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Appraisal of conservative service impacts on revenue generation in Nigerian Ports industry

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Abstract

This study is an appraisal of the impacts of conservative services on revenue generation in Nigerian ports. The conservative services are those operations designated by the law to be handled by the port authority in providing enabling environment for safe and secured navigation of calling vessels in and out of the ports, in which payments are made to the port authority on providing such services. The researcher considered among others, three basic conservative operations which include pilotage, towage and berthing/mooring operations. Data was collected on the number of vessels and vessel gross registered tonnage that visited the Nigerian ports for the periods 2010-2019. Port charges on the conservative services were. Ten years data series were collected for the period 2010-2019. The data series were from secondary data sources which include NPA statistics and NPA simplified tariff available online. The researcher formulated four hypotheses to answer the researcher questions on this study. Algebraic functions and regression model were used to analysis the data collected on the study. Excel and SPSS software were employed for computer based analysis. The study showed high significance of the impacts of independent variables on RGOCS of Nigerian Ports Authority. The researcher made some recommendations based on the findings and conclusion of the study.

Keywords: Appraisal; Conservative Services; Revenue Generation; Nigerian Ports

1. Introduction

Nigerian Ports Authority operates several seaport terminals and jetties which vessels call for port services. Conservative services are those which are by the law required to be provided by the port authority to port users to enable safe and secured entry and exit of vessels within the port environment [1]. There are a number of services which the Nigerian Ports Authority (NPA) are required by the law to provide to port users under conservative operations of the Nigerian Ports which include dredging, lighthouse, and buoys maintenance, towage, pilotage, berthing and mooring services. On providing such services, the vessels entering and leaving the port and jetties make payment as described in the Nigerian Ports Authority simplified tariff [1]. Nigerian Ports Authority on this demand ensures constant dredging of the water channels, maintenance of the lighthouses, buoys and other necessary navigational aids along the coastal water, ports and jetties for safe navigation of vessels entering and exiting the ports environment.

The relevant pilotage legislation defines a 'Pilot' as – "any person not belonging to a ship who has the conduct thereof" [1; 2]. In other words, someone other than a member of the ship's crew that has control over the speed, direction, and movement of the ship in designated restricted waters. Prior to the development and establishment of pilotage legislation, pilots were known as hobblers, who were competing with one another to first approach an incoming ship to navigate it to the docks or berth and receive payment. Today, pilotage is an important service by International Maritime

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Organization's regulation which provides that the local port authority should provide pilotage services to all calling vessels in and out the port environment [2]. Pilotage operation is the assistance given to a vessel by a domiciled trained local pilots who understand the coastal waters, navigable channels and can maneuver in and out the ports and berth locations. This provision of the law mandates the ports authority to ensure safe navigation in narrow channels of the local ports and jetties which the foreign pilots may not have the knowledge about [3].

The importance of employing qualified and licensed marine pilots in approaches to ports and other areas where specialized local knowledge is required was formally recognized by the International Maritime Organization (IMO) in 1968, when the Organization adopted Assembly resolution A. 159 (ES.IV) recommendation on Pilotage [4; 5]. The resolution recommends Governments organize pilotage services where they would be likely to prove more effective than other measures and to define the ships and classes of ships for which employment of a pilot would be mandatory [4]. The IMO Assembly in 2003 adopted resolution A. 960(23) recommendations on training and certification and operational procedures for maritime pilots other than deep-sea pilots [6]. Recognizing the perilous nature of the pilot transfers to and from the ships, IMO has also adopted resolution A. 1045(27) recommendation on Pilot Transfer Arrangements and approved Required Boarding Arrangement for Pilots (MSC.1/Circ.1428) [6]. IMO introduced measures through the Safety of Life At Sea 1974 (SOLAS) regulation V/23 in July 2012 to improve the safety of pilot transfer arrangements provided by vessels [7].

