

Factors of Ports Efficiency and Performance in Nigeria: A Case Study of the Ro-Ro Port in Lagos

DUNYA, Thlawur*

OMOTOSO, Olaoluwa Olusegun

*Department of General Studies, School of Maritime Transport,
Maritime Academy of Nigeria, Oron, Akwa Ibom State, Nigeria.*

**E-mail: dunyathlawur@gmail.com*

ABSTRACT

The paper attempts to descriptively survey the factors influencing port efficiency and performance in Nigeria: a case study of the RO-RO Port Lagos. Both primary and secondary data were collected and analysed. A Fifteen item structured questionnaire for experts' opinions on the nature of the relationship and the RO-RO port annual report (1996 to 2002) provided the data. The Statistical Package of Social Sciences (SPSS) was used to investigate the strength and direction of the relationship. The results show that the Nigeria Ports are experiencing ship diversion due to excessive ship delays. Evidence also abounds that the delay in shipping is due to the activities of regulatory bodies and internal port factors. It recommends that government should review and control the excesses of regulatory bodies operating in the ports. The Nigeria Port Authority should monitor and control ship turn-round time and provide adequate port facilities and services. It will improve the efficiency and performance of the port, which in turn will attract ships and shippers to the port.

Key Words: *Port, performance, indicators, economy, turnaround time, ship.*

1. INTRODUCTION

A port is a gateway for goods and passengers, a haven for ships, and a link in the transport chain between Inland and seaport (Emma, 1998). It provides a strategic role in national economic development. A port is nothing but a place for docking, traffic, and storage of boats for goods and people. Man developed ports to facilitate trading and movement of cargo from one country to another. According to Dayananda and Dwarakish (2018), it provides a variety of service activities and inland transport for vessels and cargo. The degree of satisfaction obtained by

the shippers will indicate the level of port performance achieved. The port is the gateway to the Nigerian economy and offers very satisfactory services to the vessel operators. It requires measures that relate to vessels' stay at port (Dayananda and Dwarakish, 2018). Once the port is not functioning efficiently, the ship services are ineffective; the entire transport system is paralysed; movement and safety of passengers are affected; the prices of imported goods go up. As a haven for ships, ports play a role in shipping activities. Since ship services depend on the ship owners or shippers' cost and the time it takes, ship time in the port is a factor.

Ship turnaround time is a vital indicator of port efficiency and competitiveness. High ship turnaround time indicates inefficiency and ship diversion to neighbouring ports. According to Maduka (2002), high ship turnaround time discourages ship owners and shippers from bringing their ships and cargoes to the port to avoid undue expenses. Again, it makes imported goods scarce and their prices high. It brings about the phenomenon called port preference among shippers and ship owners. Ports compete for increased patronage. Stopfford (n.d.) observed intense competition between ports to attract cargo by offering advanced cargo handling facilities. Port management formulates a "port development policy based on sound transport study" to compete favourably (Ekwomadu, 2001). The transport study considers all the variables that affect port efficiency and performance.

Port efficiency is a multi-dimensional concept that refers to operational performance, particularly the maximization of the produced output or the production with limited possible resources (Pallis and Rodrigue, 2020). It has expanded to include additional dimensions of port performance. The survey of some port performance enablers intends to evaluate the factors of ship turn-round time in the Nigerian Port, taking Ro-Ro Port as a case study. Ship Turnaround Time (STRT) is the port efficiency indicator or the dependent variable. Factors such as Ship Traffic (ST), Cargo Throughput (CT), Berth Occupancy Rate (BOR), and Ship Service Time (SST) are the enablers. These enablers also include ship Waiting Time (SWT) and Availability Rate (AR) of cargo handling

gears are independent variables or predictors of ship turnaround time. The purpose of such evaluation is to establish a port efficiency or performance model.

Questions raised to operationalize the variables under investigation as an empirical study are as follows:

- i. Is Nigerian Port experiencing ship diversion?
- ii. Is ship turnaround time a cause of ship diversion to neighbouring ports?
- iii. What is the effect of ship diversion on port revenue and the Nigerian economy?
- iv. What are the direct (port) and indirect (non-port) factors of port efficiency and performance?
- v. Is there a significant relationship between Ship Traffic (ST), Cargo Throughput (CT), Berth Occupancy Rate (BOR), Ship Service Time (SST), Waiting Time (WT), and Available Rate (AR) of cargo handling gears and ship turnaround time in the Nigerian Port?

