MEASUREMENT OF DELAY FACTORS IN CONTAINER PORTS OF A DEVELOPING ECONOMY:

A STUDY OF LAGOS CONTAINER TERMINAL, NIGERIA

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Abstract

This paper focuses on measuring the influence of delay causative variables /factors on the turnaround time of ships in a container terminal in Lagos, Nigeria using the respondentsô perceptions as a tool of data collection of the research. The rankings of the respondents relative to each of the causative factors were cumulated and termed the independent variables (X_1 ï X_{10}), while the average turnaround time of ships represents the dependent variable (ɔ). Using multi- regression model, the Beta coefficient of the various delay causative factors was calculated to determine the weight of each of the factors on the delay value observed. This led to the identification of critical factors relative to delay at the port. The most significant output of the study is the modeling of the relationship existing between the dependent variable (ɔ), the turnaround time of ships at the port and the independent variables (delay causative factors X_1 ï X_{10}). The output model serves as a predictive tool to forecast delay in the port. The study identified variables X_5, X_6, X_8, X_7 as critical factors relative to delays in the port. The study suggests that the number of government agencies present at the port be reduced to almost three to tackle the problem of corruption. Also there is the need to establish inland container depots and cargo stations outside the port premises in the hinterland of the port to discourage the handling of cargo and container documentations inside the port.

Keywords: Turnaround time of ships, Delay, Causative delay factors, Cumulative, Rankings Multi-regression analysis, Perception

Introduction

A seaport is a subsystem of the maritime transportation system. It is an essential organ of the transport system of a nation. A seaport is also recognized as an entry point for goods coming into a country from other countries.

The primary functions of a seaport are the provision of resting place for ships as well as the provision of facilities and equipment for safe transfer of cargoes from ocean to land transports and vice versa. There is a master/servant relationship existing between a ship and the port. A port is likened to be an enterprise established to provide quality service to her masters/customers to survive economically. This is because shippers as well as ship owners demand efficient service from port operators for continual patronage.

One distinctive feature of the container port industry is that competition between container ports is more intensive nowadays than previously been the case. Port markets used to be perceived as monopolistic due to the exclusive and immovable geographical location of the port and the unavoidable concentration of port traffic. However, the rapid

development of international container and international transportation has drastically changed the market structure from one of monopoly to one where fierce competition is rampant in many parts of the world, West and Central African regions inclusive. Many container ports no longer enjoy the freedom yielded by a monopoly over the handling of cargoes from within their hinterland. Instead, they have to compete for cargo from their neighbouring ports. The above two scenario of the contemporary container port industry are particularly true for developing countryôs ports in Africa.

Statement of the Problem

A comparative analysis of time of ship in Lagos container terminal relative to a container port in Tema Ghana shows that Nigerian ports are inefficient. Similarly the cost of doing business in Nigerian port is highest compared to other neighboring ports in West and Central Africa sub- regions. Conference and non conference liners are known to react to such unfavorable port services by increasing their freight rate charges to such port at short run. The long run effect if port services do not improve is for the liners to boycott such port entirely (See tables 1-6).

Chi-Yean and Wen-Chih (2002) had advised that one of the major tasks of a port planner is to determine the optimal number of berths that a port should construct to serve arrival vessels efficiently. This advice was adhered to by Nigeria in tackling the problem of inefficiency in Nigerian ports during the 1980 ï 1985 Development Plan. The period saw the development of many more ports which drastically reduced the waiting time for berths at the seaports.

From then, the problem of Nigerian ports has shifted from berth scarcity-related to cargo-service problem. The delays as witnessed in Nigerian ports are related to service time of ships at berth rather than waiting to service time. In other words traditionally, the turnaround time of a ship in port is a function of; (i) Waiting time/queuing time, and (ii) Service time.

The time of a vessel in port is high when either of the two is high compared to normal or the combination of the two. Waiting time is always high when the demand for berths is higher than the supply. With about sixteen (16) functional ports in Nigeria, the problem of inefficiency shifted away from that of shortage of berths relative to ship traffic volume to service time in ports. The ship owners operating in Nigerian ports have put into use bigger vessels (Very Large Container Carriers (VLCCs) and Ultra Large Container Carriers (ULCCs) which are invogue to reap the economy of scale inherent in transport business. The benefits derivable from using these VLCCs and ULCCs continue to elude Nigeria, due to port inefficiency relative to high service time.

