The effect of optimal port operations on global maritime transportation: a study of selected ports in Nigeria

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Abstract
Purpose – The study examined the effect of optimal port operations on global maritime transportation among selected ports in Nigeria.
Design/methodology/approach – It considered research questions such as are the ports in Nigeria functional, are the ports functioning to optimal capacity and are there challenges affecting smooth operations in the Nigerian ports? The study tested the null hypothesis which states that there is no positive and significant relationship between a functional port system and maritime transportation in Nigeria. The nonparametric statistics, chi-square, were used to analyze data. Data were gathered through a questionnaire administered to three major ports in Nigeria, namely Lagos Port Complex (LPC), Port Harcourt Old port and Warri Port.
Findings – From the analysis, findings showed that there exists a positive and significant relationship between operations in the ports and maritime transportation in Nigeria.
Practical implications: The study showed that the moribund state of some ports and terminals will result in loss of jobs and huge revenue, therefore, compounding the menace of unemployment with its associated vices.
Originality/value – The study concludes that the operations of a functional port affect the economic growth of maritime nations. Thus, it is recommended that government and the private sector should collaborate to raise adequate capital for port development and improve the super structures (infrastructures) for optimal port operations in the country among others.
Keywords Functional, Optimal, Port operations, Global maritime, Transportation, Nigeria
Paper type Research paper

1. Introduction
The major reason for economic diversification is to increase economic growth and development of a country. Port development is one of the strategies for diversifying an
Creating multiple investment portfolios that would in turn provide employment opportunities for the teeming army of unemployed youths as well as stabilize the economy. However, a nonfunctional port system would defeat these laudable objectives and result to colossal waste of public and private funds. Operations in the ports simply refer to port operations or the multitude of connected and complex activities that are undertaken in the ports. On this note, these concepts may be used interchangeably to address the import of this study. Port operations are trade and ancillary activities that occur in the maritime industry across the world. Elem (2008) identified several operations in the ports, such as dry docking, coastal shipping services, trawler services, terminal and jetty infrastructure, offshore construction and fabrication, supply boats to offshore oil fields, crew boats, tugboat and anchor handling, diving support vessels, cable and pipe laying vessels. According to Peretomode (2014), other operations in the ports are barge and house boat activities, dredging services, tourism services, pilotage and towage services, supply of water and fuel to vessels at anchorage mooring bouy, industrial areas and warehousing offices and port development. These are diversified investment opportunities that would enhance optimal functioning of ports as well as energies economic growth of a nation.

A functional port system may depend on effective and efficient port management approach. The application of practices, principles and theories of management in executing operations of the ports is known as port management. Therefore, port management entails the activities of planning, organizing, controlling and staffing of ports and its operations. Port management is enhanced by standard port facilities and services, which include, standard berths, cargo handling facilities, cargo storage facilities, computerization, fire service facilities, medical facilities and security architecture (Okerefe, 2018). It also includes logistics management, supply chain management and other activities that facilitate the carriage of goods by sea. Information gathering, processing through relevant technology and communication are major components of operations in the ports. This entails that ports operations is a gamut of interrelated and interconnective tasks or activities that are executed on daily basis by the human resource and machines to achieve effective and efficient management of ports facilities.

The ocean serves as international trade route that provides low cost and massive transport services (Jung, 2011). The maritime industry being a sub-sector of the transport sector accounts for about 90% of transportation needs of the world and that seaborne trade accounts for over 60% of the total gross domestic product (GDP) of the 16 countries of Economic Community for West African States (EOWAS) (Peretomode, 2014; Airahilobhor, 2011). In similar discourse, UNCTAD (2015), Stopford (2009) and Ziaul and Hans-Joachim (2018) contend that about 80% of trade are seaborne. According to Jung (2011), 75% of total trade was transported by sea in 2008.

Seaborne trade is anchored on the operations in the ports. It has been mentioned that industrial expansion and production, facilitated by global drivers boosted the significance of seaports in the supply chain of international trade (Ziaul and Hans-Joachim, 2018; Wang and Cullinane, 2006). Growth in world merchandise trade volume had also impacted on ports operations and gross domestic product (GDP) of countries doing maritime business (UNCTAD, 2015). The impact of seaborne trade on a nation’s GDP depends on the functionality of operations in the ports. In port operations, port infrastructure and manpower are key to logistics performance (Ziaul and Hans-Joachim, 2018).

