

Ship Operations and Operational Performance of Nigerian Port Authority in Nigeria

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Abstract

The study examined the empirical relationship between ship operations and operational performance in the Nigerian Port Authority. The study adopted ship operation as its independent variable while operational performance served as dependent variable while utilizing efficiency and productivity as its measures. The study cross-sectional survey design; its population covers 36 top management staff of the ports under study which was also adopted as sample size. Quantitative data were generated from the respondents by the use of a well-structured questionnaire. The Cronbach Alpha value scale threshold of 0.7 was exceeded, which provided the reliability of the scales used in the study while supervisors guide and approval and personal validation ensured the validity of the instrument. Statistical analysis was carried out at three levels, descriptive statistics and charts were done at the primary level. Pearson's Product Moment Correlation was used at the secondary level and the multiple regressions at the tertiary level were carried out with the aid of statistical packages for social science (SPSS) version 23.0. However, the findings show that significant and positive relationships exist between ship operations and operational performance in the Nigerian Port Authority. Thus, it concludes that with sustained ship operational effectiveness, general operational performance of Nigerian Port Authority will be elusive. Hence, it was recommended that Nigerian Port Authority should focus their attention on effective operation and management of their ships to achieve operational performance.

Keywords: *Ship Operations, Efficiency, Productivity, Nigerian Port Authority*

Introduction

Terminal operations are very integral part of any nation's economy as it has both direct and multiplier effects on the transportation, economic, safety, security, manufacturing, construction, education among other sectors. These benefits have over the years, become more attractive due to the global economic crisis, energy shortages, and on-going environmental concerns (reducing the carbon and sulfur dioxide emissions). However, maritime transportation is considered a complex dynamic system because of the high level of international, national, organizational interactions and communication networks which generates a complex business environment (Celik, 2009). In Nigeria, port terminal operation is an essential organ of its transportation system. It is also recognized as an entry point for goods coming into a country from other countries. In other words, it is a place where intermodal transfer of passengers and cargoes takes place (Ugboma, Ibe and Ogwude, 2004). It is a place of transfer between land and sea transport. In the context maritime, a terminal is a knot where ocean and inland transport lines meet and intertwine has the functions of providing resting place for ships as well as the provision of facilities and equipment for safe transfer of passengers and cargoes from ocean to land transports and vice versa.

Container ports and terminals form an essential component of the modern economy. The most common mode of transport in international trade is sea transport; this is in view of the large amount of cargo that is transported on sea. There are more than 2000 sea ports around the world, from the ones with a single berth location handling a few hundred tons of cargo annually to huge facilities handling about 300 million tons of cargo a year. More than 80 percent of trade with origins or destinations in tonnage is water-borne (Ugboma, Ibe and Ogwude, 2004). Ports are emerging more and more into service providers in the execution of trade and the movement of cargoes. This is aimed at enhancing the trade environment and making optimum use of port's facility. Smooth flow of maritime cargo not only

contributes to greater development of world trade but also seeks to raise the standard of living of the people in whose domains these ports are located. Maritime freight cost has been observed to be decreasing in recent years; however, the bulk of maritime freight cost still remains relatively high in developing countries.

The port terminal operation as gateway to the nation in the transaction of trade with the outside world has been given little attention in Nigeria and this negligence has adversely affected operational performance of marine terminals ranging from inefficiency to poor productivity. The inefficiencies in the Nigerian sea ports culminates to other problems such as congestion, excessive high cost payable by shippers and shipping companies which have caused many cargoes to be diverted to neighboring countries' port, causing the nation to lose huge revenue (Ugboma, Ibe and Ogwude, 2004). In spite of the crucial role the maritime sector plays in the country's economy which handles about 80% of the country's inward and outward cargo, the Nigerian marine terminals are rated among the least terminals in the West African region especially in terms of efficiency and productivity.

Amid this circumstance, to the best of our knowledge we have not come across any empirical study that specifically examined the association between ship operation and operational performance in the Nigerian Ports Authority. Although other related studies exist and some these studies may include Anyadiegwu (2014) who examined the impact of reforms on port performance in Nigeria. Also, Bichou and Gray (2004) carried out a study on logistics and supply chain management approach to port performance measurement, while Tongzon (1995) examined the determinants of port performance and efficiency. The forgoing empirical gap empowers that achieving excellent performance in port terminal operations through efficiency and productivity require establishment of competent systems integrated with advance technologies and reliable scientific models. Therefore, this study empirically examined the relationship between Port terminal operations management on operational performance in the Nigerian Ports Authority, Nigeria.

