This theory was used to determine the influence of supplier network on performance of distribution firms in Nairobi City County, Kenya.

Conceptual Framework

A Conceptual Framework is a structured representation or model that outlines the key variables or concepts within a study and shows the relationships between them (Mugenda, & Mugenda, 2019). It serves as a guide to help researchers understand the theoretical foundations of their study and how different factors might influence or interact with each other (Cooper, & Schindler, 2019)

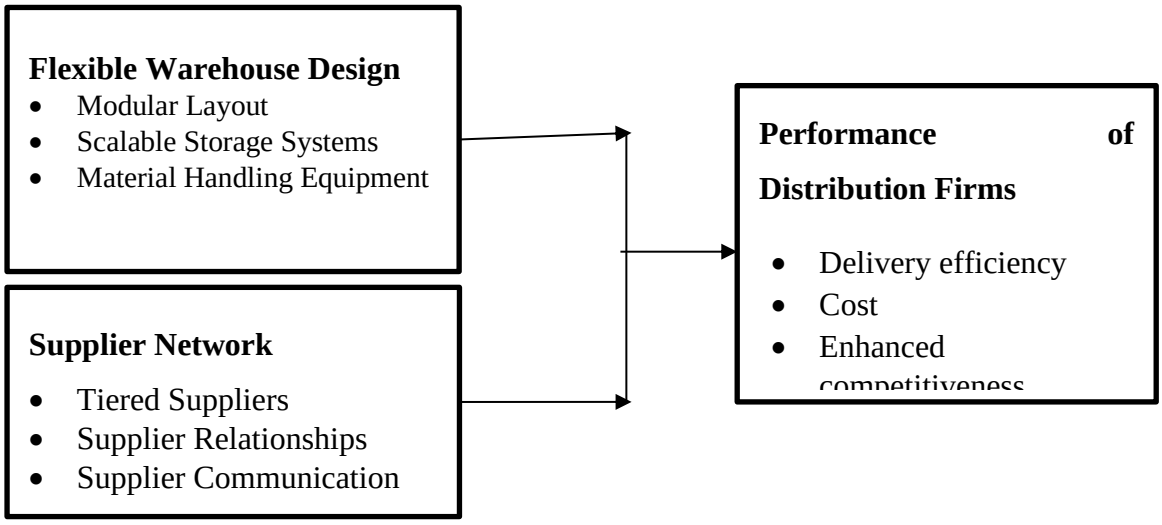

Figure 2. 1: Conceptual Framework

Flexible Warehouse Design

Flexible warehouse design refers to the strategic layout and configuration of warehouse spaces that can easily adapt to changing operational needs, product types, or market demands. Unlike traditional fixed layouts, flexible designs incorporate modular shelving, mobile storage systems, and open floor plans that can be quickly reconfigured (Yamagishi & Imada, 2020). A modular layout refers to a warehouse or facility design approach where the space is organized into interchangeable, self-contained sections or modules. This layout allows for maximum flexibility, enabling businesses to reconfigure areas quickly based on changing operational needs, such as shifts in product types, inventory volumes, or workflows (Asha & Noor, 2020). Each module can function independently or as part of a larger system, making it easier to expand, contract, or rearrange space without significant disruption.

Scalable storage systems are designed to grow or shrink in capacity based on a business's evolving storage needs. These systems may include adjustable racking, stackable containers, or automated vertical storage units that can be easily expanded or condensed without replacing the entire infrastructure (Kibet & Anaya, 2024). Scalability is especially important for companies experiencing rapid growth, entering new markets, or managing highly seasonal inventory. By using scalable storage, businesses can avoid over-investing in storage capacity during slow periods while still being prepared for peak demand. Material handling equipment encompasses the tools and machines used to move, store, control, and protect materials throughout the supply chain. This includes forklifts, pallet jacks, conveyor belts, cranes, automated guided vehicles (AGVs), and shelving systems (Jama, Okoumba & Mafini, 2023). The right material handling equipment enhances warehouse productivity by speeding up the movement of goods, reducing manual labor, and minimizing the risk of damage or injury. It also supports better inventory management, as items can be moved and retrieved quickly and accurately. Choosing appropriate equipment based on the size, weight, and frequency of goods being handled is crucial to ensuring operational efficiency, safety, and scalability in warehousing and distribution environments (Asha & Noor, 2020).

