Int Journal of Social Sciences Management and Entrepreneurship 9(1): 346-359 2025

ISSN 2411-7323

www.sagepublishers.com

WAREHOUSE CONSOLIDATION PRACTICES AND PERFORMANCE OF HORTICULTURAL EXPORTING FIRMS IN NAKURU COUNTY, KENYA

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ABSTRACT

Horticultural exporting firms, which specialize in the production and export of fruits, vegetables, flowers, and other horticultural products, play a crucial role in the global agricultural trade. Warehouse facilities offer a range of value added services to complement warehousing, distribution and fulfillment needs. Despite their importance, horticultural exporting firms in Kenya face numerous challenges that affect their performance. These challenges include high operational costs, inefficiencies in supply chain management, and logistical issues. The general objective of this study was to determine the effect of warehouse consolidation practices on performance of Horticultural Exporting Firms in Nakuru County, Kenya. The specific objectives were to; examine the effect of cross-docking on performance of Horticultural Exporting Firms in Nakuru County, Kenya and to establish the influence of space utilization on performance of Horticultural Exporting Firms in Nakuru County, Kenya. The study was guided by The Theory of Constraints, and Just in Time theory. The study adopted descriptive research design. The study targeted 50 registered Horticultural Exporting Firms in Nakuru County. The unit of observation was 200 management staff. Census was used hence all the management staff were sampled. Data was collected using questionnaires. A pilot was conducted with 20 management staff. The study used content and construct validity. Reliability analysis was conducted using Cronbach's Alpha Coefficient. The content of the questionnaire was approved by the research supervisor and warehousing experts to check. The professionals approved that the content of the questionnaire matched the purpose of the study and would help to achieve study objectives. The researcher collected questionnaires, coded them, and entered them into the Statistical Package for Social Sciences (SPSS version 28) for analysis. The results were displayed using frequency distribution tables. The regression analysis revealed that warehouse consolidation practices significantly influence the performance of horticultural exporting firms, with cross-docking ($\beta = 0.364$, $p = 0.000$) having the strongest impact, followed by space utilization ($\beta = 0.321$, $p = 0.000$). The study concludes that firms optimizing warehouse layouts, inventory control, and logistics coordination experience improved competitiveness. It is recommended that firms invest in automated inventory tracking, flexible storage solutions, and structured order-picking systems to enhance warehouse efficiency. Future research should explore the role of automation and AI in warehouse consolidation for further optimization.

Key Words: Warehouse Consolidation Practices, Cross-Docking, Space Utilization, Performance, Horticultural Exporting Firms

Background of the Study

Horticultural exporting firms, which specialize in the production and export of fruits, vegetables, flowers, and other horticultural products, play a crucial role in the global agricultural trade. The performance of these firms is typically assessed by their export volumes, revenue generation, market reach, and sustainability practices (Singh, Kumari, & Singh, 2023). Key performance indicators include productivity levels, quality standards, adherence to international regulations, and the ability to innovate and adapt to market demands. Horticultural exporting firms often excel in regions with favorable climates and fertile soils. Their performance is driven by several factors, including advanced agricultural practices, investment in technology, and access to global markets (Sahar, Mohsen, & Khosro, 2020). These firms often adopt modern farming techniques such as greenhouse farming, drip irrigation, and integrated pest management to enhance productivity and quality. Furthermore, they invest in post-harvest handling and cold chain logistics to maintain the freshness and quality of products during transportation (Ruburika, & Muiruri, 2021).

Horticultural exporting firms significantly contribute to the economies of their respective countries in multiple ways. Firstly, they are major earners of foreign exchange, which helps improve the balance of trade and strengthens the national currency. The revenue generated from exports supports economic stability and growth, funding public services and infrastructure development (Ongeri, & Osoro, 2021). Secondly, these firms create employment opportunities, both directly and indirectly. Direct employment is provided through farming, processing, packaging, and logistics operations, while indirect employment arises from the demand for inputs such as seeds, fertilizers, and equipment. This job creation is particularly important in rural areas, where employment opportunities may be limited, thus contributing to poverty alleviation and improved living standards (Mumea, & Achuora, 2020). Warehouse consolidation practices refer to strategies and processes used to optimize the storage, handling, and distribution of goods by combining shipments and inventory from multiple sources into a single location or shipment. This approach aims to reduce costs, improve efficiency, and enhance overall supply chain performance (Njeru, & Wachiuri, 2023).

Statement of the Problem

Horticultural exporting firms in Kenya play a pivotal role in the national economy. These firms significantly contribute to the country's foreign exchange earnings, with horticulture being one of Kenya's top three foreign exchange earners, alongside tourism and tea. In 2022, the sector generated KES 157.7 billion, accounting for 14% of Kenya’s total export revenue (Kenya National Bureau of Statistics [KNBS], 2023). The horticultural sector, which includes the export of fruits, vegetables, and flowers, has positioned Kenya as a leading global supplier, with approximately 70% of its horticultural exports destined for Europe (Horticultural Crops Directorate [HCD], 2023). Additionally, the sector provides direct and indirect employment to over 6.5 million Kenyans, particularly in rural areas, supporting livelihoods and food security (Agriculture and Food Authority [AFA], 2023). The industry's growth has also spurred advancements in infrastructure, technology adoption, and sustainable farming practices (Muhalia, Ngigi, & Moronge, 2021).