The maritime industry occupies a very prominent place in the economy of nations all over the world. Wang and Meng (2012) state that the maritime industry embraces all the maritime related business activities which takes place within the country's maritime environment cutting across offshore economic activities, such as fishing, salvage, towage, underwater resources and on-shore economic activities such as port activities, maritime transport (shipping), ship construction, repairs and maintenance activities. Pantuso, Fagerholt and Hvattum (2014) notes that one of the objectives of port terminal operation is to enable useful outcomes towards the enhancement of ship fleet management within the country. Unfortunately, there are records of poor maritime operation across Nigerian terminals, while some of these problems can be associated with indolence on the part of government to put necessary plans and actions in place. There are also, problems of poor cargo handling and ship operation all of which result to failure in terms of inefficiency and low productivity. One of the major reasons for poor performance regardless of any industry is the absence of too many researches to guide firms' decisions.

Statement of the Problem

The maritime industry occupies a very prominent place in the economy of nations all over the world. Wang and Meng (2012) state that the maritime industry embraces all the maritime related business activities which takes place within the country's maritime environment cutting across offshore economic activities, such as fishing, salvage, towage, underwater resources and on-shore economic activities such as port activities, maritime transport (shipping), ship construction, repairs and maintenance activities. Pantuso, Fagerholt and Hvattum (2014) notes that one of the objectives of port terminal operation is to enable useful outcomes towards the enhancement of ship fleet management within the country. Unfortunately, there are records of poor maritime operation across Nigerian terminals, while some of these problems can be associated with indolence on the part of government to put necessary plans and actions in place. There are also, problems of poor cargo

handling and ship operation all of which result to failure in terms of inefficiency and low productivity. One of the major reasons for poor performance regardless of any industry is the absence of too many researches to guide firms' decisions.

Purpose of the Study

The purpose of this study was to investigate the empirical relationship between ship operations and operational performance in the Nigerian Ports Authority. The objectives sought were to:

- i. Determine the extent of relationship between ship operations and efficiency in the Nigerian Ports Authority
- ii. Determine the extent of relationship between ship operation and productivity in the Nigerian Ports Authority.

Research Questions

The study was guided by the following research questions:

- i. To what extent does ship operations relate with efficiency in the Nigerian Ports Authority?
- ii. To what extent does ship operations relate with productivity in the Nigerian Ports Authority?

Research Hypotheses

The following tentative null hypotheses were formulated for the study

Ho1: There is no significant relationship between ship operation and efficiency in the Nigerian Ports Authority.

Ho2: There is no significant relationship between ship operation and productivity in the Nigerian Ports Authority.

Theoretical foundations

The contingency theory holds that circumstances play a critical role in determining the best possible response (Cochrane, 2008). Consequently, there is not good fit for all situations as other theories of management may tend to suggest. Each organization has unique circumstances and management has to tailor decision making to create best fits that address contextual issues. There are no predetermined notions that every organizations can fit into and there are no universal approaches that deliver results for every organization (Donaldson, 2001), in Cochrane (2008). All organizations have to attempt to uniquely respond to their circumstances and create a good fit for the emergent circumstances. When applied to the maritime transportation function, these theories lead to appreciation that the ports terminal environments are very different and unique. There are no models that are universal and can enable any organization that applies them to achieve operations outcomes ((Cochrane, 2008). While one approach works in one context or organization, the same approach would lead to failure when applied to other organizations. These are important considerations when it comes to adoption of terminal operations options and actual maritime transportation practices in organizations. Port terminal operations have to be appreciated from the terminal operations environment to fit the organizations unique circumstances thus stimulating optimal performance.

Conceptual Review Shipping Operations

Shipping is regarded as one of, if not the most economical method of transportation of goods. Seaborne business activities constitute about 90% of the total world trade and shipping critical and pivotal as it ensures the continuity of trade per schedule with less delays or loss to cargo, life or environment. About three-fourth of the entire earth is covered by water and there is long distance between countries with raw materials and industrialized countries (Christiansen and Fagerholt, 2014). The need for economic activities between countries has led to the development of ships for carrying oil and other raw materials so as to keep the transportation costs low. Further modern container ships carry large number of containers with finished goods to places where they are in demand. Shipping while diminished due to the slow speed of the ships, a new type of cruise shipping is fast developing in a big way where large ships with all modern amenities provide excellent holidays to interested people. Since not much is known about the shipping industry to outside world a brief perspective of maritime industry and ship operation is presented in this study.

