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Assessing the impact of cargo clearance process on the cost of container clearance in Lagos seaports

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Background: This study investigates the impacts of cargo clearance process on the cost of container clearance in Lagos seaports.

Objective: A questionnaire survey was conducted on 23 freight forwarding firms randomly selected from the register of the Council for the Regulation of Freight Forwarding in Nigeria.

Method: Regression analysis was carried out using SPSS software to determine the effect of cargo clearance process on the overall cost of cargo clearance in Nigerian seaports. In doing this, seven stages of cargo clearance process, namely, Processing of Form M (FM), Processing of Pre-Arrival Assessment Report (PAAR), Assessment of Duty (AD), Payment of Duty (PD), Examination (E), Custom Release (CR) and Delivery (D), were identified as independent variables, while Cost of Cargo (CC) clearance was identified as a dependent variable.

Results: The results show that FM has a positive correlation with CC, and it accounts for about 40.8% of the variations in the CC. Similarly, PAAR has a strong positive correlation with CC, and it accounts for about 58.1% of the variations in the CC. Furthermore, AD was found to have a positive correlation with CC, and it accounts for just about 35.5% of the variations in the CC. Finally, E has a positive correlation with CC, and it accounts for about 39.2% of the variations in the CC.

Conclusion: Based on the above findings, the study recommends simplifications of processing documents and a reduction in the number of agencies involved in the cargo clearing process.

Keywords: cargo; clearance process; cost of clearance; impact; Lagos seaports.

Introduction

The importance of cargo or customs clearance cannot be overemphasised in international maritime trade. This is because the efficient performance of international maritime trade of any nation depends on how fast and cost-effective the cargo clearance and processes are in the seaports of the maritime nations. This is why efforts are being made globally to create enabling and logistics-friendly environment that can facilitate domestic and cross-border trade. In Nigeria, for instance, the government, recognising the role of cargo clearance through its trade policy, established the National Economic Empowerment and Development Strategies – NEEDS (2004) of which the reforms of customs services are a major focus. Similarly, because of its role in trade facilitation, the cargo clearance process is one of the focuses of the World Bank Logistics Performance study – a tool created to help countries identify the challenges and opportunities in efficient trade logistics (Index Mundi 2019). Based on this tool, Martincus, Carballo and Graziano (2015) measured the effects of customs-related delays on firms' exports by studying export transactions data from Uruguay for the period 2002–2011, including the actual time took by customs to clear these transactions. Findings suggest that a 10% increase in customs delays results in a 4% decline in exports. This effect emanates from higher costs for exporters, which subsequently reduce their foreign sales, as well as for buyers, which appear to reduce their exposure to firms whose deliveries are subject to such delays.

Similarly, Hornok and Koren (2015) analyse the impact of administrative per-shipment costs on trade volumes. Employing Spanish shipment-level export data for the period 2006–2012, the authors find that a 50% reduction in per-shipment costs is equivalent to a 9% reduction in tariffs. In fact, a study in Nigeria by Adegbie (2011) asserted that there is a very strong relationship between the efficiency in customs service and the economic development of Nigeria. The point

here is that the efficiency of cargo clearance is crucial to national and global economic development. Thus, it is imperative to spot aspects of the clearance process where undue costs are incurred. By this, measures to remove obstacles in the way of effective and efficient cargo clearance in Lagos seaports – the main economic gateway of Nigeria – can be fixed.

The cargo clearance process constitutes procedures that imports and exports from foreign countries must pass through at the nation's seaports before they are allowed into the country. Usually, when goods arrive at their domestic seaport, they are unloaded from the ship and moved to customs for inspection, examination and clearance before they are finally picked up by the shipper for onward delivery at the shippers' factory. The process of physical inspection and examination is to ensure that the information on the documents is in consonance with the goods in the container. The duties' values declared will be looked into to ensure there are no discrepancies between the information on documents and the goods to be examined (Adewale 2017). These procedures, however, can take a short or long time depending on the nature of the process, and if there are delays, it translates to costs to be borne by the shipper.

Several authors have contributed to the debate on cargo clearance process in relation to cost and other matters. The work of Anton (2013) has found that delay in clearance process time has a significant effect on customs clearance cost. For example, a 10-day delay in customs clearing of imported goods, on average, reduces their imports by 1.6%. Carballo et al. (2014) show that an additional day of delay raises the cost for small firms by about 0.7% and for large firms by 0.9%.

