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Warehousing Optimization and Performance of Logistics Firms in Nairobi City County, Kenya

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ABSTRACT

Purpose: The general objective of the study is to assess the influence of warehousing optimization and performance of logistics firms in Nairobi City County, Kenya. This study was guided by Resource-Based View (RBV) theory and Technology Acceptance Model (TAM).

Methodology: This study adopted a descriptive research design and focused on logistics firms in Nairobi City County, Kenya. The unit of analysis comprised 108 registered logistics firms, while the target respondents were supply chain managers and logistics managers with experience in warehousing optimization, yielding a target population of 216 respondents. Using the Krejcie and Morgan sample size determination formula, a representative sample of 139 respondents was obtained. Stratified random sampling was employed to select participants. Primary data were collected using structured questionnaires. A pilot study involving 14 respondents (10% of the sample) was conducted to test the research instrument; these respondents and their data were excluded from the main study. Data were analyzed using SPSS Version 25 through descriptive and inferential statistics, and findings were presented using tables and figures.

Findings: The study concludes that space utilization has a positive and significant effect on performance of logistics firms in Nairobi City County, Kenya. Further, the study concludes that technology integration has a positive and significant effect on performance of logistics firms in Nairobi City County, Kenya.

Unique Contribution to Theory, Policy and Practice: Based on the findings, the study recommends that logistics firms in Kenya should invest in modern logistics technologies such as warehouse management systems, fleet tracking software, and automated inventory management systems. These technologies would improve operational coordination, enhance real-time information sharing, minimize logistical errors, and support timely service delivery.

Keywords: *Warehousing Optimization, Space Utilization, Technology Integration, Logistics Firms*

Background of the Study

The logistics sector plays a pivotal role in driving global trade and economic development by ensuring the smooth movement of goods and services across international and domestic supply chains (Maalim & Moronge, 2020). Warehousing, as a critical component of logistics, provides essential functions such as storage, inventory management, order fulfillment, and value-added services that enable firms to meet customer demands efficiently. With globalization and the expansion of e-commerce, the demand for warehousing optimization has increased significantly as firms strive to reduce operational costs, enhance service delivery, and maintain competitiveness in rapidly changing markets (Al-Madi, 2024). According to the World Trade Organization (WTO), global merchandise trade reached US$ 25.3 trillion in 2022, highlighting the scale of logistics operations required to sustain international commerce. Warehousing optimization has therefore emerged as a strategic priority for logistics firms, as inefficiencies in storage, handling, or distribution can disrupt entire supply chains and increase costs substantially.

The growth of the global logistics industry underscores the critical role played by warehouses in facilitating trade and meeting customer expectations. A report by Allied Market Research (2023) estimated the global logistics market at US$ 9.83 trillion in 2022, with projections to reach US$ 16.79 trillion by 2032, growing at a compound annual growth rate (CAGR) of 5.6%. Within this framework, warehousing accounts for a significant proportion of logistics costs, with studies showing that storage, inventory holding, and material handling can constitute up to 30–40% of total logistics expenses (Shanmugamani & Mohamad, 2023). Optimization of warehousing processes such as space utilization, workforce efficiency, technology integration, and process improvement is therefore essential in enhancing operational performance and reducing cost burdens. Moreover, the rapid growth of global e-commerce—expected to reach US$ 6.9 trillion by 2024 according to eMarketer has heightened the demand for optimized warehouse systems, particularly those leveraging automation, robotics, and artificial intelligence to handle increasing order volumes and shorter delivery timelines (Pawar, Potter & Jimo, 2021).

Warehousing optimization refers to the process of improving the efficiency and effectiveness of warehouse operations to ensure the optimal use of space, resources, and time. It involves strategies such as strategic layout design, inventory management, automation, order picking optimization, and the integration of warehouse management systems (WMS) to streamline the storage, retrieval, and movement of goods (Hailu, 2020). The goal of warehousing optimization is to reduce operational costs, minimize errors and delays, enhance inventory accuracy, and improve overall supply chain performance. By implementing these practices, businesses can achieve faster order fulfillment, better space utilization, and increased responsiveness to market demand, ultimately contributing to higher profitability and customer satisfaction (Appiah, Teye & Asere, 2021).

