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WAREHOUSE AUTOMATION AND OPERATIONAL PERFORMANCE OF FREIGHT FORWARDING FIRMS IN RIVERS STATE, NIGERIA

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ABSTRACT: *This study examined warehouse automation and operational performance of freight forwarding firms in Rivers State. The study adopted the correlational research design and the quantitative research approach. The population of the study consisted of 96 registered freight forwarding firms in Rivers State. Thirty-four (34) freight forwarding firms were selected for the study using purposive sampling technique. The sampling unit consisted of operational managers, warehouse managers, warehouse supervisors and store keepers of the 34 selected freight forwarding firms in Rivers State. A sample size of 136 staff was drawn from the 34 selected freight forwarding firms in Rivers State. Data were collected from the respondents using a structured questionnaire. The data collected were analyzed statistically while the Spearman Rank Order Correlation Coefficient (rho) and the SPSS version 24 were used to test the hypotheses. The findings revealed that automated picking system has significant relationship with operational efficiency of freight forwarding firms. Automated picking system was also found to have significant relationship with operational excellence of freight forwarding firms. The study also found a significant relationship between automated inventory management system and operational efficiency of freight forwarding firms. The study equally revealed that automated inventory management system is significantly related to operational excellence of freight forwarding firms. From the findings, it was concluded that warehouse automation such as automated picking system and automated inventory management system significantly improve operational performance of freight forwarding firms in Rivers State. Therefore, it was recommended that freight forwarding firms in Nigeria should adopt warehouse automation as it would improve their operational performance.*

KEYWORDS: Warehouse automation, automated picking system, automated inventory management system, operational performance, operational efficiency, and operational excellence.

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INTRODUCTION

The need to improve operational performance has prompted many firms to embrace new ways of doing things. Improving operational performance is the key that unlock the door to business success (Panigrahi et al, 2024). Otto et al (2020) noted that operational performance is the most critical factor that distinguishes successful firms from unsuccessful ones. When a firm puts in an exceptional operational performance, the firm will stand a better chance of achieving business success, but when operational performance is poor, the firm stands the risk of business failure. Ebrahimi and Hajizadeh (2021) posited that good operational performance helps to build a firm's reputation in its industry and this attracts investors and strategic partnership from larger firms in the same industry. It also helps a firm to establish itself in its industry, position it on the right path for growth, and enhance its efficiency and competitiveness. However, improving operational performance of firm is not an easy task as it requires firms to integrate technology into their business operations (Panigrahi et al, 2024). Warehousing operation is a crucial aspect of business operations and as such freight forwarding firms need to automate their warehouse operations to improve their operational performance.

Warehouse automation is an automated system designed for the movement of inventory in a warehouse from receiving, picking, packing to shipping (Thanki, 2023). Szłapka and Lubiński (2017) defined warehouse automation as a technology-driven system that helps companies to perform and manage the activities in their warehouse. It involves the use of technology, tools and digital solutions to perform warehousing activities that are previously performed by human beings. Warehouse automation can take two forms namely; digital automation and physical automation. According to Chapman et al (2013), digital automation involves the use of a more advanced warehouse management systems that go beyond tracking inventory and customer order; while physical automation involves the use of technologies such as automated guided vehicle (AGVs), robotics, and conveyor belts in moving and handling goods in a warehouse. In an automated warehouse, all the warehousing operations such as receiving goods, sorting, picking, and packing are automated, coordinated and unified on a central platform (Boute & Van Mieghem, 2021). When goods arrive, it is received into the warehouse, sorted and stored. With a smart automation that incorporates a flexible network of sensors with the use of robotics and advanced software solutions, sorting, picking and packing operations will be carried out with speed and efficiency (Ngombo, 2015).