Supplier Network

A supplier network is a system of interconnected suppliers that provide raw materials, components, and services to a business or manufacturing operation. This network is crucial for ensuring a consistent and reliable flow of inputs needed for production or distribution (Prahinski & Bentoh, 2021). A strong supplier network is characterized by strategic relationships, transparent communication, and mutual trust between the company and its

suppliers. It also involves managing risks such as supplier delays, quality issues, or geopolitical disruptions. Businesses with well-established supplier networks can maintain production continuity, respond quickly to demand changes, and often negotiate better pricing or terms due to long-term partnerships (Chinomona, 2020). Tiered suppliers refer to the hierarchical structuring of suppliers within a supply chain, typically organized into different levels based on their proximity to the end manufacturer or service provider (Kosgei, 2020). Efficiently managed tiered supplier systems are vital in industries like automotive, electronics, and construction, where multiple components are sourced and assembled (Korir, 2021).

Supplier relationships refer to the strategic and operational connections between a business and its vendors. Building strong, collaborative relationships with suppliers goes beyond basic transactions; it involves trust, open communication, long-term commitment, and shared goals (Wachiuri *et al*, 2020). Healthy supplier relationships can lead to benefits such as consistent product quality, favorable pricing, flexible lead times, and joint innovation. Suppliers are businesses or individuals that provide goods, materials, or services to another organization. They are a critical part of the supply chain, ensuring that production processes have the necessary inputs to function efficiently. Suppliers can range from manufacturers of raw materials to service providers and logistics partners (Chinomona, 2020). The reliability, cost, and quality of suppliers directly affect a company's ability to meet customer expectations and remain competitive. Therefore, selecting the right suppliers and monitoring their performance are essential strategic tasks. Factors such as delivery reliability, financial stability, production capacity, and compliance with industry standards must be evaluated carefully when managing suppliers (Kosgei, 2020).

Empirical Review

Flexible Warehouse Design and Firm Performance

Yamagishi and Imada (2020) conducted a study on the advantages of seismic design for flexible warehouse buildings using sliding loads. The duo conducted the earthquake response analysis using up to five input seismic motions but the limited number of input seismic motions was insufficient to accurately discuss the variation in response. Therefore, an earthquake response analysis was conducted for the same type of flexible warehouse that was previously investigated using 100 different artificial seismic motions with the same target spectrum. This study focused on the variation of the maximum response and the absorbed energy at each floor and the associated inter-story drift. As a result, the variation of the maximum response will depend on the superstructure condition. The variation of the maximum inter-story drift in the case of sliding loads is less than that in case of fixed loads when the frame is elastic, and its tendency when the frame is in the elastoplastic state is much higher. The sliding effect obtained by reducing the friction coefficient between the load and the floor does not require the installation of individual devices such as dampers to reduce the displacement and acceleration response, as required in a seismically-controlled structure. Owing to its significant damping characteristics, the study concluded that the seismic control structure can reduce the response of each floor; however, it cannot reduce the response acceleration of the load.

Jama, Okoumba and Mafini (2023) conducted a study on the effect of a model for inventory management and flexible warehouse performance in the South African retail industry. The study used a quantitative survey method involving 203 supply chain professionals selected from retail outlets in the Gauteng and KwaZulu Natal provinces. Data were collected using an online survey. Respondents accessed the online questionnaire through a link that was emailed to them. A submit button was provided, which transmitted the completed responses back to the principal researcher. The collection of data lasted for four months, between May and August 2022. Three inventory management practices: inventory investment and ABC analysis

Contributed positively to inventory performance. Inventory performance contributed positively to flexible warehouse performance. The result showed that inventory investment, control, and the utilization of the ABC analysis tool make a contribution. The study concluded that Inventory management and performance are important drivers of flexible warehouse performance in the retail sector. However, a correct mix of inventory management practices is essential.

