APPRAISAL OF CARGO DWELL TIME OF EASTERN PORTS OF NIGERIA BEFORE AND AFTER CONCESSION

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ABSTRACT

For more than seventeen years now since the concession of ports in Nigeria, the level of attainment of the objectives of the concession yet to be ascertained. This study examined the cargo dwell of Eastern ports of Nigeria before and after Port Concession. This study considered a twelve-year period of Pre (1994-2005) and sixteen- year Post (2007-2022) concession era. The study made used of secondary data sourced from Nigerian Port Authority Annual Reports. The data were presented using tables and charts and analysed using Wilcoxon Signed Ranks Test. Results of the analysis showed a positive significance difference between cargo dwell time before and after port concession in all the ports under study. It was concluded that port concession has improved cargo dwell time in Eastern ports. The study recommended that Terminal Operators should invest more on cargo handling equipment, improve on documentation and clearing processes to sustain the improvement.

KEYWORD: Port Concession, Port Reform, Cargo Dwell Time, Operational Performance

1.0 Introduction

Nigeria alongside other countries under the African sub-region adopted Public Private Partnership as one of its port reform agenda to boost private sector participations in the port industry. The reform policy climaxed the transfer of terminal operations to the private sector by the the public through Concession Contracts. This has led most of the container ports and other specialized ports/terminals in Nigeria to be operated by private operators/Concessionaires or operating under lease.

The belief that ports play substantial part in the total logistics chain leading to a considerable reduction in the overall transportation costs (importation and exportation of goods) has made ports in the Sub-Saharan Africa and the world over to embrace reforms in the port industry. Consequently, the belief that such reform(s) will also have positive impacts on the overall competitiveness of the economies of the countries has equally encouraged countries to be involved in the Port Concession initiative (Estache, Gonzalex, & Trujillo, 2016).

Port reforms via Concession Contracts are policies put in place by Government to enhance port performance and productivity by stimulating and reinforcing the functional and operational modalities at the ports (Ndikom, 2004). In Nigeria, the idea for port reforms was to make the Nigeria ports both investor and user friendly, vis-à-vis ensuring smooth operations at the ports. The model adopted by government of Nigeria in the reform of Nigeria ports was Concession Contracts. Port Concession

entails the retention of the ownership of infrastructure and contracting out the management and operations of the terminals /facilities to private operators for a specified period of time ranging between 25 and 30 years. In the works of Bousquet & Fayard (2015), Port Concession is when government grants private operator the right to fund, build, operate, own, upgrade, improve and maintain public infrastructure for a specified period of time while charging users for services rendered.

Port Concession is a public-private-partnership (PPP) initiative involving a contractual agreement between public institutions and private sector operators. Over the years, this initiative (PPP) has instigated port development the world over.

The history of port development in Nigeria have not followed a consistent pattern. However, the history of ports administration in Nigeria dates back to the Port Act of 1954. Through the Act, the Nigerian Ports Authority was set-up as a public corporation in April 1955. Prior to the reforms, the Nigerian Port Authority was a publicly owned institution operated by the Federal Government of Nigeria and by the provisions of the Act was given the responsibility of operating and regulating Nigeria seaports. The significance of ports as a catalyst for economic development was acknowledged in the first national development plan between 1962 and 1968. The plan which assigned Nigerian ports for development; provided £45 million for the upgrading of facilities at Port Harcourt ports (Akinwale & Aremo, 2016). There was a drawback to port development in Nigeria due to the closure of Port Harcourt port to foreign ships during the Nigerian Civil War between 1967 and 1970 that left only the Lagos port to render services in Nigeria. This saw the enactment of a

decree that empowers the Nigerian Port Authority to acquire the Eastern ports that were operated by private companies.

After the Civil War in Nigeria, ports experienced massive inflow of construction equipment and cement through importation for after-war rebuilding. This resulted to congestion at the ports. Also, insufficient road infrastructure could not permit a faster delivery of the cargoes. Averagely the waiting time of ships before being tied-up was a hundred and eighty days and about 250 days at the Lagos port, hence a huge surcharge was paid (Nwanosike, 2014).