Warehousing optimization has a significant influence on the performance of logistics firms by enhancing key operational aspects. Efficient use of warehouse space ensures that goods are stored systematically, reducing congestion and allowing faster retrieval, which can decrease order fulfillment times by up to 25% (Athumani & Salome, 2020). The integration of technology, including warehouse management systems (WMS), barcode scanning, and automated storage and retrieval systems, enables real-time tracking, inventory accuracy, and seamless coordination across the supply chain, which can improve overall service levels by over 30% (Maalim & Moronge, 2020). The study aims to assess the influence of warehousing optimization and performance of logistics firms in Nairobi City County, Kenya.

Statement of the Problem

Logistics firms play a critical role in driving economic growth and ensuring the smooth functioning of supply chains both locally and globally. In Kenya, the logistics and transport sector contributes approximately 7.2% to the national GDP, highlighting its significance in supporting trade, commerce, and industrial activities (Maalim & Moronge, 2020). These firms are responsible for the timely movement, storage, and distribution of goods, which directly affects business efficiency, customer satisfaction, and market competitiveness. According to the Kenya National Bureau of Statistics (KNBS, 2023), the transport and logistics sector supports over 1.2 million direct and indirect jobs, indicating its importance in employment creation (Ombaso & Osoro, 2023). Efficient logistics operations also reduce costs and wastage, which is particularly crucial for perishable goods; for instance, it is estimated that poor logistics management leads to losses of up to 30% of agricultural produce before it reaches the market. Additionally, logistics firms facilitate international trade, as Kenya's exports and imports rely heavily on effective freight and warehouse management, with the Kenya Ports Authority reporting over 35 million tonnes of cargo handled annually through Mombasa Port (Ominde & Kiarie, 2020). With the growing e-commerce industry, which has seen a 50% annual growth in parcel deliveries over the last five years, logistics firms have become indispensable for ensuring rapid, reliable, and cost-effective delivery of goods. This underscores their importance not only in economic terms but also in enhancing trade competitiveness, job creation, and consumer satisfaction (Muhalia, Ngugi & Makori, 2021).

Logistics firms in Kenya face multiple challenges that significantly affect their efficiency and competitiveness. One of the primary challenges is delivery speed, which is critical in meeting the expectations of both local and international clients (Mutua, Ngugi & Odhiambo, 2020). According to a 2023 report by the Kenya National Bureau of Statistics (KNBS), the average delivery time for goods in Nairobi has increased to 5–7 days, primarily due to traffic congestion, inadequate road infrastructure, and inefficient routing systems. Delays in delivery not only increase operational costs—estimated at 15–20% of total logistics expenses—but also reduce the reliability of services, making it difficult for firms to compete with international standards where same-day or next-day deliveries are increasingly common (Maalim & Moronge, 2020).

Studies indicate that about 28% of logistics firms in Nairobi report high rates of inventory mismanagement, leading to misplaced shipments and damaged goods (Ombaso & Osoro, 2023). Poor warehouse management practices, limited adoption of technology such as automated inventory systems, and inadequate staff training contribute to declining service quality. For instance, KNBS data shows that logistics firms that do not use modern tracking systems experience up to 35% higher incidences of shipment errors, undermining customer trust and increasing return or replacement costs (Ominde & Kiarie, 2020). Research by the Kenya Institute for Public Policy Research and Analysis (KIPPRA, 2022) shows that nearly 40% of urban consumers in Nairobi express dissatisfaction with last-mile delivery services, citing delayed shipments, poor communication, and damaged goods as major concerns (Muhalia, Ngugi & Makori, 2021). This dissatisfaction directly affects client retention and reduces potential revenue, with firms reporting losses of up to 25% of repeat business due to negative service experiences. In the era of growing e-commerce, where online sales in Kenya increased by over 50% between 2020 and 2023, failure to meet customer expectations in speed and quality can significantly hamper market share and growth potential (Mutua, Ngugi & Odhiambo, 2020).

Warehousing optimization plays a pivotal role in enhancing organization performance. Various studies have been conducted in different parts of the world on warehousing optimization practices and performance of logistics firms. For instance, Maalim and Moronge (2020) in Kenya assessed on the influence of warehousing optimization on logistical performance of commercial state corporations. In Kenya, Ominde and Kiarie (2020) researched on the effects of warehousing optimization on performance of manufacturing firms and Muhalia, Ngugi and Makori (2021) in Kenya conducted a study on the effect of warehousing optimization on supply chain performance of fast-moving consumer goods manufacturers. However, none of these studies focused on space utilization and technology integration on performance of logistics firms in Nairobi City County, Kenya. To fill the highlighted gaps, the current study sought to determine the influence of warehousing optimization (space utilization and technology integration) on performance of logistics firms in Nairobi City County, Kenya.

