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Logistics Integration And Seaport Efficiency Of Shipping Companies In Rivers State, Nigeria.

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Abstract: *This study aimed to assess the link between logistics integration and seaport efficiency of shipping companies in Rivers State. The study employed the quantitative research approach to address the research objective. The study population comprised 12 shipping companies operating in Rivers State. A census was taken, while primary data was collected from two (2) respondents each from the 12 shipping companies. This gave a total of 24 respondents that provided data for the study. Structured questionnaire served as instrument for data collection, while Pearson Product Moment correlation was used to test the hypotheses. The study found a very strong, positive and statistically significant relationship between logistics integration and seaport efficiency among shipping companies. The study concluded that logistics integration enhances seaport efficiency in terms of port cost reduction, port service time reduction and port service quality; and recommended that managers of shipping companies that seek improved seaport efficiency in terms of port cost reduction, port service time reduction and port service quality should ensure logistics integration of their processes and operations.*

Keywords: *Logistics integration, Seaport efficiency, Port cost reduction, Port service time reduction, Port service quality.*

1 INTRODUCTION

Shipping firms in Rivers State are in arm's length partnerships with each other since they offer a wide range of services. These organizations face a lot of problems, such as the fact that there isn't enough information sharing between ports and the logistics networks. This is evident in the delays experienced by ship owners at Nigerian ports and the corresponding delays faced by shippers in the processing of items for maritime trade (Mbachu et al 2024). Ships spend more time at Rivers State Ports than the global average of 1.25 days for container ships and for Ship Turnaround time. Cargo, on the other hand, spends longer at the ports before being cleared to leave, which is not in line with the global average of 4 days for cargo Dwell time in efficient ports. The COVID-19 epidemic has made things worse by causing maritime freight rates to drop sharply (Michail & Melas, 2020), which has had a huge effect on the shipping business and port development. This comes logically from the notion that the role of modern seaports comprises integration in the supply chain and fulfilling this role means the greater ability of the port to serve consumers and achieve its objectives (Song & Panayides 2008). Logistics chain partners, like shipping lines, terminal operators, transport operators (rail, road, and freight forwarders), port authorities, and shippers, want to strengthen their positions in the logistics chain (Notteboom & Rodrigue 2005) and become better key players (nodes) with more integration levels in logistics networks (Ascencio et al. 2014). “The shipping sector in Rivers State must alter its current operational methods and enhance economic efficiency to endure the volatile market. By offering a quick, safe, and cost-effective means for goods to get to the market through transportation, shipping businesses can greatly improve the flow of trade by combining their own functions with those of other logistics organizations. This is why the design and interaction of parts of a supply chain are so important.

As the global economy becomes more competitive, businesses are looking for new ways to get ahead and stay relevant or outsmart their competitors. Because of this, supply chain managers and professionals are considering integration as a way to make strategic alliances that will make seaports more efficient and lower costs, enhance quality, and shorten lead times (Pearcy, Parker, & Giunipero, 2008). Logistics is the idea of bringing together everyone who is involved in the technological process of delivering cargo so that they may reach an economic agreement. The main goal is to lower costs and ensure that items are delivered without interruption. The main purpose of developing and using logistical functions in planning marine and port operations is to make the companies involved work more efficiently and productively while getting the best results in terms of time, cost, risk, and other input factors (Song, 2021; Olabisi, 2019). This means that port logistical functions should lower or optimize operational costs, service time, business risk, and make sure that port users (customers) are happy, especially with service time and cost of using the port. At the same time, they should also increase output (revenue, throughput, etc.) for port authorities and terminal operators. A seaport's ability to compete depends a lot on how efficient it is, especially when it comes to how well its logistics operations work with those of other logistics chain partners. The idea of a intelligent port has come forth in recent years as a way to smartly combine the logistics supply and demand into the port collection and distribution. The key feature is the employment of new information technology in