It has been pointed out that logistics cost and reliability of supply chain are major factors affecting logistics performance. In shipping business, cost of delivery, reliability and predictability of the carrier are imperatives that must be ascertained by importers and exporters. Since poor reliability and poor predictability of logistics services increase the hedging cost and inventory maintenance needs, the reason for efficient service delivery, improved ports infrastructure and manpower training cannot be overemphasized.
The quality of infrastructure affects logistics performance which invariably tells on the GDP of a nation. Though Jung (2011) agreed that ports serve as a gateway to world trade and accelerate growth of local economies, but, due to advancement in logistics technologies and change in the structure of economies, benefits derived from ports are decreasing. Recent studies done by Jung (2011) in South Korea and Deng et al. (2013) in China also argued that operations in the ports are showing declining effects on these economies. However, Lakshmanan (2011) indicates that freight services led to growing trade, and also the studies carried out by Shan et al. (2014) and Chang et al., (2014) found that port activities impact on regional and national economies.

Since studies on port operations, ports infrastructure and logistics performance are showing differing conclusions while some are very elusive, there is a need to study the functionality of ports in Nigeria. The study, therefore, seeks to verify the following questions:

1. Are the ports in Nigeria functional?
2. If functional, are they performing to optimal capacity?
3. What are the teething challenges that must be surmounted?
4. What remedies are required for optimal functioning of these ports?

Based on foregoing, the singular hypothesis to be examined statistically reads there is no positive and significant relationship between a functional port system and maritime transportation/economic growth (GDP) of the Nigeria.

2. Review of related literature
Some literature/relevant studies were reviewed under the following sub-headings: history of ports operation in Nigeria, contributions of ports to global economy, contributions of ports to Nigerian economy and challenges hampering port operations in Nigeria.

2.1 History of port operations in Nigeria
Nigeria is a costal nation in West and Central African subregion blessed with coastline of about 853 nautical miles and 3,000 kilometers of navigable inland waterways stretching from Warri Estuaries in the south through River Niger to the north. The country is located between Latitude 4°N and 14°N and Longitude 3°E and 15°E and bounded to the north by Republic of Niger, to the west by Republic of Benin and to the east by the Republic of Cameroon. The Republic of Chad is to the northeast while the Atlantic Ocean is to the Southern tip via the Gulf Guinea. The nation’s exclusive economic zone (EEZ) occupied a total area of about 315,950 nautical kilometres (Okerefe, 2018). Based on this coastal endowment, Nigeria is on a vantage point to harness the potentials in seaborne trade.

Port operations in Nigeria started with the British Chattered Companies that were domiciled in Southern Nigeria. John Holt, Lever Brother’s and the United African Company (UAC) were given trading concerns that led to the development of ports in Calabar, Sapele, Burutu and Warri, all in Southern Nigeria. In 1906, the British Colonial Government established the Southern Nigeria Marine with headquarters in Lagos, and in 1908, the Northern Nigerian Marine was formed with headquarters in Lokoja. However, in 1914, both were merged to be known as Nigerian Marine, and the defunct Custom Wharf was formed on Lagos Island (Okerefe, 2018).

There are eight major and ancillary ports and jetties across the coastal areas in Nigeria, namely, Lagos Port Complex (Apapa LPC), Tincan Island Port, Port Harcourt Old, Federal Ocean Terminal (Onne), Warri, Calabar, KoKo and Container ports (Lagos).
2.1.1 The Lagos Port Complex (LPC). It is the first planned River Port in Nigeria. The LPC commenced operations in 1921 with a quay length of 548.64 meters and a draught of 9.75m. In 1979, the quay length was extended to 160 m, and draught is 10.5 m. The LPC has a total of 20 berths capable of handling general cargo vessels, reefer vessels, etc. It has 76,000 ton silo storage capacity. In 2004, the government approved it concession to the four private operators: Apapa Bulk Terminal Ltd, ENL Consortium, Green View Development Ltd and APM Terminal Ltd.