Table 1: Turnaround Time of Vessels at Container Terminal, Lagos 2002 – 2006

YEAR	AWT IN DAYS	AST IN DAYS	ATST IN DAYS
2002	0.32	2.22	2.54
2003	0.23	3.21	3.44
2004	0.22	2.93	3.15
2005	0.27	2.21	2.48
2006	0.25	2.11	2.36
TOTAL	1.29	12.68	13.97
AVERAGE	0.26	2.53	2.79

Source: NPA annual Report 2007

Table 2: Turnaround Time at Container Port, Tema Ghana 2002 – 2006

YEAR	AWT IN DAYS	AST IN DAYS	ATST IN DAYS
2002	0.25	2.10	2.35
2003	0.22	1.91	2.13
2004	0.26	2.32	2.58
2005	0.24	1.82	2.06
2006	0.24	1.94	2.18
TOTAL	1.11	11.09	11.20
AVERAGE	0.22	2.02	2.24

Source: Tema Port Information 2007

Table 3: Container Terminal Tariff (Total Charge Per Container Moved Including Ship To Terminal Gate In USD 2002

PORTS	AMT IN DOLLAS
NIGERIA (LAGOS)	168
LOME	143
TEMA	130
COTENON	140

Source: Nigerian Shipper Council, Lagos 2002

Table 4: Freight Rates On Containerized Cargo From Far – East Korea To Nigeria And Republic Of Benin Ports (Lagos And Cotonou) In 2002

CONTAINER SIZE	FREIGHT RATE TO LAGOS PORT	FREIGHT RATE TO COTENON PORT
1X20	USD, 9000	USD, 7,500
1X40	USD, 16,000	USD, 14,000

Source: Tom Line Shipping Company, Lagos

Table 5: Freight Rates On Containerized Cargo From USA To Nigeria And Republic Of Benin 2002

CONTAINER SIZE	FREIGHT RATE TO LAGOS PORT	FREIGHT RATE TO COTENON PORT
1X20	USD, 4,500	USD, 3,000
1X40	USD, 8,000	USD, 6,500

Source: Tom Line Shipping Company, Lagos

Table 6: Comparative Port And Cargo Handling Charges In Cotonou, Lome And Nigerian Ports (In USD) As At Nov 2ov 2002 Container Terminal Charges.

S/N	SERVICE CHARGES	NIGERIA	COTONOU	LOME
1	Shore handling 20ft container	108	-	147
2	UNSTUFFING 20ft container	251	509	89.9
3	Transfer charge	617	-	308.3
Total		$9.76	509	541.2

Source: Nigerian Shippersô Council Lagos

Aims and Objectives of the Study

Using the quantitative and the qualitative approaches, the study is aimed at fulfilling these specific objectives.

(1) To identify and assess the key determinants of high turnaround time of ships in Nigerian container terminals.
(2) To investigate the influence or weight of each causative factor in determining port delay level in Nigeriaôs container ports.
(3) To determine which delay causative factors are critical or most influential to the port operator in an attempt to reduce or eliminate abnormal delay in the container port.
(4) To provide appropriate platform for further research and consequently make suggestions for efficient and effective operational practices in the Nigerian Ports industry.

The study, using a multiple regression approach, will identify the critical factors responsible for the high turnaround time of ships in the container terminal. It will help in generating a workable and realistic Port delay control strategy capable of tackling the

problem of inefficiency in Nigerian Ports. It is a deviation from the traditional use of queuing model to obtain optimal number of berths for a given port.

Research Methodology

The study took a survey approach. First a pilot survey was conducted in which a number of personal unstructured interviews with top executives of shipping companies, port operators, freight forwarders, cargo agents and dockworkers were interviewed. This was done to discuss the purpose of the study. Apart from delay variables identified from the literature, the pilot survey highlighted some of these delay determinants from the long experiences of using the ports and working in the ports by the respondents. The results helped in constructing the questionnaire used in the study.