According to Christiansen, Fagerholt, Nygreen and Ronen (2013), a ship is a complicated floating place with extensive equipment and has a competent crew on board. The crew is well trained and certified as necessary. Ship operation is an integral part of the maritime industry. With a large coastline, shipping is also very important for Nigeria. While the ship owning and operating activities have yet to be in a very large scale, the Nigerian shipping activities have made a name in the global maritime industry. Following a report by the Royal Haskoning on Nigerian seaports reform in 2001, It can be said that ship operation in Nigeria has got critical reforms. By virtue of the go-ahead of the Federal Government, the BPE organized four workshops in all the port cities of Nigeria and a national workshop in Lagos to sensitize the nation to the expected sea change in the way shipping in Nigeria was to be modified. Ship operations include loading and discharging of the ship, navigating it from one port to other, running and operating different machineries which may be fitted on the ship, taking care of the ship, cargo, people and marine environment while the ship is in operations. The ship also has different machineries on board which may include main propulsion engine, electrical power generation and distribution system, steam generation, fresh water generation system, sewage treatment plant and many other associated systems and machineries (Christiansen, et al and Ronen, 2013). Basically, the entire crew of a ship can be divided in following categories:

Nautical officers: Officers responsible for the navigation of the vessel, communications and care, and handling of ships. This includes loading, discharging and correct storage. The most senior nautical officer is also the master of the vessel i.e. captain of the ship. Engineering Officers: These are marine engineers and are responsible for operations and maintenance of complete machineries and systems of the ship and finally, Ratings: These are the non-officer grade employees who may be both in the nautical side (also referred as deck side) or engineering side. Besides these, the ship also has ratings as cooks and stewards.

Operational Performance

Understanding and determining exactly what is meant by the word ‘performance’ is a critical issue for business environment. According to Lin (2009), success means well-being gained from the deployment and effective management of the components of a causal model(s) that leads to the timely attainment of stated objectives within constraints specific to the firm and to the situation (cited in Valentine and Gray, 2009). The concept of performance concerns itself with what happened in the past or what is happening in the present instance and therefore it is observable and measurable. Hon (2005) views performance as that which includes inputs, outputs, intermediate outcomes, end outcomes, net impacts and unintended outcomes (cited in Valentine and Gray, 2009). Performance may relate to economy, efficiency, effectiveness, productivity or equity (Folan et al., 2007 in Valentine and Gray, 2009). Operational performance is a relatively new concept in transportation and logistics management with multiple dimensions and definition. The phenomenon is applied in different contexts and are classified into two basic dimensions (profit and non-profit). For any organization to remain competitive, it needs to recognize the central role of measuring achievement thus performance measurement capability is very crucial for organizations’ achievement compared to lower performing firms (Forslund, 2007). However, it has become a challenge

for most organizations to measure their performance (Valentine and Gray, 2009), the reason being that they relate to multiple service metrics such as lead times and on time delivery which are well related to one another. Having formal means of measuring performance is important in order to achieve competitive advantage in future (Harrison and New, 2002, adopted in Lin, 2009).

Research on how organizations use performance measurement to manage relationships with vendors is rather rare (Schmitz and Platz, 2004). Forslund (2007) contend that there is need for expanding logistics performance measurements. Forslund went further to say that measurement of these metrics has no value by itself but rather what is important is to improve customer service in the direction of customer expectations. In order to assess the impact of port terminal operations on operational performance, a number of activities preceding measurement maritime transportation are necessary. All aspects of performance measurement need to start with definition of performance metrics, measurement procedure, analysis, comprehensive evaluation and finally the improvement process (Tian et al 2003, adopted in Lin, 2009). Gunasekaran et al (2004) presents a number of characteristics of effective performance measurement systems that can be used in evaluation of these measurement systems. These characteristics include: inclusiveness (measurement of all pertinent aspects), universality (allow for comparison under various operating conditions), measurability (data required are measurable), and consistency (measures consistent with organization goals) (adopted in Lin, 2009). Besides analyzing the measures based on their effectiveness, benchmarking is another important method that is used in performance measurement evaluation. Benchmarking can also serve as a means of identifying improvement opportunities. Researchers have categorized a large number of performance measures available. Neely et al. (1995) presents a few of these categories namely quality, time, flexibility and cost (cited in Lin, 2009). This categorization is a useful tool if one is to develop a model to improve one characteristic of a system, for example, time. The model may then compare manufacturing lead time or due-date performance by changing the system's configuration.