Several automated warehousing systems are established by companies to speed up their warehousing and picking operations. According to Kwon and So (2023), the most common automated warehousing and picking systems are AI-powered analytics system, automated storage and retrieval system (AS/RS), automated guided vehicles (AGVs), autonomous mobile robots (AMRs), warehouse drone, goods-to-person (GTP) system, pick-to-light and put-to-light system, voice picking and tasking (VPT) system, automated sortation system (ASS), RFID technology, and collaborative robots (cobots). A good number of warehousing processes can be automated to ensure speed and efficiency. According to Wang et al (2021), the warehousing processes that can be automated include receiving and put-away operations, picking operation, packing operation, staging activities, loading operation, cross docking, internal movement, quality checks, shipping and sorting, inventory management, returns processing, and production warehousing. It is against this backdrop that this study examines the relationship between warehouse automation and operational performance of freight forwarding firms in Rivers State.

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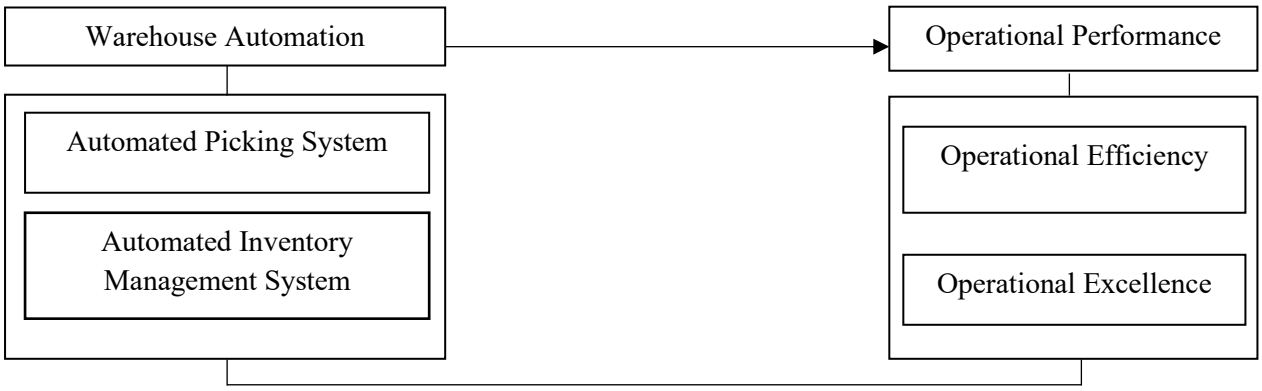
Statement of the Problem

The problem that prompted this study is the poor operational performance of some firms in Nigeria. A keen observation shows that operational performance of some freight forwarding firms is very low as they fall short of expectations. Many freight forwarding firms in Nigeria are experiencing poor operational performance as they continue to experience inefficiency despite the huge amount of financial resources invested in operational activities. Given the poor operational performance of freight forwarding firms over the years and its implications on business survival, it becomes imperative for these firms to find a smart way to improve their operational performance. There is a strong belief that the adoption of warehouse automation such as automated picking system and automated inventory management system can help to improve the operational performance of freight forwarding firms in Nigeria. Several studies (e.g. Odera and Noor, 2018; Sakthivel and Kandavel, 2024; Co and Baldovino, 2025; Kumar et al, 2023; Gaikward et al, 2024; Usele et al, 2025) have examined the contribution of warehouse automation to firm performance but none of these studies relate warehouse automation and its dimensions such as automated picking system and automated inventory management system to operational performance (operational efficiency and operational excellence) of freight forwarding firms in Rivers State, Nigeria. This has created a gap in literature which this study is motivated to fill from the Nigerian perspective.

Conceptual Framework

Fig 1: Conceptual framework of warehouse automation and operational performance of freight forwarding firms in Rivers State

The conceptual framework of warehouse automation and operational performance is shown in figure 1 below:



Source: *Author's Conceptualization*

Aim and Objectives of the Study

The aim of this study is to examine the relationship between warehouse automation and operational performance of freight forwarding firms in Rivers State. The objectives of the study are to:

1. ascertain the relationship between automated picking system and operational efficiency of freight forwarding firms in Rivers State;

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2. determine the relationship between automated picking system and operational excellence of freight forwarding firms in Rivers State;

3. ascertain the relationship between automated inventory management system and operational efficiency of freight forwarding firms in Rivers State;

4. determine the relationship between automated inventory management system and operational excellence of freight forwarding firms in Rivers State.