Objectives of the Study

General Objectives

The general objective of the study is to assess the influence of warehousing optimization on performance of logistics firms in Nairobi City County, Kenya

Specific Objectives

This study was guided by the following specific objectives

i. To determine the influence of space utilization on performance of logistics firms in Nairobi City County, Kenya

ii. To assess the influence of technology integration on performance of logistics firms in Nairobi City County, Kenya

Theoretical Framework

Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory posits that a firm's sustainable competitive advantage is derived from its ability to acquire, manage, and utilize valuable, rare, inimitable, and non-substitutable (VRIN) resources (Khalilipour, Afhami & Kohper, 2021). According to Wernerfelt (1984) and Barney (1991), these resources can be tangible, such as warehouse space, machinery, and technology, or intangible, such as organizational knowledge, brand reputation, and managerial expertise. In the context of logistics firms, the theory emphasizes that strategic utilization of resources—like optimized warehouse layouts, advanced inventory systems, and skilled personnel—can significantly enhance operational efficiency, reduce costs, and improve overall performance (Afon & Adebara, 2020).

RBV provides a framework for understanding the influence of space utilization on logistics performance (Mbiti, 2021). By treating warehouse space as a strategic resource, firms can implement optimization strategies that maximize storage capacity, minimize handling time, and ensure timely order fulfillment. Efficient utilization of such resources not only strengthens operational efficiency but also provides a competitive edge in Nairobi City County, where congestion and limited infrastructure make optimal resource management critical for logistics performance (Mugure, 2020). The theory was used to determine the influence of space utilization on performance of logistics firms in Nairobi City County, Kenya.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), explains how users come to accept and use technology within an organization (Omar & Ismail, 2020). TAM posits that perceived usefulness and perceived ease of use are the primary determinants influencing the adoption of technological systems. In logistics, TAM is particularly relevant for understanding the integration of warehouse management systems (WMS), automated inventory tracking, and real-time shipment monitoring, which are critical for improving operational efficiency and performance (Kambona, 2024).

Applying TAM allows logistics firms to examine how technology adoption impacts overall performance (Wangui, Ronoh & Etene, 2024). If employees perceive technological tools as useful and easy to use, they are more likely to leverage them effectively, enhancing order accuracy, inventory management, and delivery speed. In Nairobi City County, where logistics firms face high demand and operational complexity, successful technology integration underpinned by TAM principles can reduce costs, improve responsiveness, and strengthen competitive advantage in the sector (Masingila, Khatete & Maundu, 2021). The theory was used

to assess the influence of technology integration on performance of logistics firms in Nairobi City County, Kenya.

Conceptual Framework

A conceptual framework shows the relationship between the variables in the study (Afon & Adebara, 2020). The independent variables are space utilization and technology integration, while the dependent variable is performance of logistics firms in Nairobi City County, Kenya. Figure 2.1 below shows the conceptual framework.