The economic recession in the 80's and the changes in the global distribution network made the existing infrastructure to become obsolete and unproductive. It was glaring at this point that the government lacked the resources and managerial ability to successfully run a modern port (Razak, 2009). Consequently, the trend generally was government disengagement from port operations to regulating and provision of an enabling environment for the private sector to strive. The notion for the transfer of port operations to private investors through Concession Contracts became necessary. Furthermore, policymakers' realisation of changing the status quo in order to avoid further deterioration of the ports and its facilities was a step in the right direction. To this end, the introduction of Public-Private Partnership in the operations of Nigerian ports was brought to limelight.

The operations of the Nigerian ports by private operators through Concession Contracts was a common conviction that it will give rise to improved efficiency and make services to port users flexible. However, the level of attainment of the objectives of Concession is yet to be felt in

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most of the Nigerian ports, (Omoke, Diugwu, Nwaogbe, Ibe, & Ekpe, 2017).

This research therefore seeks to examine the cargo dwell time before and after concession of Eastern ports. Eastern ports of Nigeria comprised Onne, Rivers, Calabar and Delta ports. The aim is to determine if there are statistically significant differences between cargo dwell time before and after Concession of Eastern ports. Cargo dwell time in port (measured in days) is the interval of time between the maritime and land transport movement of exported and imported containers through the gate of the port.

1.1 The need for the Research

Before concession, Nigerian ports were characterised as inefficient due to long turn-around time of ships, long container dwell time, high berth occupancy, high service charge, and cargo insecurity among others with a resultant congestion effect (Ndikom, 2004; Leigland & Palsson, 2016). Prior to the concession, Nigerian ports also experienced the problem of excessive workforce and too many agencies being involved in the cargo clearing process. Consequently, port infrastructure and superstructure were becoming obsolete and dilapidated due to lack of maintenance and cargo handling equipment were not also available due to lack of investment by government (Ndikom, 2004). Government was not willing to commit itself in providing capital to cater for the poor state of the port because they were not performing optimally and due to corrupt practices that were prevalent in the system. In a bid to solving the teething problems experienced by the port, there was need to involve the private organisations to take part in financing the port to make it viable and competitive, hence the introduction of port privatisation via concession contracts.

The major objective of port privatisation through concession policy was to ensure the improvement of productivity and efficiency of the Nigerian ports through the improvement of service delivery to port users, but since the inception of the port concession for a period spanning seventeen years now, the level of the attainment of the objective is yet to be ascertained to know whether the ports are on track and if the concession policy is worth it (Omoke, Diugwu, Nwaogbe, Ibe, & Ekpe, 2017; Nwanosike, 2014). Researches on port concession such as Okeudo, (2019), studied the level of efficiency using cargo throughput of Onne and Rivers ports after the concession, Oghojafor, Kuye, & Alaneme, (2017), looked at concession as a strategic instrument for efficiency and Akinwale & Aremo, (2016), studied concession as a tool in managing Nigeria ports crises, Adi, Ndukwe, Iheanachor, & Dim, (2013) studied the role of contratual and institutional factors in post privatisation efficiency, have been in piecemeal as none have been able to do a holistic study aimed at determining whether the objectives of the concession policy has been met, vis-a-vis reduction in the average ship turn-around time, reduction in cargo dwell time, and reduction in the cost of port services borne by port users among others in any of the ports in Nigeria.

Equally, there is no study on port concession known to this researcher that seeks to address the interest of the shipowners and the cargo owners/shippers as it affects time and cost but rather that of the Port Authority/Terminal Operator through the use of berth occupancy rate, cargo throughput, ship's throughput and revenue generated by the port.

In order to fill the gaps so identified, this research is therefore aimed at determining

whether the concession policy has yielded significant results after its implementation and take-off with particular emphasis on cargo dwell time using Eastern ports as the study area.