Research Questions

The study attempts to answer the following research questions:

1. What is the relationship between automated picking system and operational efficiency of freight forwarding firms in Rivers State?

2. To what extent does automated picking system relate to operational excellence of freight forwarding firms in Rivers State?

3. What is the relationship between automated inventory management system and operational efficiency of freight forwarding firms in Rivers State?

4. To what extent does automated inventory management system relate to operational excellence of freight forwarding firms in Rivers State?

Research Hypotheses

The following hypotheses were developed to guide this study:

Ho_1: There is no significant relationship between automated picking system and operational efficiency of freight forwarding firms in Rivers State.

Ho_2: There is no significant relationship between automated picking system and operational excellence of freight forwarding firms in Rivers State.

Ho_3: There is no significant relationship between automated inventory management system and operational efficiency of freight forwarding firms in Rivers State.

Ho_4: There is no significant relationship between automated inventory management system and operational excellence of freight forwarding firms in Rivers State.

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REVIEW OF RELATED LITERATURE

Concept of Warehouse Automation

Warehouse automation is a software solution that is designed to streamline warehouse operations such as inventory management, order picking, and material movements (Dekhne et al, 2019). Thanki (2023) defined warehouse automation as an automation of the movement of inventory in a warehouse from receiving, picking, packing to shipping. Szłapka and Lubiński (2017) described warehouse automation as a technology-driven system that helps companies to perform and manage the activities in their warehouse. It involves the use of technology, tools and digital solutions to perform warehousing activities that are previously performed by human beings. Automated warehousing system can be used to improve the operational performance of firms. According to Shah et al (2020), warehouse automation helps to make warehousing operations faster and more accurate which make a company to achieve operational excellence. As a system that replaces manual picking and handling of goods with machines and robots, automated warehouse enhances operational efficiency (Christian et al, 2021). Dekhne et al (2019) opined that automated warehousing system helps companies to reduce their warehousing costs which consequently lead to profitability growth. According to them, companies can save labour cost, operational costs and handling costs by automating their warehousing operations. Ntando and Mofolo (2024) stated that automated warehousing system can improve operational efficiency of a firm, reduces waste and shorten the time spent in warehousing operations.

Dimensions of Warehouse Automation

Warehouse automation can take different dimensions. However, the dimensions of warehouse automation considered in this study are automated picking system and automated warehouse kiosk.

Automated Picking System

Automated picking involves the use of advanced technologies in carrying out picking operation in a warehouse (Dekhne et al, 2019). This automated picking system tends to replace the manual picking process with the use of robots or machines for the picking of goods. Companies can deploy a wide range of technologies for the picking of items in their warehouse. Examples of technologies that can be used for this operation include picking assistance devices such as pick-to-light, autonomous mobile robots (AMRs) and industrial robotic arms (Celik & Sural, 2012). However, the automation of picking operation will depend on a number of factors such as the type of products, the level of demand for the product, as well as the required flows of the products and the warehouse layout (Oksana & Yevhen, 2019). Nagarajan and White (2017) stated that a company can automate its picking operation when the demand for its product is very high and the picking process is complex. Autonomous mobile robots (AMRs) can be used to pick orders when the picking process is complex (Christian et al, 2021); while automated packing stations can be deployed for packing operations as they can scan, weigh, and measure products (Gue et al, 2016).

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Automated Inventory Management System

Automated inventory management system is a digital system designed for managing and controlling inventory operations in an organization (Talebi & Bardsiri, 2023). Inventory management processes are automated in many industries including freight forwarding industry. According to Wang et al (2024), inventory management processes are automated to streamline and improve inventory management in an organization. Many companies designed an automated system for their receiving and put-away operations (Boute & Van Mieghem, 2021). This automated system enables them to scan and log items into the inventory management system. Ding et al (2020) stated that Internet of Things (IoT), RFID and continuous tracking systems can be used to monitor inventory levels in real-time, alert stock managers of low stock, and automatically facilitate restocking. Automated inventory management system is designed to speed up inventory management operations in companies (Ntando & Mofolo, 2024).