modern logistics to make port management safer, more efficient, higher quality, and smarter. It aims to create a complete port service system that includes all parts of the logistics industry chain, with the port industry as the base, information technology as the support, and the goal of improving the use of port resources (Burinskiene, 2018).
There exists a research gap regarding the correlation between logistics integration and seaport efficiency in the specified study region. Recent research has explored a related field of inquiry; nevertheless, the literature has yet to investigate the case of Rivers State. Ali and Ayelign (2022) examine the effects of port features and port-logistics integration on port performance, specifically in the context of Ethiopian dry ports. Liu and Song (2023) examined the interplay between internal and external logistics integration capabilities, supply chain integration, and financial performance in omnichannel retailing through the lens of dynamic capacity theory. Kim, Lee, and Hwang (2020) investigated the relationship between logistics integration and supply chain performance. To address this research gap, the study experimentally investigated the correlation between logistics integration and the effectiveness of seaports utilized by shipping enterprises in Rivers State.

For this purpose, the study employed a survey methodology to gather direct data from logistics and transport managers utilizing a 5-point Likert scale questionnaire. The survey responses are examined using the Pearson Product-Moment Correlation, and the results are analyzed and interpreted. The rest of the paper is organized like this: In Section 2, we look at what other people have said about logistics and how well seaports work. Section 3 explained the approach used, which was a survey questionnaire sent to a group of shipping industry specialists. The results and interpretations are shown in Section 4. Section 5 talks about the main results. Finally, Section 6 wraps up the paper.

2 LITERATURE REVIEW

2.1 LOGISTICS INTEGRATION

Logistics integration refers to the amalgamation of logistics functions inside the company's operational divisions and among other members of the supply chain (Pinmanee 2016). Logistics integration in the supply chain management concept refers to the degree to which a company collaborates with logistics service providers to efficiently oversee its internal and external supply chain management activities (Flynn, Huo, & Zhao, 2010). The main job of logistics is to make sure that cargo is delivered on time, in the proper amount, and to the right quality. logistical integration is a set of logistical techniques and operational operations that make sure goods move smoothly from suppliers to customers along the value chain. For a firm to be successful, its members must be able to work together. Supply chains deliver goods and services, and how well the supply chain works depends a lot on how well the partners work together. In the port logistics chain, shippers or consignees are downstream players (customers). Shipping lines are thought of as members of the upstream supply chain because they are in charge of quickly and efficiently loading and unloading cargo. As part of a contract, terminal operators frequently pay port authorities concession fees to be able to handle terminals. Transport operators offer transportation services for moving goods. In an effective port logistics chain, transport services like transport operators, terminal operators, and logistics service providers are seen as links, and transport infrastructures like ports are seen as nodes. Coastal ports are the main places where ships can dock and the main places where the maritime transportation business can grow. As a key part of a global logistics integration system (Panayides & Song 2008), maritime transport providers are encouraged to stay up with other logistics operations. Sundaram and Mehta (2002) found that integrated logistics helps all logistics chain participants meet their goals, shortens lead times, and makes sure that cargo is delivered on time. It also lowers the final prices of goods and improves quality and service. Integration of information improves communication between different port logistics partners and makes it easier for them to share information. This ultimately leads to better port services and lower costs for running the port (Naab & Bans-Akutey, 2021). Logistics integration in ports has several effects, including better service, lower costs, higher production, and higher efficiency. According to Pinmanee (2016), logistical integration activities include things like organizational integration, institutional support, and resource integration. These interconnections affect how productive and efficient a port is. Logistics integration is typically necessary for linkages within and between organizational integration and coordination of material and information flow in the logistics system. Recent concepts like port-centric logistics (Mangan et al. 2008) suggest that ports can be very important in coming up with strategies, coordinating and leading the links, creating value-added services, bringing in more operators from different business sectors (not just shipping lines), managing relationships with institutions (Ng & Liu 2014), and generally bringing together relationships and activities in the port logistics chain. A well-integrated and efficient seaport may speed up the loading and unloading process and cut down on ship wait times. This can make the whole supply chain more productive and efficient. But not enough money spent on port infrastructure and not enough facilities can make it hard to reach the best performance levels.