Two issues in this study are port efficiency and its model. The first is port efficiency indicators or enablers. In other words, this implies the factors that influence port performance, productivity, or efficiency. In this study, the ship turnaround time of vessels in the case study was the efficiency indicator. What then are the factors influencing ship turnaround time? Literature on port management, planning, and shipping reveals several such factors. One of such is the lack of planning for ship traffic and poor port facilities. Emma (1998) and Ekwomadu (2001) agreed that lack of planning for ship traffic and poor facilities results in excessive ship delay. Poor facilities are inadequate, out-dated, or inefficient port facilities, for example, cargo handling and facilities. The situation is worse when these two happen to a port. When ship arrival increases and facilities remain the same or availability decreases, the result is prolonged and unbearable ship delay. The consequence is ship diversion to neighbouring ports. Maduka (2002) states that a shortage of berthing or anchorage facilities and delays in customs procedures also result in ship delays. It shows that even the activities of regulatory bodies operating in the port, for example, the Customs, the NAFDAC (National Agency for Food and Drug Administration and Control), and the SON (Standard Organisation of Nigeria), affect ship turnaround time. The

unfortunate thing is that these regulatory bodies are not under the direct control of the port authority. It makes the port efficiency more complex. Stopfford (Nd) and Emma (1998) agree that Cargo Throughput and Cargo Handling facilities affect ship turnaround time. An increase in cargo is always a welcome event at the port, but if there are inadequate modern gears to handle them in time, it results in delay. Ship owners and shippers are often discouraged by the results to shipping diversion. The ports should stand against such competition and provide adequate modern equipment and quality port services.

Other factors affecting ship turnaround time are the clearing and forwarding system. Emma (1998) observes that an inefficient clearing and forwarding system, ship waiting time, labour performance, and berth occupancy rate influences ship turnaround time and port productivity. Several issues are notable here. Ship waiting time refers to the time ship spends from arrival to the time it is allocated to a berth that is a kind of queue. The actual time (service time) taken to service the ship is a factor considered the purposeful time.

Connections to the hinterland and efficiency of the hinterland transport system are noted as factors influencing ship turnaround time in port. Inyang and Oladejo (1995), Rabi (2003) and Marcet (2005) agree that connection to the hinterland and efficiency of the hinterland transport system affects port efficiency. Several variables influence ship turnaround time. The problem (Managerial) before the port authority is how to balance providing adequate facilities and the cost of losing ships to neighbouring ports due to ship diversion and port preference. Delay will set in if these variables are not taken care of; the consequence is a diversion. On the other hand, if facilities are excess, redundancy will ensue; the result is redundant port facilities. There is a need for objective planning based on a sound analysis of the contributory factors and building a port efficiency forecasting model to operate optimally.

Jaffat, Berry and Ridley (2005) cited in Marcet and Brebbia (2005) applied percentage and time series to study the factors influencing port efficiency and monitoring of port performance. Frater *et al.* (1961) indicate that the pattern of ship arrivals was used to model Ports; the reason is that such methods allow

planners to estimate the demand for a berth at ports Inyang and Oladejo (1995). According to Inyang and Oladejo (1995), multiple linear regression analyses incorporate numerous variables. Similarly, Gonzalez and Trujillo (2009) suggest the need to understand the Port sector through systematic economic efficiency and productivity. They deem it fit to survey some variables influencing ship turnaround time and apply them in building multiple linear models using the data obtained from the RO-RO Port from 1996 to 2002. The focus of this paper is to establish the basis of such a model using descriptive statistics.

2. METHOD

The design adopted for this study is the survey. The survey is adopted because it is effective in describing opinions. Data on port performance indicators are from RO-RO Port Annual Report (1996 to 2002). The data on the ship turnaround time and predictor variables are ship traffic, cargo throughput, and others.

The instrument for data collection was a fifteen-item structured questionnaire that elicits the opinions of the experts in the port. Altogether, 25 copies of the questionnaire were administered to a cross-section of randomly selected maritime professionals. Twenty (20) copies of the questionnaire were completed and returned for analysis. Minor anomalies were detected, for example, no response to some sub-items; such cases were no-response (NR) in the tables. Some experts in the industry validated the instrument by thorough vetting and correction. Competent Port Statisticians prepared the RO-RO Port Reports. The professionals who responded to the instrument represented as 20% of respondents were from the engine department, 20% from the deck, and 60% were other professionals in the industry, for example, port management staff and lecturers of Maritime courses. The respondents can be relied upon, as they are all aware of the technical nature of the relationships under consideration.