Concept of Operational Performance

Operational performance refers to how well a company performs its core business activities (Adediran & Alade, 2013). It indicates the degree of efficiency of the internal processes in terms of achieving operational goals such as quality output, higher productivity and operational efficiency. Maritz and Shieh (2013) defined operational performance as the level by which all the units and departments of an organization perform a team work to achieve the most important goals of the organization. Operational performance shows the degree of efficiency of the internal operations of a firm. It indicates how well the work teams are doing in terms of productivity and efficiency (Wamba et al, 2020). Kiptoo and Koech (2019) posited that companies need to monitor their operational performance to know whether they are making progress towards operational excellence. When a company is able to determine its operational performance, it will identify lapses in the system and foster a positive work environment that will motivate employees to improve their job efficiency (Ilandarage, 2025)

Measures of Operational Performance

Operational performance can be measured using various indices. In this study, operational performance is measured using operational efficiency and process efficiency.

Operational Efficiency

Operational efficiency is the ability of a company to produce high quality products or services with limited resources such as time and money (Velnampy, 2013). Pulaj et al (2015) defined operational efficiency as the ability of an organization to use resources such as time, labour, equipment, inventory and money in an optimized way to achieve the desired results. Operational efficiency is one of the objectives of business organizations as it enables organizations to increase their profit margin and competitiveness (Agarwall et al, 2022). Achieving operational efficiency is the major focus of business strategy. Operating efficiently makes a company to become more agile and profitable. Oke (2022) stated that operational efficiency quickly elevates an organization to a level where the company wants to be. Maintaining operational efficiency helps a company to cut down operational costs and improve its market competitiveness (de Oliveira, 2023). Almulhim et al (2024) added that operational efficiency helps to reduce lead time, errors, accident rate and makes customers to feel happy. Operational efficiency helps companies to optimize business processes, minimize

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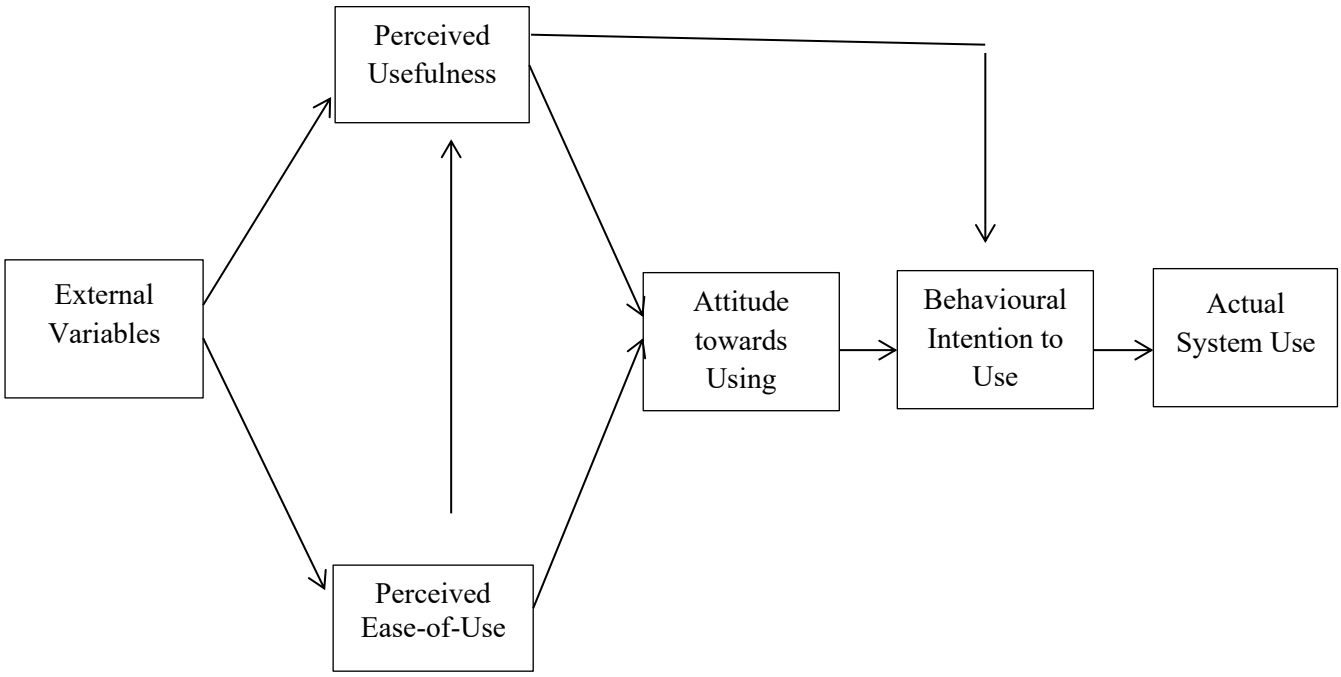
waste and increase profitability (Kazaara et al, 2024). A more efficient organization is more profitable and competitive than a less cost-efficient organization.