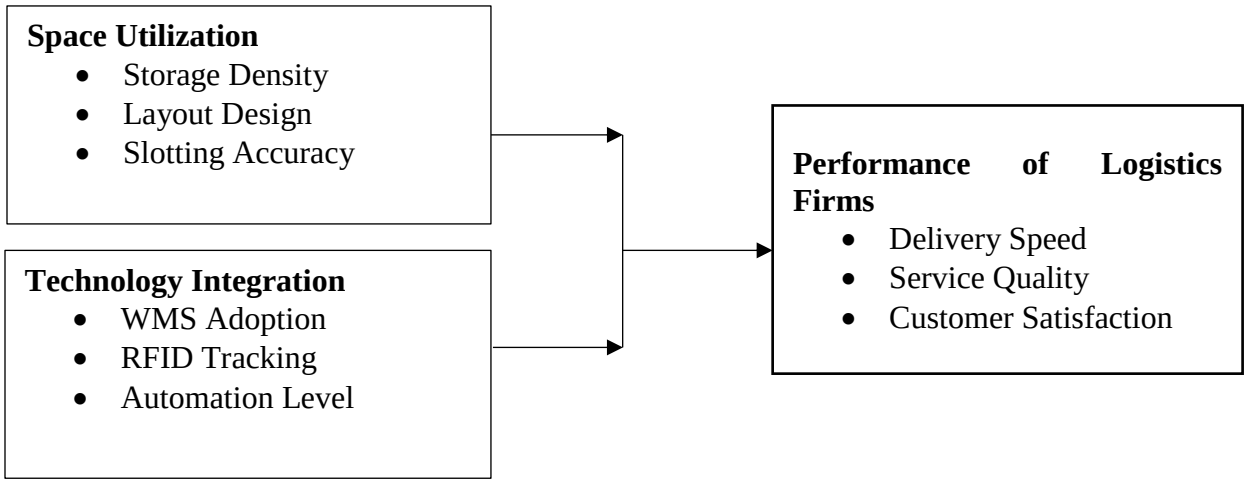


Figure 1: Conceptual Framework

Space Utilization

Space utilization refers to the efficient and effective use of physical space within an organization, facility, or project environment to maximize functionality and minimize wastage (Khalilipour, Afhami & Kohper, 2021). It involves analyzing how available space is allocated, occupied, and optimized to meet organizational needs such as productivity, safety, customer experience, or operational efficiency. Storage Density refers to the measure of how efficiently available storage space is utilized within a facility, such as a warehouse or distribution center (Mbiti, 2021). It involves maximizing the volume of goods stored in relation to the physical footprint of the storage area. High storage density reduces the need for excessive floor space, lowers facility costs, and improves overall operational efficiency. Techniques such as vertical racking systems, compact shelving, and automated storage and retrieval systems (AS/RS) are commonly applied to increase storage density.

Layout Design is the strategic arrangement of equipment, storage racks, workstations, and pathways within a warehouse or storage facility (Konyango, 2020). A well-planned layout improves material flow, minimizes travel distances, reduces bottlenecks, and enhances worker

productivity. For instance, fast-moving goods are often placed closer to picking and shipping areas, while bulk or slow-moving items can be stored in less accessible zones. Layout design also considers safety, ergonomics, and compliance with regulatory standards. Slotting Accuracy refers to the effectiveness of assigning products to specific storage locations based on their characteristics, demand patterns, and handling requirements (Afon & Adebara, 2020). Accurate slotting ensures that frequently picked items are positioned in easily accessible areas, reducing travel time and labor costs. It also minimizes errors in order picking, improves inventory visibility, and supports efficient replenishment processes.

Technology Integration

Technology Integration refers to the seamless incorporation of digital tools, automated systems, and innovative solutions into organizational processes to improve efficiency, accuracy, and decision-making (Omar & Ismail, 2020). In modern operations such as warehousing, retail, manufacturing, and service delivery, technology plays a critical role in streamlining workflows and reducing manual effort. For example, warehouse management systems (WMS), automated storage and retrieval systems (AS/RS), and barcode or RFID tracking enhance inventory visibility and reduce errors. Similarly, artificial intelligence and data analytics provide insights for demand forecasting, performance monitoring, and process optimization (Kambona, 2024). Effective technology integration not only minimizes operational costs and human error but also improves speed, scalability, and customer satisfaction. WMS Adoption involves the implementation of a Warehouse Management System (WMS) to optimize the control and coordination of warehouse operations (Masingila, Khatete & Maundu, 2021). A WMS provides real-time visibility into inventory, manages the flow of goods, and supports efficient order fulfillment processes. Its adoption enhances productivity by reducing manual errors, improving space utilization, and streamlining tasks such as picking, packing, and shipping. Additionally, WMS adoption enables data-driven decision-making through analytics and reporting tools that track performance metrics.

RFID Tracking refers to the use of Radio Frequency Identification technology to monitor and manage inventory movement with greater speed and accuracy than traditional barcoding (Omar & Ismail, 2020). RFID tags, attached to products or pallets, can be scanned automatically without direct line of sight, allowing for real-time updates of stock levels and locations. This reduces the likelihood of stockouts, misplacements, and shrinkage, while also saving time in inventory counts. In logistics and retail environments, RFID tracking improves traceability across the supply chain and enhances customer satisfaction by ensuring better inventory accuracy. Automation Level describes the extent to which machines, robotics, and software systems are used to perform tasks traditionally handled by humans (Wangui, Ronoh & Etene, 2024). In warehouses and manufacturing facilities, higher automation levels often mean the adoption of technologies such as automated guided vehicles (AGVs), robotic picking systems, or conveyor-based sortation solutions. A higher level of automation can significantly increase

speed, accuracy, and efficiency, while reducing labor costs and minimizing human error. However, finding the right balance is crucial, as excessive automation without proper planning can lead to high investment costs, complexity, and resistance from the workforce.

