



Constraints to Cargo Traffic Development in Tin Can Island Port, Lagos Nigeria

by

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Abstract

The development of cargo throughput handling at any seaport is dependent on the ability of port terminal operators to subdue the myriads of challenges bedeviling efficient operations. This study aims at examining the challenges facing cargo throughput development at terminals of Tin Can Island Port (TCIP), Lagos Nigeria. Primary data were collected through questionnaire survey randomly conducted on a total of 104 respondents who are freight forwarder and staff of private terminal operators at the port. The data collected were analysed using correlation and regression techniques of data analysis. The results of the regression analysis show a high correlation value having $R = 0.634$ with the dependent variable. It was further revealed that cargo insecurity, inadequate equipment, and poor staff attitude serve as the most significant challenges to cargo traffic development at terminals of the port. It was recommended from the study that management strategies that are geared towards reducing or eliminating the effects of the challenges on cargo throughput at the port be adopted.

Keywords –Cargo throughput; traffic development; Tin Can Island Port; Cargo traffic Challenges

1. Introduction

Ports play a strategic role to the growth and development of domestic and international trade of any nation whether developing or developed (Okeudo, 2013). Nigeria as a nation is not an exception from this because most of the country's consumables are import dependent. In the global scene however, more than 9.57 billion tons of cargo were moved on sea mode of transport which is clearly more than 80% of the world merchandise trade out of which 1.58 billion tons, were transported in containers (UNCTAD 2013). It was further stated by UNCTAD that 50% of the global seaborne value was transported in standardized containers by ship liner carriers which led to the growth of global containerized trade by 4.6% in 2013 taking total volumes of 160 million

Twenty-Foot Equivalent Units (TEUs)), up from 153 million TEUs in 2012 (UNCTAD 2013, UNCTAD 2014). Attracted by a flourishing prospect of growing the shipping market, shippers would want to efficiently expand their shipping business without any form of constraints. The demands of shippers to transact business without hindrances will force port terminal operators to handle cargo traffic in a manner that shippers will be confident of routing cargo through terminals of the port in a bid to attract more cargo traffic at the port. This makes carriers to desire a more efficient and effective cargo allocation schemes to maximize profits while combining other management strategies such as ship schedule optimization and fleet deployment adjustment. In reality, the overall operations of ports in Nigeria seem to be characterised by constraints with consequent influence on the volume of cargo traffic at the ports. Examining the issues serving as constraints to the growth of cargo throughput at terminals of Tin Can Island port is the intent of this study.

The operations of shipping lines according to Guericke and Tierney (2015), Brouer et al. (2013) can form a network built from one or more services, each calling a predetermined port in sequence that forms a cycle. The purpose of port services is to ensure that cargoes of different types and sizes are loaded from an origin port to a destination port. The buoyancy of ports depends on the level of traffic it handles with less or no constraints. The focus of the study was to seek the extent each of the identified constraints would influence cargo volume at the port.

2. Review of Related Literature

Over the last decades, global freight transportation has expanded considerably, largely resulting from globalization processes and increasing economies of scale. These growing global volumes are putting pressure on the design and operation of transport networks (Witte, Wiegman, Braun and Spit 2016). This may necessitate the spatial allocation of freight movements. The allocation will be dependent on differing criteria companies adhere to for port selection and routing as noted by Monios and Wilmsmeier (2013). The rising uncertainty of global trade and sustainable infrastructural investment are seen to be placing massive competitive pressure on modern ports, especially those in mature markets in well-developed regions talk less of developing ports like Tin Can Island Port. In furtherance to this, the undulating prices of crude in the oil market affected the Nigerian market and cargo volumes. Against this background, managing the port hinterland, namely, the geographical area to and from which cargo passing through the port or better still, port cargo traffic can be distributed, has been shown to be an influencing factor in the sustainable development of a port.