Furthermore, an analysis done by Shepa (2013) and Onogwu (2018) on the challenges against efficient cargo clearance revealed that lengthy clearance procedures, corruption because of various documentation requirements and lack of transparent procedures constitute major challenges. Automation system and significant use of information and communication technologies also influence on custom clearance (Nicholas 2017; Owoyemi 2018). Adoption of the electronic customs process was discovered to have an effect on border efficiency, owing to its ability to reduce transit time and cost of private business (Agbesi 2013). Furthermore, manual processing, numerous government agencies participation in cargo examination and unlawful additional checks (Haastup 2020; Usman 2020) were found to relate to the efficiency of customs clearance in terms of cost and time.

Furthermore, the adoption of the single-window system was found to reduce the transaction cost of clearance goods at the port (Rhodalyn 2018). Similarly, the single-window system also has a positive effect on shipping procedures, pre-clearance of goods and customs goods declaration procedures and hence improved cargo clearance efficiency at the port of Mombasa (Kabiu, Gakobo & Mwaura 2019). On challenges hampering the single-window system implementation, the following factors were discovered: a lack of government support, inadequate coordination between stakeholders as well as organisations' and human resistance to change (Abeywickrama & Wickramaaractchi 2015).

In all these studies, however, the relationship between each element in the clearance process and the overall cost of clearance is not clear. Analysing the cargo clearance process as a system, for instance, suggests that there are sub-systems (specific procedures) that interact together to form the clearance system. Thus, there is a need to understand the relationship between specific procedures in the system and the overall cost paid by importers. This study, therefore, seeks to understand how different elements of the cargo clearance process affect the overall cost of cargo clearance.

Literature review

Theoretical framework

The organisational system theory

This study hinges on organisational system theory (OST), which explains how procedures in the clearance system interact as a unitary whole. The OST (Kast & Rosenzweig 1985) has been described essentially as an explanation of how a unitary whole with two or more sub-systems can work together to achieve a common objective. In OST analysis, a problem in any part of a system is a systemic problem and affects every part as all the parts are working together to achieve the common goal. When applied in port operations, OST provides a picture of constantly interacting parts such as discharge, transfer, storage and delivery, which must not be disconnected if the achievement of the ultimate goal of an efficient port system must be realised. Any malfunctioning or ineffectiveness of any one or more of the operational stages will invariably result in bottlenecks, which will eventually affect the whole system adversely. Organisational system theory works on four principles, namely, integration, cooperation, coherence and coordination (Guessan 1995).

Organisational system theory truly depicts the cargo clearance system where several units interact together to achieve a common goal. For instance, the seven procedures, namely (1) Processing of Form M, (2) Processing of Pre-Arrival Assessment Report (PAAR), (3) Assessment of Duty (AD), (4) Payment of Duty (PD), (5) Custom Examination, (6) Custom Release (CR) and (7) Delivery, work together to complete the formalities required by customs. The emphasis here is the ultimate goal and not the individual element of interest. Thus, OST is considered the most suitable for this work owing to its emphasis on the ultimate system's goal. If all the procedures work together to achieve the common objective, this suggests that a relationship exists between each of the procedures and the common objective, that is, the total cost of cargo clearance. The submission here, therefore, is that a relationship exists between the cargo clearance process and the cost of container clearance in Lagos seaports.

Data and method

Data used for this study were collected through a structured (standardised) questionnaire, which was divided into three sections, namely, demographic data (age, educational qualification, area of operations and work experience of respondents), container clearance data (average number of containers cleared in a year, cost of clearing a container, total number of steps taken to complete each of the procedures, total number of agencies involved and total number of documents) and mode of operations (electronic or manual). Others include data on standard time and delays in container clearance. Prior to questionnaire administration, the instrument was subjected to the scrutiny of a panel of experts in the field to ensure content and construct validity. Afterwards, pilot studies as recommended in Nwankwo (2016) were carried out in an attempt to determine whether questionnaire items possess the desired quality.

A sample size of 30 freight forwarding firms in Lagos city was used for this study. This represents 15% of the entire population of 196 registered corporate freight forwarders based on the 2020 database of the Council for the Regulation of Freight Forwarders in Nigeria. Out of the 30 sampled firms, 23 firms actually returned the filled questionnaire via email addresses, representing 77%. Thus, the analysis in this study is based on 23 filled and returned questionnaires. This was based on the assertion of Osemwota, Okhaku and Tomwe (1996) that the size of the universe from which a sample is drawn does not necessarily determine the number of cases needed to yield an adequate sample of that universe, only that the sample selected should be an optimum sample.