Empirical Review

Space Utilization and Performance of Logistics Firms

Khalilipour, Afhami and Kohper (2021) conducted a study on the effect of reviewing the utilization of Tehran's space during contemporary events (case study of the constitutional revolution) in Iran. The purpose of this study is to investigate the relationship between urban space and the events of the Constitutional Revolution and the symbolic transformation of urban spaces resulting from this social action. The results of the research show that in the Constitutional Revolution, three different stages of consumption, production, and spatial confrontation can be observed. The study concluded that in the first stage, events begin in the body of a space that is historically considered legitimate, and then social action creates and represents its spaces, and everyday spaces become part of a new symbolic system of urban space

Afon and Adebara (2020) conducted a study on the effect of socio-cultural utilization of open spaces in the traditional residential neighborhood of Ile-Ife, Nigeria. The data for this study were obtained through a questionnaire survey, direct observation, measurement of open spaces, and photographic recordings. It is established that open spaces played a number of crucial roles in the socio-cultural life of residents: they served as areas for social ceremonies, burying the dead, ancestral worship/rituals, family meetings, and reception of visitors. The study concluded that open spaces are settings where residents connect socially, culturally and spiritually in the traditional environment

Mbiti (2021) conducted a study on the influence of spatial characteristics on utilization of urban parks in Nairobi City County, Kenya. Data were collected from a random sample of convex spaces generated from the six gazetted urban parks base maps. An observation schedule and an interview schedule were used to collect the data and analysis carried out using the Statistical Package for Social Sciences. Results of the study reveal a significant relationship between spatial characteristics and urban park utilization. It is concluded that spatial characteristics play a significant role in park utilization

Mugure (2020) conducted a study on the impact of resource utilization in education as perceived by teachers in secondary schools in Mathioya District, Muranga County, Kenya. The target population consisted of all the 27 public secondary schools in the district. The sample consisted of 10 secondary schools; the principal of the sampled school was automatically included in the study while one teacher was randomly elected. The study established that the number of teachers in most schools was grossly inadequate. It was also found out that the physical facilities and recreational facilities were inadequate. Based on these findings, the study therefore conclusions

that more funds be allocated to equip the laboratories, computer rooms, science rooms and agriculture rooms

Konyango (2020) conducted a study on the impact of resource utilization on the performance of physics in KCSE in public secondary schools in Ugunja/Ugenya Districts, Kenya. Data was collected using questionnaires for students and teachers, and interview schedule for principals. Data collected was analyzed using both descriptive and inferential statistics. The significance of the possible findings would provide information to policy makers and relevant stakeholders on the need to avail resources for improvement of performance in physics and the findings of the study would contribute to the improvement on the use of resources to enhance good performance in physics

Technology Integration and Performance of Logistics Firms

Omar and Ismail (2020) conducted a study on the effect of mobile technology integration in the 2020s: the impact of technology leadership in the Malaysian Context. A total of 376 secondary school teachers in the state of Kedah, Northern of Malaysia were selected as respondents through a quantitative approach involving systematic random sampling. The results of the data analysis revealed that there is a strong positive relationship between principals' technology leadership and teachers' mobile technology integration in teaching process. The study concluded that today's mobile technology integration is gaining popularity among teachers and students

Kambona (2024) conducted a study on the effect of tutors' perspectives on the integration of information and communication technology in early-grade teacher colleges in Tanzania. The purposive sampling technique was employed in sampling the four teacher colleges and four principals, while the convenience sampling technique was used to sample the 41 tutors who participated in this study. A collective case study design was used to explore participants' perspectives on the deployment of ICT integration in their daily teaching. The study findings show that the majority of tutors had limited regular professional training opportunities on the integration of ICT in teaching. The study, therefore, concludes that inadequate integration of ICT among tutors exacerbates limited acquisition of the necessary digital literacy skills among early-grade pre-service teachers.