Despite its economic significance, horticultural exporting firms in Kenya face numerous challenges that threaten their sustainability and competitiveness. These challenges include rising operational costs, inefficiencies in supply chain management, limited cold storage facilities, and logistical disruptions (Kenya Association of Manufacturers [KAM], 2023). According to KNBS (2023), the export earnings from horticulture dropped by 8.1% in 2022, from KES 157.7 billion in 2021 to KES 144.3 billion in 2022. This decline was primarily attributed to high freight costs, climate change impacts, and competition from emerging markets such as Ethiopia and Rwanda. Moreover, horticultural exports suffered a 12% decline

in volume, from 403,000 metric tonnes in 2021 to 354,000 metric tonnes in 2022, indicating supply chain inefficiencies and post-harvest losses exceeding 30% annually (AFA, 2023).

The export earnings from key horticultural products such as French beans, passion fruits, and onions have fluctuated, driven by competition from Latin American countries and inconsistent local supply (KHCP, 2023). Although avocados and passion fruits have a high export potential in Europe, production remains constrained by smallholder farming models, poor storage infrastructure, and seasonal fluctuations (Kariuki, Ngugi & Mburu, 2023). Notably, Kenya lost 2.6% of its global market share in horticulture between 2015 and 2022, dropping from 1.05% to 0.79%, primarily due to logistical inefficiencies and declining export quality (USAID, 2023). Furthermore, agriculture value-added growth declined by 2.5% in 2022, highlighting the need for improved value chain integration and export competitiveness (Nzomoi, Mutua, Kiprop, & Kathambi, 2023).

One potential solution to address these inefficiencies is warehouse consolidation practices, which can streamline inventory management, enhance supply chain efficiency, and reduce costs (Njeru & Wachiuri, 2023). By centralizing inventory and optimizing storage and distribution, warehouse consolidation can help firms mitigate supply chain disruptions, lower transportation expenses, and ensure timely deliveries (Ongeri & Osoro, 2021). Studies indicate that firms that implement warehouse consolidation experience a 15-25% reduction in operational costs and a 20% improvement in inventory turnover rates (KAM, 2023). Additionally, warehouse consolidation has been associated with higher customer satisfaction levels, improved order fulfillment rates, and enhanced export reliability (AFA, 2023).

Despite the recognized benefits of warehouse consolidation, limited research has been conducted on its impact on horticultural exporting firms in Kenya. Previous studies have primarily focused on fast-moving consumer goods (FMCG) manufacturers (Muhalia, Ngugi & Moronge, 2021), agrochemical companies (Kapaito & Wachiuri, 2023), and distribution firms (Ongeri & Osoro, 2021). No study has specifically examined the effect of warehouse consolidation practices on horticultural exporting firms in Kenya. Given the unique challenges of perishable goods logistics, this study aimed to fill the research gap by assessing how warehouse consolidation impacts the performance of horticultural exporting firms in Nakuru County, Kenya.

General Objective

The general objective of this study was to determine the effect of warehouse consolidation practices on performance of Horticultural Exporting Firms in Nakuru County, Kenya.

Specific Objectives

The study was guided by the following research objectives

i. To examine the effect of cross-docking on performance of Horticultural Exporting Firms in Nakuru County, Kenya.

ii. To establish the influence of space utilization on performance of Horticultural Exporting Firms in Nakuru County, Kenya.

LITERATURE REVIEW

Theoretical Review

Theory of Constraints

The Theory of Constraints (TOC) was developed by Eliyahu M. Goldratt (1984). The Theory of Constraints asserts that every system has one or more constraints that limit its performance. By identifying and addressing these constraints, organizations can improve their overall effectiveness and efficiency. TOC is centered around the idea that optimizing the performance

of the constraint will lead to overall improvements in the system. The TOC principle of optimizing the flow of materials aligns with the objectives of cross-docking, which aims to improve the efficiency of material handling by directly moving goods to their next destination. This streamlined flow reduces delays and enhances overall system efficiency. In TOC, managing capacity constraints is crucial for improving performance. Cross-docking helps manage capacity constraints by ensuring that the warehouse is used primarily for sorting and consolidation rather than long-term storage. This approach keeps the warehouse operating efficiently and prevents capacity from becoming a limiting factor.