The statistical techniques for the data analysis include the simple percentage and Pearson's Product Moment Correlation. Other statistical tools used include the t-test and R². The correlation coefficients were from the Statistical Package of Social Sciences outputs. In addition, the data obey normal distribution. The data

on the general information are in Section A of the questionnaire. The data obtained from Section B relate to the variables under study. The data obtained from the case study were analysed using the SPSS.

3. RESULTS AND DISCUSSION

3.1 Ship Diversion And Ship Turnaround Time

The questions under consideration here are: Is there any ship diversion in the Nigerian port? Is this related to ship turnaround time? The responses are shown in the following two tables.

Table 1: Ship Diversion

Responses	SA	A	D	SD	Total
Number	10	7	2	1	20
%	50	35	10	5	100

Source: Survey, 2020

Table 1 reveals that an aggregate of 85% of the respondents agreed that the Nigerian Port was experiencing the problem of ship diversion during the study, while 15% disagreed. This 15% difference may be because ship diversion is relative. Ships still berth at the Nigerian port, but that is not exactly the number that would have berthed if the ports were as efficient as they should. The difference in opinion is therefore significant. We are experiencing ship diversion to neighbouring ports.

Table 2: Ship turnaround time

Responses	SA	A	D	SD	Total
Number	4	10	6	0	20
%	20	50	30	0	100

Source: Survey, 2020

Table 2 shows responses to the questions on the possible cause of ship diversion. A total of 70% of the respondents agreed that the observed ship diversion is due to excessive ship delay or ship turnaround time. Having established that ship

turnaround time causes ship diversion, we need to ask; what is the effect of ship diversion on the port and national economy at large? Table 3 shows the responses to the questions on the effect of ship diversion on port revenue.

Table 3: Effects of Ship Diversion on Port Revenue

Responses	SA	A	D	SD	Total
Number	15	4	1	0	20
Percentage	75	20	5	0	100

Source: Survey, 2020

Table 3 reveals that 95% of the respondents agreed that ship diversion reduced port revenues. It is in agreement that ship diversion affects other factors, such as cargo traffic, as seen in Tables 4 and 5 on the effects of ship traffic and cargo throughput on port revenue.

Table 4: Effects of ship traffic on port revenue

Responses	Number	Percentage	Yes Increase	Yes Decrease
YES	15	75	11(73.3%)	4(26.7%)
NO	3	15	0	0
Total	18	90	0	0
NR	2	10	1(6.7%)	

Source: Survey, 2020

Table 4 shows 75% of respondents agreed that ship traffic affects port revenues. In addition, the direct effect was positive since 73.3% of those who agreed confirmed that an increase in ship traffic increased port revenue.

Table 5: Effect of Cargo Throughput on Revenue

Responses	Number	Percentage	Yes Increase	Yes Decrease
YES	17	85	15(88.2%)	2(11.8%)
NO	2	10	0	0
Total	19	95	0	0
NR	1	5	1(5.9)	

Source: Survey, 2020

Table 5 shows that Cargo Throughput harms port revenue more than ship traffic 85% agreed that Cargo Throughput affects port revenue and 88.2% of those who agreed also confirmed that an increase in Cargo Throughput increases port revenue. These differences may be that ship traffic may not necessarily imply a higher rate in Cargo Throughput. Putting all these together, the effects of ship diversion on port revenue are adverse. Consequently, the national economy and prices of imported goods increase due to the resultant scarcity of such goods. It is therefore imperative for the port management to do all things possible to reduce ships directly to the barest minimum. The cause of which is the ship turnaround time of vessels. Hence, owners and shippers divert inefficient ports to avoid high charges, demurrage, and other reasons. What then are these factors influencing ship turnaround time? The factors affecting ship turnaround time are indirect and direct.

3.2 Indirect Factors Affecting Ship Turnaround Time

These are activities conducted in the port by other bodies which can reduce or increase ship turnaround time. Some of those considered in the questionnaire include regulatory bodies (for example, customs, SON, NAFDAC), freight forwarding activities, connection to Inland transport, and the efficiency of the Inland transport system.

Table 6: Effects of activities of regulatory bodies on ship turnaround time

Responses	SA	A	D	SD	Total	None Response
Number	7	13	0	0	20	0
Percentage	35	65	0	0	100	0

Source: Survey, 2020

From Table 6, all the respondents (100%) agreed that the regulatory bodies may cause an increase in ship turnaround time in the Nigerian Ports. These factors are not directly under the control of the port management. The port only suffers the blame and the resultant economic and quality consequences, as ship owners and shippers will always count it against the port as inefficiency and performance.