2.0 Literature Review

African ports are said to have an unusual long cargo dwell time ranging between two and three weeks comparable to other ports in Europe, Latin America and Asia with an average dwell time within the range of seven days (Aminatou, Jiaqi, & Okyere, 2018). Prior to the Concession of ports in 2006, Nigerian ports were also characterised as having long cargo dwell time (Nwanosike, 2014). The objectives of the Port Concession policy were to among other things correct the inefficiencies that resulted in long cargo dwell time in Nigerian ports. The duration of stay of cargo after being discharged from the ship and before it is taken out of the port gate is one of the indicators of measuring the efficiency and effectiveness of the port, hence the adoption of cargo dwell time as a variable in this research.

Cargo dwell time in port is measured as the total time (in days) that a container stays at the terminal after being discharged from the ship and before attracting storage fee (Ducruet, et al., 2014; Le-Griffin & Murphy, 2006). Cargo dwell time is also described as the total time taken by imported containers transiting the port before proceeding on the landward journey (Nicoll, 2007). Refa & Cantens (2011), equally defined cargo dwell time in port as the interval of time between the maritime and land transport movement of exported and imported containers through the gate of the port. The authors further explained that dwell time is the time gap between the arrival of the containership and the exit of the truck carrying the container from the port gate.

According to Refas & Cantens (2011), dwell time consist of three different components, namely; **Operational dwell time:** this is the total time involved to physically transfer containers from the ship to the container yards in addition to the idle time encountered in between the transfers. The operational dwell time is dependent on port efficiency and the ability of terminal operators to provide adequate handling equipment; **Transactional dwell time:** this is the time between the arrival of the containers ship to the time of issuance of custom's exit note and **Discretionary dwell time:** this is strictly storage time comprising the sum of idle time the container spends at the yard and the time before exiting the yard. There is no handling operations or clearance during this period.

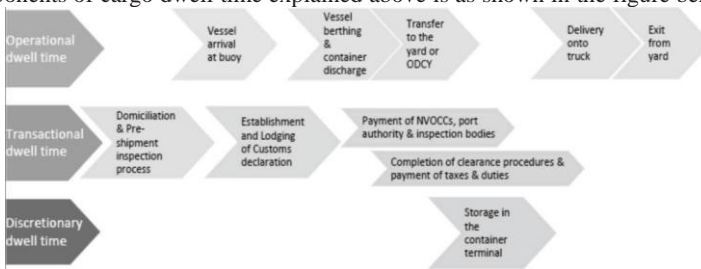The components of cargo dwell time explained above is as shown in the figure below.

Figure 1: Components of cargo dwell time
Source: Refas & Cantens, 2011

Since this research focusses on the effectiveness side of performance as it affects port users' satisfaction for the services provided by the Terminal Operators, the operational and transactional dwell time are more relevant to this research. This is because for the operational and transactional dwell time to be reduced, the Terminal Operators must do the right things (effectiveness) to reduce the average dwell time of containers in the port. Although the Terminal Operators still have a role to play in determining the storage dwell time by reducing the free storage time and increasing the penalty fee to prevent shippers or their agents from taking the port as a warehouse and thereby elongating the total dwell time of cargo, the cargo interests are said to contribute immensely to the storage dwell time mostly through their unprofessionalism in the cargo clearance process (Refas & Cantens, 2011).

Several empirical studies have been undertaken to evaluate the relationship between dwell time of cargo at the port and terminal efficiency and effectiveness. Since the average dwell time is a major determinant of the overall capacity of a terminal, Terminal Operators are looking for ways to increase the size of the terminal to match the increasing demand from the increasing size of container ships (Chu & Huang, 2005). Merck (2005), one of the early researchers of the impact of dwell time on terminal capacity through the design of a framework in optimising terminal capacity, suggested the imposition of varying pricing mechanisms based on different dwell time charging systems. In addition to the above study, Rodrigue & Notteboom (2017), pointed out how logistic organisations with limited storage areas and distribution centres made optimum use of their free storage time in the terminal yard and how Terminal

Operators addessed the situation through the restriction of their terminal access and dwell time. The authors also stressed that if the number of hours gate are opened are extended by port operators, dwell time of containers can be reduced.