Estimation techniques

This study conducts a regression analysis on the impact of cargo clearance process on the cost of container clearance in Lagos seaports, Nigeria. This implies that certain factors help to explain the cost of container clearance in Lagos seaports. It can, therefore, be conceptualised that there is a set of variables $x_1, x_2, x_3 \ldots xn$, which can be used to explain the cost of cargo in Lagos seaports. This may be mathematically stated as follows:

$$Y = f(x_1, x_2, x_3 \ldots\ldots\ldots xn \quad \text{[Eqn 1]}$$

This can be transformed using the multiple regression equation, and thus:

$$Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots xbnxn+e \quad \text{[Eqn 2]}$$

where Y = the dependent variable, that is, the cost of clearance, a = constant, b_1, b_2, b_3,…bn = the intercept, x_1, x_2, $x_3 \ldots xn$ = the independent variables and e = error term representing the unexplained variables. This study considered a multiple regression model appropriate based on its application by Safira, Buchari and Kadarsah (2020) where more than one variables are used. The model is a useful statistical tool for finding the contribution of independent variables to dependent variables. The statistical tool produces a coefficient of determination, which is a measure of the total contribution of the explanatory variables to the dependent variable. The equation results provide a basis for predicting the value of the dependent variable from two or more independent variables (Katerina 2018). For the purpose of this study, the multiple regression is operationalised as follows:

$$CC = F(FM, PAAR, AD, PD, E, CR, D) \quad \text{[Eqn 3]}$$

The clearance process represents the independent variable, while the cost of clearance represents the dependent variable. There are seven stages in the cargo clearance process in Lagos seaports, namely; Processing of Form M (FM), Processing of Pre-Arrival Assessment Report (PAAR), Assessment of Duty (AD), Payment of Duty (PD), Examination (E), Custom Release (CR) and Delivery (D). The CC, which stands for the cost of clearance, represents the dependent variable. This is therefore transformed as:

$$CC = a + b_1FM + b_2PAAR + b_3AD + b_4PD + b_5E + b_6CR + b_7D \quad \text{[Eqn 4]}$$

For each of the stages, the regression equation is given as:

$$CC = a + b_1 + FMNS + b_2FMNA + b_3\ FMND \quad \text{[Eqn 5]}$$

where CC represents the cost of clearance, FM represents Form M and the first stage of the process, NS represents the number of steps an importer must take under FM, NA represents the number of government agencies assigned to complete FM and ND represents the number of documents to be completed by an importer under FM. NS, NA and ND are common to all stages of the process:

$$CC = a + b_1 + PAARNS + b_2PAARNA + b_3PAARND \quad \text{[Eqn 6]}$$

$$CC = a + b_1 + ADNS + b_2ADNA + b_3ADND \quad \text{[Eqn 7]}$$

$$CC = a + b_1 + PDNS + b_2PDNA + b_3PDND \quad \text{[Eqn 8]}$$

$$CC = a + b_1 + ENS + b_2ENA + b_3END \quad \text{[Eqn 9]}$$

$$CC = a + b_1 + CRNS + b_2CRNA + b_3CRND \quad \text{[Eqn 10]}$$

$$CC = a + b_1 + DNS + b_2DNA + b_3DND \quad \text{[Eqn 11]}$$

Results and discussion

Description of the container clearance process in Lagos seaports

There are seven stages in the container clearance system based on the data collected from clearing agents and customs in Apapa and Tin Can Island seaports. Under each of the stages, four elements were captured, namely, the number of steps an importer must take under a specific process, the number of government agencies assigned to complete a specific process, the number of documents to be completed

by an importer under a specific process and the mode of operation (manual or electronics). The seven stages that make up the container clearance process are as follows:

1. Processing of e-Form M.
2. Processing of PAAR.
3. Assessment of Duty.
4. Payment of Duty.
5. Examination.
6. Customs Release.
7. Delivery.

Table 1 shows the description of the container clearance process in Apapa and Tin Can Island seaports.

Analysis based on Table 1 shows that an average of 19 steps are involved in the container clearance process in Apapa and Tin Can Island seaports. It also shows that an average of 26 agencies and 39 documents are involved. The table further revealed that processing of e-form M, PAAR and PD is done 100% electronically. Assessment of duty is done 95% electronically, while the remaining 5% is done manually. The process of examination, customs release and delivery are done 74%, 70% and 65%, respectively, electronically.