The various delay causative variables identified from the pilot survey were factored into ten (10) variables namely:

(a) Inadequacies of berth (IADB) X_1
(b) Lack of cargo handling equipment (LCHE) X_2
(c) Lack of manpower (LMP)X_3
(d) Scarcity of skilled manpower (SSMP) X_4
(e) Administrative bottleneck (ADBN) X_5
(f) Deliberate attempt to extort money from port users by port workers (DADPU) X_6
(g) Lack of storage facilities (LSF) X_7
(h) Insufficient depth of the entry channel (INDECH) X_8
(i) Too many public holidays and strikes X_9
(j) Too much idle time due to equipment breakdown X_{10}

The survey lasted for a period of twelve months. This made it possible for the field officers recruited to pay several repeat visits to the respondents. This process accounted for a monthly visit to the port with the questionnaire. On each visit to the study location, the field officers took time to observe the arrival and departure times of the calling ships. This gives the turnaround time of the ships. The figures obtained from the observatory method actually agreed with the secondary data obtained from the records of Nigerian Ports Authority (NPA).

The respondents with a sample population of fifty (50) chosen through a judgmental approach were mainly port users and port operators. They were asked to rank each of the delay factors according to how strong they feel each factor may influence port delay. The most influential factor earns a maximum of ten (10) marks. The next factor earns nine (9) marks, etc.

The monthly rankings of each delay factor by the respondents were cumulated to arrive at the yearly ranking of each delay factor. This seemed very interesting for the purpose of analyzing the relationship between delay causative factors and delay values. By so doing the most critical factors were identified. The critical factors are those which posed heavy constraints in the achievement of efficient port operations especially in the area of turnaround time.

The Sample and Method of Selection

The population of the study comprises of the entire service providers and all the port users in the port of study. The service providers consists of staff of Nigerian Ports Authority (NPA), the staff of the private terminal operators, the dock workers as presently managed by Nigerian Maritime Administration and Safety Agency (NIMASA). The port users consist of the staff of the shipping companies as well as the clearing and forwarding companies. Since it was not easy to have the staff list of these organizations, the study assumed the population of the study to be relatively large. Consequently, the study adopted a judgmental technique to identify the fifty (50) respondents that made up the sample size. The purposive or judgmental sample was drawn because of the ease of data collection and special features of the members of the sample. Therefore, the selection of the sample units is based upon the assumption that the field officers can identify those that serve the research purpose.

A random approach could not be adopted because of the unknown population. The survey was designed to determine the perception of the staff of these organizations, on each of the delay causative factors identified on the high turnaround time of ships in the container port. The researcher recruited two field officers and handed over to them the fifty questionnaires to administer to the respondents as follows:

Table 7: Distribution Of Questionnaires At Container Terminal Lagos Managed By AP Moller Terminal

Shipping Agents staff	10
Freight forwarders	10
NPA Staff	10
Private Terminal Operators	10
Dockworkers (NIMASA)	10
Total	50

Method and Tool for Data Analysis

The research questions which form the basis for the selection of tools for data analysis include:

(i) What are the delay factors relative to the container terminal?
(ii) Which causative delay factors are the most influential, most significant or critical on port delay?
(iii) What is the effect of tackling the problem of the critical factors on ships time in the port?
(iv) Does the elimination of these critical factors improve the turnaround time of ships in the port.

The study made use of multiple regression analysis which looked at the delay factors at disaggregated level or relative to the container terminal. Multiple regression technique believes that there are several causative factors that determine delay in ports. The list of these factors is inexhaustible. You can add more and more factors according to environment or location in an attempt to build a port delay model, the major task of the study.

In the multi-regression analysis, the coefficient of each variable X_1, X_2 é Xn determines the weight or influence of each delay causative variable. Consequently, a partial

regression analysis on each factor is conducted to determine the change in Y (time in port), the dependent variable relative to X_1 when X_2 é X_n are held constant.

One of the major outputs expected from the study is to construct a model for the container terminal. This is done using a multivariate regression that links delay to causative factors.

The basic model will look like this:
$Yit = Ao + b_1X_1 + B_2X_2 + b_3X_2 + ei$
Where X_{11}, X_{21}, X_{31} é Xn represent the delay causative variables, i = any port, e = error, t = time.