Table 7: Effect of freight forwarding Activities on ship turnaround time

Responses	SA	A	D	SD	Total	None Response
Number	3	10	6	0	19	1
Percentage	15	50	30	0	95	5

Source: Survey, 2020

A majority (65%) of the respondents agreed that freight forwarding activities increase ship time in Port, 30% disagreed and 5% were neutral. From the result, freight forwarding activities influence ship time in the Port.

Table 8: Effect of connection to Inland transport system

Responses	SA	A	D	SD	Total	None Response
Number	5	11	3	0	19	1
Percentage	25	55	15	0	95	5

Source: Survey, 2020

Table 8 shows that 80% of the respondents agreed that connection to Inland transport (roads, access to markets, feeder services, free trade zones, and shipment) influences ship turnaround time, 15% disagreed, and 5% did not respond. It is clear that these factors increase or decrease ship time in Ports; the magnitude depends on the efficiency of such a system.

Table 9: The effects of efficiency of Inland transport system

Responses	SA	A	D	SD	Total	None Response
Number	7	11	0	1	19	1
Percentage	35	55	0	5	95	5

Source: Survey, 2020

Table 9 only indicates the effect of connection to the Inland transport system. We also need to see whether the efficiency of such a system is necessary. Table 9 gives more insight into the effect of Inland transport. A total of 18 (90%) agreed that the efficiency of the Inland transport system affects ship turnaround time 5% disagreed, and 5% did not respond. It is striking as such factors are hardly important when accessing port efficiency, especially for shippers and ship owners. We can deduce that port efficiency depends on many factors, some of

which are outside the control of the port management. Only the government can control or facilitate these to make the ports efficient and competitive. But is that all? What of the factor under the control of the Port Authority or Management?

3.3 Direct Factors Affecting Ship Turnaround Time

Ship turnaround time has been one of the indicators of port efficiency and performance, especially as it concerns the major port customers (ship owners and shippers). It has that several factors are due to the activities of other bodies. Let us now probe into those related to internal port activities. These include ship traffic, cargo throughput, berth occupancy rate, cargo handling gears, and service time.

3.3.1 Cargo Throughput And Ship Turnaround Time

Table 10: Effects of Cargo Throughput on ship turnaround time

Responses	Number	Percentage	Increase	Decrease
YES	18	90	15 (83.3%)	3 (16.7%)
NO	2	10		
Total	20	100		
NR			2(11.1%)	

Source: Survey, 2020

Table 10 shows that an increase in Cargo Throughput increases ship turnaround time as 90% of the respondents confirmed yes in answer to the relational question. Only two or 10% said no, and only two had no responses to the question. In addition to effects, 83.3% of the respondents who agreed indicated that increased Cargo Throughput increases ship traffic. Only 16.7% of the respondents agreed that an increase in Cargo Throughput decreases turnaround time. It further proved as the correlation coefficient r is .689 and coefficient of determination r^2 is 47.5% calculated t is 2.127 showing that r is significant at 95% confidence level. Since an increase in Cargo Throughput increases revenue, ports' management would relax as the Cargo Throughput increases. But technically and quality-wise, increases in ship turnaround time and an increase in Cargo Throughput create another problem of ship diversion.

3.3.2 Ship Traffic And Ship Turnaround Time

Table 11: Effects of ship traffic on ship turnaround time

Responses	Number	Percentage	Yes Increase	Yes Decrease
Yes	17	85	11 (64.7%)	6 (35.3%)
No	13	15	0	0
Total	20	100	0	0
NR			0	

Source: Survey, 2020

Table 11 shows that an increase in ship traffic increases ship turnaround times as 85% of the respondents choose yes in answer to the relational questions. The proportion of yes is 85%, while only 15% said no. In the direction of effect, 64.7% of respondents who choose yes also indicate that an increase in ship traffic causes an increase in ship turnaround time. Since an increase in ship traffic also increases revenue, port management would relax as ship traffic increases. But technically and quality wise increase in ship traffic brings about another phenomenon called ship diversion to other ports. It further proved that the correlation coefficient r is .654 and coefficient of determination r^2 is 42.8% calculated t is 1.934 showing that r is not significant at a 95% confidence level. Hence, the port management needs to constantly monitor and control ship turnaround time so as not to create or allow port congestion and inefficiency. Some of the causes of increased ship turnaround time need to be investigated. These are the internal causes of an increase in ship turnaround time.