2.1.2 The TinCan Island Port. This Port was developed in 1975 but commissioned to commence full-scale operations in 1977. It has 11 berths comprising seven break-bulk general cargo berth and mooring buoys. Total quay length is 2,500 meters consisting of seven break-bulk general cargo berths, two roll on roll-off (RoRo) berths and dry cargo import berth. Each berth has a maximum draught of 10 m. Under concession arrangement, four private terminal operators run its activities, namely Josepdam Port Services, TinCan Island Container Terminal Ltd, Ports and Cargo Handling Services Ltd and Five Star Logistics Ltd.

2.1.3 The Port Harcourt Old Port. It was built in 1912 as a natural port, and it is the third largest in Nigeria. The Port has a marine quay of 1,390 m long, draught of 7.6 m and 13 berths. It is equipped with dockyard, five mooring berths and tanker buoys. Based on concession agreement, it is operated by Port and Terminal Operators Nigeria Ltd and BUA Port and Terminals.

2.1.4 The Federal Ocean Terminal. It was initially designated as trans-shipment or hub port for West and Central Africa for deep draught ocean going vessels not capable of berthing in other conventional port in Nigeria. The port has a draught of 13 meters, 1,590 meters quay length, 6 berths, 4 transit shed, 3 warehouses, 200,000 square meters for containers and bulk cargoes.

2.1.5 The Warri port. It is known as the largest among the constellation of ports that constitute the delta ports, like Koko, Sapele, Burutu, and Aladja Steel Jetty. The Warri Port consists of the old and new ports. The old port has eight berths and the new one has six berths including one RoRo berth. It has a total quay length of 1,600 meters and draught of 8 meters. Under concessional arrangement, Intels Nigeria Ltd and Associated Marine Services Ltd operate the terminals.

2.1.6 Koko port. The Koko Port is a natural medium-sized port located on the estuary of Benin River. It has a quay length of 137 meters and a draught of over 7 meters. The oil jetty is operated by Total Nigeria Plc.

2.1.7 The Calabar port. It is one of the oldest natural harbours established by the British Chattered Company, the UAC in the coastal region of Nigeria. The quay length is 550 meters, and a draught of 8 meters with a contiguous free zone that offers wide latitude for import and export processing activities. Under concession, the port is operated by Intels Nigeria Ltd, Ecomarine Nigeria Ltd and Shoreline Logistics Ltd.

2.1.8 The container terminal. It is located at the third Apapa Wharf extension covering 144 hectares land area. The terminal has installed capacity to handle 22,000 TEUs (twenty equivalent units). It has quay length of 250 meters and 6 berths.

2.2 Contributions of port operations to maritime transportation/economies of the world

Omoke et al. (2019) recognize shipping as a strong catalyst to socioeconomic development of countries. It is also affirmed that shipping activities positively impact on income. Seaport is the most significant node in maritime transport, and its efficiency reduces transport cost. The modified neoclassical growth theory, also known as the theory of endogenous development, postulates the relationship between seaport developmental investment and economic growth of nations (Omoke et al., 2019; Grossman and Helpman, 1991).

Accordingly, Sjafrizal (2008) found a positive relationship between maritime activities, infrastructure and economic growth of archipelagic regions of the world. Port operations
include the combination of throughput volume of goods, gross registered tonnage, numbers of vessels and number of employees. The growth of GDP of maritime nations largely depends on these activities. It has been seen that transportation network, port activities affect per capita growth, increase fiscal revenue and economic growth (Banerjee, 2009; Essoh, 2013). Fintell (2004) opines that the maritime subsector is a major catalyst for socioeconomic development and international competitiveness in the global landscape. In the USA, every job in the merchant marine creates 4.4% additional jobs in the economy (Haralambidis, 2014).

Similar results were demonstrated in Holland, UK, Italy, Belgium and European Union maritime regions, where 40% of their GDP was from operations of the ports (Peretomode, 2014). As recorded in 2012, the maritime sector contribution to the GDP of India was 28.1%, China, 9.7%, Russia, 5.9%, Brazil, 2.8%, South Africa, 1.3% and Nigeria was 0.15% (Peretomode, 2014). The relationship between ports and local economies according to Jung, (2011) was examined in two distinct ways: traditional view is that ports accelerate economic development, while pessimistic group of scholars assert that port respond to demand through the physical transfer of freight flows that means economic growth generates demand for port development not the reverse. The two positions are not far from true deductions in development economics, from either ways, both tend towards achieving a singular economic goal. The desire for growth has a causal link to the development of ports, and subsequently, the operations in these ports would generate employment, revenue and social benefits for people and the state. It has been discovered that the location of ports affect both urban and port systems in Asia and in China, which means port-centered coastal areas precede inland cities in economic growth (De Langen and Heiji, 2014; Ducrut, 2003) just as location and localization of industries are catalyst to urbanization and economic growth.