Competition in The Container Ports Of Developed Countries

Martine et al (2004) and Wang (2004) identified the paramount importance of the container port industry as the basis for the economic development of the European Union. One of the distinctive features of the contemporary container port industry is that of fierce competition between/among ports in the developed countries. According to the researchers, container port markets used to be perceived as monopolistic due to the exclusive and immovable geographical location of the port and the unavoidable concentration of port traffic. Presently, the arrival and rapid development of international container and intermodal transportation have drastically changed the market structure from one where intensive competition is rampant. Many container ports no longer enjoy the freedom yielded by a monopoly over the handling of cargoes from within their hinter lands.

Consequently, these ports strive to be efficient and cost effective in their operation to retain customers. In other words, this intense competition which characterizes the container port industry has stimulated an overt interest in the efficiency with which they utilize their resources to excel over others.

The studies consequently analyzed the performance of the individual container ports or terminal and agreed that performance level is of great significance for the survival of the players in the competitive industry. The studies also recognize that such performance analysis not only produces a powerful management tool for port operators but also constitutes an important input for national and regional port planning exercise and operations. However, it is of note that such analysis is aimed only at deriving and comparing the relative acceptability or efficiency of one port over the other. This is similar to the stated preference techniques or ordering where port A is equal to port B is not obtainable. It is either that port A is less than port B in terms of efficiency or vice versa.

The studies could not establish any direct causal relationship existing between efficiency factors and the degree of efficiency established or changing level of efficiency over time. Tongzon (2001) in like manner studied the efficiency of four (4) Australlian and twelve (12) other international container ports in 1996. Troubled by poor data availability and a small sample size of only sixteen (16) respondents, Tongzon (2001) merely concluded that some ports are efficient while others are inefficient. Tongzon (2001) suggested that further work should be done with enlarged sample size to determine the factors responsible for efficient and inefficient container ports operation.

Valentitive and Gray (2001), applied DEA-CCR model to 31 container ports in 1998 to examine relationship between port efficiency and type of port ownership and organizational structures. Barros and Athanassion (2004) applied DEA to estimate the

relative efficiency of a sample of Portuguese and Greek seaports. The purpose of their studies was to identify areas or factors responsible for poor performances so as to identify strategies and management practices that could improve port efficiency within the European ports context. The studies recommended privatization as an appropriate method for achieving economic efficiency in port operation.

Other studies that assessed container terminal efficiency includes: Nottebroom et al (2000), Coto ï Millan et al (2000) and Heaver et al (2000 and 2001). They assessed the economic and productive efficiency of container terminals in Spanish ports using the Data Envelopment Analysis (DEA) approach.

Time in Port as a Measure of Efficiency

Tongzon (2002) specifically identified a few port choice determinants, namely time efficiency, port charges, response to port userôs need, reputation for cargo damage claims etc. These factors are what attract customers to the port. It must be emphasized that most determinants relate positively to delays in the port. In his conclusion, time efficiency was rated highest among other factors. This is consistent with the global trend. With the adoption of logistical approach like ñJust in Timeò delivery, Jongzon is of the opinion that, high value products like containerized products must pass through the port fast to avoid high charges accumulation.

Time in port has always been an important determinant of port choice or attraction to port users. Koi (2006) assessed the attractiveness of ports in the North European Container transshipment market. Koi (2006) concluded that Hamburg and Rotterdam are the most attractive port user option. Hence they act as transshipment hub within Northern Europe. Antwerp and Bremenhaven Container terminals followed closely behind whereas Felistowe and La Havre are the least attractive options requiring substantial improvement in quality service delivery mostly time in port to change to current situations.

Ha (2003) investigated the service quality offered by fifteen (15) ports around the world involving container handling. Ha (2003) scored information flow highest among other determinants. Note that information flow is related to time because a knowledge of time to be spent in port will enable a ship operator to take a decision to enter the port or not. Availability of information flow will always assist port users in taking alternative action to improve cost. Information flow consequently acts as a cost control measure to port users. Alpharliner (2005) also recognized adequate information flow as an important factor in determining port choice.