Operational Excellence

Operational excellence is a systematic process of creating a culture that focuses on continuous improvement and implementation of principles and tools that will improve organizational performance (Mpuon et al, 2023). Wang (2021) defined operational excellence as an approach to business that emphasizes continuous improvement in all aspects of the business operations and processes through the implementation of change. Operational excellence is achieved when an organization delivers value to their customers by doing things better than its competitors (Panigrahi et al, 2024). Halim et al (2024) stated that operational excellence is guaranteed when an organization embraces process management, quality assurance and gives customers a positive experience. Through continuous improvement in processes, companies can deliver high quality of products and services to their customers and achieve operational excellence (Mbaidin, 2024).

Theoretical Review

This study is guided by the Technology Acceptance Model (TAM) which was developed by Fred Davis in 1986. The TAM explains the reasons why technology is accepted and utilized by organizations in modern society. According to TAM, organizations accept and use technology because of their perceived usefulness and perceived ease-of-use. According to Davis, perceived usefulness connotes the extent to which a firm believes that its business operations would improve if it applies modern technology while perceive ease-of-use indicates the degree to which the firm believes that less effort will be required if it uses this technology. The technology acceptance model (TAM) is presented in figure 1 below:



Source: *Adapted from Davis (1986)*

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The TAM explains that external variables such as perceived usefulness and ease-of-use made everyone to develop attitude towards using technology and this eventually leads to behavioural intention to use it and finally the actual system use. By relating the TAM to the present study, it means that warehouse automation is facilitated by the perceived usefulness and ease-of-use of technology. According to the model, perceived usefulness and ease-of-use made freight forwarding firms to develop positive attitude towards using automated system and this leads to their behavioural intention to use the system and actually use it in their warehouse operations to improve their operational performance.

Empirical Review

A number of related empirical studies have been conducted on warehouse automation and operational performance of firms. For instance, Odera and Noor (2018) examined the role of warehouse automation on supply chain performance in distribution firms in Kenya. The study adopted the case study research design where questionnaire was used to collect data from 82 employees of Acceler Global Logistics Limited in Nairobi. The data collected were analysed using percentage and frequency tables and pie charts while the hypotheses were tested using Pearson Correlation, ANOVA and SPSS 24 version. The findings revealed that staff training, lead time, customer satisfaction and ICT integration play significant role in improving supply chain performance of distribution firms. The study concluded that positive relationship exists between warehouse automation and supply chain performance of distribution firms in Kenya.

Usele et al (2025) explored warehouse automation strategies and supply chain performance of oil servicing firms in Port Harcourt. Their study adopted the exploratory research design and the quantitative approach where a structured questionnaire was used to collect data from 108 managers of oil servicing firms in Port Harcourt. The data collected were analysed statistically while the hypotheses were tested using International Business Machine (IBM), Structural Equation Modelling, t-test statistics and SPSS version 27. The findings revealed that warehouse management automation strategies (autonomous mobile robots and good-to-person technology) are positively and significantly related to supply chain performance (on-time delivery and inventory turnover) of oil servicing firms in Port Harcourt.