The contributions of container port development to economic growth of Pearl River Delta region was the facilitation of foreign direct investments (FDIs) (Zhang and Zhang, 2005). Mode and type of operations of shipping firms and the use of target marketing strategy affect productive capacities (Mobalaji et al., 2012). Shipping is one of the constitutive operations in the ports. Its activities contribute to growth and development of maritime nations. Shipping being a source of cheap transport creates wider markets for distribution of goods and services and specialization. Accordingly, it means the transportation of cargo from one point to another on any stretch of water (Ekpo, 2012). The effect of port activities on local employment had been established to be encouraging. That is, every million tons of net port throughput would provide about 400–600 jobs in West European countries (Bottasso et al., 2013). In Bottasso et al. (2014), every 10% increase in port throughput would also generate 6–20% increase in the GDP of the region. Its spillover effect would cause 5–18% increase of employment on neighboring regions.

Benson and Adekemi (2018) agreed that operations at the port terminals under concession and liberalization will result to increased efficiency, performance and profitability of the port system. The provisions of superstructures, infrastructure and highly skilled professionals would lead to revenue growth and cargo throughput in the ports. Government agencies and terminal operators usually on concession grounds, stevedore companies, importers and exporters, warehouse operators, haulage companies, chandlers, freight forwarding, clearing and forwarding agents and maintenance companies have been identified as users and operators of ports across the world (Ndikom, 2006; Benson and Adekemi, 2018).

Also in the study of Benson and Adekemi (2018), the activities of private operators have improved the process of cargo handling and transhipment of goods over international waters and economic development of countries. Therefore, ports are the hub and node of networks for all kinds of water borne transport that link countries to others. These networks of roads promote trade and exchange of goods and services at the cheapest rate. More so, ports are a combination of infrastructures and facilities and services that quicken international trade, determine freight transport costs and provide access to global markets.
However, inefficient and ineffective port system and operations will cause poor state of economic performance (Osadume and Edih, 2020). This is the more reason to urgently address the challenges causing poor performance of ports in world.

2.3 Contributions of port operations to maritime transportation/economy of Nigeria

National archives showed that ports operations started in 1906 (Crown, 2017) when the Colonial government was in force. The Nigerian Marine was established in 1914 to oversee all ports, then mostly in Southern Nigeria. Port development creates diversified investment portfolios. Such investment opportunities include, but not limited to the following, dry docking, ship repairs and maintenance, coastal shipping services, terminal/jetty infrastructure, offshore construction and fabrication, etc (Elem, 2008). These investment portfolios are possibilities for generating employments for Nigerians.

In Nigeria, the maritime industry is manned by two sister agencies set up by the Federal government. They are the Nigeria Ports Authority (NPA) and Nigerian Maritime Administration and Safety Agency (NIMASA). It was the Nigerian Marine that metamorphosed into NPA in 1954. Its major function is to oversee the operations of the eight ports across the coastal area of the country. On the other hand, the NIMASA was formed in 2006 for the purpose of regulating the maritime industry in Nigeria. It is empowered by law to carry out nine key maritime services such as effective maritime safety administration, maritime labor administration, maritime labor regulations, maritime pollution prevention, control, search and rescue operations, cabotage enforcement, shipping development and registration, training and certification of seafarers and maritime capacity development (Peretomode, 2014).