Highly qualified marine pilots are usually employed by the local port authority or maritime administration and provide their services to ships for a fee, calculated in relation to the ship's tonnage, draught or other criteria [7]. Pilots may be required to possess prior maritime experience or engaged as a trainee pilot. For example, pilot trainees must have a master's license, command experience on offshore or deep draft vessels, pass written & oral examinations and simulator exercises, followed by years of practical training gaining experience with different types of vessel and docking facilities. Following licensing, pilots are also required to engage in continuing educational and professional development programmes to maintain currency of knowledge and skill-sets.

Source: Field survey

Figure 1 Pilotage operation

According to Hetherington, Flin & Mearns [8], training of marine pilots is the responsibility of the local Port Authority or Maritime administration or Pilotage Services Provider. A marine pilot must possess intimate local knowledge of the pilotage area/district and display highly developed ship-handling and maneuvering skills and competencies [8]. The minimum standard of these skills and competencies are to be determined by the Port Authority /Maritime Administration and are to be appropriate for the pilotage port to which that license relates and type and size of vessels

being piloted. These skills and competencies may be acquired through a combination of factors which including by experience; on-the-job training by licensed marine pilots; manned model training and simulator training. The required elements for training, assessment, and length of training are to be determined by the Port Authority in accordance with the International and National Legislation /Pilotage Training Standards or Codes through the Port Authority [9].

Nigerian Ports Authority has five major areas/districts of pilotage services. These districts are areas along the water channels where the local pilots could board the vessels entering the ports or jetties for assistance. The NPA pilotage districts include: Lagos pilotage district, which covers all jetties and ports in Apapa, Tin Can. RORO, and all new terminals along Lagos district in the western ports. Bonny Port Harcourt pilotage district, covers the vessels entering and leaving Port Harcourt ports, Onne ports and all jetties within Port Harcourt coastal areas. Warri pilotage district, covers Warri ports and jetties. Calabar pilotage district, covers calabar ports and jetties. When the vessels arrive the farewell buoy, the master contact the port traffic for a pilot assistance to bring vessel to her berth on entering the port and similarly, when leaving, the pilot assist the vessel to the fare way buoy where the master can take over the deep sea navigation. In NPA pilotage is compulsory for all vessels except, however, vessels below 500GT with pilotage Exemption Certificate (PEC) are excluded. All Tankers and Vessels carrying classified substances (including mixtures and solutions) as specified in International Maritime Dangerous Goods (IMDG) Code must navigate with a Pilot on board while in the Districts [9; 10]. A vessel issued with Pilotage Exemption Certificate may require pilotage and towage services if the vessel equipment is substandard or defective, the vessel is maneuvering with difficulty or has a history of difficulty in maneuvering; adverse weather is prevailing or expected, the Master of the vessel is incapacitated; the vessel's position is exposed to imminent danger or navigational hazard or it is apparent that the Master of the vessel is not performing to international best practices and to the satisfaction of the Port Authority and the service of a tug is required [10].