Efficiency

Shipping lines have always pursued high efficiency in ship operation to strengthen their competitiveness and maximize profit in competitive markets. To achieve this goal, during the last couple of decades, shipping lines have focused on the improvement of operational productivity to maximize transport capability with minimizing input assets using various operational strategies (Tongzon, 2001). These strategies have enabled shipping lines to not only minimize operating costs with less financial risks but also raise the quality of service. In recent times, a strategic goal in terms of efficiency of ship operation has been changed in liner shipping. Under the intensive pressure of high fuel prices and low freight rates, shipping lines are focusing on more efficient ship operation. Efficiency is defined as the relative production capacity over a given time period either within a firm or amongst firms (Wang et al. 2006). Efficiency involves measuring the use of the firm's own production potential by computing the productivity level over time relative to a firm-specific Production Frontier, which refers to the set of maximum outputs given the different level of inputs. Efficiency measures the performance of a particular firm relative to its best counterpart (s) available in the industry (Lansink *et al.*2001).. The importance of analyzing operational performance at the port has increased as a result of the intense competition among ports, increase in containerization, supply chains and the development of new production distribution-consumption systems as well as fluctuation in the shipping market.

Productivity

According to Valentine and Gray (2002), understanding port performance is an essential concept in any port management, blithe measurement of port productivity against utilization and output, or against port competition. Chung (2005) opined that, the operational performance of a port is generally measured in terms of speed with which a vessel is dispatched, the rate at which cargo is handled and the duration that cargo stays in port prior to ship mentor post discharge, which is summed up

in productivity. To better understand productivity, we start off from defining production as a process by which inputs are combined, transformed and turned into outputs (Case and Fair, 1999). We most often find that these inputs are normally natural resources such as land, human resources, and equipment's. Outputs on the other hand are categorized into more tangible products like goods and also intangible products like services (Wang *et al.*2002). Productivity and efficiency are the two most important concepts relevant in measuring performance have over the years been mistakenly treated as having the same meaning in most of the literature available on this topic (Wang *et al.* 2002). Productivity is easily described as the ratio of output(s) to input(s). When however, there are multiple variables to be compared, this definition may not be suitable.

Shipping Operations and Operational Performance

Moon and Woo (2014) analyzed the impact of port operations on efficient ship operations. The study conceptualized port management with ship operation, equipment infrastructure planning and cargo handling equipment. It employed the questionnaire and personal interview to generate its data. The study used Pearson's product moment correlation to measure the level of impact of port operations on efficient ship operations; it found that there is a strong relationship between of ship operation dimension of the study and efficient ship operations. Clark *et al* (2001) carried out a study on maritime transport costs and port efficiency. The study employed the questionnaire and personal interview to generate its data. The study used Pearson's product moment correlation to measure the level of relationship between maritime transport costs and port efficiency; it found that there is a moderate and significant relationship between ship operation costs and port efficiency. The study concluded that ability of a ship to function economically depends among other factors, the availability of a good functional port.

Valentine and Gray (2001) applied the DEA-CCR model to 31 container ports out of the world's top 100 container ports for 1998 to determine if there exists any relationship between ship management and organizational structure. The authors conclude that clusters and synergies analysis is a viable tool for identifying organizational structures and that the ports sector exhibits three structural forms that seem to have a relationship to estimated levels of efficiency. Wang and Meng (2012) examined the operations of the liner ship fleet deployment and container transshipment operations. The study concluded that container transshipment operations performance is heavily dependent on port terminal efficiency. Lam and Notteboom (2014) investigated the port management tools that are used by leading ports in Asia and Europe. The study divided port management into ship operation, port dredging and cargo handling. Questionnaire was used to generate the study data and regression analysis was employed in testing the study hypotheses. The study found that ship operation dimension has a very strong and positive relationship with performance of leading ports in Asia and Europe.