Port competitiveness, a function of cargo traffic is a concept to be examined and re-examined in the shipping operations, not only within the ports and the terminal environments, but in all that concerns the changing circumstances which may arise in cargo movement from the hinterland, to the points of delivery and finally, the existing government policy on port operation. The Nigerian port case has been widely viewed by different scholars mostly revolving round the pre and post port reform. This was because most Nigerian ports descended behind international standards in which Tin Can Island port was not an exception. This was in terms of operational facilities, service enhancements and performance manifesting in congestion which resulted in several port intricacies before port reform. This actually started after the civil war era of 1967-1970. The effect of congestion then was diversion of Nigerian goods to neighbouring ports and furthermore, smuggling of the goods to Nigeria. From all these, there arose a need for port

reform and the need for port reform has its major backing with Nigerian decree 25 of 1988 on privatization and commercialization.

It is important to stress that cargo traffic development is a subset of port performance though there exist enormous literature on port performance. This is so because the development of cargo traffic is relevant to port users, policy makers, port developers and other stakeholders. Port users may be especially interested in performance indicators related to items such as costs, reliability and transaction costs; policy makers may be interested in those indicators as well, but on top of that also find indicators such as employment in ports and CO₂ footprint relevant (De Langen and Sharypova 2013). The authors further asserted that environmental stakeholders may be especially interested in indicators of local (negative) environmental impacts, such as water quality and noise.

Meanwhile, De Langen and Haezendonck (2012) noted that the port is a cluster of economic activities where a large number of firms provide products and services and together create different port products. Research studies as well as industry initiatives have focused on developing performance indicators for terminals. However, De Koster, Balk and van Nus (2009) are skeptical of the quality of academic papers that use DEA to benchmark container terminals), but less so for ports as a whole. Mostly, volume of cargo is part of the widely used port performance indicators and arising from this, ports are ranked according to their volume of cargo throughput. Adenigbo and Afolayan (2014) analysed the types and volume of cargo traffic at terminals of Tin Can Island Port, Lagos. The study made use of cargo traffic data of port from 2007 – 2011 to determine each terminal's share and specialisation in the handling of cargo volume and types at the port by finding their location quotient (LQ) and specialisation index (SI). It was found that the port is import dominated while each of the terminals handles a preponderant share of a cargo type at the port. It further revealed that the terminals are specialised in handling a cargo type that dominates it.

3. Material and Method

The study made use of primary data collected through a survey of freight forwarders and staff of private terminal operators at the port. The survey took census of a total of 104 respondents to form the sample size for the study since a population for the study could not be determined. The sample size meets the suggestion of Hair, Anderson and Black (1995) referred to in Williams, Brown and Onsmann (2010) that sample size should be over 100 or greater. The study employed purposive sampling technique to collect data with the support of the research assistants. The choice of the sampling technique was to ensure that only freight forwarders and staff of private terminal operators were sampled at the port. Information in the questionnaire was presented such that respondents will have to indicate the weight they attached to a multiple of factors that is capable of challenging the development of cargo throughput at the port.

The instrument was fashioned on a multiple-item measurement scale presented on the 5-point Likert scale to allow for a wide measurement of the degree of the respondents' consideration of each challenge to cargo throughput development presented in the questionnaire. The challenges measured were six (6). The items included manpower shortage, poor technical know-how, inadequate equipment, cargo insecurity, inefficient operations and high terminal charges. The variables were tabulated for the respondents to rank in order of significance from 1 – Not Significant to 5 – Highly Significant.

The study employed correlation and multiple linear regression analyses as techniques for data analysis. This is in the light of the need to determine the level of

relationship between the variables, and measure the extent of the influence of the variables on the development of cargo throughput at the port. Concerning multiple linear regression analysis, Laudau and Everitt (2004) saw it is a method of analysis for assessing the strength of the relationship between each of a set of explanatory variables (sometimes known as independent variables), and a single response (or dependent) variable. The model specification for the extent of relationship between the dependent variable and the independent variables takes the general form:

$$Y = a + B_1X_1 + B_2X_2 + B_3X_3 \dots B_nX_n + e$$

Where; Y = Dependent Variable;

$B_1, B_2, B_3 \dots B_n$ = Coefficients;

a = Constant, while

$X_1, X_2, X_3 \dots X_n$ are the independent variables while

e = the error term.