Source: filed survey

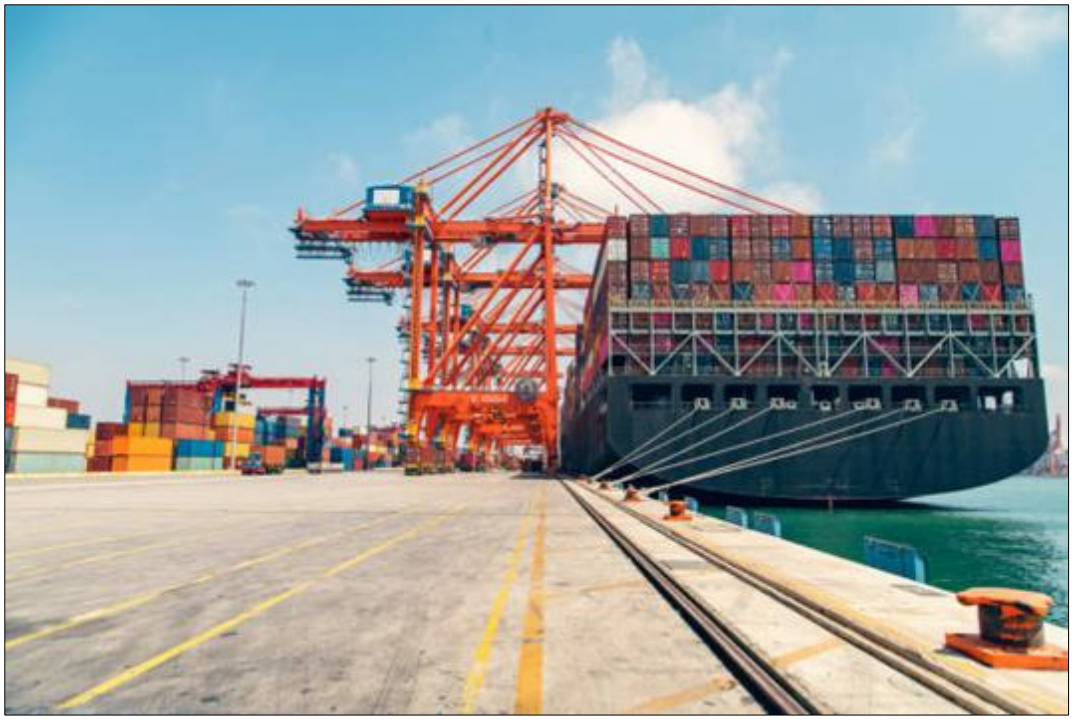
Figure 2 Tug operation

Tug operations also known as Towage service on the other hand is mandated by the law to aid pilotage operations whereby tugs are employed to assist during the maneuvering of vessels in restricted water channel entering and leaving ports/berths [11]. Towage service is an essential and compulsory service which payment is made to port authority for rendering such services. Towage services is a core function of the NPA, but presently NPA has outsourced private company in the Lagos ports and Rivers Ports areas, leaving the agency with only Warri and Calabar ports to manage [10].. Towage services are part of the technical function of the NPA, which are supposed to be resident with the authority as the landlord ports in the port concession regime. According to Tola, [10], studies have shown that towage services contractors to NPA remit a little sum of $920 per vessel towed as against $3,600 paid by the vessels to the contractors, which is a little less than the global charge of $3,620. He notes that globally, towage services charges are $3,620 dollars. Although the NPA outsourced towage service to currently charge the standard rate as done all over the world, it remits only $920 Dollars to the agency and diverts the rest despite using the agency's infrastructure and manpower. NPA

shipping statistics show that an average of 60 vessels call at the Lagos district ports monthly [12]. However, before the current downturn in importation, the average vessels calling at Lagos ports stood around 110 per month [13]. The towing services contractors are currently servicing not less than 60 vessels per month, charging $3,600, but remitting only $920 to NPA [12]. This leaves NPA with a loss of $2,680 per vessel [13; 14].

Berthing and mooring operations are very technical operations in ports which are handled by the ports authority in Nigerian ports. Berthing operation is a process which enables vessels come to berth locations safely and long-side on the quay provided for the berth space. Mooring is a very technical operation as it ensures safe, secured and firm tying of vessels at berth with the marine rope or chain on the provided quayside bollards to avoid drifting occurring due to sea current and waves during loading or discharging operations. Berthing and mooring operations are done by trained shoreline men by the ports authority to ensure that vessels at berth are secured and properly tied during the operations.

Vessel mooring is a highly technical operation that requires safety awareness. The International Maritime Organization (IMO) drafted new requirements to improve the safety of mooring operations which were approved by the Maritime Safety Committee (MSC) in 2019 [15]. The new regulation follows the many serious and fatal accidents linked to mooring operations, typically caused by human errors on manual handling of equipment or mooring line breakage [16].



Source: field survey

Figure 3 Berthing & Mooring operations

Gross Tonnage (GT) of a vessel is the measure with which the ship is registered in national authority [17]. It is the measurement of the vessel capacity in cubic feet of the spaces within the hull and of the enclosed spaces above the deck available for cargo, stores, passengers and crew, with certain exceptions, divided by 100 [18]. Thus 100 cubic feet of capacity is equivalent to one gross ton. The net tonnage of a ship is a metric that determines the actual capacity of cargo that the vessel can carry. The word tonnage is derived from the practice of laving dues on ships which were collected based on tons that the vessel could accommodate. The gross tonnage of a vessel is the basis for determining pilotage, berthing/mooring charges in Nigerian ports [19; 20].