2.2 SEAPORT EFFICIENCY

Most people agree that improving performance is one of the main goals of most transportation systems. This can be assessed by efficiency, which means doing things well, and effectiveness, which means doing the right things (Georgiadis et al., 2014; Daraio et

al., 2016). Pienaar and Havenga (2016) say that being efficient involves reaching a goal at the lowest possible cost. Efficiency means that a business can reach its goals and use its resources in the most cost-effective way possible. One way to think about efficiency is as a ratio, or even just a connection, between a company's inputs and outputs. A business can also be said to be efficient if it can meet its goals and have the necessary impact. When we talk about technical efficiency, we're more interested in the best output that can be produced straight from the current input. This is usually measured in terms of output per unit of product, like freight, passengers, and turnover (Wang et al., 2022; Wang et al., 2021). The costs and monetary worth of products are two common ways to measure economic efficiency. It can be quantified as the monetary ratio of inputs to outputs. Currently, there is a challenge in delineating port efficiency owing to the absence of a common definition of the indicators of an effective port or the components that constitute port efficiency (De Monie, 2009). A seaport that works well should be able to do its job well. According to this definition, the effectiveness of sea-port operations is based on how long ships stay at a port, how well cargo is handled, and how well inland transport vehicles are treated when passing through the port. Berth throughput is a measure of how well cargo is handled, and the quality of service to the inland vehicle depends on the port's infrastructure. Productivity has been recognized as an indicator of operational efficiency in seaports (Tongzon, 2001; Tongzon & Heng, 2005). Clark et al. (2001) posited that a port is an organization that must deliver great service to its clients to ensure economic viability. This is because ship owners and shippers want port operators to provide efficient services so that they keep using them. A ship's capacity to operate efficiently depends on a number of things, one of which is having a decent port that works. Ruamsook and Thomchick (2012) observed that prevalent transport performance metrics regarding efficiency include 'costs' (transport costs, inventory carrying costs, material handling costs); 'quality' (on-time and damage-free delivery, complete order); and 'time' (order cycle time length and variability, response time). Consequently, this study utilized cost, quality, and service time as indicators of seaport efficiency.

2.2.1 Port Services Quality: For delivery to be efficient, it is highly important to deliver on time (OTD). According to Kamali (2018), OTD is a way to measure how many client orders were delivered On Time and In Full (OTIF). The OTD indicates that manufacturers and suppliers can meet the delivery requirements according to the specified time, referred to as the delivery date (Kamali, 2018). So, if they can't deliver on time, it will slow things down because the OTD process can only work if all the parts of the process perform well together (Kamali, 2018: 198). Kamali (2018) suggested that to deal with the OTD problems, the following steps should be taken: making full use of the Enterprise Resource Planning (ERP) systems, enhancing management performance, and making a 3PL partner a strategic aim. To make sure that materials are delivered quickly, transportation consolidation should be used to create bigger total shipments, which will make better use of vehicles.

2.2.2 Port ServiceTime: Port service time indicates whether or not the port users face challenges of delay in processing trade through the seaports. This in turn can be viewed in two major components name: (i) Ship-turnaround time, which indicates the service time for ship operations and vessel husbandry experiences of ship operators in a given port. The ship-turnaround time provides the basis for understanding the amount of delay or otherwise, that ship operators experience in particular ports. (ii) Cargo dwell time, which indicates the overall time of processing shipping trade from the port by shippers. The cargo dwell time as well provides the basis for understanding the quantum of delays experiences of shippers in seaports (Mbachu et al 2024). A good seaport equipped with adequate infrastructure can speed up the loading and unloading process and reduce ship waiting times, thereby optimizing efficiency in the supply chain (Jia, Meng and Kuang, 2021).