Asha and Noor (2020) conducted a study on the role of flexible warehouse layout design on performance of distribution firms in Kenya; case of DHL supply chain. This study adopted a descriptive research design, a descriptive research design determines and reports the way things are and it is used whenever the data being collected is to describe persons, organizations, settings or phenomena. The targeted population of this study consisted of DHL supply chain employees in Procurement, flexible warehouse, warehouse category managers, Dispatch Officers, Picking, Consolidation Officers and Transport and Distribution. The study employed a census approach to collect data from the all the respondents mainly involved in the management of flexible warehouse operation hence no sampling techniques was used. The study established that there are several basic principles that apply to warehouse layout design, and running an effective distribution center operation. Without the proper layout and design of your distribution center, no matter the square footage, Distribution Firms will be facing capacity issues, decrease in productivity, and storage inadequacies. The study concludes that in the design of a flexible warehouse/storage building should consider the overall structure, size and dimension, features of departments, selection of its strategic operation, and equipment to be used in the storage process.

Kibet and Anaya (2024) conducted a study on the effect of flexible warehouse layout and performance of distribution firms in Kenya. This study used both descriptive and explanatory research designs. In addition, this study employed a positivist research philosophy. The target population was based on the total of 1061 registered distribution firms in Kenya spread all over the country. The sample size for the study was 290 distribution firms. This study also used questionnaire to collect data relevant to this study. In particular, the introduction of firm size as a moderating variable positively influenced the relationship between flexible warehouse Layout and the performance of distribution firms. From the findings, there is a clear indication that introduction of firm size as moderating variable has positive influence on performance of distribution firms in Kenya. Therefore, based on these findings, the study concludes that firm size does have a significant moderating effect, enhancing the relationship between flexible warehouse Layout and the performance of distribution firms in Kenya.

Supplier Network on Firm Performance

Prahinski and Bentoh (2021) conducted a study on the effect of supplier evaluations: network strategies to improve supplier performance. Using structural equation modeling (SEM) and data collected from 139 first-tier North American automotive suppliers, the results of this research have shown that, contrary to the SDP literature from the buying firm's perspective, the supplier's perceptions of the buying firm's communication does not directly influence suppliers' performance. Specifically, the supplier evaluation network process does not ensure improved supplier performance unless the supplier is committed to the buying firm. Buying firms can influence the supplier's commitment through increased efforts of cooperation and commitment. The results also indicate that when a buying firm utilizes collaborative network, the supplier perceives a positive influence on the buyer–supplier relationship. The study concluded that that the implementation of several supplier evaluation network strategies by itself is not enough to influence the supplier's performance.

Kosgei (2020) conducted a study on the effect of supplier network management on organizational performance: a case study of Kenya airways limited. The research involved a

cross sectional study design that was carried out in Kenya Airways, where a sample of 82 respondents was selected from a target population of 272 KQ employees to answer research questions of interest. The study also found out that there was a great opportunity for organizations to improve its performances through proper use of SRM strategies. The study concluded that understanding and practicing of supply chain management with key focus on supplier network is an essential prerequisite for staying competitive in the global race and enhancing profitably in the market.

Korir (2021) conducted a study on the effect of buyer-supplier network on procurement performance: evidence from Kenyan supermarket. This study employed explanatory research design. The target population was 112 procurement and sales managers drawn from thirty-four (34) supermarkets located in Nairobi County. Census technique was used. Study results showed that commitment, network, cooperation and trust have a positive and significant effect on procurement performance. The study concluded that high levels of commitment, trust, network and cooperation enhance sustainable competitive advantage hence improving the procurement performance.

Wachiuri *et al* (2020) conducted a study on the influence of supplier network on the performance of state corporations in Kenya. The study adopted cross-sectional survey design using both quantitative and qualitative approaches. The target population was all the 187 state corporations in Kenya. The study employed a census approach. Primary data was collected using questionnaires. The findings revealed that supplier network explained almost half the total variations in performance of state corporations in Kenya. Further, the results indicated that the overall model was statistically significant. The findings show that there is a positive and significant relationship between supplier network and performance of state corporations in Kenya. The study concluded that an increase in supplier network by 1 unit would increase the performance of state corporations.