The study made use of Statistical Package for Social Sciences (SPSS version 21) to analyse the data collected for the study using regression techniques. Data collected using Likert scale can be suitable for parametric analysis. This follows the study of Norman (2010) who using real scale data found that parametric tests such as Pearson's correlation and regression analysis could be used with Likert data without fear of coming to the wrong conclusion.

4. Results and Discussion

The volume of cargo handling in various types has implication on the level of trade and exchange of a country. Trade volume of a country can be affected when operations at the seaports terminals are characterised by challenges that reduce the overall capacity of ports to develop its cargo throughput. The degree of the influence of individual challenge on the development of cargo throughput at seaports is expected to have a corresponding effect on the overall operations of the port. The probable challenges facing the development of cargo throughput at Tin Can Island port complex identified in this study was found to be related to each other through correlation analysis. For ease of table presentation the variables are represented by MS, PTK, IE, CI, IO, PSA, and HCC where MS = Manpower Shortage; PTK = Poor Technical Know-How; IE = Inadequate Equipment; CI = Cargo Insecurity; IO = Inefficient Operations; PSA = Poor Staff Attitude; and HCC = High Cost of Clearance. The result presented in Table 1 shows that the variables have positive relationships with another. The relationship between inadequate equipment and cargo insecurity ($r = .609$) indicated that when equipment were grossly inadequate, especially equipment that had to do with security and the ones to stack/handle cargo, the level of security would decline.

Table 1: Correlation Results of Constraints to Cargo Throughput Development

Variables	MS	PTK	IE	CI	IO	PSA	HCC	
MS	Correlation	1.000	.252	.457	.104	.223	.269	.177
	Sig. (2-tailed)	.	.010	.000	.295	.023	.006	.073
	Df	0	104	104	104	104	104	104
PTK	Correlation		1.000	.271	.182	.135	.140	.125
	Sig.(2-tailed)		.	.005	.065	.172	.157	.208
	Df		0	104	104	104	104	104
IE	Correlation			1.000	.609	.672	.486	.249
	Sig. (2-tailed)			.	.000	.000	.000	.011
	Df			0	104	104	104	104
CI	Correlation				1.000	.756	.322	.311
	Sig.(2-tailed)				.	.000	.001	.001
	Df				0	104	104	104
IO	Correlation					1.000	.457	.262
	Sig.(2-tailed)					.	.000	.007
	Df					0	104	104
PSA	Correlation						1.000	.534
	Sig.(2-tailed)						.	.000
	Df						0	104
HCC	Correlation							1.000
	Sig.(2-tailed)							.
	Df							0

Source: Authors' Computation

The issue with the significant relationship between inadequate equipment and inefficient operation ($r = .672$) implied that cargo traffic management and handling operations will suffer when various handling equipment are not adequate. This proved the fact that efficient operations, that is, operations at reduced cost for optimum profit results from the use of up to date equipment. The fact that inefficient operations is having significant relationship with cargo insecurity ($r = .753$) reflected the feelings that general inefficiency of operations threatens the security of cargo at any port. The relationship between high cost of clearance and poor staff attitude ($r=.534$) implied that the attitude of staff saddled with the responsibilities of handling cargo clearance procedures at the port may cause freight forwarders to induce port terminal employees with some financial benefits if they do not want clearing procedures to be made difficult for them.

The study took a step further in the analysis of the constraints to cargo throughput development at the port by conducting multiple linear regression analysis. Table 2 presents the model summary of the multiple linear regression analysis in order to assess the strength of the relationship between the independent variables and the dependent variable. It shows the model correlation coefficients, R , its square, R^2 , and an adjusted version of this coefficient as summary measures of the model fit. The multiple correlation coefficient $R = 0.63$ predicted a strong correlation in the relationships between and within the dependent and independent variables.

Table 3: Model Summary of Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.634 ^a	.402	.358	.316

a. Predictors: (Constant), High Clearance Cost, Manpower Shortage, Cargo Insecurity, Poor Staff Attitude, Poor Technical Know-How, Inadequate Equipment, Inefficient Operations

Source: Authors' Computation 2016

The R² value showing 0.402 indicated that the variables could explain 40.2% of the variance in the constraints to cargo throughput development in Tin Can Island port. In other words, 40% of the variance in the constraints could be used to explain the influence of high clearance cost, manpower shortage, cargo insecurity, poor staff attitude, poor technical know-how, inadequate equipment, inefficient operations on cargo throughput development. Since by definition, R² will increase when further terms are added to the model, even if this does not explain variability in the population, the adjusted R² is an attempt at improving the estimation of R² in the population. The index is adjusted down to compensate for the chance increase in R², with bigger adjustments for larger sets of explanatory variables. The use of this adjusted measure leads to a revised estimate that 35.8% of the variability of the independent variables could be used to explain the dependent variable.