Just in Time Theory

Just in Time Theory was developed by Taiichi Ohno (1970). This approach is associated with all actions linked to item storage and material control. The fundamental goal of JIT is to emphasize the transition to a higher volume of recurring manufacturing processes from job-lot production by drastically reducing waste. In this situation, waste is defined as activities that do not create value inside the business or achievement of firm goals (Cox, 1986). JIT results in the production of the essential products, at the desired quality and in the appropriate numbers, at the exact moment they are needed. Managers have the alternative from learning to live with an unacceptably high degree of production interruptions or putting in a lot of effort to uncover and addressing the sources of production challenges (Kootanaee, Babu, & Talari, 2013).

JIT procedures aid in the elimination of waste caused by an unstructured work space, unscheduled downtime, and machine performance unpredictability. JIT's purpose is to continuously maintain, enhance, and optimize the quality and efficiency of equipment by including every personnel, from senior management to ground employees (Chase & Aquilano, 1992). Heragu et al. (2011) propose that analytic data is one of many key elements needed to determine the right number of supplies to keep in a warehouse. Companies face a challenging task to make sure that the supplies are in a steady flow and that the movement is fluid within and out of warehouses. To maximize the warehouse space at its fullest potential, firms need to find an optimal replenishment schedule to minimize the Maximum Warehouse Space Requirement (MWSR). The lower the MWSR, the better the replenishment schedule. Inventory helps to reduce any overstock items and make it where it is a JIT (Just in Time) inventory concept helping to free up needed space. The theory is related to space utilization. Designing warehouse layout through the computer help to map out the space that is needed to maximize efficiency. Companies need to know what is right versus what is wrong in determining what type of space needed to effectively carry out the distribution activities efficiently.

Conceptual Framework

A conceptual framework is a device that organizes empirical observations in a meaningful structure (Shapira, 2019). It forms part of the agenda for negotiation to be scrutinized, tested, reviewed and reformed as a result of investigation and it explains the possible connections between the variables (Durham & Stokes, 2019).

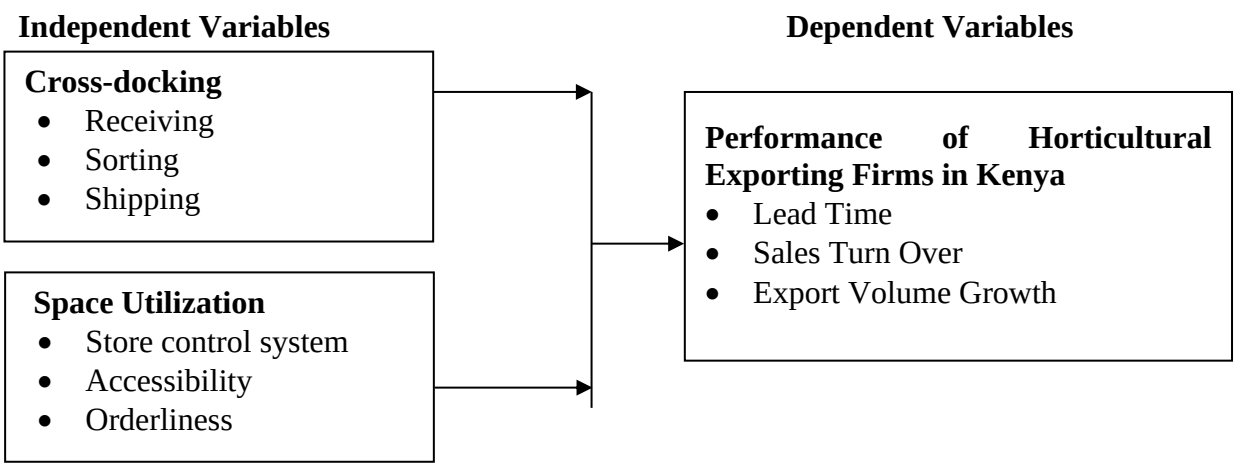

Figure 2. 1: Conceptual Framework

Cross-docking

Cross docking (CD) is the process of consolidating the products coming from different suppliers, but having the same destination, with minimal handling and almost no storage between loading and unloading of the good. Cross docking is a new approach towards supply chain and replaces traditional warehousing. It enables uninterrupted flow of goods with no storage space (Waller, 2023). Cross docking is a distribution system where things received at the warehouse are not acknowledged into stock, but are arranged for shipment to another location or for retail supplies. It is the uninterrupted movement, where the continuous freight chain is moving from inbound to outbound (dispatch), hence eradicating cargo space. It describes movement throughout division (Gumus & Bookbinder, 2022).

According to Al Chall (2020), cross dock facilities include the receiving, staging/sorting, and load building activities. In cross-docking, the warehouse's function is considered as inventory coordination points rather than inventory storage points. In typical cross-docking systems, goods arrive at warehouses from the manufacturer, are transferred to vehicles serving the retailers, and are delivered to the retailers as rapidly as possible. Goods spend very little time in storage at the warehouse—often less than 12 hours. The fundamental principles of the CD concept are reflected in the consolidation of goods flows at CD terminals with little or no storage of goods. The objective is to achieve optimization of time, space and costs. The wide range of fields of implementation of the CD concept has enabled its use in various production and distribution sectors, including printing (magazines and newspapers), supply of spare parts, postal and urban distribution systems, intermodal transport (IT) and food distribution (Tadić, Mićić, & Krstić, 2023).