3.3.3 BERTH OCCUPANCY RATE

Table 12: The Effect of Berth Occupancy Rate

Responses	Number	Percentage	Yes Increase	Yes Decrease
Yes	17	85	10(58.8%)	7(41.2)
No	3	15	0	0
Total	20	100	0	0
NR	0	0	0	

Source: Survey, 2020

Table 12 shows that an increase in Berth Occupancy Rate increases ship turnaround time because 85% of respondents answered yes; while 58.8% of these

went further to indicate the direction of effect. It further proved as the correlation coefficient r is .783 and coefficient of determination r^2 is 61.3% calculated t is 2.814 showing that r is significant at a 95% confidence level. Though Berth Occupancy may increase revenue, the resultant effect is that increase in ship turnaround discourages ship owners and shippers from patronizing the ports, leading to shipping diversion to neighbouring ports.

3.3.4 Availability Rate And Ship Turnaround Time

Table 13: Effect of availability rate of Cargo handling equipment

Responses	Number	Percentage	Yes Increase	Yes Decrease
Yes	19	95	10(52.6%)	9(47.4%)
No	1	5	0	0
Total	20	100	0	0
NR				

Source: Survey, 2020

Out of the 20 respondents, 95% indicate that the availability rate of Cargo handling gears influences ship turnaround time. Those who supported the positive relationship said an increase in the availability of cargo handling equipment increases ship turnaround time. These results show an element of error because an increase in availability rate facilitates cargo handling and reduces turnaround time. The respondents seem to misunderstand this question. It accounts for the 47.4% of the respondents who indicated that an increase in availability decreases ship turnaround time. It further proved as the correlation coefficient r is .544 and coefficient determination r^2 is 29.6% calculated t is 1.450 showing that r is not significant at 95% confidence level.

3.3.5 Waiting Time And Ship Turnaround Time

Table 14: Effect of waiting turn on ship turnaround time

Responses	Number	Percentage	Yes Increase	Yes Decrease
Yes	19	95	12(63.2%)	7(36.8%)
No	1	5	0	0
Total	20	100	0	0
NR	0	0		0

Source: Survey, 2020

Table 14 shows that 95% of the respondents agreed that an increase in waiting time increases ship turnaround time. Also, 63.2% of those who agree indicate that the direction of effect is positive. It further proved as the correlation coefficient r is .738 and coefficient of determination r^2 is 54.5% calculated t is 2.446 showing that r is significant at a 95% confidence level.

3.3.6 Effect Of Service Time And Ship Turnaround Time

Table 15: Effect of service time on ship turnaround time

Responses	Number	Percentage	Yes Increase	Yes Decrease
Yes	16	80	11(68.8%)	5(31.2%)
No	3	15	0	0
Total	19	95	0	0
NR	1	50	0	

Source: Survey, 2020

From Table 15, the percentage of those who indicated that service time affects turnaround time (80%) and 15% show that service time influences turnaround time. The direct effect is also positive since 68.8% of the respondents are in favour. It further proved as the correlation coefficient r is .991 and coefficient of determination r^2 is 98.2% calculated t is 16.515 showing that r is significant at a 95% confidence level. The internal port variable under study causes ship turnaround time to increase simultaneously. The only one that shows a negative relationship is the availability rate. Of all these variables, only ship traffic and cargo throughput contribute revenue to the ports as turnaround time increases. All the rest are port efficiency indicators that management needs to monitor closely. Evidence abounds that they account for the measure of ship time in the port. Port management, therefore, needs to measure them, set standards, and monitor their changes and the corresponding market implications.

Table 16: Port Efficiency Indicator (or predictors)

Year	Indicator Variables							
	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
1996	1.80	92	353.751	13.75	60.38	0.17	1.63	8473
1997	1.55	110	378815	13.97	50.00	0.19	1.36	8001
1998	1.70	103	391,691	20.96	54.72	0.19	1.55	7299

1999	1.64	150	544919	31.51	58.62	0.09	1.55	13051
2000	1.61	231	799856	48.00	68.00	0.08	1.53	22595.3
2001	2.82	244	983248	64.73	65.00	0.25	2.57	41250.4
2002	2.40	228	649479	59.40	67.0	0.32	2.08	33204.6

Source: RO-RO port annual report, NPA Lagos (1996 – 2002)

Ship turnaround time, X_1 = ship traffic, X_2 = cargo throughput (tonnes), X_3 = Berth Occupancy rate (%), X_4 = Availability rate (%) of equipment, X_5 = Average waiting time (days), X_6 = Average service time (days), X_7 = Revenue generated.