Aim and objectives of the study

The aim of the study is to appraise conservative services impacts on revenue generation in Nigerian Ports industry. The specific objectives are as follows:

- To determine the impacts of vessel gross tonnage on revenue generated on conservative services in Nigerian ports.
- To determine the impacts of pilotage services on revenue generated on conservative services in Nigerian ports.
- To determine the impacts of berthing/mooring services on revenue generated on conservative services in Nigerian ports.
- To determine the impacts of towage services on revenue generated on conservative services in Nigerian ports.

1.1. Research questions

- What is the significant impact of vessel gross tonnage on revenue generated on conservative services in Nigerian ports?
- What is the s significant impact of pilotage services on revenue generated on conservative services in Nigerian ports?
- What is the s significant impact of berthing/mooring services on revenue generated on conservative services in Nigerian ports?
- What is the s significant impact of towage services on revenue generated on conservative services in Nigerian ports?

1.2. Hypotheses

- H_{01}: Vessel gross tonnage has no significant impact on revenue generated on conservative services in Nigerian ports.
- H_{02}: Pilotage service has no significant impact on revenue generated on conservative services in Nigerian ports.
- H_{03}: Berthing/Mooring service has no significant impact on revenue generated on conservative services in Nigerian ports.
- H_{02}: Towage service has no significant impact on revenue generated on conservative services in Nigerian ports.

2. Material and methods

The data used for the study were secondary data sourced online from Nigerian Ports Authority website (NPA tariff regulation and NPA statistics). The study gathered data on vessel gross tonnage from 2010-2019; NPA tariff on pilotage, footage, berthing/mooring and towage which are conservative services to vessels entering and leaving the ports. The researcher adopted algebraic function and simple regression model as the statistical tool to analyze data and used MS Excel and SPSS version 22 computer aided software to evaluate the data set collected on this study.

The algebraic function is a mapping from a set of inputs (the domain) to a set of possible outputs (the codomain). The definition of function is based on a set of ordered pairs, where the first element in each pair is from the domain and the second is from the codomain, where an input x from the domain X is computed to give the output, the element

$$y = f(x)$$

from the codomain Y.

Where;
y = Revenue generated on conservative services (RGOCS)

x = f (PS× GRT +BMS× GRT +2TS×V) for the period 2010-2019

PS= Pilotage Service
BMS= Berthing/Mooring Service
TS=Towage Service
V= Number of vessels
GT= Gross Tonnage of vessels that came into Nigerian Ports between 2010-2019

Simple regression is a bivariate statistical technique that can be used to analyze the relationship between a single dependent variable and independent variable. The objective of simple regression analysis is to use the independent

variables whose values are known to predict the value of the single dependent variable. Simple regression can mathematically be represented as given below:

$$y = a + bx.$$

Where;
y is the dependent variable (Revenue Generated on Conservative Services RGOCS)
x is the independent variables include GT, PS, BMS, TS
b is the slope of the line
a is the intercept (y when x=0)

2.1. Data presentation

Table 1 Charges on pilotage services in NPA

Pilotage District	Pilotage Due (USD)	Footage Due USD	Pilotage Service (PS) USD
Lagos Pilotage	0.070	0.042	0.112
Warri Pilotage	0.150	0.090	0.240
Bonny Port Harcourt Pilotage	0.138	0.082	0.220
Calabar Pilotage	0.138	0.082	0.220
Average Pilotage dues	0.124	0.074	0.198

Source: NPA tariff regulation (www.nigerianports.govt.ng)

The table 1 shows the pilotage districts in various locations of the Nigerian ports, the services rendered by NPA and the stipulated charges base on locations and distance from the fare way buoy to the port/berth. The pilotage districts areas include: Lagos pilotage district, Warri pilotage district, Bonny Port Harcourt pilotage district, and Calabar pilotage district. The researcher calculated the average charges in all the pilotage districts for a simplified evaluation on this study.

This implies that the average pilotage services in NPA is 0.198 USD.

