

## **Modernization of Infrastructure and Port Performance in Nigerian ports in Rivers State**

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### **Abstract**

This study examined the relationship between modernization of infrastructure and ports performance in Nigerian Ports, Rivers State. It adopted effectiveness and efficiency as measures of port performance. The study adopted the cross-sectional survey in its design. The population of the study were the two seaports in Rivers State with 58 participants captured as respondents. Given the size of the population and its corresponding participants, the study adopted census in the determination of its sample size, thus adopting 58 as the study sample size. The research instrument was validated through the supervisor's scrutiny and approval while the reliability of the instrument was ascertained using the Cronbach Alpha coefficient with all the items scoring above 0.70. Data obtained was analysed and presented using both descriptive and inferential statistical tools. The hypothesis was tested using the Spearman's Rank Order Correlation Statistics. However, in view of the findings of the study, it is thus concluded that modernization of infrastructure is a necessary strategic action to promote port performance in Ports in Rivers State. Therefore, it recommends the National Inland Waterway Authority and conjunction with port authority should intensify efforts to actualize the concession of the terminals to private organizations for full capacity utilization of the terminals; thereby improving effectiveness and efficiency.

**Keywords:** *Modernization, Effectiveness, Efficiency, Sea Port*

### **Introduction**

Maritime sector is one of the backbones of Nigeria's economic stability. This is because it promotes international trade and huge source revenue for the country. The viability of a nation's maritime sector is among other things premised on the effectiveness of its ports. Ports not only a chain in transportation for inter-change, but they function as self-sustaining industry that is linked with domestic and international trade. In other instances, ports also serve as a foreign exchange earner not only in the form of transshipment or hub port but as part of supply chain management by providing logistics services to the industry. Nigeria has a total of eleven ports and eight oil terminals organized in three zones of Western, Central and Eastern zones. The central zone with its headquarters in Warri and the Eastern zone with its headquarters in Port Harcourt are predominantly oil terminals, although Warri, Sample, Koko, Port Harcourt, Calabar and the Federal ocean terminal are important general cargoes (Chioma, 2011). Nigerian Ports just like every other organization in both public and private sector is goal centered. These goals revolve around profitability, growth and expansion, good citizenship, goodwill, survival and others (Jaja, Gabriel & Wobodo, 2019). The achievement of these goals is a reflection of performance; therefore, its effective port performance is a critical goal. Performance has been described as comprising the actual results of an organization as measured against its planned/intended outputs. In this view, Richard, Simon and Brut (2009) maintain that performance has its focus on three

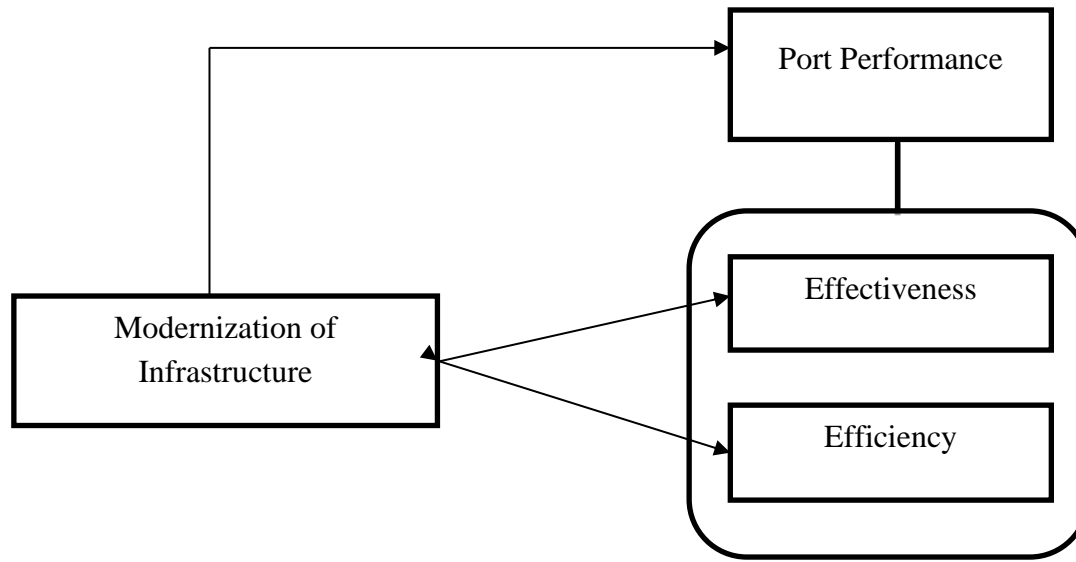
specific areas of outcomes: first, financial performance which involves the likes of profitability, return on equity, etc.; second, product/service market performance involving the likes of market share, sales, business growth, etc.; and third, optimized shareholder return involving the likes of economic value added, total shareholder return, etc. Therefore, performance can be seen as a multi-dimensional construct consisting of more than simply financial performance (Baker & Sinkula, 2005). More so, Anya, Umoh and Worlu (2017) identified that increasing and intense competitiveness in the market is the reasons why performance is seen as the most important issue for profit and non-profit organizations for businesses.