2.2.3 Port Cost Reduction: Shippers aim to reduce logistics costs as they search for ways to improve efficiencies in the logistics supply chains (Rodrigue, Comtois & Slack 2016). Efficient ports can attract more shipping lines, cargo, and customers, leading to increased revenue and economic growth. Reducing costs in the port requires the work of reducing bureaucracy in the port operation and improving managerial structures as well as obtaining managerial support. Otherwise, ports may incur high transitory costs under excessive instability which requires strong strategic capital planning capabilities and risky new investments, without the benefits of instantly increased market share.

2.3 EMPIRICAL REVIEW

Research by Liu and Song (2023) investigated the relationships among internal and external logistics integration capabilities, supply chain integration, and financial performance in omni channel retailing based on the dynamic capability view. empirical study is conducted based on a survey of 230 omni channel retailers in China’s market. Factor analysis and regression analysis are conducted to examine the hypotheses of the proposed conceptual model. The quantitative analyses show that the internal logistics integration capability is significantly related to the external logistics integration capability, and they both have positive effects on SCI, while the external logistics integration capability generates a higher impact. Ali and Ayelign (2022) identifies the impacts of port characteristics and port-logistics integration on port performance in the case of Ethiopian dry ports. The study was conducted in three dry ports of Ethiopia having a sample of 279 employees. To complete the study, they used structural equation modeling to test the relationship between port characteristics and port-logistics integration with port performance. The finding shows that port characteristics such as port infrastructure, port connectivity, and port privatization have significantly impacted port performance. Also, port-logistics integration has an impact on both port operational performance and port efficiency. Kim, Lee and Hwang (2020) examined the link between logistics integration and supply chain performance. The study collected data from 250 South Korean

manufacturers for analysis. Structural equation modelling was used for data analysis. The results revealed positive impacts of trust, satisfaction, and commitment on logistics integration between manufacturing firms and logistics service providers that enhances logistics service capabilities of the firms. Ashutosh, Singh and Nath, (2019) studied the antecedents of logistics integration and firm performance in the context of the downstream petroleum supply chain in India. The study collected data from 348 petrol stations in the states of Uttarakhand, Uttar Pradesh and Haryana, India. Path analysis using structural equation modelling was performed to know the strength of the relationship between the variables. The study findings show that long- term relationship affects firm performance. Also, information technology positively affects logistics integration which positively affects firm performance. Han (2018) identifies the impact of port supply chain integration on port performance in Busan by using factor analysis and regression method in the case of Busan container ports. Data was collected from eight port terminal operators in Busan. The empirical results show that customer integration has an important effect on quality performance. Furthermore, cost performance has a positive impact on both ship calls and cargo throughput. Prajogo and Olhager, (2012) investigated the integrations of both information and material flows between supply chain partners and their effect on operational performance. Using data from 232 Australian firms, they found that logistics integration has a significant effect on operations performance. Information technology capabilities and information sharing both have significant effects on logistics integration. In view of the findings of previous studies, it can be stated that the application of logistics integration will improve seaport efficiency of shipping companies in Nigeria. Thus, the study hypothesizes as follows:

H_{01}: There is no relationship between logistics integration and port cost reduction of shipping companies in Rivers State.

H_{02}: There is no relationship between logistics integration and port service time reduction of shipping companies in Rivers State.

H_{03}: There is no relationship between logistics integration and port service quality of shipping companies in Rivers State.

