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ANALYSIS OF SEAPORT PRODUCTIVITY IN PRE AND POST CONCESSION PERIODS IN NIGERIA. A STUDY OF APAPA PORT

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Abstract:

Efficiency of seaport is a catalyst for economic affluence of any nation. This study examined productivity level of Apapa port in pre and post concession periods, factors responsible for the productivity and efficiency in the port, and established difference in cargo throughput, turn-around time and berth occupancy. Hundred (100) questionnaires were purposively administered to Nigeria Port Authority (NPA) officials in the study area. Socio-economic characteristics of respondents and perceptions on level of efficiency, productivity and infrastructural development in the two periods were presented descriptively. Student 't' test was used to measure difference in cargo throughput, turn-around time and berth occupancy. Findings revealed positive changes in infrastructural development, efficiency and productivity in post concession than pre concession periods of Apapa port. The analyses of cargo throughput, turn-around time and berth occupancy showed significant difference in cargo throughput ($t = 2.39$, $P \text{ value} \leq 0.05$), turn-around time ($t = 2.97$, $P \text{ value} \leq 0.05$) and berth occupancy ($t = 2.68$, $P \text{ value} \leq 0.05$) between these periods. Study recommends proper implementation and strict adherence to existing port policies to avoid operational delays, increase in infrastructural development like rail/road (intermodal) connectivity which will enhance improve productivity of Apapa port and ports with similar problems.

Keywords:

Berth occupancy, Cargo throughput, Concession, Productivity, Reform, Seaport, and Turn-around time.

INTRODUCTION

The global economy is in no doubt changing not only the way the world does business, the way it lives and also governs itself. Pertinently, the global economy though still undergoing reformation is presenting challenges to economist, technocrats and politicians alike [10]. It is crystal clear that the past 20 years have witnessed a fundamental change in the way governments think about the provision of infrastructure and co-ordination of business opportunities both in rich and poor countries alike as private ownership operations have been replacing public provision while monopoly has been giving way to competition with reformations significantly playing a central role in these changes [10]. Globalization of the world economy is in no doubt a reality in terms of the apparent and impressive reforms that have taken place virtually in most parts of the world including Nigeria. The pattern of port reforms all over the world is towards deregulating, revitalizing, decentralizing and privatizing the sector and organizes competition within it. However, port reforms are policy measures by government that are aimed at revitalizing, strengthening operational and functional modalities at the ports, thereby resulting in increased efficiency and productivity [2].

Relatively, it is pertinent to understand that the concept of concession is an integral part of a privatization principle that sees the actual contracting out of the management of the port to private sector for a period of time. It is the process by which the assets of a state owned enterprise are entrusted to a private operator for a limited period of time whose duration can be extended [6, 10]. Its main objective which reflects an aspect of globalize policy is basically to ensure gradual divestment of government shares from the public ports and transferring same to private management hands, which ignites increased efficiency, performance, productivity and competition amongst the ports. It is also aimed at transforming, restructuring and reforming the ports, thereby creating user-friendly ports with an improved operational performance and functions [6]. This concept of concession if adequately implemented will reduce undue waiting time of vessels and increased vessel turn-around time at the ports, manifesting in lower operating costs of vessels, sheds, cargo berths and terminals at the end.

The embrace of port reform in Nigeria is aimed at making our ports not only user-friendly but also investor-friendly, by achieving shorter turn-around time of vessels, transparent shipping operations and reduction in shipping cost and losses, which in turn leads government into providing modern cargo handling plants and equipment to enhance smooth operations at the ports. However, it is imperative to state clearly that the operational functionality of the port terminal operations through the provisions, of super structures and infrastructural facilities will increase the efficiency, performance and productivity of any port system, thereby registering an appreciable cargo throughput at the end of the day [5, 6]. Unfortunately, this has never been the case for Nigerian ports, which over the years have suffered from numerous problems which are identified as but not limited to port neglects, lack of infrastructural facilities and funding, lack of shipping policy, inconsistency of government policy, undue interruptions and interventions by government in maritime issues and operations, management problems, high port charges, ageing port infrastructure, cumbersome and bureaucratic cargo clearance, inadequate investment in equipment. These challenges however over the year have hindered the operational functionality, performance, flow of administrative links and development of Nigerian ports [1, 6, 10]. Although the maritime industry can be described as a major catalyst in the socio-economic development of Nigeria, the industry cannot be described as healthy as the level of performance of the sector is very low. Productivity is low and efficiency is at the lowest ebb. However, this should not be so because maritime transportation is central to growth, development and civilization. In concrete terms, it remains the patents ingredients of economic growth for any nation.