Given the social nature of organization, its performance depends on many factors and employees contribution. For instance, Hagedoorn and Cloudt (2003) noted that in pursuit of higher operational effectiveness and organizational performance, scholars and practitioners are now looking for new approaches to improve operational performance, boost profitability, and enhance competitiveness. Similarly, Mello (2005) argues that organizations that are considered as successful are increasingly realizing that there are a number of factors that contribute to performance. Thus, one of these factors is hinged on management commitment towards sustained modernization of critical infrastructure that drives performance, especially in a technology driven organization like Nigerian Port Authority. Modernization is considered essential for port performance it leads to improve productivity and efficiency and improve management capability (Alderton, 1999). Although in a bid to provide solution to the problem of poor performance of sea ports, several efforts have been made by both scholars and managers in practice. However, amongst the identified studies, while we have not seen any empirical evidence linking modernization of infrastructure to port performance in Nigerian Port in Rivers State, those identified within and outside the context of Nigerian business environment either adopted a different predictor or criterion variable, thus given their studies a different perspective from what this study is set out to achieve. For instance, Munim and Schramm (2018) examine the impacts of port infrastructure logistics performance of seaborne trade wherein the finding reveal that it is vital for developing countries to continuously improve the quality of port infrastructure as it contributes to better logistics performance, leading to higher seaborne trade, yielding higher economic growth. Nyema (2014) evaluated factors influencing container terminals efficiency of Mombasa entry Port. Based on this observed gap, this study empirically fills the gap by examining the relationship between modernization of infrastructure and port performance in Rivers State.

### **Statement of the Problem**

With growing international sea traffic and changing technology in the maritime transport industry, sea ports are coping with mounting pressures to upgrade and provide cutting-edge technology. They are also being forced to improve terminals efficiency to provide comparative advantages that will attract more traffic. Within the context Port Harcourt and Onne Port in Rivers State some challenging factors include: providing adequate and performing equipment, reducing berth times and delays, enabling large storage capacity and ensuring multi-modal connections to hinterland (UNCTAD, 2006); as well as improving infrastructure (Haralambides, 2002). Terminal operations are affected not only by the larger number of vessel calls but also by the increased variability of call sizes. According to Cullinane and Khanna (1999), vessels of over 15000 TEU are becoming increasingly common in sea ports, including Port Harcourt and Onne ports. This concentrate container flows on a few mega ports, in turn influencing berth and crane efficiency of the terminal and adding pressure on hinterland links, often with adverse effects on congestion and the environment (Yap & Lam, 2013). Other identifiable problems associated to the poor performance inefficiency of the Port Harcourt and Onne port are: dwell time issue, management of trucks loading and unloading goods, collection of custom duties, inspections, etc. Also, ship size has been observed to be on the increase day by day. The current state of our existing ports may not be capable of handling too many of the large ships. So to compete with growing maritime trade that helps to national development deep sea port infrastructure optimization by way of modernization is very essential.