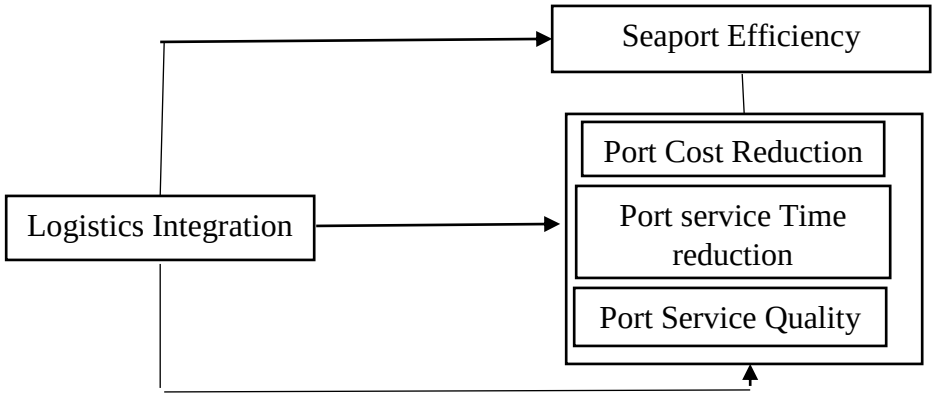

Fig.1 Conceptual Framework

2.4 THEORETICAL FRAMEWORK

The resource-based theory emphasizes the organizations' internal dynamic competences and external environment as major determinants of success. In the resource-based theory, rent-producing resources determine the profit level of organizations. However, for profits to be sustainable, the resources have to be scarce, difficult to substitute and difficult to trade in factor markets. The resource-based view (RBV) theory states that the organization's performance is affected by firm-specific resources and capabilities and based on this theory resources are allocated unevenly within an industry (Warnier, Weppe, & Lecocq, 2013). RBV provides a new perspective on how a company competes. It focused on the internal strength and weakness analysis of the company. According to the resource-based theory, Barney and Clark (2007) stated that the resources distributed among the organizations are heterogeneous and immobile. It is believed that capabilities are distributed heterogeneously among firms and are difficult to imitate and transfer, which sustain the competitive advantage of the firm.

3 METHODOLOGY

An empirical study was conducted based on a survey of Shipping companies in Rivers State. Cross- sectional survey research was used and applied in this study. This is used so that generalization can be made from the sample chosen. The population of the study consist of the twelve (12) shipping companies operating in Rivers State, according to a report from NIMASA 2024. A census study was adopted by using the entire population as the sample size. Two (2) copies of structured questionnaire were distributed to seek

information from logistics and transport managers using the structured 5- point Likert scale. Therefore, the total respondents for the study were twenty- four (24) managers. The primary source of data was employed. Cronbach Alpha reliability test was carried out to ascertain the reliability of the study instrument. A threshold of 0.70 established by Nunally (1978) was adopted in determining the reliability of the research instrument. The descriptive statistics and correlation were employed to analyzed the data. For descriptive statistics, tables, chats, frequency distribution and percentage distribution were all used. To test the hypotheses of the relationship between logistics integration and seaport efficiency a Pearson Product moment correlation was used.

4 RESULTS AND INTERPRETATION

From the distributed 24 questionnaire copies (100%), 22 copes (92%), were retrieved successfully. Collations and post-coding assessments revealed the substantiality and suitability of all retrieved copies.

Univariate Analysis

The univariate data distribution for the variables is illustrated using table 1. Distributions demonstrate the disposition of participants to the variables and the extent to which these may be considered as prevalent within the context of the investigation.

Table 1: Univariate distribution for the variables

		Logistics Integration	Port Service Quality	Port Service Time Reduction	Port Cost Reduction
N	Valid	22	22	22	22
	Missing	0	0	0	0
Mean		3.1705	3.0909	3.1818	3.2159
Std. Deviation		1.23536	1.30827	1.27284	1.21815
Skewness		-.092	-.238	-.195	-.211
Std. Error of Skewness		.491	.491	.491	.491
Kurtosis		-1.975	-2.088	-2.128	-2.069
Std. Error of Kurtosis		.953	.953	.953	.953

Source: Research Data, 2025

The data distribution for the variables points to evidence of the variables within the context of the shipping companies in Rivers State. Analysis shows that port cost reduction (x = 3.2159) is the more dominant within the companies. This is followed by the distribution for port service time reduction (x = 3.1818) and with the data distribution for logistics integration (x = 3.1705) next. The least distribution is observed to be for port service quality (x = 3.0909). Evidence affirms to the substantiality of all variables, thus, identifying all four as characterizing the shipping companies, however, at a moderate level. Illustrated in Figure 1 is the summary for seaport efficiency, the criterion variable."