Table 2 Charges on conservative services in NPA

Conservative services	NPA charges USD
Pilotage services (PS)	0.198
Berthing/Mooring in & out (BMS)	250
Towage in & out (TS)	1176

Source: NPA tariff regulation (www.nigerianports.govt.ng)

In Table 2, the researcher considered three basic conservative services in Nigerian Ports which are Pilotage service, Berthing/Mooring in & out and Towage in & out. The charges for each of these conservative services are stipulated in NPA simplified tariff as shown in table2.

Table 3 Revenue generated on conservative services

Year	No. of Vessels	GT	PS (usd)	BMS (usd)	TS (usd)	RGOCS (usd)
2010	4881	106,689,553	211241	26672388250	11480112	26684079603
2011	5,232	122,814,716	243174	30703679000	12305664	30716227838
2012	4,837	120,818,683	239229	30204670750	11376624	30216286603
2013	5,369	130,628,057	258645	32657014250	12627888	32669900783
2014	5,333	148,323,065	293677	37080766250	12543216	37093603143

2015	5,014	141,250,703	279679	35312675750	11792928	35324748357
2016	4,373	134,066,547	265456	33516636750	10285296	33527187502
2017	4,292	130,357,357	258107	32589339250	10094784	32599692141
2018	4,009	128,671,805	254777	32167951250	9429168	32177635195
2019	4,180	131,897,472	261159	32974368000	9831360	32984460519

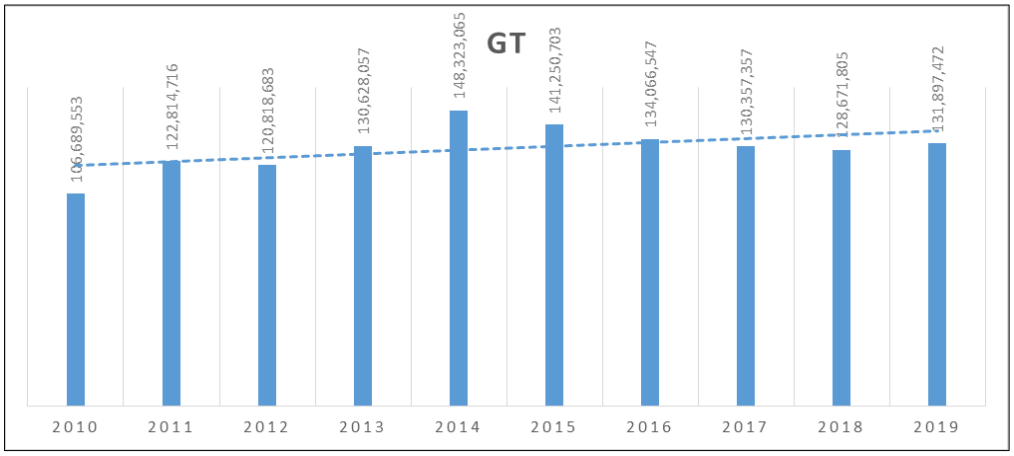
Source: Author's computation

Table 3 represents the vessel gross registered tonnage, revenues on pilotage services, berthing/mooring services, towage services and total revenue on conservative services for the periods of 2010 -2019 covering a time series data of ten years. The researcher computed each of the conservative services using the algebraic function $y=f(x)$: x = f (PS×GRT+BMS× GT +2TS×V) for the periods 2010-2019.