Most of these studies reviewed so far have pointed at delays or time in port as a crucial factor that determines port choice. Delay is a manifestation of service or operational inefficiency. It is the principal measure of service degradation which could be caused by several factors including adverse weather condition, ship and cargo congestion, strikes, breakdown of cargo handling gears, administrative bottleneck etc. Another setback in these studies reviewed is their inability to weigh the influence of each of these delay causative factors. In an answer to this problem, this study, which aims at investigating the critical factors influencing port delays especially in a container terminal, Lagos is imperative to explore with a model that will help in solving the problem of delay in port. This will ensure that prompt attention is given to these influential factors under limited budget availability. Knowledge of the causes of poor quality services experienced in container ports as it relates to high turnaround time of ship in port is a positive step in finding solutions to port problem.

The development of a model that will capture the relationship between the delay factors and the value of the delay experienced will be an added advantage in tackling the problems of delays in Nigerian ports.

Data Presentation and Analysis

Some ports are observed to be more suitable than others in the actual handling of a particular traffic. Consequently, delay factors may seem to be same but the critical factors are relative to each port and its operations. Consequently, the data to be presented are relative to container terminal operation in Lagos in 2007 as managed by AP Mollers Nigeria Ltd. Consequently, the presentation and analysis of data at a disaggregated level will provide a reasonable and acceptable yardstick for evaluating and comparing the influence of each delay causative factors in the different ports that make up the port system in Nigeria.

Identification of the Critical Factors for Container Terminal, Lagos Using the Regression Analysis Approach and Discussions on the Identified Critical Factors

The average turnaround time of ships at the container terminal Lagos in 2007 was 2.79 days (see table 1). This shows a high turnaround time which signify abnormal delay at the port when compared to a bench mark of one day and even below for some world class container ports. For instance, according to LLoydôs Maritime Magazine Report 2007, the average turnaround time for container terminal Port Elizaboth South Africa is 8 ï 12 hours, Bombay India 12 hours, Durban South Africa 16 hours (Lloyds Shipping Intelligence Service, 2007).

In these world class container terminals, port operations are 24 hours per day. There is no restriction to large vessel. The minimum draft for 24 hours navigation averages 19 metres with no labour problems. The pilot launches as well as shore crane availability are optimum.

The coefficient of correlation between the delay causative factors and the dependent variable (turnaround time) for the container terminal stood at 0.556 or 55.6% whereas the coefficient of determination shows a weak value of 0.310 or 31% (see table 9).

Tables 8: The Cumulative Tanking of Delay Causative Factors of Container Terminal, Lagos Jan – Dec. 2007

Months	Delay/ ATRT in Days	IADB X_1	LCHE X_2	LMP X_3	SSMP X_4	AOBN X_5	DAOPU X_6	LSF X_7	INDECH X_8	TMPHS X_9	TMIDT EF X_{10}
JAN	1.24	140	160	70	150	223	200	140	140	80	85
FEB	1.33	100	175	80	160	276	202	168	160	95	68
MARCH	2.86	150	196	60	170	298	266	198	170	100	95
APRIL	3.06	103	192	70	180	300	280	194	120	150	115
MAY	2.59	102	186	66	170	284	240	196	160	140	128
JUNE	2.19	85	176	45	160	296	255	200	175	132	125
JULY	2.44	104	160	67	142	280	240	176	162	152	125
AUG	3.16	96	156	98	171	256	196	185	104	180	100
SEPT	2.03	122	141	102	145	266	208	194	142	96	102
OCT	2.04	140	135	140	176	278	214	210	148	102	96

NOV	3.63	156	142	130	186	280	200	220	136	100	120
DEC	3.64	164	151	138	175	266	175	168	147	141	76
TOTAL	30.21	1462	1970	1066	1979	3303	2676	2249	1774	1458	1235
AVERAGE	2.79	12183	164.17	88.88	164.9	275.2	223.0	18742	14783	12150	102.92
AVERAGE	2.79	43.0	5806	31.25	58.21	97.15	78.71	66.15	52.18	42.88	36.32

Table 9: The Regression Statistics For Container Terminal, Lagos, Nigeria 2007

					CHANGE		STATISTICS			
MODEL	R	R SQUARE	ADJUSTER SQUARE	Std Error of the Estimate	R SQUARE CHANGE	F. CHANGE	df1	df2	Sig F change	Durbin wartson
1	0.556[a]	0.310	- 6.594	4.41634	0.310	0.045	10	1	.999	2.429

(a) Predictors constant, TMIDT, SSMP, LICHE, TMPHS, INDEC, IADB, ADBN, DADPU, LSF, LMPW