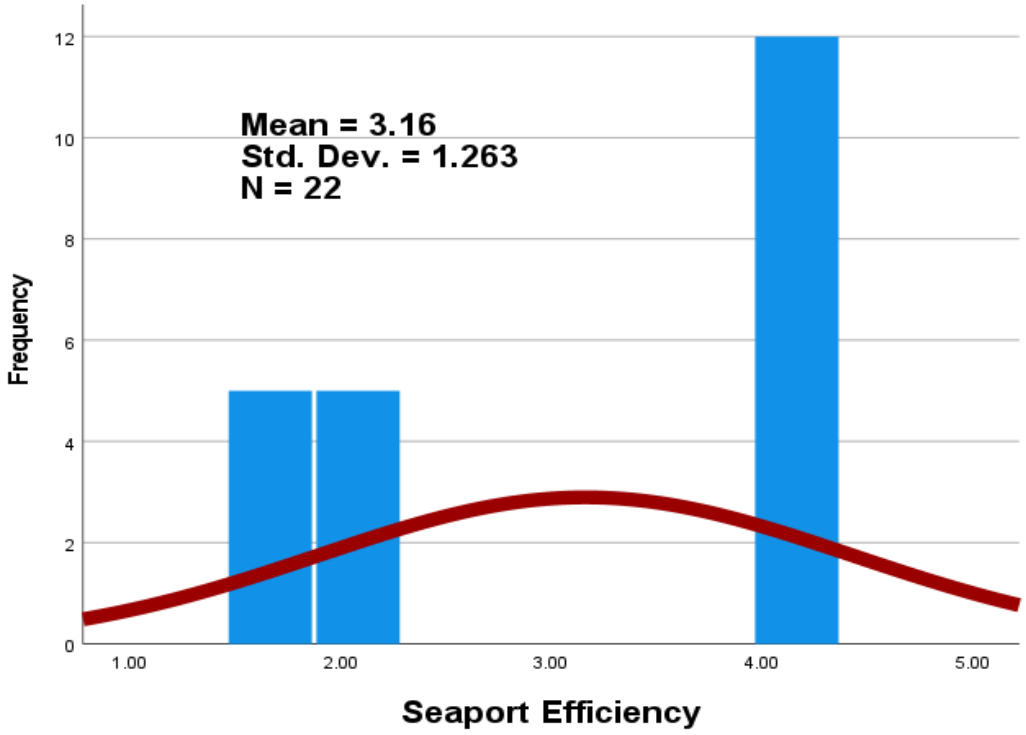

Fig. 2: Summary for seaport efficiency

Evidence (x = 3.16) indicates that there is a moderate level of seaport efficiency. The result from the univariate analysis indicates that participants affirm to the shipping companies' relative control over their costs and related expenses. This draws on earlier aggregates and summaries for measures such as port service quality, port service time reduction and port cost reduction.

Bivariate Analysis

The test for the null hypothetical statements for this research, bothered with establishing the nature of the relationship (positive or negative) between logistics integration and the measures of seaport efficiency. Tests are carried out as two-tailed and are anchored on the probability value as the criteria for accepting (where P > 0.05) or rejecting (where P < 0.05) the null hypothesis. Table 2 illustrates the result for the test for the hypotheses between the variables.

Table 2: Test for relationship between logistics integration and seaport efficiency

		Logistics Integration	Port Service Quality	Port Service Time Reduction	Port Cost Reduction
Logistics Integration	Pearson Correlation	1	.970**	.967**	.973**
	Sig. (2-tailed)		.000	.000	.000
	N	22	22	22	22
Port Service Quality	Pearson Correlation	.970**	1	.996**	.992**
	Sig. (2-tailed)	.000		.000	.000
	N	22	22	22	22
Port Service Time Reduction	Pearson Correlation	.967**	.996**	1	.987**
	Sig. (2-tailed)	.000	.000		.000
	N	22	22	22	22
Port Cost Reduction	Pearson Correlation	.973**	.992**	.987**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	22	22	22	22