Regrettably, the immediate consequence of these constraints and inadequacies as stated above has led to poor operational efficiency of Nigeria ports, loss of revenue to government, high operational cost, high port delays, capacity underutilization, embracing and deplorable international image, loss of patronage and genuine customers which makes cargo shipped from Nigeria ports costly and led to diversion to neighboring ports and not unconnected with unconventional, notorious, unethical and sharp practices of port employees, customs, police as well as importer and exporter who are the primary losers in the context of inefficient pre-reform scenario prevailing within the shipping sector [1, 6]. The growth in shipping business, the need for congenial business environment of the ports, advent of containerization and advances in cargo handling methods which imposed considerable infrastructure requirements in seaports, the growing inability of government to finance its owned ports and other risen challenges has led to deregulation processes of Nigeria ports this in turn introduced several measures aimed at minimizing and correcting anomalies and malaise in the port services and maritime industry as a whole [3]. It is crystal clear that the Nigerian government deregulated its ports to improve productivity through injection of private sectors resources in the management of ports and specifically adopted the landlord port model in which the port authority collects rents on existing infra and superstructure under concession to private operators while the concessionaires provide cargo handling and warehousing services to port users. However, ancillary services like towage, pilotage and dredging are retained by the authority and where additional infrastructure is in need, the private operator can access and built it through contract agreement (e.g Build-Operate and Transfer (BOT) with the port authority.

Significantly, over many years after concession of the ports, most people still believe that the much expected reduction in the prices of cargo clearance and other shipping cost has remained a mirage even as concessionaries keep on inventing new ways of collecting levies from port users. It is also opined that there is no meaningful infrastructural development at the nation's port despite the huge revenue collected by the government after concession. These problems are mostly painted to high level of corruption practices in the sub sector and as such literatures revealed that there is no difference in the problems encountered during the pre and post concession period. It is on this backdrop that this study examined the productivity level in pre and post concession period in Nigeria seaports with reference to the Apapa Port, the factors responsible for the observed level of productivity and efficiency in Apapa port in pre and post concession period, examined the traffic in cargo throughput in pre and post concession period of Apapa port as well as test the significant difference in cargo throughput, turn-around time and berth occupancy in pre and post concession period of Apapa port.

1 SEAPORT EFFICIENCY AND PRODUCTIVITY MEASURES

Seaports are major gateways to the economy of a nation. They represent a complex structure in a country's transportation system providing ship-harbour interface services such as pilotage, dredging provision of berths, maintenance of navigation channels [5]. [9] opined that Seaports have been considered to be important parts of international supply chains. They hold a very important role and are the most critical nodes in the supply chain. It is widely believed that sea-ports form a vital link in the overall trading chain. Seaports are a component of freight distribution as they offer a maritime to land interface for cross-border businesses. Therefore, efficiency of seaport operation is vital for supply chains. It is important to note that seaport operation can be seen as the operation of a wharf and other port facilities, operation of port passenger transport service, operation of cargo loading/unloading, haulage

and warehousing services within a port area. It is seen as cargo handling activities significantly performed by a designed company, consisting of labor and machines [9].

Significantly, for any seaport to be regarded efficient, it must be competent in its operations. Based on this latter, [5, 9] opined that efficiency of seaport operations is determined by duration (*time*) of ship's stay in a port, quality of cargo handling and quality of service to inland transport vehicle during passage through the port. It is important to note that the quality of cargo handling forms the throughput and quality of service to inland vehicle is dependent on port infrastructure. Productivity has been identified as a measure of seaport operational efficiency.