Arabani, Ghomi, and Zandieh (2021) indicated that CD is the contemporary approach where freight is discharged from the receiving dock, rearranged and assembled into categories according to specific items further weighed down onto the dispatching dock for shipment according to its order sample in a supply system. CD plays a key role in distribution networks. Wen, Larsen and Laporte (2020) suggest that many manufacturing and retailing companies extensively adopt cross docking in practice. Its successful application is at Wal Mart the highest as well as largest revenue generating sellers in the world. It uses uninterrupted delivery of products to Wal Mart centre, from there they are selected, rearranged and shipped to market place with no stock storage. Through adoption of cross docking, Wal Mart has been able to come up with a low price strategy and also improves its market share and profitability by evading expending precious instance and administrative stock rate. CD eliminates traditional warehousing strategy of inventory holding while allowing a new approach of consolidation. The overall process of cross docking from inbound to outbound usually takes 24 hours, more or less than an hour. It also provides excellent consumer checks however in addition give considerable benefit above conventional warehousing: reduced stock ventures, cargo space,

reduced handling rate, and order cycle time in addition more rapidly stock turnover and quick cash flows.

Space Utilization

Space utilization is defined as the efficient use of available storage space to maximize operational efficiency and reduce costs (Tutam, 2022). Proper space utilization ensures that inventory is stored in a manner that facilitates easy access, efficient movement, and effective management of goods. Key elements of space utilization include store control systems, accessibility, and orderliness (van Geest et al., 2021). . Khan et al. (2019) described that modern store control systems like Warehouse Management Systems (WMS) are designed to optimize space utilization, improve inventory management, and enhance overall operational efficiency. Other systems like automated storage and retrieval systems (AS/RS), and radio frequency identification (RFID) enhance the accuracy and efficiency of warehouse operations by providing real-time data and automated processes

Min and Joo (2022) recommended U-shaped and I-shaped configurations as optimal layout designs for improving access to goods. The researchers found that these designs facilitate smoother workflows and minimize travel distances within the warehouse. Technologies such as pick-to-light systems, voice-directed picking, and mobile shelving units enhance accessibility. The storage assignment policies that assign items to storage locations are usually random storage, dedicated storage and class-based storage categories. The advantage of this policy is that fast moving products can be stored near the warehouse, whereas flexibility and high storage space use of random storage are applicable.Song et al., 2021).

Rebelo (2021) stresses the need of well-oiled storage and put-away processes for optimum product movement. Problems with storage space allocation and possible delays could occur when staff do not have a thorough grasp of incoming merchandise. In addition, retrieval operations may be further complicated by poorly built storage rooms with restricted mobility, which impacts efficiency and safety. Another way that improper storage methods may reduce productivity and heighten the danger of accidents is by blocking paths with misplaced objects.

Empirical Review

Cross-docking and Firm Performance

Dudukalov, Subhani, and Ushakov (2020) investigated the impact of cross docking on transportation and distribution efficiencies in the logistic industry from four major Asian countries including China, Pakistan, India and Sri Lanka. The study sampled 1073 respondents from the logistic industry selected through probability sampling. The respondents were contacted through their LinkedIn and Facebook profiles. Data was collected using survey monkeys. The findings confirmed that improvements in warehousing costs are due to improvements in cross docking.

Vasiljevic and Stepanovi (2022) explored the effects of cross docking on business trading companies. The study used information from articles on actual logistics and supply chain management literature review. The results showed that cross docking can be a suitable tool for food distribution improvement and valuable for the company's competitiveness. The validity of the cross docking implementation is reflected in multiple (direct and indirect) benefits not only for the company, but also for the whole supply chain.

Yassine (2019) investigated the costs/benefits of implementing the cross-docking strategy in a retail supply chain context. The study was based on a case study of an FMCG company and a major French retailer. The configurations studied were the traditional warehousing strategy where both retailers and suppliers keep inventory in their warehouses; the cross-docking pick-by-line strategy, where inventory is removed from the retailer warehouse and the allocation and sorting are performed at the retailer distribution centre level, the cross-docking pick-by-store strategy, where the allocation and sorting are done at the supplier level, and finally a

combination of cross-docking pick-by-line strategy and traditional warehousing strategy. Results showed that compared to traditional warehousing, cross-docking with sorting and allocation done at the supplier level increases the entire supply chain cost by 5.3 per cent. Second, cross-docking with allocation and sorting of the products done at the retailer level is more economical than traditional warehousing: a 1 per cent reduction of the cost. Third, combining cross-docking and traditional warehousing reduces the supply chain cost by 6.4 per cent.