3. Results and discussion

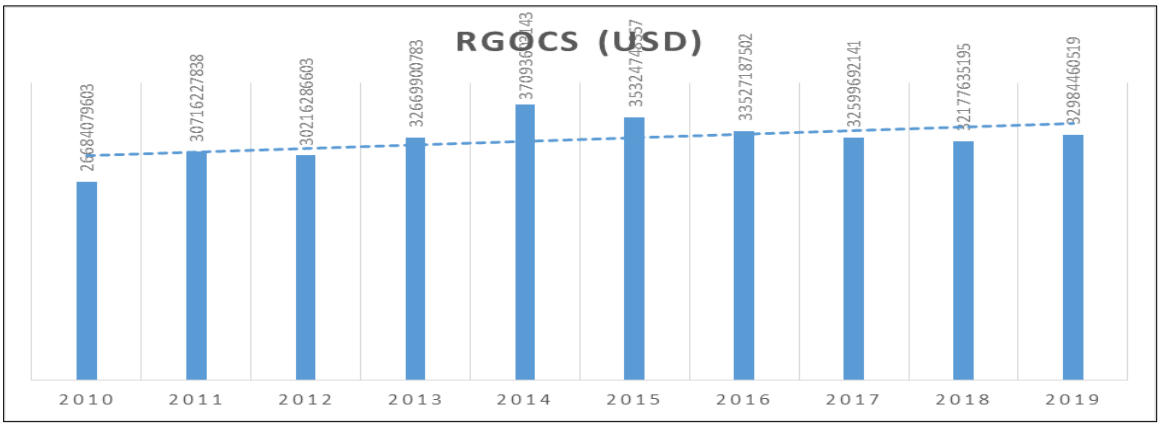
3.1. Analysis and discussion of results

Figure 4 shows that gross tonnage GT of vessels that visited Nigerian Ports Authority (NPA) from 2010-2019. The chart showed the trend line which signified the performance of the ports in terms of GT of vessels that visited the port within the periods under review. The chart showed that the ports recorded highest vessel GT during the year 2014. The trend line identified average performance in 2011, 2013, 2014, 2015 and 2016. The ports performed below average in 2010, 2012, 2017, 2018 and 2019. These series of fluctuations in vessel GT would have effects on port revenue generated from conservative services.



Source: NPA statistics (https://nigerianports.gov.ng/ports-statistics)

Figure 4 Vessel GT 2010-2019



Source: Author computed

Figure 5 RGOCS

Similarly, figure 5 represents revenue generated on conservative services in NPA from 2010-2019 as computed by the Author. The trend line identified similarity as in figure 1, implying that vessel GT affects RGOCS. The chart showed 2014 the highest with the value of 37093603143USD and 2010 the least performance with the value 26684079603USD.

H_{01}: Vessel GT has no significant impact on revenue generated on conservative services in Nigerian ports.

Table 4 Model Summary

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	1.000[a]	1.000	1.000	1248617.359

a. Predictors: (Constant), GT

The model summary table shows that there is strong positive correlation between the data variables. It also informs that the independent variable GT could explain 100 per cent variance in the dependent variable RGOCS. This simply means that GT has 100 per cent influence on RGOCS.

Table 5 Regression coefficient

Coefficient s[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	9881240.957	4761705.066		2.075	0.072
	GT	250.012	0.037	1.000	6825.587	0.000

a. Dependent Variable: RGOCS

The regression coefficient table shows high significance level of between the data sets. From the table, the constant or the intercept of regression line is 9881240.957 and the slope of the line is 250.012. This represents the relationship between RGOCS and GRT given as RGOCS = 9881240.957 + 250.012 GT.

H_{02}: Pilotage service has no significant impact on revenue generated on conservative services in Nigerian ports.

Table 6 Model Summary

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	1.000[a]	1.000	1.000	1241320.821

a. Predictors: (Constant), PS

The model summary shows the correlation R value as 1 and R Square as 1. This implies that perfect correlation exit between RGOCS and Pilotage service revenue. Further, the R square suggests that the independent variable could explain 100 per cent variance in dependent variable. This informs that pilotage service has significant impact on revenue generated on conservative services in Nigerian ports.

Table 7 Regression coefficient

Coefficients [a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	9883808.425	4733878.739		2.088	0.070
	PS	1262.686	0.184	1.000	6865.708	0.000

a. Dependent Variable: RGOCS

The regression coefficient table shows high significance between the data variables. The intercept of regression line on the table is 9883808.425 and the slope of the line is 1262.686, hence, the regression equation of the variables is given as RGOCS = 14834.659 + 7203.019 PS. This informs that Pilotage service has significant impact on revenue generated on conservative services in Nigerian ports.

H_{03}: Berthing/Mooring service has no significant impact on revenue generated on conservative services in Nigerian ports.