Impacts of cargo clearance process on the cost of container clearance

In analysing the impacts of cargo clearance process on the cost of container clearance, a multiple regression analysis was carried out. Under each stage, steps involved, number of agencies, number of documents and mode of operations were measured against the cost of container clearance. Mode of operation was measured nominally where 1 and 2 stand for manual and electronic, respectively. The results of the regression analysis for all stages in the cargo clearance process against the cost of container clearance are shown in Table 2.

Results in Table 2 show that Form M has a positive association (r = 0.639) with container clearance cost, and it accounts for about 40.8% (r^2 = 0.408) of the variations in the cost of container clearance. Similarly, PAAR has a strong positive association (r = 0.762) with the cost of container clearance, and it accounts for about 58.1% (r^2 = 0.581) of the variations in the cost of container clearance. Furthermore, customs duty assessment was found to have a positive correlation (r = 0.596) with container clearance cost, and it seems to account for just about 35.5% (r^2 = 0.355) of the variations in the cost of container clearance. It was also discovered from the summary that examination process has a positive correlation (r = 0.626) with container clearance cost, and it seems to account for about 39.2% (r^2 = 0.392) of the variations in the cost of container clearance. The result also shows that delivery process has a positive correlation (r = 0.669) with container clearance cost, and it seems to account for 44.8% (r^2 = 0.448) of the variations in the cost of container clearance. Customs release was also found to have a positive correlation (r = 0.587) with container clearance cost, and it seems to account for about 34.5% (r^2 = 0.345) of the variations in the cost of container clearance.

Further analysis shows that only the number of agencies involved in e-Form M processing has a statistically significant relationship with the cost of container clearance. For every additional Form M agency involved, there seems to be an increment of N119 878 on the cost of clearing a container. It also shows that only PAAR number of steps and number of documents involved have a statistically significant effect on the cost of container clearance with the number of steps having a strong negative correlation and the number of documents involved having a mild positive correlation. There is also a statistically significant positive relationship between the number of agencies involved in the examination and the cost of container clearance. For the delivery process, the number of steps, the number of agencies and the number of documents involved have a

TABLE 2: Model summary for cargo process on container clearance cost.

Model	*R*	*R* square	Adjusted *R* square	Std. error of the estimate
1. Form M	0.639†	0.408	0.269	255.79444
2. PAAR	0.762†	0.581	0.482	215.35248
3. Assessment of duty	0.596†	0.355	0.153	275.28384
4. Payment of duty	0.484†	0.234	0.064	282.88630
5. Examination	0.626†	0.392	0.152	259.31808
6. Customs release	0.587†	0.345	0.152	269.24381
7. Delivery	0.669†	0.286	0.286	247.13148

PAAR, Pre-Arrival Assessment Report.

†, Predictors: (Constant), for each of the seven stages of processes, there are modes of operations, which are manual or electronics, number of documents involved, number of steps and number of agencies involved.

TABLE 1: Description of the container clearance process in Apapa and Tin Can Island seaports.

S/N	Description of process	Average number of steps an importer must take under a specific process	Average number of government agencies assigned to complete a specific process	Average number of documents to be completed by an importer under a specific process	Mode of operation (manual or electronics)
1	Processing of e-form M	3	4	4	100% Electronic
2	Processing of PAAR	3	3	6	100% Electronic
3	Assessment of duty	2	2	4	95% Electronic
4	Payment of duty	2	2	3	100% Electronic
5	Examination	3	6	8	74% Manual
6	Customs release	3	4	7	70% Electronics
7	Delivery	3	5	7	65% Electronic
8	Total	19	26	39	-

PAAR, Pre-arrival Assessment Report.

statistically significant effect on the overall cost of container clearance.

Based on the results of ANOVA in Table 3, it is safe to say that there is a statistically significant relationship ($p = 0.052 \approx 0.05$) between Form M and the clearance cost of containers. However, only the Form M number of agencies involved has a significant effect ($p = 0.042$) on the cost of container clearance with a strong positive correlation ($r = 0.575$). For every additional Form M agency involved, there seems to be an increment of ₦119 878 on the average cost of clearing a container. In this same vein, PAAR has a statistically significant relationship ($p = 0.004$) with the clearance cost of containers. Similarly, the delivery stage was found to have a statistically significant relationship ($p = 0.053$) within its variables with the clearance cost of containers. The implication of the above is that an increase in the variables within Form M, PAAR and delivery process will lead to an increase in the cost of container clearance.