Table 3 represents an ANOVA result providing an F-Test equal to 9.158 when the explanatory variables are set at zero. The result showed $F(7, 97) = 9, p < 0.001$, which could lead to the conclusion that the independent variables significantly influenced cargo traffic development at the port.

Table 3: ANOVA^a result of constraints to cargo throughput development

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	6.442	7	.920	9.158	.000 ^b
Residual	9.748	97	.100		
Total	16.190	104			

a. Dependent Variable: Cargo traffic constraints

b. Predictors: (Constant), High Clearance Cost, Poor Technical Know-How, Inefficient Operations, Manpower Shortage, Poor Staff Attitude, Inadequate Equipment, Cargo Insecurity.

Source: Authors' Computation 2016

The coefficient of cargo traffic constraints presented in Table 3 provides the estimates of the regression coefficient, standard errors of the estimates, t-tests that a coefficient takes the value zero, and confidence intervals. The estimated coefficients are given under the heading 'Unstandardized Coefficients B; these give, for each of the explanatory variables, the predicted change in the dependent variable when the explanatory variables is increased by one unit conditional upon all the other variables in the model remaining constant. It therefore shows that identified constraints to cargo traffic development tend to be increasing by 8.3%, 0.5%, 11.9% and 16.9% for every additional score on manpower shortage, poor technical know-how and poor staff attitude respectively. The influence of the constraints on cargo traffic development will tend to be decreasing by 1.56% and 0.7% for every additional score on inadequate equipment and

inefficient operations respectively (See Table 4). This implied that the independent variables were significant factors influencing to the development of cargo throughput at the port.

Table 4: Coefficient of constraints to cargo traffic development

Model	Unstandardized		Standardized	T	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	1.863	.143		6.042	.000
Manpower Shortage	.083	.031	.247	2.706	.008
Poor Technical Know- How	.005	.030	.013	.161	.872
1 Inadequate Equipment	-.156	.033	-.553	-4.781	.000
Cargo Insecurity	.119	.035	.433	3.403	.001
Inefficient Operations	-.007	.051	-.020	-.147	.884
Poor Staff Attitude	.169	.035	.489	4.885	.000

a. Dependent Variable: Cargo traffic constraints

Source: Authors' Computation 2016

The definition of the model specification for the extent of relationship between the dependent variable and the independent variables takes the form:

Cargo traffic constraints = 1.863 + .083(Manpower Shortage) + .005(Poor Technical Know-How) - .156(Inadequate Equipment) + .119(Cargo Insecurity) - .007(Inefficient Operations) + .169 (Poor Staff Attitude)

Table 4 shows that poor staff attitude, inadequate equipment and cargo insecurity form the most significant issues capable of influencing the development of cargo throughput and operations at Tin Can Island port, Lagos.

5. Conclusion and Recommendations

An understanding of the variability in the figure of cargo throughput and operations is crucial for efficient cargo management at any port. This understanding will be required in order subdue the constraints that are capable of hindering the development of cargo traffic within a port. The need to remedy the influence of varying degree of constraints against cargo traffic development should be the focus of private terminal operators at Tin Can Island port. This is because private operators are solely responsible for the handling operations of cargo at terminals of the port. The government through the Nigerian Ports Authority (NPA) should put up policies that will encourage private terminal operators to be more dedicated to customers' satisfaction and service delivery, acquisition of adequate handling equipment and security of cargo at the port.

The study subjected 6 variables believed to be challenging development of cargo throughput to correlation and regression analyses. It was concluded from the study that poor staff attitude, inadequate equipment and cargo insecurity form the most significant issues capable of influencing the development of cargo throughput and operations at Tin Can Island port, Lagos.

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