(b) Dependent variable: Delay/ATRT

Table 11: Regression Results For Container Terminal, Lagos, Nigeria

Model	Standardized coefficients		Standardized coefficients	T	Sig	995% confidence internal for B				
	B	Std Error	Beta			Lower Boundary	Upper Boundary	Zero order	Partial	Part
Constant	9.035	34.539	.168	.262	.837	-429.823	447.894			
IADBS X_1	.010	.106	-.380	.095	.940	-1.333	1.353	-.241	.094	.079
LCHE X_2	-0.030	.327	-.644	.090	.943	-4.179	4.120	.348	-.090	-.075
LMPW X_3	-.032	.253	.044	-.126	.920	-3.244	3.180	-.439	-.125	-.105
SSMP X_4	.005	.277	-.587	.019	.988	-3.519	3.529	-.177	.019	.016
ADBN X_5	-0.044	.258	.635	-.172	.892	-.321	3.232	.049	-.169	-.143
DADPU X_6	0.031	.130	.396	.241	.849	-1.624	1.687	.316	234	.200
LSF X_7	0.029	.205	.205	.143	.910	-2.577	2.636	.174	.142	.119
INDEC X_8	.026	.133	.333	.195	.877	-1.668	1.720	.178	.192	.162
TMPHS X_9	0031	.088	.088	.353	.784	-1.083	1.145	.141	.333	.293
TMIDT X_{10}	-.045	.147	.149	-.300	.814	-1.943	1.853	.065	-.287	-.49

This signifies that the statistical relationship between the dependent variable (Y) and the independent variable X_1-X_{10} could only be explained to the tune of 31%. From the table 11, the study empirically supports that variable X_6 (deliberate attempt to extort money from port users) with B = 0.031 is the predominant or the most critical delay causative factors.

This is followed by variable X_7 (lack of storage facilities) with B value 0.029. The next critical variable is X_8 (shallowness of the entry channel) whose B value is 0.026. In this study, the combination of variables X_5 and X_6 (Administrative Bottleneck X_5 and Deliberate

Attempt to Extort money from port users) could be termed ñcorruptionò. Corruption is the bane of poor operations or performances of Nigerian port industry. The study therefore suggest that much emphasizes should be placed on the monster ñcorruptionò to improve the efficiency of Nigeria ports industry, the container terminal inclusive.

Lack of storage facilities X_7 is a very important or critical factor as far as delay in the container terminal is concerned. For instance, the different government agencies - the customs, the NAFDAC etc. - ask for this exercise at different times and different places for the same container. Consequently, lack of coordination among the activities of these government agencies leads to unnecessary delay of container delivery to shippers. This often leads to container congestion at the port with its concomitant effect on ship congestion and high turnaround time of vessels at the port.

The shallowness of the entry channel X_8 is another positive contributory variable to delay in the container terminal. Most modern container ships are of giant sizes known as Very Large Container Carriers (VLCCs) and Ultra Large Container Carriers (ULCCs). They require very deep draughts to enable vessels to be floated in for discharge. A situation whereby the deepest draught of the terminal, at the time of the study, was 8.5 metres calls for worry. The calling container vessels therefore have to depend or wait for the arrival of high tides to aid floating in and out of vessels in the port. Variable X_8 or draft restriction (B = 0.026) along the entry channels is a critical factor which needs to be tackled through constant dredging. This, the present private terminal operators AP Mollers Ltd, must pursue vigorously to ensure efficiency at the port.

Another causative delay factor, whose contribution to the delay values of the port is positive, is the inadequacies of berthing facilities X_1 whose Beta value is 0.010. The reason for this cannot be over-emphasized. The scarcity of storage facilities which leads to cargo congestion, also leads to ship congestion. In other words, the problem of scarcity of berths is induced by these other critical factors X_8, X_7, and X_5.

From the study, scarcity of skilled manpower is another positive contributor to delay at the container terminal, Lagos. The Beta value for variable X_4 is 0.005. Though X_4, lack of skilled manpower, is a very weak contributor, it needs to be mentioned and reason given so as to find solution to the delay problem at the port. The private terminal operator during the concession agreement with the Federal Government was forced to absorb the abundant unskilled labour force at the port to avoid industrial strike. The problem of unskilled labour at the specialized port could be tackled through constant training and re-training of the labour force.