Mwakima and Osoro (2024) examined the effect of inventory management practices and performance of logistics firms in Nairobi City County, Kenya. The study adopted a descriptive survey research design. The study targeted 100 logistics firms in Nairobi City. The unit of observation was the procurement, warehouse, and finance managers from each firm hence 300 respondents were targeted. The study sample of 171 staff was calculated using Yamane sampling formula. The study collected primary data using questionnaires. Results showed that there is a strong significant relationship between cross docking and performance of logistics firms. The management recognized the pivotal role cross-docking plays in managing inbound goods efficiently. By avoiding long-term storage, the firms significantly cut down on warehousing expenses, mitigating concerns related to storage space, labor costs, and inventory management. Logistics firms have successfully embraced cross docking which has enabled them to save on warehousing costs. The firms have improved on transport infrastructure for efficient logistics efficiency.

Space Utilization and Firm Performance

Abideen and Zubairu (2024) study to determine the effect of warehouse capacity utilization rate and its long-term viability. This study employed the Symptom Versus Problems Theory (SVP), mathematical computation, and related simulation. The study showed that space utilization is the root cause of the entire network problem in a company's warehouse. Pick and pack process productivity suffers when items are lost or positioned widely apart owing to a shortage of space.

Genevieve and Akumuntu (2024) evaluated how warehouse capacity building affects supply chain performance in Inyange Industries, Rwanda. The study adopted a correlational research design. The study targeted a total of 105 members of the staff from the logistics department; warehouse department, finance, operations, and Quality Department. Questionnaires were used to gather primary data. Results showed that warehouse capacity planning contributes a lot in delivering damage-free products. Warehouse capacity planning contributes in reducing supply chain costs and warehouse space utilization has a high significant effect on supply chain performance.

Shimels (2018) studied warehousing practices on Finfine Furniture Factory plc in Ethiopia. The study adopted a descriptive research design, using both qualitative and quantitative data analysis. 59 employees were selected using census sampling methods. Primary data were collected through questionnaires and observation. The warehousing effectiveness involving receiving, unloading, storage, order processing, and delivery influenced firms' performance. Ararsa (2021) examined the effect of warehousing management on warehouse performance in the case of Modjo dry port. Both primary (questionnaires and interviews) and secondary sources of data were used. Stratified simple random sampling was used to select 101 respondents for the study. The analysis showed that there is lack of space for loading and unloading items, lack of shelves, pallets and racks; poor well established put away process for received items, poor tight control of the storage areas, high warehousing cost, and high inventory cost. The multiple regression revealed that receiving, storage, put away, order picking and shipping significantly influence warehouse performance of the organization.

Muhalia, Ngugi, and Moronge (2021) aimed to determine the effect of warehouse management systems (WMS) on the supply chain performance of fast-moving consumer goods (FMCG) manufacturers in Kenya. The researchers used a descriptive research design. The target group involved operations managers of the 51 FMCG manufacturers in Nairobi. The study used a census method, resulting in a sample size of 51 respondents. Primary data were collected using questionnaires. The study found that warehouse management systems have a positive and significant impact on the supply chain performance of FMCG manufacturers in Kenya by reducing picking errors, maximizing storage space, and optimization of stock control. Asudi and Shale (2019) studied the role of warehouse layout design in the performance of distribution firms in Kenya, focusing on DHL Supply Chain. The researchers used a descriptive research design. The study found that improper layout and design could lead to capacity issues, decreased productivity, and storage inefficiencies. The findings also described the importance of flexibility in the operation and layout of performance of distribution firms in Kenya.

RESEARCH METHODOLOGY

The study adopted descriptive research design. The descriptive research design allows the researcher to gather information, summarize, present and interpret it for the purpose of clarification (Karama, Iravo, & Shale, 2019). The unit of analysis for this study was Horticultural Exporting Firms in Nakuru county, Kenya. According to Agriculture and food authority (AFA) (2023) there are 50 registered Horticultural Exporting Firms in Nakuru County. The unit of observation of this study was procurement, stores, finance, and logistics managers from each firm hence 200 management staff. The study adopted a census whereby all units were considered as the sample. Therefore, the study sampled all the 200 procurement, stores, finance, and logistics managers. The sample size was adequate as recommended by Orodho (2014) that sampling is suitable when the target is less than 200.

This research used a questionnaire to collect primary data. According to Patton *et. al (*2019), a questionnaire is appropriate in gathering data and measuring it against a particular point of view. In this study, 10% of the sample size participated in the pilot study hence 20 management staff were not included in the actual study. The researcher collects questionnaires, codes them, and enters them into the Statistical Package for Social Sciences (SPSS version 28) for analysis. The data was based on the study's objectives and research hypothesis. The descriptive statistical techniques of frequency, mean, and standard deviation were used to analyze the quantitative data acquired. The results were displayed using frequency distribution tables, which kept track of how many times a score or response appears. Qualitative data collected was analyzed using content analysis and presented in prose form. Inferential statistics including regression and correlation analysis were used in the study.