Sakthivel and Kandavel (2024) conducted a study on warehouse management automation technologies. Their study adopted the descriptive research design and the mixed method approach where questionnaire, interview and focus group discussion were used to collect data from 100 employees comprising managers, business leaders and warehouse employees. The data collected were analysed using pie chart and bar chart while the hypotheses were tested using ANOVA. The findings revealed that warehouse management automation technologies enhance fulfilment efficiency, boost productivity, increased customer satisfaction level and improve overall performance of firms.

Kumar et al (2023) explored automation and technology in warehouse management in Swiggy Instamart warehouse in Rohini, India. The study employed the case study research design where semi-structured interview, observations and document analysis were used to gather data for the study. The data collected were analyzed using coding, content and thematic analysis. The findings revealed that the integration of industry 4.0 technologies such as smart devices and automation into warehouse operations improves efficiency, reduce errors, enhance quick delivery and increase customer satisfaction.

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Ilandarage (2025) examined digital transformation in warehouse management with a particular focus on the impact of automation on operational flexibility and supply chain efficiency. Their study adopted the mixed method approach where focused group discussion, semi-structured interviews and questionnaire were used to collect data from logistics professionals and warehouse operators in two logistics companies in Vaasa. Data collected via questionnaire were analysed using descriptive statistics while those obtained from interview and focus group discussion were analysed using content and thematic analysis. The findings revealed that warehouse automation significantly increase order accuracy, reduce lead time, improve inventory control and enhance efficiency.

Co and Baldovino (2025) conducted an assessment of warehouse automation in an international organization in Africa and how it enhances strategic management plan. Their study adopted the survey research design and the quantitative research approach where online questionnaire was used to collect from 98 warehouse employees of an international organization in seven geographical locations in Mali, West Africa. The data collected were analyzed using Structural Equation Modeling (SEM) and the results showed that warehouse automation is strongly and positively related to service quality, customer satisfaction, and data accuracy in international organizations in Mali.

Gaikward et al (2024) carried out a study to determine the level of adoption of automation technologies in warehouse management. Their study adopted the descriptive research design and the mixed methods strategy where interview, focus group discussion and online questionnaire in Google Form were used to collect data from 100 employees comprising managers, warehouse employees and industry experts in Gujarat State. The data collected were analyzed using pie chart, bar chart and software program such as Excel and Python program while the hypotheses were tested using ANOVA. The findings revealed that there is high level of adoption of automation technologies in warehouse management among companies in Gujarat State. The study also revealed that warehouse automation streamlines tasks, improve inventory control and enhance efficiency.

Gap in Literature

It is observed from the literature review that considerable number of studies have been conducted on warehouse automation but none of these studies relate warehouse automation to operational performance of freight forwarding firms in Rivers State, Nigeria. Even the dimensions of warehouse automation such as automated picking system and automated inventory management system were not related to the measures of operational performance such as operational efficiency and operational excellence of freight forwarding firms in Rivers State. This has created in vacuum in literature which this study is expected to fill from the Nigerian context.

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METHODOLOGY

This study adopted the correlational research design and the quantitative research approach. The population of this study consisted of 96 registered freight forwarding firms in Rivers State (https://www.freightnet.com/directory/p1/cNG/s30.htm). Thirty-four (34) freight forwarding firms were selected for the study purposively based on the criteria that they operate an automated warehouse system. The sampling unit consisted of operational managers, warehouse managers, warehouse supervisors and store keepers of the 34 selected freight forwarding firms in Rivers State. A sample size of 136 staff of the above categories was drawn from the 34 selected freight forwarding firms in Rivers State on the basis of 4 staff per firm. A structured questionnaire was used to gather data from the respondents. The questionnaire was structured on a 4 point rating scale ranging from Strongly Agree, Agree, Disagree to Strongly Disagree. The questionnaire was validated using content validity method while its reliability was determined using Cronbach Alpha method. The questionnaire was administered to the respondents with the aid of two research assistants. 136 copies of the questionnaire were administered to the respondents and 114 copies were collected from them. The data collected were analyzed using descriptive statistics while the hypotheses were tested using Spearman Rank Order Correlation Coefficient (rho). The SPSS version 24 was used to perform the correlation analysis.