Wangui, Ronoh and Etene (2024) conducted a study on the effect of exploring interactive learning approaches and technology integration in the Kenyan education system. Additionally, interactive learning methodologies, such as game-based learning and the Learning by Asking (LBA) system, are scrutinized for their potential to engage learners and foster their skill acquisition. The study found that furthermore, the emergence of competency-based education (CBE) models is analyzed in response to evolving educational objectives, emphasizing the cultivation of practical skills, problem-solving abilities, and commitment to lifelong learning. In conclusion, integrating interactive technologies offers Kenya an opportunity to redefine its educational approach

Masingila, Khatete and Maundu (2021) conducted a study on the effect of implementation to efficacy: factors affecting Kenyan secondary teachers' technology integration. The study used questionnaire and classroom observation data to examine what types of ICTs for education are available in secondary schools in Kenya and what training teachers have had in using ICTs for education; teachers' perspectives regarding the role of ICT in teaching and learning; and what factors might influence ICT integration in teaching and learning in public secondary schools in Kenya. The study found that while few teachers are integrating ICT into their teaching and learning, many teachers are implementing ICT in their teaching. It is concluded that the Kenyan government, through the Ministry of Education, Science and Technology make a policy that all of the secondary teacher education institutions in the country have mandatory preparation for pre-service teachers in technology integration in teaching

Akwee, Toili and Palapala (2022) conducted a study on the effectiveness of computer based technology integration in teaching and learning of gene concept among high school students, Kenya. The study was carried out in Kakamega Central District of Kenya. The target population was the entire Form 4 biology students at the public secondary schools. The findings in the study showed that the integration of computer-based technology in teaching and learning improved students' achievement scores and understanding of the gene concept. The study concluded that firstly, it is apparent that poor performance and students' loss of interest in biology, particularly the gene concept in genetics, is a result of inadequate understanding of the concept.

RESEARCH METHODOLOGY

Research Design

This study used a descriptive research design. Mugenda and Mugenda (2018) explained the descriptive design is 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. The description research design aspect of it attempted to provide more details and insights from the respondents on how the dependent variables impact on the independent variable. This descriptive research design enabled the researcher to analyze the findings and draw informed conclusions.

Target Population

Target population is the entire set of individuals (or objects) having the same characteristics as pointed out in the sampling criteria used for the study (Bryman, 2019). The target population makes a part of the universal population (Creswell, 2019). This study targeted logistics firms in Nairobi City County, Kenya. The unit of analysis was therefore 108 registered logistics firms in Nairobi City County, Kenya. The target respondents were employees in logistics firms with experience in warehousing optimization. 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

Sample refers to a part of or fraction of population that is being investigated upon. It can also be defined as a group of individuals who are engaged or participating in a study. Wilson (2019) defined it as selected elements such as objects, subjects or people that participate in a particular study. Samples are used to reflect the entire attributes of a given population under investigation such that the study's findings can be generalized to the entire population. A good sample size should be enough to adequately represent the characteristic of the population being studied. Sahu (2017) notes that the best sample should give enough data on the population and this data should be adequate and capable of being analyzed easily.

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 that was used for arriving at the sample size is;

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

Where:

n=sample size

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

N=Population size (216)

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

Chuan and Penyelidikan (2019) 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 139 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. This sampling technique divides the population into groups or strata. The strata are reached upon on the basis of the shared traits (Singpurwalla, 2018). One of the advantages of stratified random sampling is that it allows for each of the strata to be well represented when the sample is chosen (Bryman & Cramer, 2019). The study then 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 is 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 were 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.

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 is 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 were not 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 was 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 is 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.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Whereby;

Y = Performance of logistics firms in Nairobi City County, Kenya

β_0 = Constant

$\beta_1, \beta_2,$ = Coefficients of determination

X_1 = Space utilization

X_2 = Technology integration

ε = Error term

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

Response Rate

The researcher sampled 138 respondents who were each administered with the questionnaires. From the 138 questionnaires 114 were completely filled and returned hence a response rate of 82.6%. The response rate was considered as suitable for making inferences from the data collected. As indicated by Metsamuuronen (2019), a response rate that is above fifty percent is considered adequate for data analysis and reporting while a response rate that is above 70% is classified as excellent. Hence, the response rate of this study was within the acceptable limits for drawing conclusions and making recommendations.

Descriptive Statistics Analysis

Space Utilization and Organization Performance

The first specific objective of the study was to determine the influence of space utilization on performance of logistics firms in Nairobi City County, Kenya. The respondents were requested to indicate their level of agreement on statements relating to space utilization and performance of logistics firms in Nairobi City County, Kenya. The results were as presented in Table 3.