RESEARCH FINDINGS AND DISCUSSION

The response rate refers to the proportion of questionnaires successfully completed and returned by the respondents. A total of 180 questionnaires were distributed to procurement, stores, finance, and logistics managers from horticultural exporting firms in Nakuru County, excluding the 20 questionnaires used for the pilot study. Out of these, 159 questionnaires were duly completed and returned, yielding a response rate of 88.6%. According to Mugenda and Mugenda (2019), a response rate of 50% is adequate, 60% is good, and above 70% is excellent for data analysis.

Descriptive Analysis

This section presents the descriptive analysis of the study variables, including cross-docking, space utilization, and performance of horticultural exporting firms. The analysis is based on the respondents' level of agreement with various statements, measured using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The results are presented using means and

standard deviations, where a higher mean (4.0–5.0) indicates strong agreement and widespread implementation, while a lower mean (1.0–2.9) suggests disagreement or limited adoption. A moderate mean (3.0–3.9) reflects neutral or mixed views. The standard deviation shows response variability; a higher value (≥1.0) indicates diverse opinions, while a lower value (≤0.5) suggests strong consensus among respondents.

Cross-Docking

The first specific objective was to examine the effect of cross-docking on performance of Horticultural Exporting Firms in Nakuru County, Kenya. Table 4.4 presents the descriptive statistics for cross-docking practices in horticultural exporting firms.

Table 1: Descriptive Statistics for Cross-Docking

Statement	Mean	Standard Deviation
Products of similar quality are consolidated to a fasten the flow of operations	4.32	0.768
Products are sorted and categorized accordingly	4.46	0.692
There is a suitable network of transportation facilities and equipment	4.12	0.825
The warehouse staff recognize the urgency of moving product rather than storing it.	4.29	0.743
Consignment for delivery are merged while on transit to meet lead times	3.98	0.884
There is consolidation and deconsolidation to make the transport as efficient as possible	4.11	0.810
The firm has numerous truck scheduling models to track scheduling in the cross-docking network.	3.86	0.917
Cross-dock shapes are based on activities performed at the cross-dock facility	3.74	0.958
Aggregate Score	**4.11**	**0.825**

The findings indicate strong agreement that product sorting and categorization (M = 4.460, SD = 0.692) is critical for streamlining warehouse operations. Similarly, respondents affirmed that product consolidation (M = 4.320, SD = 0.768) helps improve workflow, and warehouse staff prioritize product movement over storage (M = 4.290, SD = 0.743), ensuring efficiency. The presence of suitable transportation networks (M = 4.120, SD = 0.825) also enhances supply chain performance. However, merging consignments while in transit (M = 3.980, SD = 0.884) received slightly lower agreement, suggesting inconsistencies in implementation. Although consolidation and deconsolidation (M = 4.110, SD = 0.810) were positively rated, some firms reported challenges with truck scheduling models (M = 3.860, SD = 0.917). The lowest mean (M = 3.740, SD = 0.958) for cross-dock shape optimization suggests that warehouse layouts may not always be designed to fit operational requirements.

The overall mean score for cross-docking was 4.110, confirming its significant role in improving warehouse performance. These findings align with Dudukalov, Subhani, and Ushakov (2020), who confirmed that cross-docking significantly reduces warehousing costs by improving inventory flow and transportation efficiency. Similarly, Vasiljevic and Stepanovi (2022) found that cross-docking is particularly valuable in food distribution, enhancing supply chain competitiveness by reducing lead times and improving logistics coordination.

Space Utilization

The second objective was to establish the influence of space utilization on performance of Horticultural Exporting Firms in Nakuru County, Kenya. Table 2 presents the descriptive statistics for space utilization.

Table 2: Descriptive Statistics for Space Utilization

Statement	Mean	Standard Deviation
There is effective minimizing of goods damage in the warehouse	4.25	0.711
The firm makes maximum use of the warehouse	4.17	0.760
There is regular inspection and cleaning of warehouse	4.08	0.798
Storage space is maximized with the help of a warehouse management system.	4.14	0.782
The staff are guided by the risk assessment of warehouse management.	3.98	0.850
The orders are always delivered to the right customer on time	3.89	0.864
The loading and unloading costs are within the market range	3.76	0.917
The warehouse layout is flexible to accommodate stocks	3.82	0.902
Aggregate Score	**4.01**	**0.823**

The findings presented in Table 2 indicate strong agreement that firms effectively minimize goods damage (M = 4.250, SD = 0.711) and maximize warehouse space usage (M = 4.170, SD = 0.760). Regular inspection and cleaning of warehouse facilities (M = 4.080, SD = 0.798) further supports warehouse efficiency. The use of warehouse management systems for storage optimization (M = 4.140, SD = 0.782) was moderately agreed upon, though some respondents noted variability in staff adherence to risk assessments (M = 3.980, SD = 0.850). Timely order deliveries (M = 3.890, SD = 0.864) were also reported but remain an area for improvement. Loading and unloading costs (M = 3.760, SD = 0.917) were found to be inconsistent across firms, and warehouse layout flexibility (M = 3.820, SD = 0.902) had the lowest rating, suggesting that some firms struggle to adjust their layouts based on inventory needs.