Studies have identified factors that influenced dwell time to include terminal operation's efficiency, location of the terminal, port policies as it affects extended gate hours and delayed shipments, Custom's clearance/administrative procedures, Cargo owner or its agents, availability of hinterland connections, cargo to be transported, mode of transport used and business relationships between the parties involved (Moini, Boile, Theofanis, & Leventhal, 2016; Rodrigue, et al., 2017).

Moini et al. (2016), went further to measure the impact of the factors on the productivity of a terminal through the application of genetic algorithms and found a positive correlation of all the factors with terminal productivity.

Also, Kourounioti, Polydoropoulou, & Tsiklidis (2015), in their study suggested a framework that uses both aggregate and disaggregate models to forecast container dwell time in a terminal. The study made use of regression models that showed the impact of a consignee's container and commodity on dwell time. The study also revealed that, if terminal operators should know in advance the exact day a container is to be discharged at the terminal, they would organise the yard properly so as to retrieve easily the containers with higher pick-ups and so reduce the number of rehandling moves. The study was supported by Zhao & Goodchild (2010), through the use of simulation model to assess how the importance of information influences marine terminal efficiency. The result of the study showed that the day the

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arrival of a truck was known in advance, there was a remarkeable reduction in making unproductive moves. To address the shortage of flow of information, a Truck Appointment Systems (TAS)- a system which allocates a slot for a specified number of transaction within a period of time was suggested (Giuliano & O'Brien, 2007). Another study by Huynh (2006), considered rehandling productivity and storage strategies to analyse the relationship between dwell time and yard capacity and stressed the need for Terminal Operators to know the the influence of dwell time on yard productivity before coming up with tariff plan or free period that will encourage long dwell time.

Cargo dwell time at ports has been seen as an important issue that affects the operation of modern day ports. In its report, the National Academy of Sciences (2010), stressed the need to reduce the total time spent by vessels and cargo at the port so as to reduce the total shipping costs of shippers. The report went further to point out that dwell time is a major factor of competition between ports and advised that ports should offer timely service to importers and exporters if they must strive in the face of competition. This is because competition has shifted towards faster, better and more cost effective side (Magala & Adrian, 2008). Due to intense competition between ports, various studies have also identified cargo dwell time as one of the major determinants of port choice (Veldman & Buckmann, 2003; Nir, Lin, & Liang, 2003; De Langen, 2007; Tongzon & Sawant, 2007; Sanders, Verhaeghe, & Dekker, 2015).

Another area of concern about cargo dwell time is in the aspect of international trade competitiveness. The impact of long dwell time on the efficiency of trade has been identified as a major impediment to the

development of countries with low income and must undergo urgent reform (Dasgupta, 2009). Other studies to show the direct influence of longer dwell times on trade also exist. The works of Djankov, Freund, & Pham (2006), using gravity model discovered that a delay of a product for a day before shipment reduces the volume of trade by 1%. Study also shows that eliminating port inefficiencies through the reduction of dwell time can increase the gross domestic product (GDP) by 0.5% (Kent & Fox, 2005).

As pointed out earlier, customs's cargo clearance and administrative processes will also influence the dwell time of cargo in the port. Cargo clearance is the time involved in processing and issuing of cargo to its owners or Agents (Milimu, 2015). The time taken for the processing of documents before cargoes are issued to the owners does not usually follow a stipulated time frame. This will depend on the overall effectiveness of the clearing process to be determined by smooth customs documentation, availability of handling equipment, transport infrastructure, availability of integrated information technology system, space capacity of the terminal among other factors.

Delays associated with customs clearance procedures have been identified by many studies as one of the most determinant factors affecting the effectiveness of cargo clearance in ports (Livingstone, 2010; Milimu, 2015; Sokolova, 2017; Clark, Dollar, & Micco, 2004; Haralambides & Londoño-Kent, 2004). Livinstone (2010) specifically pointed out that globally, African ports has an average of 12 days of customs delay, and that delays associated with customs clearance constitute over 10% of the total exportation cost.

