Assessing the Impact of Hinterland Transport Connectivity on Port Operational Performance in Nigeria

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ABSTRACT

This study set out to establish the impact of hinterland transport connectivity on port operational performance in Nigeria. With a more efficient integration of land transport system in the country, it facilitates increased logistics performance index, vessels turnaround time, and enhance port performance. Hypotheses were tested, regression and analysis of variance (ANOVA) was deployed to test its significance. Base on the result obtained from the data collated, Logistics Performance Index, Domestic logistics cost and liner connectivity index all have significant impact on hinterland integration of all modes of transport to enhance port performance in Nigerian ports.

Keywords: Hinterland, Performance, Logistics, Port, Integration

INTRODUCTION

Ports have been, and still are, an integral part of freight transportation as they play a major role in a country's development and prosperity. Hence, port performance and efficiency are vital for a country's economy because the world economy continues to be the driving force behind the maritime sector [1]. Importantly, moreover, most of the world trade is carried by ships, which use ports as the ultimate gateways as world seaborne trade represents about 70% of the value and 90% of the volume of world trade [2].

The historical role of ports is as a natural site to transfer and receive goods, working with the bidirectional logistics system. They receive goods from ships, and from land through road, rail, and inland waterway transport. Hence, ports are the nodes that link maritime and hinterland transport by providing a rigorous interface. On the other hand, they play a vital function in the supply chain because of the facilitation of cargo handling, management, and exchange of related information with different suppliers [3] .

Performance measurement plays an important role in the development of an organisation. As a result, all ports, without exception, use a variety of methods to examine their performance. Ports are essentially providers of service activities, in particular for vessels, cargo and inland transport. As such, it is possible that a port may provide sound service to vessel operators on the one hand and unsatisfactory service to cargo or inland transport operators on the other. Therefore, port performance cannot normally be assessed on the basis of a single value or measure.

The multiple indicators of port performance can be found in the example of the Australian port industry [4]. The indicators are selected from the perspective of the stevedore, the shipping line and the port authority (port management). Evaluations are made by comparing indicator values for a given port over time as well as across ports for a given time period. Despite the importance of port performance measurement, however, it is

surprising to note that there are almost no standard methods that are accepted as applicable to every port for the measurement of its performance [5]. More surprisingly, it is even harder to find standard terminology to describe port production, with different container ports using different terms to describe port production. “Measurement will always have a natural tendency to be terminal-specific” [6].

Hinterland connections increasingly turn out to be the weakest link in the chain; therefore, there is a substantial risk that ports will bear a loss of traffic if their hinterland connections are inefficient or incur high costs [7].

This means that the hinterland transport system is one of the factors that influences port performance, as it largely boosts port efficiency and productivity. The better-organized the transport, the better and more promising port performance will be.

Port competitiveness is increasingly influenced by the process of developing trade corridors. The goal is to integrate the port system in a multimodal transportation network in order to improve market access, fluidity of trade and the integration in an industrial network. In this context, a port must have interfaces between major oceanic maritime trade and economic activities of ports and inland terminals that provide intermodal structures and connections between the forelands and hinterlands [8]. Obviously, business transactions require an adaptation to hinterland means. Conversely, the amplification capacity of transport modes may allow the expansion of trade. These bonds of mutual causality are now present in the traffic of port cities. The quality and capacity of hinterland modalities, roads and relays are essential to any expansion of trade.

Without a rail system the whole concept of a dry port in Nigeria would be a mirage. This issue has been the prevalent in the Nigerian economy. Due to mismanagement of public funds and corruption, most infrastructure within the country is dilapidated [9].

The Nigerian rail network which is managed by the Nigerian Railway Corporation (NRC) is characterized by inefficiency, ill-managed personnel and other vices. The level of infrastructural decay at the Nation’s railway stations is appalling. Irregular movement of goods on a few existing routes is what is left of the network system [10].

International freight forwarding is interrelated with performance of logistics services in the country. Logistics activities (e.g. storage, forwarding, and handling) connect all modes of transport used in freight transportation. The main modes of transportation are rail, road, pipeline, air and water; some tradeoffs must be taken into account selecting mode of transport: cost versus speed, packaging expense versus risk of damage, flexibility versus dependability [11]. The tradeoffs among the transport modes should be developed within the larger framework of the logistics system as a whole.

Transport infrastructure has a significant impact on the productivity and the cost structure of businesses [12]. For example, better port and hinterland connections may reduce the expenditure required for construction of distribution networks or transport of raw materials. Empirical studies show that FDI is attracted to areas with efficient transportation systems[13]. For this reason, an effective and efficient logistics system is the cornerstone of a prosperous economy in attracting foreign investment.

The hinterland remains a fundamental component in the port and maritime shipping industries. The density and extent of hinterland shapes inland freight distribution and port operations. The Nigeria Ports Authority are invited to embrace and enhance the hinterland integration currently being championed by the Federal Ministry of Transportation by its deliberate policy on rail development in view of addressing current port-related challenges, mainly congestion, growing costs, limited handling capacity and the generation of additional traffic to our seaports. With a more efficient access to the hinterland, mainly through modal shift, ports operational performance is thus increased, hence this study intends to fill these gaps.

Objectives of the Study

The main objective of this study is assessing the impact of hinterland transport on port operational performance in Nigeria . The specific objectives are:-

1. To analyze the concepts of hinterland transport and port performance in Nigeria
2. To assess how efficient hinterland domestic logistics cost transport influences ports performance in general.
3. To determine the impact of logistics performance index on hinterland transport in Nigeria
4. To assess the impact of vessels turnaround time on port performance with respect to hinterland transport in Nigeria

Hypotheses

The following hypotheses were considered suitable to investigate this study:-

Ho_1: Domestic logistics cost do not contribute significantly to port performance.