Source: Research Data, 2025

Table 2 reveals a correlation coefficient of 0.973** between logistics integration and port cost reduction, indicating a strong positive relationship between logistics integration and port cost reduction. Moreso, the probability value (0.000) is less than the critical value (0.05), this shows that there is a very strong and statistically significant relationship between logistics integration and port cost reduction. This further implies that logistics integration can be used to achieve port cost reduction among shipping companies in Rivers State. Based on this, we reject the null hypothesis that there is no significant relationship between logistics integration and port cost reduction of Shipping companies in Rivers State and accept the alternate hypothesis that there is a very strong positive and significant relationship between logistics integration and port cost reduction of Shipping companies in Rivers State.

Again, Table 2 reveals a correlation coefficient of 0.967** between logistics integration and port service time reduction, indicating a very strong, positive relationship between logistics integration and port service time reduction. Moreso, the probability value (0.000) is less than the critical value (0.05), this shows that there is a very strong and statistically significant relationship between logistics integration and port service time reduction. This further implies that logistics integration can be used to achieve port service time reduction among shipping companies in Rivers State. Based on this, we reject the null hypothesis that there is no significant relationship between logistics integration and port service time reduction of Shipping companies in Rivers State and accept the alternate hypothesis that there is a very strong, positive and significant relationship between logistics integration and port service time reduction of Shipping companies in Rivers State.

Table 3 reveals a correlation coefficient of 0.970** between logistics integration and port service quality, indicating a very strong positive relationship between logistics integration port service quality. Moreso, the probability value (0.000) is less than the critical value (0.05), this shows that there is a very strong and statistically significant relationship between logistics integration and port service quality. This further implies that logistics integration can be used to achieve port service quality among Shipping companies in Rivers State. Based on this, we reject the null hypothesis that there is no significant relationship between logistics integration and port service quality of Shipping companies and accept the alternate hypothesis that there is a very strong positive and significant relationship between logistics integration and port service quality of shipping companies in Rivers State.

5 DISCUSSION OF FINDINGS

As shown from the results of the correlation analysis with respect to relationship between logistics integration and port service quality, it was shown that there is a very strong, positive and statistically significant relationship between the variables. The results of correlation analysis relationship between logistics integration and port service time reduction showed that there is a very strong, positive and statistically significant relationship between the variables. Finally, results of the correlation analysis showed that there is a very strong, positive and statistically significant relationship between logistics integration and port cost reduction. These results imply that logistics integration has significant relationship with seaport efficiency in terms of port service quality, port time reduction and port cost reduction. This finding agrees with the report that logistics integration has positive and significant relationship with supply chain performance (Kim, Lee & Hwang, 2020); and that port supply chain integration significantly relates to port performance in Busan (Han, 2018).

The current finding also support report that logistics integration has a significant effect on operations performance (Prajogo & Olhager, 2012). The findings also compare to the findings that internal and external logistics integration capabilities, supply chain integration, has a positive and statistically significant relationship with financial performance in omni channel retailing, while the external logistics integration capability generates a higher impact (Liu & Song, 2023). Furthermore, the findings align with the view that port-logistics integration has an impact on both port operational performance and port efficiency (Ali & Ayelign,2022); and supports the finding that a positive correlation exist between information technology and logistics integration which positively affects firm performance (Ashutosh, et al.,2019).

6 CONCLUSION AND RECOMMENDATIONS

Logistics integration can help reduce logistics costs, time and service quality, which in turn helps improve the company's competitiveness and performance. Based on the results obtained from the empirical tests and discussion of findings above, the study concludes that logistics integration significantly relates to seaport efficiency with regards to shipping companies. Building a strategic relationship for logistics services helps the shipping companies improve their business and seaport efficiency in their supply chain. Therefore, it is recommended that mangers of shipping companies should ensure that logistics integration is encouraged to achieve the organization's goals in terms of seaport efficiency, and further researches should to be carried out in other institutions to find out if the same results can be obtained.

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