RESEARCH METHODOLOGY

Research Design

This study used of a descriptive research design. Mugenda and Mugenda (2018) explained the descriptive design as a process of collecting data in order to test a hypothesis or to answer the questions of the current status of the subject under study. Its advantage is that, it is used extensively to describe behavior, values, attitude and character.

Target Population

The unit of analysis was the distribution companies and the population of 108 registered firms in Kenya. The target respondents were employees in distribution individual firms with experience in the supply chain and logistics responsibilities. This study therefore targeted supply chain managers and logistics managers. The total target population was therefore 216 respondents

Table 1: Target Population

Category	Target Population
Supply chain managers	108
Logistics Managers	108
Total	**216**

Sample and Sampling Techniques

The study's sample size was reached at using Krejcie and Morgan sample size determination formula (Russell, 2019). Using this formula a representative sample was obtained. The study's total population is 216.

The formula used for arriving at the sample size was;

$$n = \frac{x^2 NP(1-P)}{\left(ME^2(N-1)\right) + (x^2 P(1-P))}$$

Where:

n=sample size

x^2=Chi-square for the specified confidence level at 1 degree of freedom

N=Population size (216)

P = was the proportion in the target population estimated to have characteristics being studied. As the proportion was unknown, 0.5 was used.

Chuan and Penyelidikan (2016) indicate that the use of 0.5 provides the maximum sample size and hence it is the most preferable.

ME=desired margin of Error (Expressed as a proportion) 207.45/1.504

$$\frac{1.96^2 216 * 0.5 * 0.5}{(0.05^2 * 216) + (1.96^2 * 0.5 * 0.5)}$$

$$n = 137.9$$

Table 2: Sample Size

Category	Target Population	Sample Size
Supply chain managers	108	69
Logistics Managers	108	69
Total	**216**	**138**

The 138 respondents were chosen with the help of stratified random sampling technique. Stratified random sampling technique was used since the population of interest is not homogeneous and could be sub-divided into groups or strata to obtain a representative sample. The study used simple random sampling to select respondents from each group.

Data Collection Instruments

Primary data was used in this study. Greener (2018) indicates that primary data is made up of first-hand information that has not been processed or analyzed. A questionnaire which was a form of quantitative data collection tool was used to collect primary data. The study's primary data was obtained using semi-structured questionnaires.

The structured questions was useful as they enabled easy analysis of data and reduced the time and resources needed for data collection. The unstructured questionnaires helped the researcher get in-depth responses from the respondents as they give a chance to them provide views and suggestions on the various issues. Kultar (2019) points out that a questionnaire is a cheap tool for data collection is very effective in collecting information from a large population. Further the data would not be biased as the questionnaire guarantees anonymity.

The questionnaire had three sections, with the first part requesting the respondent's socio-demographic data. Part two composed of five sections and had data on the independent variables and dependent variable.

Pilot Test Study

A pilot study, or, pilot test or pre-test is defined as a small-scale preliminary research that is conducted so as to evaluate time, cost and feasibility to improve on the design of a particular study prior to conducting the actual one or full-scale research project (Kultar, 2019). The researcher carried out a pilot study to ensure the data collection tool was reliable and valid. The pilot test helped correct some of the challenges encountered before undertaking the final study. The pretesting sample was made of 14 respondents, representing 10% of the sample size. The results from the pilot test was be used in the main study. In addition, the respondents used in the pilot test were excluded from the final study.

Data Analysis and Presentation

Before the data could be analysed, the researcher ensured the data was checked for completeness, followed by data editing, data coding, data entry, and data cleaning. Inferential and descriptive statistics were employed for analysis of quantitative data with the assistance of Statistical Package for Social Sciences (SPSS version 25). To summarize the respondent's responses in relation to their views on the various aspects of the variables, and the respondents' demographic information analysis was undertaken using descriptive statistics (Bhattacherjee, 2019).