Table 17: Summary of correlation coefficient between ship turnaround time

Independent Variables	Correlation Coefficient (r)	Coefficients of Determination (r^2)	Calculated t value	Decision at $\alpha = 0.05$
Ship Traffic	0.654	42.8%	1.930	Not significant
Cargo Throughput	0.689	47.5%	2.127	Significant
Berth Occupancy Rate	0.783	61.3%	2.814	Significant
Availability Rate	0.544	29.6%	1.450	Not Significant
Waiting Time	0.738	54.4%	2.446	Significant
Service Time	0.991	98.2%	16.515	Significant
Revenue Generated	0.889	79.0%	4.341	Significant

Source: Microsoft SPSS for Windows

4. SUMMARY OF THE RESULTS

The Nigerian port was passing through ship diversion during the period under review. This experience was due to undue delay in shipping which caused ship owners and shippers to prefer neighbouring ports. It further revealed that the factors contributing to the problem included the activities of the regulatory body, an efficient Inland transport system, and the port's internal factors such as high berth occupancy rate and waiting. Also included were the low availability rate of cargo handling equipment, delay to ship produces high port revenue, it misleads the authority. The effect of port diversion neutralized the seeming advantage of increased revenue. It was because as ships diverted (or preferred) neighbouring ports, the prices of imported goods increased due to scarcity and the high transport cost of moving them by land from the neighbouring ports such as Cotonou. The situation was rendered worse by the state of the Inland transport system in Nigeria.

5. CONCLUSION AND RECOMMENDATIONS

The paper briefly explored the existence and causes of ship diversion at Nigerian ports using RO-RO Port in Lagos State as a case study. Results indicated ship diversion from the Nigeria Ports due to excessive ship turnaround, inefficiency, and poor performance. The paper shows two factors influencing the ship turnaround time at the RO-RO Port. One of such factors is the internal port or non-port. The non-port factors responsible for variation in ship turnaround time are activities of regulatory bodies operating in the system. The internal factors influencing ship turnaround time are factors such as the availability rate of port facilities and the general effectiveness of the port management system. For the ports to be efficient and competitive, the government and the Port Authority should attract ships, shippers, and their cargoes to the Ports. In response, the revenue will improve, prices of imported goods will reduce to the minimum, and the national economy will improve.

Based on the findings, the following are recommended:

- (i) The Nigerian Port Authority should beef up the provision of adequate and efficient modern port facilities to facilitate quick ship service and reduced ship turnaround time.
- (ii) The Nigeria Port Authority should also set an internal quality service system that enhances shorter ship turnaround time.
- (iii) Government should review and monitor the activities of the regulatory bodies operating in the ports.
- (iv) Government should also improve the inland transport system in terms of efficiency and connectivity to the ports.
- (v) The ports should seek to establish virile research and planning unit whose sole duty shall be to gather, analyse and interpret port statistics, which will serve as the basis for every strategic decision.

REFERENCES

- Dayananda, S. K and Dwarakish, G. S. (2018). Measuring port performance and productivity, *ISH Journal of hydraulic engineering*, 26(2), 221-227, DOI: 10.1080/0971500.2018.147381
- Ekwomadu, K. (2001). *Maritime transport. The New Transportant*, p. 21.
- Ema, O. J. (1998). *Mechanics of port operation and management*. Daniel Jackson Publishers.

- Gonzalez, M. M and Trujillo, L. (2009). Efficiency measurement in the port industry: a survey of the empirical evidence. *Journal of transport economics and policy*, 43(2): 157-192
- Inyang, S. I. and Oladejo, M. O. (1995). An Evaluation of the spatial structural stability of regression coefficients applied to hinterlands studies in Nigeria, *Nigeria Journal of Technical Education*, 12(1 & 2), 151 – 167.
- Maduka, J. (2002). Advantages of port congestion. *The Voyage*. October – December p.12.
- Market, R. Barbe, T and Brebbia, L. A. (eds) (2005). *Maritime Heritage and Modern Ports*. WIT Press
- Nigeria Ports Authority (2002). Annual Report of the Nigerian Port Authority (NPA), Lagos, 1996 – 2002.
- Pallis, A. A, and Rodrigue (2020). Port economics, management and policy. Routledge
- Rabiu, A. (2003). Inland dry ports and efficient multimodal transport as a tool for sustainable economic development. *Ecomaritime Digest*. August/September, p.37.
- Stopfford, M. (n.d.). *Maritime Economics* (2nd Ed). Rutledge.