### Conceptual Framework



**Fig.1: Conceptual Framework of Modernization of Infrastructure and Port Performance**  
Source: Desk Research, 2021

### Purpose of the Study

The purpose of this study was to empirically examine the relationship between modernization of infrastructure and port performance in Nigerian ports in Rivers State.

### Research Questions

In line with study purpose, the following two research questions were raised to guide study:

- i. How does modernization relate with efficiency in Nigerian Ports, Rivers State?
- ii. How does modernization relate with effectiveness in Nigerian Ports, Rivers State?

### **Research Hypotheses**

In view of the two research questions stated, the following two hypotheses were formulated:

H0<sub>1</sub>: There is no significant relationship between modernization and efficiency in Nigerian Ports in Rivers State.

H0<sub>2</sub>: There is no significant relationship between modernization and effectiveness in Nigerian Ports in Rivers State.

### **Theoretical foundations**

#### **Resource Based View Theory**

The importance of identifying the theoretical underpinnings that define the relationship between a study variable has immensely been acknowledged by scholars. In this study, we identified resource base view theory as potent baseline theories that best explain the complex relationship between infrastructure optimization and performance of a business. We adopted this theory because it explicitly clarifies role of effective utilization of organizations' internal resources in driving performance in a competitive business world. Resource-Based View theory was originally conceptualized by Penrose (1959), and further enhanced in the work of Wernerfelt (1984) and Connor (1991). The theory argues that through effective utilization of an organization's internal resources such as employees, the organization gains competitive advantage over its competitors (Kraaijenbrink *et al.*, 2010). It explains that resources available or acquired by an organization are the basic drivers of its performance outcome (Wobodo, Asawo & Asawo, 2018). It further states that if an organization is to attain a state of sustainable competitive edge, it must acquire and control valuable, rare, inimitable, and non-substitutable (VRIN) resource and capabilities. In line with the assumptions of this theory, we can see that in today's technology economy, infrastructure optimization remains a critical action that management of organizations wishing to remain operationally sustainable amid competition must take. This is important for operational performance, especially as it constitute rare competitive advantage for the organization.

#### **Concept of Modernization of Infrastructure**

Modernization of ports infrastructure refers to as the process of improving the performance of a port by introducing more suitable systems, working practices, or equipment and tools within the existing system of bureaucratic constraints. The advantage of this strategy is that certain changes in the organization can be made without the requirement to change laws or national policy. Sanchez and Tichel (2005) approached port modernization (development) from a systems approach, which involves identifying those variables that are likely to affect the port's progress and putting them in order. These include the port's physical structure (location, infrastructure, superstructure), the institutional/ political environment (political, institutional, organizational), economic and the social environment. The idea for port modernization is something that no port management team and the government of a nation should take for granted, because of the strategic importance of sea port to a nation's economic growth. This is because economic growth has continually remained an objective of every country of the world, especially developing nation like Nigeria. The imports and exports that pass through Port Harcourt and Onne Port are strategic to Nigeria's economic balance, liquid bulk items, mostly petroleum, oil and lubricants, are the single greatest import item by weight without these imports, Nigeria oil industry may face a serious survival threat. This is because right now, Nigeria does not have functional refineries as such depend on imports for all of its petroleum needs.

Given this, modernization of Port Harcourt and Onne Port become necessary for optimal performance of the Ports; especially as studies have affirmed the essentiality of sea port for a country's economic advancement. For instance, Tareq *et al.* (2020) assert that the deep sea port development as an economic infrastructure influences positively on the growth of a country. The need for modern equipment in ports is necessary in order to keep pace with modern technologies and to satisfy customers. In fact, the benefits of Port modernization are multidimensional. This means that it benefits all stakeholders, government, management and ship operators. According to Nyema (2014), Port users prefer the port with the best price/quality ratio. Hence, UNCTAD (2014) report on "Small Island developing

States which focuses on challenges in transport and trade logistics, indicates that one way of attaining economic growth as a nation especially developing nation like Nigeria is by focusing attention on tackling the challenges faced by transport and trade logistics. Also, the introduction of more capital-intensive methods of handling cargo and the use of larger and more expensive ships make it more important than ever to ensure that the most effective methods are used, that ships are not kept waiting for labour more than is necessary. According to UNCTAD (1985) the high cost of labor in many 64 industrialized countries, has justified the use of more advanced techniques of mechanization and automation.