From the results, the respondents agreed that their warehouse makes optimal use of available storage space to accommodate inventory efficiently (M=3.842, SD= 0.665). In addition, the respondents agreed that storage density in their warehouse reduces unnecessary movement of goods and maximizes capacity (M=3.820, SD=0.903). Further, the respondents agreed that the warehouse layout is designed to allow smooth flow of goods and minimize handling time (M=3.801, SD= 0.715).

From the results, the respondents agreed that the current warehouse layout supports easy access to frequently used items, improving operational efficiency (M=3.796, SD=0.659). In addition, the respondents agreed that items in the warehouse are accurately slotted according to their categories and demand frequency (M=3.774, SD=0.694). Further, the respondents agreed that correct slotting of inventory helps reduce errors in picking and improves order fulfillment speed (M=3.758, SD= 0.706).

Table 3: Space Utilization and Organization Performance

	Mean	Std. Dev
Our warehouse makes optimal use of available storage space to accommodate inventory efficiently.	3.842	0.665
Storage density in our warehouse reduces unnecessary movement of goods and maximizes capacity.	3.820	0.903
The warehouse layout is designed to allow smooth flow of goods and minimize handling time.	3.801	0.715
The current warehouse layout supports easy access to frequently used items, improving operational efficiency.	3.796	0.659
Items in the warehouse are accurately slotted according to their categories and demand frequency.	3.774	0.694
Correct slotting of inventory helps reduce errors in picking and improves order fulfillment speed.	3.758	0.706
Aggregate	**3.799**	**0.724**

Technology Integration and Organization Performance

The second specific objective of the study was to assess the influence of technology integration on performance of logistics firms in Nairobi City County, Kenya. The respondents were requested to indicate their level of agreement on various statements relating to technology integration and performance of logistics firms in Nairobi City County, Kenya. The results were as presented in Table 4.

From the results, the respondents agreed that their warehouse uses a Warehouse Management System (WMS) to track inventory and manage operations (M=3.860, SD= 0.898). In addition, the respondents agreed that the WMS helps improve accuracy and efficiency in warehouse processes (M=3.845, SD=0.665). Further, the respondents agreed that RFID or barcode technology is used to monitor inventory movement in real-time (M=3.822, SD= 0.761).

From the results, the respondents agreed that the use of RFID tracking reduces errors and enhances inventory visibility (M=3.808, SD=0.889). In addition, the respondents agreed that automated systems (e.g., conveyors, sorting machines) are used to streamline warehouse operations (M=3.794, SD=0.781). Further, the respondents agreed that higher levels of automation in the warehouse improve productivity and reduce manual errors (M=3.771, SD= 0.899).

Table 4: Technology Integration and Organization Performance

	Mean	Std. Dev
Our warehouse uses a Warehouse Management System (WMS) to track inventory and manage operations.	3.860	0.898
The WMS helps improve accuracy and efficiency in warehouse processes.	3.845	0.665
RFID or barcode technology is used to monitor inventory movement in real-time.	3.822	0.761
The use of RFID tracking reduces errors and enhances inventory visibility.	3.808	0.889
Automated systems (e.g., conveyors, sorting machines) are used to streamline warehouse operations.	3.794	0.781
Higher levels of automation in the warehouse improve productivity and reduce manual errors.	3.771	0.899
Aggregate	**3.817**	**0.816**

Organization Performance

The respondents were requested to indicate their level of agreement on various statements relating to performance of logistics firms in Nairobi City County, Kenya. The results were as presented in Table 5.

From the results, the respondents agreed that their firm consistently delivers goods within the promised time frames (M=3.824, SD= 0.667). In addition, the respondents agreed that delivery speed has improved due to efficient warehouse and logistics operations (M=3.783, SD=0.580). Further, the respondents agreed that the firm maintains high standards in handling and delivering products (M=3.749, SD= 0.716).

From the results, the respondents agreed that service quality in their logistics operations meets client expectations consistently (M=3.708, SD=0.788). In addition, the respondents agreed that customers are satisfied with the overall performance of their logistics services (M=3.690, SD=0.769). Further, the respondents agreed that high service quality and timely delivery have positively impacted customer satisfaction (M=3.656, SD= 0.836).