RESULTS AND DISCUSSION

The data collected on warehouse automation (automated picking system and automated inventory management system) were correlated with those obtained on operational performance (operational efficiency and operational excellence) of freight forwarding firms using the SPSS version 24. The results are presented in the tables below:

Table 1: Result of correlation analysis between automated picking system and operational efficiency of freight forwarding firms

			Automated Picking System	Operational Efficiency
Spearman (rho)	Automated Picking System	Correlation Coefficient	1.000	.858**
		Sig. (2 tailed)	.	.001
		N	114	114
	Operational Efficiency	Correlation Coefficient	.858**	1.000
		Sig. (2 tailed)	.001	.
		N	114	114

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)

Source: *SPSS-Generated Output*

Table 1 shows a very strong and positive correlation between automated picking system and operational efficiency of freight forwarding firms (rho = .858**) and this correlation is significant at 0.01 level. Based on this result, the null hypothesis (Ho_1) is rejected and the alternate hypothesis is accepted. This means that there is significant relationship between automated picking system and operational efficiency of freight forwarding firms in Rivers State.

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Table 2: Result of correlation analysis between automated picking system and operational excellence of freight forwarding firms

			Automated Picking System	Operational Excellence
Spearman (rho)	Automated Picking System	Correlation Coefficient	1.000	.804**
		Sig. (2 tailed)	.	.001
		N	114	114
	Operational Excellence	Correlation Coefficient	.804**	1.000
		Sig. (2 tailed)	.001	.
		N	114	114

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)

Source: *SPSS-Generated Output*

Table 2 indicates a very strong and positive correlation between automated picking system and operational excellence of freight forwarding firms (rho = .804**) and this correlation is significant at 0.01 level. Consequently, the null hypothesis (Ho_2) is rejected and the alternate hypothesis is accepted. This means that there is significant relationship between automated picking system and operational excellence of freight forwarding firms in Rivers State.

Table 3: Result of correlation analysis between automated inventory management system and operational efficiency of freight forwarding firms

			Automated Inventory Management System	Operational Efficiency
Spearman (rho)	Automated Inventory Management System	Correlation Coefficient	1.000	.829**
		Sig. (2 tailed)	.	.001
		N	114	114
	Operational Efficiency	Correlation Coefficient	.829**	1.000
		Sig. (2 tailed)	.001	.
		N	114	114

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)

Source: *SPSS-Generated Output*

Table 3 reveals that automated inventory management system has a very strong and positive correlation with operational efficiency of freight forwarding firms (rho = .829**) and this correlation is significant at 0.01 level. As a result of this we then reject the null hypothesis (Ho_3) and accept the alternate hypothesis which states that there is significant relationship between automated inventory management system and operational efficiency of freight forwarding firms in Rivers State.

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Table 4: Result of correlation analysis between automated inventory management system and operational excellence of freight forwarding firms

			Automated Inventory Management System	Operational Excellence
Spearman (rho)	Automated Inventory Management System	Correlation Coefficient	1.000	.788**
		Sig. (2 tailed)	.	.001
		N	114	114
	Operational Excellence	Correlation Coefficient	.788**	1.000
		Sig. (2 tailed)	.001	.
		N	114	114

**Correlation is significant at 0.01 levels (2 tailed)
*Correlation is significant at 0.05 levels (2 tailed)

Source: *SPSS-Generated Output*

Table 4 indicates that automated inventory management system is strongly and positively correlated to operational excellence of freight forwarding firms (rho = .788**) and this correlation is significant at 0.01 level. Based on this result, we reject the null hypothesis (Ho_4) and accept the alternate hypothesis which states that there is significant relationship between automated inventory management system and operational excellence of freight forwarding firms in Rivers State.

DISCUSSION OF FINDINGS

This study found a significant relationship between automated picking system and operational efficiency of freight forwarding firms in Rivers State. This finding was deduced from the result of the correlation analysis carried out on the two variables. The result showed a very strong and positive correlation between automated picking system and operational efficiency of freight forwarding firms (rho = .858**) and this correlation is significant at 0.01 level. Based on this result, the null hypothesis (Ho_1) was rejected and the alternate hypothesis was accepted. This means that there is significant relationship between automated picking system and operational efficiency of freight forwarding firms in Rivers State. This finding is supported by Mpuon et al (2023) and Ilandarage (2025) as both studies revealed that automated picking system ensures speed and accuracy in picking operations, and guarantee operational efficiency.