### **Port Performance**

According to Griffin (2003) performance is concerned with the organization's ability to meet the needs of its stakeholders and its own needs for survival. In this sense, organizational performance depicts that an organization is achieving its mission and goals. In the same view, Drudcer (2009) asserts that performance is the comprehensive end results of all the organization's work process and activities, Within the purview of seaport operations, performance explains how much cargo is handled, at what rate, and at what efficiency (UNCTAD, 1987). Again, a Port is considered to be performing or efficient if its cargo flow is stable and continuously increasing and is not creating systematic problems of transportation (Escribano et al., 2009). Ports are essentially providers of service activities, in particular for vessel, cargo, and inland transport. As such, it is possible that a port may provide sound service to vessel operators on one hand and an unsatisfactory service to cargo or inland transport operators on the other. Hence, port performance cannot normally be accessed on the basis of a single value or measure, rather evaluations are made by comparing indicator values for a given port over time as well as across ports for a given time period (De Monie, 1999).

The importance of port performance is to compare actual performance of the port with targets set. But despite the importance of port performance measurement, it is surprising to note that there are almost no standard methods that are accepted as applicable to every port for measurement of its performance (Cullinane, 2002). However, the performance of a port can be evaluated by observing both its utilization and the speed and reliability of movement of cargo; and services through the port (UNTAD, 2002). While there are a number of activities involved from entry to departure of a cargo into/out of the port, it is important to measure the performance of the ports or the total movement of cargo. This may include the throughput of the port, ship traffic, berth occupancy, ship turnaround time, effectiveness, efficiency etc. The challenge for any organizational performance is generally indicated by the effectiveness of an organization to achieve its objectives and efficiency to use the resources properly, satisfaction of employees and customer innovation, quality products and services and thereby ability to maintain unique human resource pool (Katou & Budwar, 2007).

### **Ports Effectiveness**

In today's business world, every goal oriented organization whether for profit or not-for-profit are concerned with output, sales, quality, creation of value added, innovation and cost reduction. This is achieving these things indicate performance. Bartuseviciene and Sakalyte (2013) refer effectiveness to as the degree to which an organization achieves its goals or how outputs interrelate with the environment economically and socially. Effectiveness is the evidence that reveals the extent to which organizations carryout their task to achieve performance. Normally, effectiveness predicts the policy objectives of the organization or the degree to which the organization delivers on its mandates rightly and timely (Zheng, 2010). Meyer and Herscovitch (2001) analyzed organizational effectiveness through organizational commitment. Commitment in the workplace may take various forms, such as relationship between leader and staff, staff personal affiliation with the organization, involvement in the decision making process, psychological attachment felt by an individual. However, in terms of ports management, effectiveness may manifest in terms of ship turn-around time is an accumulation of the two critical times, ship service time at berth and waiting time or the time the ship spends in port from its arrival within the limits of the port up to its departure (Francou, 2001).

### **Port Efficiency**

The measure of efficiency is a concept directly related to the measure of productivity. However, they are not analogous notions, even though they are occasionally treated as synonymous, especially when the interest of the research is centered on comparing the performance of firms.

According to Alan (2008), efficiency refers to as firm's ability to utilize minimum possible expenditure of resource (inputs) through its implementation. It is related to as that positive outcome achieved when input is compared against output (Kovac, 2007). In the same manner, Robbins and Coulter (2005) aver that it pertains to achieving the highest possible outputs with minimum quantities of inputs. Furthermore, it measures relationship between inputs and outputs or how successfully the inputs have been transformed into outputs (Low, 2000). Efficiency is viewed as a vital business outcome. This is because; its progressive realization ensures business survival. Excellent organizational efficiency could improve organizational performance in terms of management, productivity, quality and profitability.