The overall mean score for space utilization was 4.010, confirming its role in enhancing operational efficiency, though some improvements are needed in cost management and layout optimization. These findings align with Genevieve and Akumuntu (2024), who found that efficient warehouse capacity planning significantly reduces supply chain costs and improves warehouse space utilization. Additionally, Shimels (2018) concluded that poor warehouse layout and storage organization negatively impact warehouse effectiveness, leading to inefficiencies in picking and packing operations.

Performance of Horticultural Exporting Firms

The general objective of this study was to determine the effect of warehouse consolidation practices on performance of Horticultural Exporting Firms in Nakuru County, Kenya. Table 3 presents the descriptive statistics for the performance of horticultural exporting firms, measuring various performance indicators influenced by warehouse consolidation practices.

Table 3: Descriptive Statistics for Performance of Horticultural Exporting Firms

Statement	Mean	Standard Deviation
Horticulture products are always delivered on time.	4.32	0.725
There has been an improvement in sales.	4.19	0.762
The firm's profits have been increasing.	4.10	0.801
There is positive customer feedback/reviews.	4.05	0.837
The firm has expanded into new international markets.	3.92	0.865
Customer retention and repeat purchases have increased.	3.87	0.882
Operational costs have decreased due to improved warehouse management.	3.78	0.926
The firm has improved compliance with export regulations and standards.	3.95	0.899
Aggregate Score	**4.02**	**0.837**

The results in Table 3 indicate that timely delivery of horticultural products (M = 4.320, SD = 0.725) is a key performance strength. Respondents also reported sales improvements (M = 4.190, SD = 0.762) and profit growth (M = 4.100, SD = 0.801), confirming the positive impact of warehouse consolidation on financial performance. Customer feedback (M = 4.050, SD = 0.837) was generally positive, but firms expressed moderate agreement on expanding into new international markets (M = 3.920, SD = 0.865), suggesting external trade barriers. Customer retention and repeat purchases (M = 3.870, SD = 0.882) were moderately rated, while cost reduction due to improved warehouse management (M = 3.780, SD = 0.926) had the lowest mean, implying that savings from warehouse optimization have not been fully realized. Additionally, compliance with export regulations (M = 3.950, SD = 0.899) remains a challenge, with varying levels of adherence across firms.

The overall mean score for firm performance was 4.020, confirming that warehouse consolidation positively impacts efficiency and financial performance, though areas such as cost reduction and market expansion require further attention. These findings are supported by Mwakima and Osoro (2024), who found that cross-docking and inventory management improvements significantly enhance logistics firm performance by reducing warehousing costs and improving transport efficiency. Similarly, Ogola and Ndeto (2021) found that demand forecasting and stock control positively impact inventory turnover and financial performance, reinforcing the importance of warehouse consolidation in cost efficiency.

Inferential Analysis

The study computed inferential analysis, which examines the statistical relationships between warehouse consolidation practices—cross-docking and space utilization—and firm performance in horticultural exporting firms. Correlation analysis was used to determine the strength and direction of relationships between the variables, while multiple regression analysis assessed the extent to which warehouse consolidation practices influence firm performance.

Correlation Analysis

Correlation analysis was conducted using Pearson's correlation coefficient (r) to measure the strength and direction of the relationship between warehouse consolidation practices and firm performance. The correlation values range from -1 to +1, where +1 indicates a perfect positive relationship, -1 represents a perfect negative relationship, and 0 signifies no relationship.

Table 4: Correlation Matrix

		Firm Performance	Cross-Docking
Firm Performance	Pearson Correlation	1	
	Sig. (1-tailed)		
	N	159	
Cross-Docking	Pearson Correlation	.712**	1
	Sig. (1-tailed)	.000	
	N	159	159
Space Utilization	Pearson Correlation	.689**	.414
	Sig. (1-tailed)	.000	.212
	N	159	159

The correlation analysis confirms that all warehouse consolidation practices have a positive and statistically significant relationship with firm performance. Cross-docking ($r = 0.712$, $p < 0.05$) exhibited the strongest correlation, indicating its vital role in enhancing supply chain efficiency by reducing storage time, minimizing costs, and improving product flow. This aligns with the findings of Dudukalov, Subhani, and Ushakov (2020), who established that cross-docking improves transportation and distribution efficiencies, leading to reduced warehousing costs. Similarly, Vasiljevic and Stepanovi (2022) confirmed that cross-docking contributes to business competitiveness by streamlining logistics operations and ensuring faster order fulfilment.