For customs duty assessment and payment assessment, however, there is no statistically significant relationship ($p = 0.178$) and ($p = 0.281$), respectively within their variables with the clearance cost of containers. The examination process also does not have a significant relationship ($p = 0.281$) within its variables with the clearance cost of containers. The result also shows that customs release has no significant relationship ($p = 0.169$) within its variables with the clearance cost of containers.

TABLE 3: ANOVA.†

Model	Sum of squares	Df	Mean square	*F*	Sig.
FM					
Regression	767632.8	4	191908.20	2.933	0.052‡
Residual	1 112 324.0	17	65430.80	-	-
Total	1 879 956.0	21	-	-	-
PAAR					
Regression	1 091 553.0	4	272888.20	5.884	0.004‡
Residual	788403.7	17	46376.69		
Total	1 879 956.0	21			
Assessment of duty					
Regression	667457.3	5	133491.50	1.762	0.178‡
Residual	1 212 499.0	16	75781.19		
Total	1 879 956.0	21			
Pay of duty					
Regression	440600.6	4	110150.10	1.376	0.281‡
Residual	1 440 444.0	18	80024.66		
Total	1 881 044.0	22			
Examination					
Regression	737864.7	5	147572.90	2.195	0.103‡
Residual	1 143 180.0	17	67245.87		
Total	1 881 044.0	22			
Customs release					
Regression	648676.6	5	129735.30	1.790	0.169‡
Residual	1 232 368.0	17	72492.23		
Total	1 881 044.0	22			
Delivery					
Regression	842 787.0	5	168557.40	2.760	0.053‡
Residual	1 038 257.0	17	61073.97		
Total	1 881 044.0	22			

PAAR, Pre-Arrival Assessment Report; FM, Form M.

†, Dependent variable: Mean cost of clearance ('000).

‡, Predictors: (Constant), for each of the seven stages of processes there are modes of operations, which are manual or electronics, number of documents involved, number of steps and number of agencies involved.

These findings are in agreement with the studies of Shepa (2013), Sirika and Gizaw (2016), Rhodalyn (2018) and Kabiu et al. (2019) whose specific procedure in the clearance system influences customs transaction cost.

Furthermore, this study found that the number of steps and the number of documents involved in PAAR processing have a statistically significant effect ($p = 0.012$ and $p = 0.004$, respectively) on the cost of container clearance with the number of steps having a strong negative correlation ($r = –0.564$) and the number of documents needed having a weak/mild positive correlation ($r = 0.256$). For both AD and PD, none of their variables has a significant effect on the cost of container clearance. Contrary to peoples' opinion that customs examination is the most cumbersome aspect of the clearance process, it was found out that examination of the container does not have a significant relationship with the cost of container clearance except for its number of agencies, which has a significant effect ($p = 0.049$) on the cost of container clearance with a positive correlation ($r = 0.533$). As for the delivery process, the number of steps, the number of agencies and the number of documents involved, all have significant effects on the overall average cost of container clearance.

Conclusion and recommendations

The results of this study show that the number of steps, the number of agencies and the number of documents involved in the cargo clearance process in seaports have significant impacts on the total cost of cargo clearance. These findings are in agreement with the studies of Shepa (2013), Sirika and Gizaw (2016), Rhodalyn (2018) and Kabiu et al. (2019) whose specific procedure in the clearance system influences customs transaction cost.

In this study, impacts, however, vary across processes. Form M process has a greater impact on the cost of clearance, followed by PAAR and then delivery. For instance, an increase of additional agencies in the FM process will cost an additional cost of N119, 878. The variations in the way steps, agencies and documents across the processes influence total cost were not clear in previous studies (Anton 2013; Carballo et al. 2014; Shepa 2013). Thus, this study has contributed to the debate on cargo clearance by determining the specific impact of steps in the process on the total cost of clearance in Nigerian seaports.

Based on the results obtained in the study, a review of steps, agencies and documents involved in FM, PAAR and delivery processes is hereby recommended. Furthermore, the impact of cargo process on importers' business should be explored in future research.

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Competing interests

The authors have declared that no competing interest exists.

Authors' contributions

J.A.O. contributed to the conception and design, analysis and interpretation of data. He also critically revised the manuscript for important intellectual content and approved the final version. B.G.O. made a substantial contribution to the conception and design, acquisition of data, and analysis and interpretation of data. He also drafted the manuscript. V.O. critically revised the manuscript for important intellectual content and also approved the final version to be published. A.S.O. made a substantial contribution to data instrument design, acquisition of data, and analysis and interpretation of data.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

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