In the context of Port, efficiency often means speed and reliability of container terminal services. In a survey conducted by UNCTAD (2011), 'on-time delivery' was cited to be a major concern by most shippers (UNCTAD, 2006). In fast paced industries where products must be moved to the markets on time, terminal operators are vital nodes in logistics chain and as such must be in a position to guarantee shipping lines very reliable service levels. These include on-time berthing of vessels, guarantee turnaround time for vessels and guaranteed connection of containers. That is the total turnaround time it takes to wait for pilot to berth, terminal time, un-berthing and final departure from port area (Tongzon, Chang & Lee, 2009).

### **Modernization of Infrastructure and Port Performance**

Seaports are confronted by a fast evolving global market place which includes extensive business networks, complex logistics systems, increasing vessel sizes and global terminal operators (Notteboom, 2007). Therefore, upgrading of its ports' facilities and services are crucial to its effective and efficient performance, and if ignored will result in increased competition pressures at the expense of declining market shares. Among these hindrances, include insufficient port financing for capital and maintenance projects, inadequate maintenance, management, and IT systems, insufficiently skilled workforce, and little or no environmental protection practices. Also, sustainable development practices in relation to environmental management have grown rapidly over the years (Couper 1992). It is revealed that complying with environmental protection practices and research projects as commissioned by the World Bank, Marine Pollution (MARPOL) Convention of the International Maritime Organization (IMO), and achieving international certifications such as from the International Organization for Standardization (ISO 14000) are key essentials in gaining port competitive advantage . Thus, we believe that through modernization of port operational logic is sure means of achieving these targets.

Port modernization enhances container terminal operations through the application of efficient technological tools (Chin & Tongzon, 1998). Similarly, Smith (2016) asserts that the role maintenance and upgrades play at ports is naturally critical to keeping assets running well and cargo moving as efficiently as possible. Ports are challenged to prioritize their limited resources between major capital investments required for bigger ships, versus the cyclical major upgrades of wharves and other facilities. It is also revealed that fostering partnerships with shipping lines and public and private sector agencies support the supply chain infrastructure for enhanced port performance. In Latin America, Wilmsmeier, Hoffmann and Sánchez (2006) calculates that doubling port efficiency through infrastructure modernization in a pair of ports has the same impact on international transport costs as halving the distance between them. Similarly, Clark, Dollar and Micco (2002) found that improving port efficiency from the 25th to 75th percentile reduces shipping costs by 12% in this region. Hence, we hypothesize that:

H0<sub>1</sub>: There is no significant relationship between modernization and efficiency in Nigerian Ports in Rivers State.

H0<sub>2</sub>: There is no significant relationship between modernization and effectiveness in Nigerian Ports in Rivers State.

**Methodology**

According to Baridam (2001), research design explains how the subjects of the research will be brought into the scope of the research setting to produce the required data; rather than viewing it as a specific method of data collection such as questionnaire, interview. In the same trend, Eze and Agbo (2005), consider it as the specification of procedures involved in the collection and analysis of all necessary data needed to examine a particular phenomenon. Therefore, in this study, the cross-sectional survey was adopted and it grouped as a type of quasi-experimental design. We adopted this approach because it allows the research to obtain data in single time spanning through weeks or months. To buttress this, Sekeran (2003) posits that, a cross-sectional study is one that involves data collection at one single point which might be over a given period ranging from few days, weeks or months. The study population study comprises of 58 managerial staff of the two Ports (Port Harcourt and Onne Port) situated in Rivers State. The study also adopted the population as its sample size relying on census approach. The study was collected using structured questionnaire and analyzed using the Spearman’s rank order correlation coefficient at a significance level of 0.05.

**Data Analysis**

In this section, data results for the analysis and tests for all previously hypothesized bivariate associations are presented. The section examines the relationship between the dimensions of the predictor variable – infrastructure optimization and the measures of the criterion – Port Performance which constitutes the objective of the study. A total of four null (hypotheses one to hypotheses four) bivariate associations are tested in this section using the Spearman rank order correlation coefficient at a 95% confidence interval. The decision rule is set at a critical region of  $p > 0.05$  for acceptance and  $p < 0.05$  for rejection (two-tailed).