Space utilization ($r = 0.689$, $p < 0.05$) was also strongly correlated with firm performance, indicating that maximizing storage space and implementing efficient warehouse layouts contribute to better inventory management and operational efficiency. This aligns with the findings of Genevieve and Akumuntu (2024), who concluded that warehouse capacity planning plays a crucial role in reducing supply chain costs and ensuring optimal space usage. Similarly, Shimels (2018) found that poor warehouse layout negatively affects storage efficiency and increases picking errors, further emphasizing the significance of effective space utilization.

Regression Analysis

The regression coefficients in Table 5 provide detailed insights into the influence of each warehouse consolidation practice—cross-docking, and space utilization—on firm performance. The magnitude, direction, and statistical significance of these coefficients help determine which factors have the most substantial impact on operational efficiency.

Table 5: Regression Coefficients of Study Variables

Model	**Unstandardized B**	**Std. Error**	**Standardized Beta**	**t-Statistic**	**Sig.**
(Constant)	1.103	0.247		4.463	0.000
Cross-Docking (X_1)	0.364	0.058	0.382	6.276	0.000
Space Utilization (X2)	0.321	0.063	0.325	5.095	0.000

Based on the findings, the fitted regression equation is:

Firm Performance = 1.103 + 0.364 (Cross-Docking) + 0.321(Space Utilization)

The constant ($B = 1.103$, $p = 0.000$) represents the baseline level of firm performance in the absence of warehouse consolidation practices.

Cross-Docking ($B = 0.364$, $p = 0.000$) had the highest influence on firm performance, indicating that a one-unit increase in cross-docking leads to a 0.364 increase in firm

performance. This suggests that efficient cross-docking enhances supply chain operations by reducing storage time, optimizing transportation, and ensuring faster delivery cycles. These findings align with Dudukalov, Subhani, and Ushakov (2020), who confirmed that cross-docking significantly improves warehousing efficiency and reduces logistics costs. Similarly, Vasiljevic and Stepanovi (2022) emphasized that cross-docking enhances business competitiveness by minimizing order processing delays.

Space Utilization (B = 0.321, p = 0.000) was the second most significant predictor of firm performance, suggesting that optimal warehouse space usage reduces congestion, improves order fulfillment speed, and enhances inventory control. This supports the findings of Genevieve and Akumuntu (2024), who established that effective space utilization directly contributes to cost efficiency and higher productivity in warehouse management.

Conclusions

Cross-docking was found to be the most influential warehouse consolidation practice in improving firm performance. Firms that prioritize moving products quickly rather than storing them benefit from reduced holding costs, optimized transportation efficiency, and enhanced order processing. However, better coordination in truck scheduling and warehouse layouts is necessary to further enhance productivity.

Space utilization was found to enhance warehouse efficiency and productivity, as firms have made efforts to optimize storage capacity, reduce product damage, and improve warehouse layouts. However, some firms struggle with layout flexibility, making it difficult to adapt to changing inventory needs. Investing in adjustable storage solutions and automation can help firms maximize warehouse efficiency and reduce operational costs.

Recommendations

Cross-Docking

Firms should strengthen cross-docking operations by improving truck scheduling models to enhance coordination and minimize transit delays. The study found that while firms have embraced product sorting and consolidation, inefficiencies in truck routing and scheduling affect overall logistics performance. To improve efficiency, firms should invest in advanced tracking and scheduling systems to optimize delivery times, reduce storage durations, and ensure seamless operations. Additionally, training warehouse staff on effective cross-docking techniques will enhance their ability to prioritize fast-moving goods, reducing unnecessary storage time.

Space Utilization

Enhancing space utilization should be a priority for firms seeking to maximize storage capacity and streamline warehouse operations. While firms have invested in warehouse management systems, layout inflexibility remains a concern. To address this, firms should redesign warehouse layouts to accommodate scalable and modular storage solutions that can be adjusted based on inventory needs. Implementing vertical racking systems and optimizing shelf arrangements will help firms better utilize warehouse space, reduce congestion, and improve stock accessibility. Additionally, adopting automated material handling equipment, such as conveyor belts and mechanized pallet systems, will enhance the movement of goods and minimize manual inefficiencies.

Suggestions for Further Research

Future research should explore the role of warehouse automation and artificial intelligence (AI) in optimizing warehouse consolidation practices. While this study focused on traditional

warehouse management strategies, emerging technologies such as AI-powered inventory management and robotic order fulfillment present new opportunities for enhancing warehouse efficiency. Investigating how automation influences operational performance, cost savings, and error reduction will provide deeper insights into modern warehouse optimization.

Further studies should examine the impact of warehouse consolidation practices on different export commodities beyond horticultural products. Since different industries have unique storage and logistics requirements, research comparing warehouse management strategies across horticulture, pharmaceuticals, and manufacturing will help identify cross-industry best practices that can be tailored to different supply chain needs.

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