It is on the basis of the maritime vision that the Nautical College of Nigeria, now Maritime Academy of Nigeria, was established in 1979 at Oron, Akwa Ibom State. In similar quest for manpower and capacity building for the maritime sector, the Federal government established the Nigeria Maritime University (NMU), Okerenkoko, Delta State in 2014 by Goodluck Ebele Jonathan administration. It has been established that 4,300 Nigerian Merchant Navy Officers and other 65,000 workers in marine services were trained at Maritime Academy of Nigeria, Oron. Also, discovered was that the Nigerian Shipping industry requires 50,000 seafarers to realize its optimal operating potentials (Peretomode, 2014). In that case, the formation of two institutions for manpower or capacity development for the maritime and related sectors of the economy is paramount to achieving the country’s maritime dream. It was mentioned by Hadiza (2017) that the maritime (ports) sector is a huge employer of human capital that has the potential of generating over 80,000 jobs annually. Also referred was that improved port infrastructures would stimulate revenue growth and general development. The status of registered dock labour employers (stevedore companies) which stood at 167 (NIMASA Register for Registered Stevedoring Companies) have the multiplier effect of creating enormous opportunities for Nigerians.

Omode et al. (2019) assert that gross-registered tonnage of vessels contributes significant proportion to Nigeria GDP. UNCTAD (2015) recognizes that, out of the 70% of goods coming to West and Central African regions, 80% is transported by sea to Nigeria. It is recorded that Nigeria accounts for 55% of total private sector investments in sub-sahara African ports at 1.3 bn US dollars (World Bank, 2008). Port operations had been seen as means of diversifying the Nigerian economy and stimulate import and export trade between countries (Lazarus, 2013; Balarabe, 2004 as cited in Peretomode, 2014). Total revenue to gross-registered tonnage has a positive and significant effect on economic growth, and there exists a positive relationship between ports activities and the economy (Osadume and Edih, 2020). In Ekpo (2012), shipping facilitates movement of oil and gas from point of production to point of need either locally or internationally. The study of Obed (2006) also affirms the relationship between shipping operations and economic growth which solidifies national interest.
2.4 Challenges to maritime transportation in Nigerian ports

Studies done on port operations (Ekpo, 2012; Omoke et al., 2019), port infrastructure and logistics performance (Benson and Adekemi, 2018) have identified common problems and challenges retarding the functionality of the Nigerian ports. The challenge of decline in the number of vessels calling at ports in Nigeria compared to neighboring countries is worrisome. In 2016, Nigeria experienced a reduction of calls by 2.72% compared to previous years. Equally identified was the issue of poor database for activities going on in the ports. Computerization of port operation data is poor. Other challenges such as port congestions, high container dwell time, high turnaround time of vessels and trucks, inadequate ports facilities (berths) affect operations in Nigerian ports (Omoke et al., 2019). It is experiential that shippers tend to call at ports with no or less congestion issue and up-to-date cargo handling equipment or standard port facilities. Lack of standard port facilities were seen as a misnomer that would result to inefficiency and poor logistics performance.

Ekpo (2012) also itemized factors that influence the Nigerian shipping industry to include, lack of capital, poor incentives for investors and poor integrated transport system. In addition, there are important development and changes in shipping worldwide which are impacting rather inhibiting performance of the Nigerian ports. Among these peculiar changes are technological innovations, liberalization policy, institutional changes and inadequate shipping management skills, knowledge and experience.

Benson and Adekemi (2018), referred to paucity of port infrastructure as major challenge to the smooth running of operations in the ports. Nigerian ports are suffering from inadequate superstructures, infrastructure and funding. Therefore, these ports are in dire need for structural reengineering and reforms. It was discovered that government is still interfering with the operations of the ports resulting to bureaucratic bottlenecks in the decision-making process and corruption usually associated with the public service. More so, international conventions, rules and regulations on port operations and system are not fully domesticated and abided by.

3. Materials and methods

The study adopted survey research design which involves the distribution of 90 sets of questionnaire to staff of the PLS, Port Harcourt Old Port and Warri Port. These ports were selected using a nonprobability sampling technique (convenience) in order to realize the purpose of the study. Data were analyzed using the nonparametric statistics, chi-square test.

3.1 Model specification

\[ \text{Chi} - \text{square} = X^2 \]

\[ X^2 = \frac{(O_i - E_i)}{E_i} \]

where

\[ O_i = \text{observed frequency} \]
\[ E_i = \text{expected frequency} \]
\[ X^2 = \text{value of random variables} \]

3.2 Testing of hypothesis

There is no positive and significant relationship between a functional port system and economic growth in Nigeria. Hypothesis would be tested at 5% (0.05) level of significance.
3.3 *A priori expectation*

The results from the analysis would show that global maritime transportation is largely dependent on optimal performance of ports. Thus, the need to put measures that would gear up a standard operation in the ports is paramount.