Table 8 Model Summary

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	1.000[a]	1.000	1.000	1248617.360

a. Predictors: (Constant), BMS

The model summary table shows a perfect positive correlation between the data variables and the independent variable could explain 100 per cent variance in the dependent variable. This suggests that there a strong relationship between RGOCS and BMS which could imply that Berthing/Mooring service has influence on revenue generated on conservative services in Nigerian ports.

Table 9 Regression Coefficient

Coefficients [a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	9881240.957	4761705.069		2.075	0.072
	BMS	1.000	0.000	1.000	6825.587	0.000

a. Dependent Variable: RGOCS

The regression coefficient table above shows 100 per cent significance between RGOCS and BMS. The table shows that the impact of BMS is 1.000USD per operation per tonnage. The equation of the regression is thus RGOCS = 9881240.957 + 1.000 BMS. Therefore, Berthing/Mooring service has significant impact on revenue generated on conservative services in Nigerian ports.

H_{04}: Towage service has no significant impact on revenue generated on conservative services in Nigerian ports.

Table 10 Model Summary

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.096a	0.009	-0.115	2999117226.099

a. Predictors: (Constant), TS

The model summary table R and R Square implies that there is positive correlation in the data sets and however the independent variable could not explain the variance in the dependent variable. This suggests that towage service influence on revenue generated on conservative services in Nigerian ports is no significant at 95per cent confidence level.

Table 11 Regression Coefficient

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	29809043240.623	9495022509.137		3.139	0.014
	TS	231.762	845.288	0.096	0.274	0.791

a. Dependent Variable: RGOCS

The regression coefficient table gives 29809043240.623 for the intercept and 231.762 for slope. Hence, the equation of the line is given as RGOCS = 29809043240.623 + 231.762TS. From the table, it means that TS does not contribute significantly to the RGOCS in Nigerian ports. Thus, towage service is not significant at 95 per cent confidence level. Its significance is given at 20.9per cent which is far less than 95per cent. Towage service has no significant impact on revenue generated on conservative services in Nigerian ports.

4. Conclusion

The study is an appraisal of conservative service impacts on revenue generation in Nigerian Ports industry between the periods 2010-2019. The study highlighted pilotage dues, berthing/mooring dues and towage dues as the major conservative services used on this study. Vessel GT from 2010-2019 was evaluated. It was found that there is positive correlation between vessel GT and RGOCS of Nigerian ports, since the port industry charges based on vessel tonnage per service. The study showed high significance level between GT and RGOCS and RGOCS increases by 250.012per vessel GT that visited the ports. Therefore, the researcher concludes that vessel GT has high significant impact on revenue generated on conservative services in Nigerian ports.

Secondly, the study analyzed the impact of revenue on PS on RGOCS for the periods 2010-2019. The study considered data on PS and revenue generated on conservative services. It was found that PS contributed 1262.686USD per tonnage per service rendered to vessels in NPA. The results also informs that there is high significance and correlation existing between PS and RGOCS. Hence, the researcher concludes that pilotage service has significant impact on revenue generated on conservative services in Nigerian ports.

The study also analysis the data on berthing/mooring operations and RGOCS. It was found that there is a positive correlation in the data sets and independent variable significantly influences the dependent variable. The finding

showed that BMS influences RGOCS with the value of 1.000USD per tonnage per service. Therefore, the researcher concludes that berthing/mooring service has strong significant impact on revenue generated on conservative services in Nigerian ports.

Lastly, the data on TS was evaluated with RGOCS and the results showed insignificance and positive correlation in the data series. TS has less impact on RGOCS with very low significance level of 20per cent. Its contribution is given as 231.762USD per vessel. Hence, it is concluded that towage service contribution on revenue generation on conservative services in Nigerian ports is insignificant.

Recommendations

The study obviously has showed the impacts of conservative services on revenue generation in Nigerian ports vis-a-vis the port total revenue. Therefore, based on the findings of this study the following were recommended.