Methodology

Research design refers to the structuring of investigation that is aimed at observing variables and their relationship to one another. It serves as a meaningful guide to the researcher in his attempt to gather data for his study. According to Avwokeno (2007), a research design is a plan, structure or strategy for investigation, a strategy for answering research questions and control variances. This study adopted the cross-sectional survey research design. This was because, the study gathered data over a period of time. The population of the study is made up of 36 senior officers of the six organization examined. However, in terms of the study sample size, we adopted the population figure as its sample size based on its accessibility. Questionnaire was used as our data collection tool. Data analysis was carried out using Pearson Product Moment Correlation with the help of the statistical package for social sciences (SPSS), version 23.0.

Data Analysis

Ho₁: There is no significant relationship between ship operation and efficiency in the Nigerian Ports Authority.

Table 1: Showing the Extent of Relationship between Ship Operation and Efficiency

		Ship Operation	Efficiency
Ship Operation	Pearson Correlation	1	.620**
	Sig. (2-tailed)		.000
	N	36	36
Efficiency	Pearson Correlation	.620**	1
	Sig. (2-tailed)	.000	
	N	36	36

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

Table 1 shows a correlational coefficient of 0.620; indicating that there is a strong, positive relationship between ship operation and efficiency. Again, the probability value is less than the critical value (i.e., 0.000 < 0.05), which means that there is a strong significant relationship between ship operation and efficiency of Nigerian port authority. This further indicates that some of the changes in the dependent variable (efficiency) are attributable to the independent variable (ship operation), while other changes are caused by externalities. We therefore, reject the null hypothesis that there is no significant relationship between ship operation and efficiency in the Nigerian Ports Authority and accept an alternate hypothesis, that there is a strong significant relationship between ship operation and efficiency in the Nigerian Ports Authority.

Ho₂: There is no significant relationship operation and productivity in the Nigerian Port Authority

Table 2 : Showing the Extent of Relationship between Ship Operation and Productivity

		Ship Operation	Productivity
Ship Operation	Pearson Correlation	1	.683**
	Sig. (2-tailed)		.000
	N	36	36
Productivity	Pearson Correlation	.683**	1
	Sig. (2-tailed)	.000	
	N	36	36

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

The result on Table 2 depicts a correlational coefficient of 0.683 and this indicates that there is a strong, positive relationship between ship operation and productivity. Again, the probability value is less than the critical value (i.e., $0.000 < 0.05$), which means that there is a strong significant relationship between ship operation and productivity of Nigerian port authority. The study further indicates that some of the changes in the dependent variable (productivity) are attributable to the independent variable (ship operation), while other changes are caused by externalities. We therefore, reject the null hypothesis that there is no significant relationship between ship operation and productivity in the Nigerian Ports Authority and accept an alternate hypothesis, that there is a strong significant relationship between ship operation and productivity in the Nigerian Ports Authority.

Discussion of Findings

The findings of this study are in line with the findings of other similar studies earlier conducted in different contexts. Practically speaking, the findings confirm with the findings of Moon and Woo (2014) who analyzed the impact of port operations on efficient ship operations. The study conceptualized port management with ship operation, equipment infrastructure planning and cargo handling equipment. It employed the questionnaire and personal interview to generate its data. The study used Pearson's product moment correlation to measure the level of impact of port operations on efficient ship operations; it found that there is a strong relationship between ship operation dimension of the study and efficient ship operations. Also, the study corroborates with Clark et al. (2001) on maritime transport costs and port efficiency. The study employed the questionnaire and personal interview to generate its data. The study used Pearson's product moment correlation to measure the level of relationship between maritime transport costs and port efficiency; it found that there is a moderate and significant relationship between ship operation costs and port efficiency, the study also agrees with Lam and Notteboom (2014) port management tools that are used by leading ports in Asia and Europe.

Conclusion and Recommendations

Sequel to the findings of this study, we conclude that significant and positive relationships exist between ship operations and operational performance in the Nigerian Port Authority. It also concludes that with sustained ship operational effectiveness, general operational performance of Nigerian Port Authority will be elusive. Hence, it was recommended that Nigerian Port Authority should focus their attention on effective operation and management of their ships to achieve operational performance.

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