Descriptive statistics such as frequency distribution, mean (measure of dispersion), standard deviation, and percentages were used. Descriptive statistics therefore enables researchers to present the data in a more meaningful way, which allows simpler and easier interpretation (Singpurwalla, 2019). Inferential data analysis was conducted by use of Pearson correlation coefficient, and multiple regression analysis. Inferential statistic was used to make judgments about the probability that an observation is dependable or one that happened by chance in the study. The relationship between the study variables was tested using multivariate regression models.

RESEARCH FINDINGS AND DISCUSSIONS

Descriptive statistics

Flexible Warehouse Design and Performance of Distribution Firms

The first specific objective of the study was to determine the influence of flexible warehouse design on performance of distribution firms in Nairobi City County, Kenya. The respondents were requested to indicate their level of agreement on various statements related to flexible warehouse design and performance of distribution firms in Nairobi City County, Kenya. The results were as shown Table 3.

From the results, the respondents agreed that different sections of the warehouse are designed to operate independently if needed (M= 3.781, SD= 0.826). The respondents agreed that their modular layout allows for smooth integration of new processes or technologies (M=3.770, SD=0.625). Further, the respondents agreed that they efficiently scale up or down without disrupting warehouse operations (M=3.768, SD=0.615). The respondents agreed that their storage infrastructure supports future growth and product diversification (M=3.654, SD= 0.828). The respondents also agreed that they use adaptable material handling equipment that supports various types of goods (M=3.608, SD=0.731). The respondents also agreed that their equipment setup allows for quick adjustments to workflow changes (M=3.591, SD=0.502).

Table 3: Flexible Warehouse Design and Performance of Distribution Firms

	Mean	Std. Deviation
Different sections of the warehouse are designed to operate independently if needed.	3.781	0.826
Our modular layout allows for smooth integration of new processes or technologies.	3.770	0.625
We efficiently scale up or down without disrupting warehouse operations.	3.768	0.615
Our storage infrastructure supports future growth and product diversification.	3.654	0.828
We use adaptable material handling equipment that supports various types of goods.	3.608	0.731
Our equipment setup allows for quick adjustments to workflow changes.	3.591	0.502
Aggregate	**3.716**	**0.688**

Supplier Network and Performance of Distribution Firms

The second specific objective of the study was to determine the influence of supplier network on performance of distribution firms in Nairobi City County, Kenya.The respondents were requested to indicate their level of agreement on various statements related to supplier network and performance of distribution firms in Nairobi City County, Kenya. The results were as shown Table 4.

From the results, the respondents agreed that their supplier network is structured in clear tiers based on capability and reliability (M=3.852, SD=0.704). Further, the respondents agreed that they maintain a diverse mix of primary and secondary suppliers to reduce supply risk (M=3.845, SD=0.658). In addition, the respondents agreed that their organization works closely with suppliers to improve product quality and service (M=3.788, SD=0.552). The participants agreed that there is mutual trust and commitment between their firm and its major suppliers (M=3.773, SD=0.730). Further, the respondents agreed that communication with their suppliers is frequent, clear, and effective (M=3.695, SD=0.805). The respondents also agreed that they use digital tools and platforms to streamline communication with suppliers (M=3.651, SD=0.632).

Table 4: Supplier Network and Performance of Distribution Firms

	Mean	Std. Deviation
Our supplier network is structured in clear tiers based on capability and reliability.	3.852	0.704
We maintain a diverse mix of primary and secondary suppliers to reduce supply risk.	3.845	0.658
Our organization works closely with suppliers to improve product quality and service.	3.788	0.552
There is mutual trust and commitment between our firm and its major suppliers.	3.773	0.730
Communication with our suppliers is frequent, clear, and effective.	3.695	0.805
We use digital tools and platforms to streamline communication with suppliers.	3.651	0.632
Aggregate	**3.767**	**0.680**

Correlation Analysis

This research adopted Pearson correlation analysis determine how the dependent variable (performance of distribution firms in Nairobi City County, Kenya) relates with the independent variables (flexible warehouse design and supplier network). The findings were as depicted in Table 5.