[4] define productivity as a concept is the extent of output produced from an engaged input. Technically, productivity is the measure of the ratio of output (total services offered, usually measured in terms of throughput) against the input (total resources engaged to achieve the output, usually including labour, assets and machineries- vessels and cargo handling equipment, and entrepreneurship). [4] opined that productivity can be expressed as the throughput handled per unit factor of production utilized. For example, total port gang hours (TPGH) as productivity indicator for labour (stevedore) showing the volume of cargo stevedore handled per hour. The point of view here is economic where productivity is seen as representing a technical relationship between input and output [4, 9]. The performance and productivity of seaport (which is an integral part of the shipping industry) is largely tied to the performance and efficiency of the connecting land transport systems and infrastructures. Productivity measurement could be seen in terms of the Output changes and Factor opportunities [4]. The output of the shipping industry provides the means of exchanging commodities between land and maritime transport which can be measured in terms of 'Throughput'. This is regarded as a measure of port productivity and is expressed mathematically as:

$$\text{Productivity, } P = (\text{Throughput, } T) / \text{Input, } I$$

$$P=T/I$$

2 MATERIAL & METHODS

Apapa is the major port of the city of Lagos, Nigeria, and is located to the west of Lagos Island, across Lagos Harbour with a latitude of $6^{\circ} 26' 43'' \text{N}$ and longitude $3^{\circ} 25' 34'' \text{E}$. It is also one of Nigeria's 774 Local Government Areas. Apapa is the site of a major container terminal. The terminal was owned and operated by the Federal Government of Nigeria until March 2005, when it was sold to the Danish firm A. P. Moller-Maersk Group for about US\$1 billion. Adjacent to the container port is the Tin Can Island port, which has Ro-Ro facilities. It also houses some refineries like the Bua Group. It also has a big banking software company, Neptune Software Plc. [7]. Apapa port was formally referred to as the Lagos Port complex, comprising the following: Apapa Quays, Apapa Dockyard, Fish Wharf, Ijora Wharf. It started operation in 1913 with an initial length of 1950ft and draught of 26ft. Today Apapa Port covers a land area of 100 hectares with total land area of 2459 meters covering only the Apapa Quay. The port of Apapa quay is the primary outlet for the country export [7]. The port of Apapa is the country's biggest port, handling a wide range of commodities. The port contains facilities specialized in handling what oil cement, fish dray cargo and containers. The port of Apapa container Terminal Covers 44 hectares and can handle up to 22 thousand TEUS of containerlized cargo with six berths with alongside depth of 10.5 meters and total quay length of 950 meters. The port container terminal also contains 6.4 thousand square meters of covered storage. The container yard has capacity of 19.5 thousand TEUS and it contain 298 refer plugs [7]. The Nigeria Port Authority regulates all major ports in Nigeria including the port of Apapa, while the privatized company mission is to contribute to

national economy and well being through efficient management port operation, optimal allocation and use of resources and diversification of revenue source and provision and maintenance of infrastructural facilities towards achieving adequate returns on investments.

This study employed the use of both quantitative and qualitative method of data presentation. Data was obtained through primary and secondary sources and basically derived its authority from research instruments (questionnaire and interview guide). Information was collected from the port administrators who constitute the Nigeria Port Authority (NPA) personnel. Collection of primary data involved an exclusive field work and administration of questionnaire and interview guide embodied with questions like how efficient is port concession as a means of integrating port reform in Nigeria?; how can you rate the productivity of Apapa port before and after concession? e.t.c. Secondary data on cargo throughput, turn-around time of vessels and berth occupancy were sourced from Apapa port for the period of eighteen (18) years (1997-2005 pre and 2006-2014 post).

The study adopted a non-probability sampling of purposive sampling procedure in the selection of respondents in the port. This was however so because only a particular group of people that is the NPA personnel can actually provide the appropriate and valid answer to the instrument used to measure the stated objectives. A total of 100 copies questionnaires were distributed to Apapa port administrators (NPA personnel). This sample size was chosen due to the limited population of NPA personnel in the study area, to allow easy administration and control of the research instrument as well as to adequately ensure that the research objective is relatively achieved. Data collected were analyzed using simple descriptive and inferential statistics. The descriptive statistics of frequency distribution, percentage and table were used to analyzed primary data while the secondary data were analyzed using inferential statistics of student 't' test to test the hypothesis 'there is no significant difference in cargo throughput, turn-around time of vessels and berth occupancy in the pre and post concession periods of Apapa port'. The study however employed the use of Statistical Package for Social Sciences (SPSS) in carrying out both the descriptive and inferential statistics. In other words, productivity is the measure of the ratio of output (total service offered usually measured in terms of cargo throughput) and input (total resources engaged to achieve the output, usually including asset and machineries e.g. berth occupancy and turn-around time of ships. these however was used as performance indicators.