Ho_2: logistics performance index on hinterland transport does not contribute significantly to improve port performance in Nigeria.

Ho_3: There is no relationship between vessels turnaround time and port performance Chapter

MATERIALS AND METHOD

The simple regression analysis and analysis of variance (ANOVA) was used to model the relationship between the dependent and independent variables. Data obtained from Nigeria Ports Authority and World Bank was utilised in the analysis. The simple regression was deployed to obtain the coefficients associated with seaport economic growth in the Nigerian maritime industry. The regression line which defines this relationship is expressed as:

Model Specification

$$\mathbf{Y = B_o + B_1X_1 + B_2X_2 + B_3X_3 + ut}$$

Where:

Y = Port Productivity

$\mathbf{B_o}$ = Constant

$\mathbf{X_1}$ = Domestic Logistics Cost (DLC)

$\mathbf{X_2}$ = Logistics performance index (LPI

$\mathbf{X_3}$ = Turnaround Time (TAT)

B_o is the baseline while B_1, B_2 and B_3 are coefficients of the regression parameters to be estimated. The values of the coefficients are obtained using the ordinary least square method. The values will be gotten from the output of the Statistical Package for Social Scientist (SPSS V22.0).

The sign and value of the estimators indicate the proportionate direction and magnitude of effect each independent variable (input) will have on the dependent variable (output). For instance, a positive sign will indicate a direct proportionate effect.

Discussion of Findings

From the results obtained in this work, several observation and interpretations can be made. The results obtained from the above model are discussed as follows:

Table 1. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.689[a]	.475	.250	1.48170	2.357
a. Predictors: (Constant), TAT , Domestic Logistics Cost, Timeliness of Shipments					
b. Dependent Variable : Port Productivity					

The relationship parameters are: coefficient of correlation (R) = 68.9%, coefficient of determination (R^2) = 47.5%, and adjusted coefficient of determination (25.0 %). The above imply that 47.5% of the variation in Port Productivity growth per year can be explained by the variation in the independent variables, Turnaround Time (TAT), LPI, DLC, 52.5% could be explained by parameters not included in the model. The coefficient of correlation value of 68.9% implies that, there is a strong positive correlation between the dependent and independent variables.

This implies that there is a high goodness of fit between the dependent and independent variables. The adjusted R-square of 25.0 % means that the model has accounted for 25.0 % of the variance in the independent variable. The remaining 75.0% of the variation is explained by stochastic factors.The R^2 value obtained for the model is high and aligns within the acceptable range, hence the model has a high goodness of fit and confirms that 47.5% variations of the dependent variable (port productivity) is explained by the independent variables.

The value of the coefficient of correlation of 68.9% indicates a strong positive correlation between the dependent and the independent variables. Which implies that, as the dependent variable increases, the independent variables also increases.

Table: 2. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.908	3	4.636	2.112	.187[b]
	Residual	15.368	7	2.195		
	Total	29.276	10			
a. Dependent Variable: Port Productivity						
b. Predictors: (Constant), Logistics Performance Index, TAT , Domestic Logistics Cost						

From Table 2 above the value of the F- ratio tested on the model shows that the regression parameters are not all equal to zero. Since the calculated F-value (2.112) is greater than the tabulated F- value (3.71), implies that all parameters are equal to zero. The t-values for each independent variable explain their individual contributions on the dependent variable.

a) The calculated t- value obtained for Domestic Logistics Cost (X_1) parameter (0.201) is less than that of the tabulated (1.81) at (10) degrees of freedom, then we accept the null hypothesis, i.e., a Domestic logistics cost do not contribute significantly to port performance.

b) The calculated t- value obtained for the LPI (X_2) parameter (1.650) is less than (1.81) tabulated t-value at (10) df, then the null hypothesis is accepted, that is; Logistics Performance Index does not have a significant relationship with Logistics Performance Index of freight forwarding.

c) The calculated t-value obtained for the TAT (X_3) parameter (0.255) is less than the tabulated t value (1.81) at (10) degrees of freedom (df), then the null hypothesis is accepted, that is; T There is no relationship between vessels turnaround time and port performance

The LPI index allows for interpretation of the data based on the diversity of the metrics used,and on previous knowledge on a specific country; take the example of Nigeria. Based on the ratings, Nigeria is positioned significantly higher (97), when compared to some other low-income countries, for instance Senegal (105), and Ghana (129). [14] note the correlation between the successful customs reforms, on border processing, and the quality of support services; "Forwarders praise the clearance system in Senegal (76 on border processing), but are overwhelmingly negative for Nigeria (96 on border processing). However, they have the opposite opinion for the quality of support services (such as ports and trucking), where Nigeria has benefited from efficient port operations, thanks to privatization of the main container terminals" [15].

CONCLUSION

In conclusion, from the result obtained, seaport is one of the infrastructures that drives the economy. It is the gateway to international trade of all developing and developed economies. The Nigeria Port Authority should develop inland waterway transport as an environmentally friendly transport mode in the seaport–hinterland distribution network. Nigeria is making tremendous effort to pull its economy out of the woods. Significant efforts have been made by successive governments to open up the economy for more investment. No country can boast of increase in trade and investment by neglecting its ports. The impact of ports transcends all sectors of the economy. Thus any action taken by government to industrialize the economy is not done in isolation. The port is usually given prime attention since the high volume of goods produced will have to be exported through it.

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