Table 5: Correlation Coefficients

		Performance Of Distribution Firms	Flexible Warehouse Design	Supplier Network
Performance Of Distribution Firms	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	120		
Flexible Warehouse Design	Pearson Correlation	.813**	1	
	Sig. (2-tailed)	.001		
	N	120	120	
Supplier Network	Pearson Correlation	.823**	.437	1
	Sig. (2-tailed)	.000	.020	
	N	120	120	120

From the results, there was a very strong relationship between flexible warehouse design and performance of distribution firms in Nairobi City County, Kenya (r = 0.793, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings are in line with the findings of Asha and Noor (2020) who indicated that there is a very strong relationship between flexible warehouse design and performance of distribution firms.

Moreover, there was a very strong relationship between supplier network and performance of distribution firms in Nairobi City County, Kenya (r = 0.803, p value =0.000). The relationship was significant since the p value 0.000 was less than 0.05 (significant level). The findings are in line with the findings of Prahinski and Bentoh (2021) who indicated that there is a very strong relationship between supplier network and performance of distribution firms.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (flexible warehouse design and supplier network) and the dependent variable (performance of distribution firms in Nairobi City County, Kenya).

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.884[a]	.781	.782	.10381

a. Predictors: (Constant), flexible warehouse design and supplier network

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.781. This implied that 78.1% of the variation in the dependent variable (performance of distribution firms in Nairobi City County, Kenya) could be explained by independent variables (flexible warehouse design and supplier network).

Table 7: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	90.037	2	45.019	416.843	.000[b]
	Residual	12.645	117	.108		
	Total	102.682	119			

a. Dependent Variable: performance of distribution firms in Nairobi City County, Kenya
b. Predictors: (Constant), flexible warehouse design and supplier network

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 416.843 while the F critical was 3.073. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.003 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of flexible warehouse design and supplier network on performance of distribution firms in Nairobi City County, Kenya.

Table 8: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.334	0.096		3.792	0.000
Flexible Warehouse Design	0.358	0.099	0.357	3.616	0.003
Supplier Network	0.365	0.099	0.366	3.687	0.001

The regression model was as follows:

$$\mathbf{Y = 0.334+0.358X_1 +0.365X_2 + \varepsilon}$$

According to the results flexible warehouse design has a significant effect on performance of distribution firms in Nairobi City County, Kenya (β_1=0.358, p value= 0.003). The relationship was considered significant since the p value 0.003 was less than the significant level of 0.05. The findings are in line with the findings of Jama, Okoumba and Mafini (2023) who indicated that there is a very strong relationship between flexible warehouse design and performance of distribution firms.

The results also revealed that supplier network has a significant effect on performance of distribution firms in Nairobi City County, Kenya (β1=0.365, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings are in line with the findings of Chinomona (2020) who indicated that there is a very strong relationship between supplier network and performance of distribution firms.

Conclusions

The study concluded that flexible warehouse design has a positive and significant effect on performance of distribution firms in Nairobi City County, Kenya. Findings revealed that, modular layout, scalable storage systems and material handling equipment influences performance of distribution firms in Nairobi City County, Kenya.

In addition, the study concluded that supplier network has a positive and significant effect on performance of distribution firms in Nairobi City County, Kenya. Findings revealed that tiered suppliers, supplier relationships and supplier communication influences performance of distribution firms in Nairobi City County, Kenya.

Recommendations

The study recommends that the management of distribution firms in Nairobi City County, Kenya should invest in modular and reconfigurable warehouse infrastructure that allows for quick adaptation to changes in inventory volume, product types, and delivery schedules. This includes using mobile shelving units, scalable racking systems, and technology-integrated layouts that can be easily adjusted without major renovations.

In addition, the study recommends that the management of distribution firms should focus on building and strengthening strategic partnerships with a diverse and reliable supplier network to ensure consistent supply, reduce risks, and enhance operational efficiency. This can be achieved by evaluating suppliers based on performance, reliability, and capacity, while also fostering long-term relationships through transparent communication and mutually beneficial agreements.

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