Of all the components associated with Customs clearance, documentation

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constitute the greater part of the delays. This is because documentation plays key role in the cargo clearance process. This is confirmed by Milimu (2015), that paper work is an important part of shipping, as it must be completed before, during and after shipment of goods. The author further stressed that documentation is not a style but a necessary part in shipping. The rigorous and cumbersome documentation process of the Nigerian Customs service has been identified as one of the causes of delays in Nigerian ports.

Another factor responsible for delays in cargo clearance according to Milimu (2015), is the efficiency of cargo handlings within the terminal yards and storage facilities. This, the author stressed is dependent on the availability of handling equipment in the port terminal as the unavailability or poor handling equipment will lead to shoddy work and prevent the port from handling the required load on time, causing delays, congestions and inefficiencies along the clearing process.

Infrastructure is seen as another critical factor in contributing to delays in the cargo clearing process in the port. This is so because it is an important requirement needed to achieve efficient handling of cargo. More so, infrastructure adequacy is necessary to guard against congestion, stimulate development of trade in addition to achieving deep-sea connectivity for countries that depend heavily on international trade (Haralambides, 2002). Infrastrucure comprises physical and soft features. While the physical features include but no limited to number of berths, number of cranes, capacity of storage space and inter-modal transport facilities, the soft features involve the manpower. Maximum employment of both infrastructure will enhance the speedy processing and delivery of cargoes into and

out of the terminal (Tongzon & Heng, 2014).

The capacity of space in the terminal is another critical factor that determines cargo clearance effectiveness. Space availability in the storage or stacking areas will enhance quick inspection and documentation of cargo by Customs and other statutory personnel and ensure speedy handling of cargo within and out of the terminal. Adequate space in terms of berth space for ships will enhance speedy loading and unloading of cargoes from ships. This is as pointed out by Nyema (2014) that cargo handling can be slowed down by the capacity of space at the port. The author also stressed that where berths are not sufficient to accommodate the vessels coming into the port it will require a longer time for the vessel to be assigned any available berth, hence leading to congestion and impeding effective cargo clearance at the terminal.

The relevance of cargo clearance effectiveness as a performance indicator in port operations should not be over-looked owing to it impact on the total costs and time associated with processing of cargo in the port. Also, it can be recalled that prior to Concession of ports in Nigeria, the ports were charaterised by long and cumbersome documentation processes and too many agencies operating in the port, hence the introduction of Concession policy to address the problem. This research was therefore undertaken to determine if Concession has any significant improvement on cargo clearance and documentation effectiveness that results in reduction of cargo dwell time in Eastern ports after Concession.

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3.0 Study Area and Methodology

The study area to this research was the Nigerian Port Authority, Eastern ports, comprising Rivers, Onne, Calabar and Delta ports.

Data for this study were sourced from Nigerian Port Authority Annual reports between 1994 and 2005 (representing the pre-concession period) and between 2007 and 2022 (representing the post-concession period).

The data were analysed using Wilcoxon Signed Ranks Test to test the following hypotheses:

1. There are no statistically significant differences between cargo dwell time before and after Concession of Calabar ports.

2. There are no statistically significant differences between cargo dwell time before and after Concession of Onne ports.

3. There are no statistically significant differences between cargo dwell time before and after Concession of Rivers ports.

4. There are no statistically significant differences between cargo dwell time before and after Concession of Delta ports.

The Wilcoxon test statistic was computed as the sum of the positive ranks. The test statistic was computed using the formula below.

$$W = \sum_{i=1}^{n_1} R_i^{(+)}$$

Where

W = Wilcoxon test statistic

R_i = sum of positive ranks

n = number of years

The null hypotheses were represented as H_0: $\mu_1 - \mu_2 = 0$ (the difference between the means before and after Concession is equal to 0), while the alternate hypotheses were represented as H_1: $\mu_1 - \mu_2 \neq 0$ (the difference between the means before and after Concession is not 0).