Cargo throughput: is defined as the totality of import and export cargo handled by utilizing port infrastructure and labor and it is represented by X.

Turn-around time: is the period between the arrival time and departure time of a vessel in a port and it is represented by Y.

Berth occupancy: is a measure of a period in which a berth is occupied by a vessel. This is represented by Z

3 FINDINGS AND DISCUSSION

Results of the investigations are presented and discussed under the following subheadings: Socio-economic characteristics of respondents; productivity level at Apapa port in pre and post concession periods; factors responsible for the observed level of productivity; and statistical difference in cargo throughput, turnaround time and berth occupancy at Apapa port in pre and post concession period.

3.1 Findings on Socio-Economic Characteristic

It was discovered from the study that majority of the respondents are male (67%) while 33% were female which implies that male are involve in port administration than their

female counterpart; that 48% of them were aged more than 40 years indicating that almost all of them were still in their very productive stage of their lives; 53% had tertiary education of HND/B.Sc equivalent, implying that the sampled population could comprehend the need for the study and hence could provide reliable information. In the case of marital status of the respondents, majority 82% of them were married while less than 15% were single. Work experience profile of respondents revealed that close to two-fifths (39.74%) of the respondents had work experience of between 11 and 15 years.

3.2 Findings on Productivity Level of Apapa Port in Pre and Post Concession Periods

This study revealed that over 60% of the respondents indicated that port concession programme as a means of improving and integrating port performance and productivity in Nigeria seaports is very efficient. Study also showed that majority (78%) of the respondents indicated that the productivity level of Apapa port before concession is quite low while 72% of the respondents revealed that the productivity level of Apapa port after concession is quite high. This findings justified that the concession (reform) programme has distinctly improved the productivity level of Apapa port particularly through its port services. The port services and the corroborating volume of traffic witness in post concession period is higher than what is observed the pre concession period (see Table 1).

Tab. 1 Perceptions on Efficiency Level of Apapa Port in Pre Concession Period

Note: P-poor; F-fair; G-good; VG- very good; Excellent and T-total

	Pre Concession						Post Concession					
	P	F	G	VG	E	T	P	F	G	VG	E	T
Port services	%	%	%	%	%		%	%	%	%	%	
Turn-around time for ship	33	63	4	-	-	100	-	2	24	74	-	100
Cargo handling plant & equipment	93	7	-	-	-	100	-	-	19	67	14	100
Dwell time for goods	4	86	10	-	-	100	-	2	43	49	6	100
Security	84	14	2	-	-	100	-	-	17	53	30	100
Road/rail connection	16	56	28	-	-	100	1	16	64	19	-	100
Adequate manpower	17	75	8	-	-	100	-	1	8	54	37	100

Source: [11], Author's Fieldwork, 2014

The result of the analysis in Table 1 revealed that the post concession period has improvement in the service rendered in Apapa port than the pre concession period using turn-around time of ship, cargo handling plant and equipment, dwell time for goods, security, railroad connection and adequate manpower to measure the efficiency level of the port.

Tab. 2 Perceptions on Structure and Infrastructural Development in Apapa Port in Pre and Post Concession Period

Note: L- low; A-average; H- high; T- total

	Pre Concession				Post Concession			
	L	A	H	T	L	A	H	T
Structure and infrastructural development	%	%	%		%	%	%	
Dredging	32	65	3	100	-	35	65	100
Quayside	29	66	5	100	-	7	93	100
Container yard paving	80	20	-	100	-	7	93	100
Open storage yard	46	54	-	100	1	4	95	100
Sheds	27	73	-	100	-	81	19	100
Land slide accessibility	10	84	6	100	3	91	6	100
Cranes and pipes	63	46	-	100	2	23	75	100

Terminals	54	46	-	100	1	2	97	100
Berth	72	28	-	100	-	10	90	100

Source: [11], Author's Fieldwork, 2014

The critical review of the result analysis presented in Table 2 revealed that the post concession period has significant improvement in than the structure and infrastructural development in Apapa port than the pre concession period in using dredging, quayside, container yard paving and infrastructure, open storage yard, shed, land slide accessibility, cranes and pipe, terminals and berth as an indices of measurement.