One outstanding finding of the study is the non-inclusion of lack of cargo handling equipment X_2 as a positive contributory delay variable. The take-over of the operations of the container terminal by Mess A P Mollers Ltd has attracted better improvement in the availability of cargo gears both in quantity and quality. Therefore, the unavailability of cargo handling equipment is not very significant in the study result.

A controversial result of the study relative to the container terminal is the inclusion of too many holidays and strike X_9 with Beta value 0.031 as a positive contributory factor to delay. This could be defended through the presence of too many government agencies at the port. The staffs of these government departments do observe public holidays which are frequent in the Nigerian Public Service. The withholding of vital documents needed for cargo clearance and delivery by the staff of these government agencies often leads to delay

in cargo release which, at long run, affect the turnaround time of vessels at the terminal. The port seizes to operate on weekends and other public holidays.

World class container terminals operate 24 hours daily even on weekends with night operations. In the study location, night sailing is yet to commence and pilots do observe public holidays such as Salah, Christmas, Easter and other gazetted holidays.

Construction of a Multi-Regression Model for the Container Terminal, Lagos- Nigeria

One of the major contributions of the study is the construction of a regression model to establish the relationship between the delay variables identified and the delay values or turnaround time of vessels at the port. We therefore, use the Beta coefficients of the various causative delay factors in table II to construct the regression model for the container terminal, Lagos, Nigeria.

$AVTRAD/DELAY = 9.035 + 0.010x_1$ ï $0.030X_2$ ï $0.032X_3 + 0.005X_4$ ï $0.044X_5 + 0.031X_6 + 0.029X_7 + 0.026X_8 + 0.031X_9$ ï $0.045X_{10} +$ ň

Where X_1 = inadequacy of Berthing Facilities

X_2 = Lack of Cargo Handling Equipment

X_3 = Lack of Manpower

X_4 = Scarcity of Skilled Manpower

X_5 = Administrative Bottleneck

X_6 = Deliberate Attempt to extort money from port users

X_7 = Lack of Storage Facilities

X_8 = Inadequacies of draft of the entry channel or shallowness.

X_9 = Too much public holidays and strikes

X_{10} = Too much idle time due to equipment failures

ň = Error

AVTRAD = Average Turnaround Time of Vessels at the port.

Conclusion

The equation concludes that delay will increase on average of 0.010 of a unit increase in X_1, decrease on average of 0.030 of a unit increase in X_2 decrease on average of 0.032 of a unit increase in X_3, increase by an average of 0.005 of a unit increase in X_4, decrease by 0.044 of a unit increase in X_5, increase by 0.031 of a unit increase in X_6, increase on average of 0.029 of a unit increase in X_7, increase on an average of 0.026 of a unit increase in X_8, increase by an average of 0.031 of a unit increase in X_9, and a decrease by an average of 0.045 of a unit increase in X_{10}.

Recommendation

Consequently, the study is of the opinion that to arrest the delay problem of the container terminal, Lagos, priority attention must be accorded to the issues of corruption, lack of space for storage of containers, draft of the entry channel or draft restriction, too much holidays and strikes, inadequacies of berthing facilities and scarcity of skilled manpower. The problem of lack of space should be solved by the establishment of Inland Container Depots (ICDs) at the hinterlands where cargo clearance operations and other documentation activities should be carried out. Demurrage charges, should as a matter of policy, be placed on any container known to have overstayed a stipulated period at the port.

This will enable or force shippers to come forward to clear and take delivery of their containerized cargoes.

The entry channel needs to be dredged to a lower limit of 11 metres to accommodate large container carriers prominent in the present day container trade. Otherwise the use of Barge carrying vessels (BCV) or Lighter Aboard Ship (LASH) system should be encouraged where the container vessels are discharged amidst stream. The terminal operators should concentrate on the human capacity building through Training and retraining of manpower to handle the sophisticated modern cargo handling equipment associated with container operations.

Finally, the government should intensify efforts to fight corruption at the port by reducing the number of government agencies as well as documentations necessary for certain clearance to at most two even one as obtained in other worldôs class container terminals like Rotterdam, Antwerp, etc.

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