A α-level of $W_{0.05}$ (two tailed) was used as the level of significance. The decision rule was to reject the null hypothesis if the W test statistic is $\leq$ the lower critical value or the W test statistic is $\geq$ the upper critical.

4.0 Results and Discussions

The table below depicts the cargo dwell time (in days) before and after Concession of Eastern ports.

Table 1: Cargo dwell time of Eastern Ports (in days)

S/No	Year	Calabar Port	Onne Port	Rivers Port	Delta Port	Total
1	1994	4	6	6	3	19
2	1995	2	6	5	4	17
3	1996	4	5	5	3	17
4	1997	5	4	5	3	17
5	1998	3	4	6	4	17

6	1999	3	5	5	3	16
7	2000	4	4	5	3	16
8	2001	3	6	6	4	19
9	2002	3	6	6	3	18
10	2003	4	6	5	3	18
11	2004	3	5	5	4	17
12	2005	4	5	5	4	18
13	2006	3	5	6	4	18
14	2007	3	4	5	2	14
15	2008	3	5	4	3	15
16	2009	3	4	4	3	14
17	2010	2	5	5	2	14
18	2011	2	5	5	4	16
19	2012	1	4	3	3	11
20	2013	1	3	5	3	12
21	2014	1	5	5	3	14
22	2015	1	4	5	2	12
23	2016	0	5	4	2	11
24	2017	0	4	4	3	11
25	2018	1	5	4	4	14
26	2019	2	4	5	3	14
27	2020	2	4	4	4	14
28	2021	2	4	3	3	12
29	2022	2	4	4	4	14

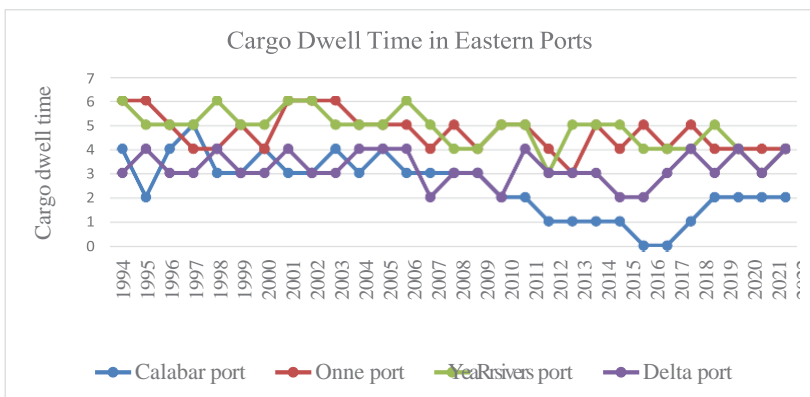*Source: NPA Eastern Ports Annual Reports 1994-2022*

Figure 2: Cargo Dwell Time in Eastern ports
Source: Field Study, 2023

Seen from the Figure above, it can be deduced that the cargo dwell time in days is far above the international acceptable standard of twenty-four hours. However, the post concession era pointed to a positive direction as the lines on the graph show a downward slope indicating remarkable improvements in the dwell time of cargo as compared to the pre concession era.

Test of Hypotheses

1. There are no statistically significant differences between cargo dwell time before and after concession of Calabar port

To test the above hypothesis, the table below shows the Wilcoxon Signed Ranks Test conducted to test the hypothesis.

Table 2: Wilcoxon Signed Ranks Test for Cargo Dwell Time (CDT)in Calabar Port

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
pre_cargo_dwell_time_in_Calabar_port	12	3.50	.798	2	5
post_cargo_dwell_time_in_Calabar_port	16	1.63	.957	0	3

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
post_cargo_dwell_time_in_Calabar_port - pre_cargo_dwell_time_in_Calabar_port	Negative Ranks	11[a]	6.86	75.50
	Positive Ranks	1[b]	2.50	2.50
	Ties	0[c]		
	Total	12		

a. post_cargo_dwell_time_in_Calabar_port < pre_cargo_dwell_time_in_Calabar_port
b. post_cargo_dwell_time_in_Calabar_port > pre_cargo_dwell_time_in_Calabar_port
c. post_cargo_dwell_time_in_Calabar_port = pre_cargo_dwell_time_in_Calabar_port