**Table 1: Correlation for Modernization and Port Performance**

|                |               |                         | Modernization | Effectiveness | Efficiency |
|----------------|---------------|-------------------------|---------------|---------------|------------|
| Spearman's rho | Modernization | Correlation Coefficient | 1.000         | .933**        | .903**     |
|                |               | Sig. (2-tailed)         | .             | .000          | .000       |
|                |               | N                       | 55            | 55            | 55         |
|                | Effectiveness | Correlation Coefficient | .933**        | 1.000         | .843**     |
|                |               | Sig. (2-tailed)         | .000          | .             | .000       |
|                |               | N                       | 55            | 55            | 55         |
|                | Efficiency    | Correlation Coefficient | .903**        | .843**        | 1.000      |
|                |               | Sig. (2-tailed)         | .000          | .000          | .          |
|                |               | N                       | 55            | 55            | 55         |

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

Source: SPSS Output

**Ho<sub>1</sub>:** There is no significant relationship between modernization and in Nigerian Ports in Rivers State.

The result of correlation matrix obtained between modernization and effectiveness was shown in Table 1. Similarly displayed in the table is the statistical test of significance (p - value), which makes possible the generalization of our findings to the study population. The correlation coefficient of 0.933 confirms the direction and strength of this relationship. The coefficient represents a positive moderate correlation between the variables. The test of significance shows that this relationship is significant at  $p < 0.000 < 0.01$ . Therefore, based on observed findings the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between modernization and efficiency in Nigerian Ports in Rivers State.

**Ho<sub>2</sub>:** There is no significant relationship between modernization and efficiency in Nigerian Ports in Rivers State.

The result of correlation matrix obtained between Modernization and Efficiency was shown in Table 1. Similarly displayed in the table is the statistical test of significance (p - value), which makes possible the generalization of our findings to the study population. The correlation coefficient of 0.903 confirms the direction and strength of this relationship. The coefficient represents a positive very strong correlation between the variables. The tests of significance shows that that this relationship is significant at  $p < 0.000 < 0.01$ . Therefore, based on observed findings the null hypothesis earlier stated is hereby rejected and the alternate upheld. Thus, there is a significant relationship between modernization and efficiency in Nigerian Ports in Rivers State.

### **Discussion of Findings**

This study examined the relationship between modernization of infrastructure and port performance in the Nigerian Ports in Rivers State. The finding of the study is in line with Brunel (2004) who opined that the demand for infrastructure optimization is a phenomenon that has been on the increase in Nigeria over the years. This is as a result of obvious infrastructural deficit to drive the nation's socio-economic progress. Since 1960, Nigeria had her independence several governments has come and gone both military and democracy, yet the much needed infrastructure to run the economy is still lacking. In this stance, Escribano *et al.* (2009) explain that the ways that infrastructure affects Africa's economic growth poses several difficulties because of the special characteristics of the African region. Estache (2005) takes stock of the basic characteristics of infrastructure in Sub-Saharan Africa and concludes that the impact of infrastructure in Africa may be different from other regions.

### **Conclusion and Recommendations**

Managing cargo flows between ports and inland destinations has remained a challenge for terminal operators. Delay in ports means rising costs for shippers as it adds to customer pressure for goods to be delivered just in time. Most studies indicate that it is difficult to model the entire container terminal in a single integrated optimization model. Consequently, most of the studies have focused on developing models to solve individual problems related to specific terminal equipment and not integrated or combine problems relating all handling equipment. It is necessary for the terminal yard and quays to be managed in an integrated fashion i.e. with simultaneous regard for parallel processes. However, in view of the findings of the study, it is thus concluded that modernization of infrastructure is a necessary strategic action to promote port performance in Ports in Rivers State. Therefore, it recommends the National Inland Waterway Authority and conjunction with port authority should intensify efforts to actualize the concession of the terminals to private organizations for full capacity utilization of the terminals; thereby improving effectiveness and efficiency.



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