4. Data and analysis

4.1 Results

Table 1 (below) shows the response patterns of the participants to set of questions relating to the effect of functional port system on revenue generation to the economy. It further explains that 80% of the respondents agreed that there is positive relationship between functional port system and income generation. However, a negligible 5% of the participants held a contrary view.

Table 2 (below) also indicates the response pattern of the 85 respondents; out of which, 82.36% concurred that functional port operations create employment opportunities for the people. It is therefore inferred that the remaining 2.64% objected to it. This is an indication that there exists a positive correlation between standard port system and job creation.

Tables 3 and 4 (below) illustrate the combined analysis on data of Tables 1 and 2 to test the null hypothesis that states that there is no positive and significant relationship between functional ports system and maritime transportation/economic growth. Maritime

<table>
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<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Strongly agreed</td>
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<td>58.82</td>
</tr>
<tr>
<td>Agreed</td>
<td>30</td>
<td>35.29</td>
</tr>
<tr>
<td>Disagree</td>
<td>02</td>
<td>2.35</td>
</tr>
<tr>
<td>Strongly disagreed</td>
<td>03</td>
<td>3.53</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>100</td>
</tr>
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</table>

**Source(s):** Analysis from field survey, 2021

<table>
<thead>
<tr>
<th>Impact</th>
<th>Response</th>
<th>Percent</th>
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<tbody>
<tr>
<td>SA</td>
<td>55</td>
<td>64.71</td>
</tr>
<tr>
<td>A</td>
<td>15</td>
<td>17.65</td>
</tr>
<tr>
<td>D</td>
<td>10</td>
<td>11.76</td>
</tr>
<tr>
<td>SD</td>
<td>5</td>
<td>5.88</td>
</tr>
<tr>
<td>Total</td>
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<td>100</td>
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</table>

**Source(s):** Analysis from field survey, 2021

<table>
<thead>
<tr>
<th>Impact</th>
<th>Table 1</th>
<th>Table 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (SA/A)</td>
<td>80</td>
<td>70</td>
<td>150</td>
</tr>
<tr>
<td>No (SD/D)</td>
<td>5</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>85</td>
<td>170</td>
</tr>
</tbody>
</table>

**Source(s):** Analysis from field survey, 2021
transportation/Economic growth is proxy by revenue growth and creation of opportunities for employments. Decisions for accepting or rejecting the null hypothesis are based on the calculated value using the chi-square.

Expected frequency for Yes (SA/A)

\[ EFR_{1C1} = \frac{150 \times 85}{170} = 75.0 \]

Expected frequency for No (SD/D)

\[ EFR_{1C2} = \frac{20 \times 85}{170} = 10.0 \]

\[ X^2_C = \frac{(80 - 75.0)^2}{75.0} + \frac{(70 - 75.0)^2}{75.0} + \frac{(5 - 10.0)^2}{10.0} + \frac{(15 - 10)^2}{10.0} = 5.66 \]

Calculated chi-square \( (X^2_C) = 5.66 \).

Tabulated chi-square \( (X^2_T) = 3.84 \).

Level of significance = 5%

Degree of freedom = 1

4.2 Discussion of findings

It was observed from the above statistical analysis for Tables 3 and 4 that the calculated chi-square value \( (X^2_C) \) of 5.66 was greater than the tabulated chi-square \( (X^2_T) \) of 3.84 at 0.05 level of significance, and degree of freedom was one.

Since the calculated chi-square value is greater than the tabulated chi-square value, the null hypothesis was rejected while the alternate hypothesis was accepted. This implies that there exists a positive and significant relationship between a functional standard port system and maritime transportation/economic growth. There is therefore need to standardize the operations in the Nigerian ports so that they can function optimally.