Test Statistics[a]

	post_cargo_dwell_time_in_Calabar_port - pre_cargo_dwell_time_in_Calabar_port
Z	-2.890[b]
Asymp. Sig. (2-tailed)	.004

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Source: SPSS Result, 2023

Wilcoxon Signed Ranks Test as presented in the table above shows that W= min (2.50, 75.50) and since W=0 less than or equal to the lower critical value (13) and significant at $W_{0.05}$ with 0.004 significance level (2 tailed), the null hypothesis cannot be accepted to conclude that the median (mean) is not equal to 0.

The test statistic implied that the median (mean) score of cargo dwell time before concession (3.50) was statistically significantly higher than the median

(mean) score of cargo dwell time after concession (1.63), hence negating the assumption of the null hypothesis and affirming the alternate hypothesis that there are statistical significant differences between cargo dwell time before and after concession of Calabar port.

A smaller mean of 1.63 in cargo dwell time after concession as against the mean of 3.50 before concession shows a positive improvement in the cargo dwell time of

Calabar port after concession, hence port concession has impacted positively on cargo dwell time.

2. There are no statistically significant differences between cargo dwell time before and after concession of Onne port

The table below shows the Wilcoxon Signed Ranks Test conducted to test the above hypothesis.

Table 3: Wilcoxon Signed Ranks Test for Cargo Dwell Time (CDT)in Onne Port

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
pre_cargo_dwell_time_in_Onne_port	12	5.17	.835	4	6
post_cargo_dwell_time_in_Onne_port	16	4.31	.602	3	5

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
post_cargo_dwell_time_in_Onne_port - pre_cargo_dwell_time_in_Onne_port	Negative Ranks	9[a]	6.22	56.00
	Positive Ranks	2[b]	5.00	10.00
	Ties	1[c]		
	Total	12		

a. post_cargo_dwell_time_in_Onne_port < pre_cargo_dwell_time_in_Onne_port
b. post_cargo_dwell_time_in_Onne_port > pre_cargo_dwell_time_in_Onne_port
c. post_cargo_dwell_time_in_Onne_port = pre_cargo_dwell_time_in_Onne_port

Test Statistics[a]

	post_cargo_dwell_time_in_Onne_port - pre_cargo_dwell_time_in_Onne_port
Z	-2.179[b]
Asymp. Sig. (2-tailed)	.029

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Source: SPSS Result, 2023

Wilcoxon Signed Ranks Test as presented in the table above shows that W= min (56.00, 10.00) and since W=0 less than or equal to the lower critical value (13) and

significant at W0.05 with 0.03 significance

level (2 tailed), the null hypothesis cannot be accepted to conclude that the median (mean) is not equal to 0.

The test statistic implied that the median (mean) score of cargo dwell time before

concession (6.22) was statistically significantly higher than the median (mean) score of cargo dwell time after concession (5.00), hence negating the assumption of the null hypothesis and affirming the alternate hypothesis that there are statistical significant differences between cargo dwell time before and after concession of Onne port.

A smaller mean of 5.00 in cargo dwell time after concession as against the mean of 6.22 before concession shows a positive improvement in the cargo dwell time of Onne port after concession, hence port concession has impacted positively on cargo dwell time.

3. There are no statistically significant differences between cargo dwell time before and after concession of Rivers port

The table below shows Wilcoxon Signed Ranks Test conducted to test the above hypothesis.