This study also found a significant relationship between automated picking system and operational excellence of freight forwarding firms in Rivers State. This finding emerged from the result of the correlation analysis carried out on the two variables. The result showed a very strong and positive correlation between automated picking system and operational excellence of freight forwarding firms (rho = .804**) and this correlation is statistically significant at 0.01 level. Consequently, the null hypothesis (Ho_2) was rejected and the alternate hypothesis was accepted. This means that there is significant relationship between automated picking system and operational excellence of freight forwarding firms in Rivers State. This finding is consistent with the research conducted by Wang (2021) which reported that automated picking allows a firm to perform its picking operations in a timely and cost-effective manner and achieve operational excellence. Halim et al (2024) also agreed with this

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finding when they revealed that firms that adopt automated picking system are likely to improve their picking operations and achieve operational excellence.

This study discovered a significant relationship between automated inventory management system and operational efficiency of freight forwarding firms in Rivers State. This finding was derived from the result of the correlation analysis carried out on the two variables. The result revealed that automated inventory management system has a very strong and positive correlation with operational efficiency of freight forwarding firms (rho = .829**) and this correlation is significant at 0.01 level. As a result of this we then rejected the null hypothesis (Ho_3) and accepted the alternate hypothesis which states that there is significant relationship between automated inventory management system and operational efficiency of freight forwarding firms in Rivers State. This finding is supported by Panigrahi et al (2024) who posited that automated inventory management has the potentials of improving operational efficiency of firms. Mpuon et al (2023) also supported this finding when they revealed that a firm stands a better chance of achieving operational efficiency if it automates its inventory management system.

Finally, it was discovered that significant relationship exists between automated inventory management system and operational excellence of freight forwarding firms in Rivers State. This finding was obtained from the result of the correlation analysis carried out on the two variables. The result revealed that automated inventory management system is strongly and positively correlated to operational excellence of freight forwarding firms (rho = .788**) and this correlation is statistically significant at 0.01 level. Based on this result, we rejected the null hypothesis (Ho_4) and accepted the alternate hypothesis which states that there is significant relationship between automated inventory management system and operational excellence of freight forwarding firms in Rivers State. This finding is in line with the findings of Thanki (2023) and Chapman et al (2013) which revealed that automated inventory management system is a strategic tool for achieving operational excellence.

CONCLUSIONS

This study critically examined the relationship between warehouse automation and operational performance of freight forwarding firms in Rivers State. From the result of the analysis carried out, it was discovered that significant relationship exists between automated picking system and operational efficiency of freight forwarding firms. The study also found a significant relationship between automated picking system and operational excellence of freight forwarding firms. The study equally discovered a significant relationship between automated inventory management system and operational efficiency of freight forwarding firms. Automated inventory management system was also found to have significant relationship with operational excellence of freight forwarding firms. From the findings, it was concluded that warehouse automation such as automated picking system and automated inventory management system are significant predictors of operational performance of freight forwarding firms in Rivers State.

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RECOMMENDATIONS

The study provides the following recommendations:

1. That, freight forwarding firms in Rivers State particularly those that are experiencing poor operational performance should take advantage of modern technology and automate their warehousing operations as it would improve their operational performance.

2. That, freight forwarding firms in Rivers State should automate their picking operation as it would speed up their picking operation, save costs associated with labour and achieve operational efficiency.

3. That, freight forwarding firms in Rivers State should automate repetitive tasks in their warehouse so that they can avoid unnecessary labour costs, increase process efficiency and achieve operational excellence.

4. That, freight forwarding firms in Rivers State should automate their inventory management system as it would not only enhance operational efficiency but also guarantee operational excellence.

5. Finally, it is recommended that freight forwarding firms in Rivers State should adopt a more advanced warehouse management systems that go beyond tracking inventory and customer order to include the use of automated guided vehicle, robotics, and conveyor belts in moving and handling goods in a warehouse as it would improve their operational performance.

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