These findings are in line with the studies carried out by Omoke et al. (2019), Benson and Adekemi (2018), Jung (2011) and Zhang and Zhang (2005). These studies affirm that operations (shipping, private terminal operators and others) affect the gross domestic product of an economy. Similarly, improved ports infrastructure affects logistics performance (Ziaul and Hans-Joachim, 2018). However, nonfunctional, ineffective and inefficient port operations may lead to economic waste and declining results in revenues (Osadume and Edih, 2020; Deng et al., 2013). This is a justification for studying the effect of optimal operations in the ports to ascertain the state of affairs and proffer measures that would lead to better performance.

4.3 Policy implications

This study is an eye opener to the infrastructural dearth and terminal’s decay existing in Nigerian ports. It has also revealed the teething challenges that are hampering optimal ports operation in Nigeria. Therefore, the following implications have to be addressed by government;

<table>
<thead>
<tr>
<th>Impact</th>
<th>Table 1</th>
<th>Table 2</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Yes (SA/A)</td>
<td>80(75.0)</td>
<td>70(75.0)</td>
<td>150</td>
</tr>
<tr>
<td>No (SD/D)</td>
<td>5(10.0)</td>
<td>15(10.0)</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>85</td>
<td>170</td>
</tr>
</tbody>
</table>

Table 4. Expected frequency

Source(s): Analysis from field survey, 2021
(1) The more the infrastructural dearth in the ports is unattended to, the more the problem of port congestion, resulting to demurrage that may scare away operators (importers and exporters).

(2) If port operations are not separated from the usual politicking, these identified problems limiting efficient operations will persist and frustrate creativity and innovations.

(3) If the legal framework regulating operations and economic relationships in the ports are not amenable to global dynamics in maritime affairs, Nigerians would miss several opportunities because of stringent tax policy (import and export duties) and other obnoxious laws.

(4) Consequently, there will be loss of jobs and huge revenues as a result of diversion of port operation by operators to others ports in sister countries, which provide better services at lower cost. This will reduce revenue (GDP) and compound the menace of unemployment and associated vices.

5. Conclusion
This study examined the effect of optimal port operations on global maritime transportation among the selected ports in Nigeria, and the following situations were observed:

(1) A functional port system affects the GDP of a maritime nation. This finding is in line with the literature review.

(2) The establishment of eight major ports and ancillary jetties/terminals are indications that ports in Nigeria are functioning and boosters to maritime transportation. More so, the formation of two sister agencies (NPA and NIMASA) to oversee and regulate the affairs of maritime industry is a stronger indication of a functioning port system in the country.

(3) The Federal government also established two maritime institutions (Maritime Academy, Oron and NMU, Okerenkoko) to train manpower and enhance capacity building for the maritime industry.

(4) The established ports, terminals and jetties and concessionary arrangements with private terminal operators have helped in diversifying the Nigerian economy and created investment portfolios as well as employment opportunities for employable youths.

(5) However, factors such as lack of capital/funding, deficit in port infrastructure, ports congestion, paucity of skilled manpower, political interference, technical and institutional innovations among others were observed as limiting the smooth running of operations in the Nigerian ports.

(6) It thus implies that ports in Nigeria are not operating at their full capacities (optimality). There is therefore an urgent need to remedy these challenges.

The implementation of the following recommendations by policymakers would bring the Nigerian ports to an enviable standard port status above minimum benchmark across maritime nations of the world.

(1) It is therefore recommended that there should be a stronger collaboration between government and the private sector under public private arrangement to raise adequate capital for port development in Nigeria.
(2) The fund/capital raised should be channeled into building specific and required port infrastructures such as road and rail, increase security networks, more terminals and jetties, increased quay and draught length, office for maritime workers and other super structures.

(3) Collaboration should also be sought through public private partnership in implementing modern strategies and adopting global best practices, innovations in technologies to enhance the functionality, and transparency and efficiency of operations in the ports.

(4) The two-sister maritime institutions established by the Federal government, the Maritime Academy, Oron and NMU, Okerenkoko should be adequately funded to enhance infrastructure and conducive environment for learning, research and training as well as equipped with the requisite professionals that would in turn train the manpower for the maritime and related sectors. Their current state, especially NMU is far below the global benchmark of a training institute in the maritime industry.

(5) The laws (Cabotage Act, Merchant Shipping Act, NPA Act, NIMASA Act, etc) regulating the Nigeria Maritime sector should be revised and where required, amended to accommodate and domesticate international conventions, rules and regulations on maritime trade.


**About the authors**

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