Table 4: Wilcoxon Signed Ranks Test for Cargo Dwell Time (CDT)in Rivers Port

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
pre_cargo_dwell_time_in_Rivers_port	12	5.33	.492	5	6
post_cargo_dwell_time_in_Rivers_port	16	4.31	.704	3	5

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
post_cargo_dwell_time_in_Rivers_port - pre_cargo_dwell_time_in_Rivers_port	Negative Ranks	10[a]	5.50	55.00
	Positive Ranks	0[b]	.00	.00
	Ties	2[c]		
	Total	12		

a. post_cargo_dwell_time_in_Rivers_port < pre_cargo_dwell_time_in_Rivers_port
b. post_cargo_dwell_time_in_Rivers_port > pre_cargo_dwell_time_in_Rivers_port
c. post_cargo_dwell_time_in_Rivers_port = pre_cargo_dwell_time_in_Rivers_port

Test Statistics[a]

	post_cargo_dwell_time_in_Rivers_port - pre_cargo_dwell_time_in_Rivers_port
Z	-3.051[b]
Asymp. Sig. (2-tailed)	.002

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Source: SPSS Result, 2023

Wilcoxon Signed Ranks Test as presented in the table above shows that W= min (55.00, 00.00) and since W=0 less than or equal to the lower critical value (13) and

significant at W0.05 with 0.002 significance level (2 tailed), the null hypothesis cannot be accepted to conclude that the median (mean) is not equal to 0.

The test statistic implied that the median (mean) score of cargo dwell time before concession (5.50) was statistically significantly higher than the median (mean) score of cargo dwell time after concession (00.00), hence negating the assumption of the null hypothesis and affirming the alternate hypothesis that there are statistical significant differences between cargo dwell time before and after concession of Rivers port.

A mean of 00.00 in cargo dwell time after concession as against that of 5.50 before concession shows a positive improvement in the cargo dwell time of Rivers port after concession, hence port concession has impacted positively on cargo dwell time.

4. There are no statistically significant differences between cargo dwell time before and after concession of Delta port

The result of the Wilcoxon Signed Ranks Test for the above hypothesis is as shown below.

Table 5: Wilcoxon Signed Ranks Test for Cargo Dwell Time (CDT)in Delta Port

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
pre_cargo_dwell_time_in_Delta_port	12	3.42	.515	3	4
post_cargo_dwell_time_in_Delta_port	16	3.00	.730	2	4

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
post_cargo_dwell_time_in_Delta_port - pre_cargo_dwell_time_in_Delta_port	Negative Ranks	7[a]	4.00	28.00
	Positive Ranks	0[b]	.00	.00
	Ties	5[c]		
	Total	12		

a. post_cargo_dwell_time_in_Delta_port < pre_cargo_dwell_time_in_Delta_port
b. post_cargo_dwell_time_in_Delta_port > pre_cargo_dwell_time_in_Delta_port
c. post_cargo_dwell_time_in_Delta_port = pre_cargo_dwell_time_in_Delta_port

Test Statistics[a]

	post_cargo_dwell_time_in_Delta_port - pre_cargo_dwell_time_in_Delta_port
Z	-2.646[b]
Asymp. Sig. (2-tailed)	.008

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Source: SPSS Result, 2023

Wilcoxon Signed Ranks Test as presented in the table above shows that W= min (28.00, 00.00) and since W=0 less than or equal to the lower critical value (13) and significant at W0.05 with 0.008 significance level (2 tailed), the null hypothesis cannot be accepted to conclude that the median (mean) is not equal to 0.

The test statistic implied that the median (mean) score of cargo dwell time before concession (4.00) was statistically significantly higher than the median (mean) score of cargo dwell time after concession (00.00), hence negating the assumption of the null hypothesis and affirming the alternate hypothesis that there are statistical significant differences between cargo dwell time before and after concession of Delta port.

A mean of 00.00 in cargo dwell time after concession as against that of 4.00 before concession shows a positive improvement in the cargo dwell time of Delta port after concession, hence port concession has impacted positively on cargo dwell time.

5.0 Recommendations and Conclusion

Based on the findings, it was concluded that there was a positive significant improvement in the cargo dwell time after Port Concession.

It was recommended that in order to sustain the significant improvement achieved in the cargo dwell time during the Concession era, Terminal Operators should invest in acquisition of more cargo handling equipment.

It was also recommended that Terminal Operators should improve on the documentation and clearing processes to maintain a reduction in the dwell time of cargo.

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