- The Nigerian Port Authority should carryout promotion on port activities and advertise the port on global market to attract more vessel tonnages and patronize to the ports.
- The Nigerian Port Authority should make the port pricing and other port operational factors very competitive among other ports in the West and Central Africa. This will enable the ports attract more vessels traffic as a hub port.
- The NPA should encourage Research and Development (R&D) department of the port industry to study the vessel traffic and tonnage of the ports and ways to encourage high vessel tonnage.
- The port authority should also ensure compliance to IMO regulations. Constant dredging of the port channels to accommodate bigger vessels of high tonnages and ensure high level security standards along the water ways and ports.

Compliance with ethical standards

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Disclosure of conflict of interest

All listed Authors duly participated and intellectually contributed to the manuscript writing and should be treated accordingly.

References

[1] Gard (2014) Pilotage. Available online at http://www.gard.no/Content/73002/Pilotage

[2] IMO (2016). Pilotage. Available at http://www.imo.org/en/OurWork/Safety/Navigation/Pages/Pilotage.aspx.

[3] Akyuz E. A. (2016). Hybrid accident analysis method to assess potential navigational contingencies: The case of ship grounding. Saf Sci 2015, 79:268–276

[4] CAMSS (2012). Pilot-on-board. Available at: http://camss.jblfmu.edu.ph/index.php/my-articles/83-pilot-on-board.

[5] Akhtar M.J & Utne I.B. (2014). Reducing the probability of ship grounding: which measure to undertake? World Maritime University Journal. Marit Aff 2014, 13(1):27–42

[6] Chauvin C, Lardjane S, Morel G, Clostermann PJ, & Langard B (2013). Human and organizational factors in maritime accidents: analysis of collisions at sea using the HFACS. Accid Anal Prev 2013, 59:26–37

[7] Ćorović B, & Djurovic P. (2013). Marine accidents researched through human factor prism. Promet-Traffic Transp 2013, 25(4):369–377

[8] Hetherington, C., Flin, R. and Mearns, K. (2006). Safety in shipping: The Human Element. Journal of safety research 37401 https://doi.org/10.1016/j.jsr2006.04.007

[9] Manjur Khan (2018). Vessel Pilotage Operations-Safe Pilot Transfers https://bdmariners.org/vessel-pilotage-operations-managing-a-perilous-task-manjur-khan-19n/

[10] Tola Adenubi (2016). Billions of NPA Revenue Diverted under Towage Services —SSACTAC BUSINESS NEWS Lagos on Jul 17, 2016. Available at https://tribuneonlineng.com/billions-npa-revenue-diverted-towage-services-ssactac/

[11] Armstrong M (2007). Practical ship-handling, 3rd edn. Brown, Son & Ferguson Ltd

[12] Sulaimon Salau (2020). NPA inaugurates new tugboats to facilitate shipping in Nigeria

[13] Business highlights (2016). New NPA Board May Cancel Towage Contracts In Lagos, and PH. Available online @ https://businesshilights.com.ng/2016/10/04/new-npa-board-may-cancel-towage-contracts-in-lagos-ph/

14] Abiola Seun (2021). NPA's towage charges, ridiculous, retrogressive, non-competitive y (NPA), Maritime Mag. September 29, 2021. Available online https://nigeria maritime360.com

[15] Imo (2019). Upcoming IMO requirements on safe mooring https://www.dnv.com/news/upcoming-imo-requirements-on-safe-mooring-178033

[16] Eliopoulou E, Papanikolaou A, Voulgarellis M. (2016). Statistical analysis of ship accidents and review of safety level. Saf Sci, 2016, 85:282–292

[17] Choi T.M. and Qiang Meng (2022). Transportation Research Part E: Logistics and Transportation Review Elsevier Ltd. 1366-5545 ISSN https://www.sciencedirect.com/journal/transportation-research-part-e-logistics-and-transportation-review

[18] The Economics Times (2022). What is 'Gross Registered Tonnage' https://economictimes.indiatimes.com/definition/gross-registered-tonnage

[19] Eyres D. J. & Bruce G. J. (2012). Ship Construction (Seventh Edition). Available online @ https://www.sciencedirect.com/topics/engineering/gross-tonnage

[20] Hsu W.K.K. (2012).Ports' service attributes for ship navigation safety. J Saf Sci 2012, 50(2):244–252.