Table 5: Organization Performance

	Mean	Std. Dev
Our firm consistently delivers goods within the promised time frames.	3.824	0.667
Delivery speed has improved due to efficient warehouse and logistics operations.	3.783	0.580
The firm maintains high standards in handling and delivering products.	3.749	0.716
Service quality in our logistics operations meets client expectations consistently.	3.708	0.788
Customers are satisfied with the overall performance of our logistics services.	3.690	0.769
High service quality and timely delivery have positively impacted customer satisfaction.	3.656	0.836
Aggregate	**3.735**	**0.726**

Inferential Statistics

Inferential statistics in the current study focused on correlation and regression analysis. Correlation analysis was used to determine the strength of the relationship while regression analysis was used to determine the relationship between dependent variable (performance of logistics firms in Nairobi City County, Kenya) and independent variables (space utilization and technology integration).

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (space utilization and technology integration) and the dependent variable (performance of logistics firms in Nairobi City County, Kenya) dependent variable. Pearson correlation coefficient range between zero and one, where by the strength of association increase with increase in the value of the correlation coefficients.

Table 6: Correlation Coefficients

		Organization Performance	Space Utilization	Technology Integration
Organization Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	114		
Space Utilization	Pearson Correlation	.835**	1	
	Sig. (2-tailed)	.001		
	N	114	114	
Technology Integration	Sig. (2-tailed)	.002	.088	
	N	114	114	
	Pearson Correlation	.857**	.283	1
	Sig. (2-tailed)	.000	.027	
	N	114	114	114
	Sig. (2-tailed)	.003	.065	.037
	N	114	114	114

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

From the results, there was a very strong relationship between space utilization and performance of logistics firms in Nairobi City County, Kenya (r = 0.835, 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 Khalilipour, Afhami and Kohper (2021) who indicated that there is a very strong relationship between space utilization and organization performance.

Moreover, the results revealed that there is a very strong relationship between technology integration and performance of logistics firms in Nairobi City County, Kenya (r = 0.857, 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 Omar and Ismail (2020) that there is a very strong relationship between technology integration and organization performance.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (space utilization and technology integration) and the dependent variable (performance of logistics firms in Nairobi City County, Kenya).

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.806	.650	.649	.10129

a. Predictors: (Constant), space utilization and technology integration

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 0.650. This implied that 65% of the variation in the dependent variable (performance of logistics firms in Nairobi City County, Kenya) could be explained by independent variables (space utilization and technology integration).

Table 8: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.386	2	32.193	109.129	.000[b]
	Residual	32.691	111	.295		
	Total	97.077	113			

a. Dependent Variable: performance of logistics firms in Nairobi City County, Kenya

b. Predictors: (Constant), space utilization and technology integration

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 109.129 while the F critical was 3.078. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of space utilization and technology integration on performance of logistics firms in Nairobi City County, Kenya.

Table 9: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.255	0.066		3.864	0.000
	space utilization	0.338	0.087	0.337	3.885	0.001
	technology integration	0.360	0.093	0.359	3.871	0.000

a Dependent Variable: performance of logistics firms in Nairobi City County, Kenya

The regression model was as follows:

$$Y = 0.255 + 0.338X_1 + 0.360X_2 + \varepsilon$$

According to the results, space utilization has a significant effect on performance of logistics firms in Nairobi City County, Kenya β_1=0.338, 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 Khalilipour, Afhami and Kohper (2021) who indicated that there is a very strong relationship between space utilization and organization performance.

The results also revealed that technology integration has significant effect on performance of logistics firms in Nairobi City County, Kenya β1=0.360, p value= 0.000). The relationship was considered significant since the p value 0.000 was less than the significant level of 0.05. The findings are in line with the findings of Omar and Ismail (2020) that there is a very strong relationship between technology integration and organization performance.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study concludes that space utilization has a positive and significant effect on performance of logistics firms in Nairobi City County, Kenya. Findings revealed that storage density, layout design and slotting accuracy influence performance of logistics firms in Nairobi City County, Kenya.

Further, the study concludes that technology integration has a positive and significant effect on performance of logistics firms in Nairobi City County, Kenya. Findings revealed that WMS adoption, RFID tracking and automation level influences performance of logistics firms in Nairobi City County, Kenya.

Recommendations

The study recommends that logistics firms in Kenya should optimize the utilization of available warehouse and storage space through proper facility layout planning, systematic inventory arrangement, and effective use of vertical storage systems. This would enable firms to maximize available space, minimize storage costs, improve accessibility of goods, and enhance overall operational performance.

Further, the study recommends that logistics firms in Kenya should invest in modern logistics technologies such as warehouse management systems, fleet tracking software, and automated inventory management systems. These technologies would improve operational coordination, enhance real-time information sharing, minimize logistical errors, and support timely service delivery

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