Tab. 3 Perception on the Impact of Apapa Port Services Based on Port Effectiveness in Pre and Post Concession Period

Note: L- low; A-average; H- high; T- total

	Pre Concession				Post Concession			
	L	A	H	T	L	A	H	T
Socio-economic impact	%	%	%		%	%	%	
Increase customer satisfaction	8	90	2	100	-	8	92	100
Increase private sector participation	98	2	-	100	-	11	89	100
Efficiency in tool management	88	12	-	100	-	11	89	100
Increase decentralization of the port system	82	18	-	100	-	71	29	100
Port operational delays	-	20	80	100	-	20	80	100

Source: [11], Author's Fieldwork, 2014

The result of the analysis in Table 3 revealed that the post concession period has distinct difference than the pre concession period in terms of port effectiveness of the socio-economic services and operational impact of Apapa port. Majority of the respondents indicated high in post concession period for customer services satisfaction (92%), private sector participation (89%), efficiency in management tools (89%), decentralization of port services (89%) and but indicated indifference in port operations delays in pre and post concession periods as indices to measure effectiveness in respect to socio-economic impact.

3.3 Findings on Factors Responsible For the Observed Level of Productivity in ApapaPort in the Pre and Post Concession Periods

Tab. 4 Perceptions on the Factors that Determine Productivity in Apapa Port in Pre and Post Concession Periods

Note: L- low; A-average; H- high; T- total

Determinant of Port Productivity	Pre Concession				Post Concession			
	L	A	H	T	L	A	H	T
	%	%	%		%	%	%	
Port operation efficiency level	90	10	-	100	-	12	88	100
Port cargo handling charges	10	88	2	100	-	75	25	100
Reliability	83	16	1	100	-	12	88	100
Port selection preference of carriers and shippers	78	15	7	100	-	14	86	100
The depth of navigation channel	10	79	11	100	-	18	82	100
Landslide accessibility	6	94	-	100	-	76	24	100

Source: [11], Author's Fieldwork, 2014

The result of the analysis in Table 4 revealed that the post concession period has significant improvement on the factors that determine productivity in Apapa port than the pre concession period as majority of the respondent indicated high for port operation efficiency

level (88%), reliability (88%), port selection preference of carriers and shippers (86%), the depth of navigation channel (82%) and landslide accessibility (24%) as an indices used in measurement.

Tab. 5 Perceptions on Problems that Affect Productivity in Pre and Post Concession Period of Apapa Port

Note: L- low; A-average; H- high; T- total

	Pre Concession				Post Concession			
	L	A	H	T	L	A	H	T
Problems	%	%	%		%	%	%	
High degree of centralization	-	21	79	100	62	37	1	100
High port charges	13	60	27	100	2	71	27	100
Ageing port infrastructure	-	4	96	100	93	6	1	100
Inadequate investment in equipment	-	12	88	100	93	7	-	100
Cumbersome and bureaucratic cargo clearance	2	21	77	100	52	41	7	100
Excessive political pressure affecting operations	-	12	88	100	44	49	7	100

Source: Author's Fieldwork, 2014

The result of the analysis in Table 5 revealed that the post concession period has reduced level of problems affecting productivity of Apapa port than the pre concession period. Majority of the respondents noted that the concession programme brings about high degree reduction in degree of centralization (62%), ageing port infrastructure (93%), inadequate investment in equipment (93%), cumbersome and bureaucratic cargo clearance (52%), and excessive political pressure affecting operation (49%).

3.4 Findings on Strategies to Improve Productivity Level of Apapa Port

It was discovered from the research investigation that majority over 80% of the respondents agree and/or strongly agree that proper and correct valuation of goods, reduction in the number of operational agencies at the port, and reduction in port tariff measures will enhance and improved productivity level of Apapa ports (see Table 6).

Tab. 6 Perceptions on Imperative Measures that will Enhance Productivity Level of Apapa Port

Note: SD- strongly disagree; D-disagree; A- Agree; SA-Strongly agree; T-total

	SD	D	A	SA	T
Imperative measure	%	%	%	%	
Introduction of multiple agencies	-	95	4	1	100
Proper and correct valuation of goods	-	2	22	76	100
Reduction in the number of operational agencies at the port	-	4	78	18	100
Reduction in port tariff measures	-	4	88	8	100

Source: Author's Fieldwork, 2014

As showed in Table 7, the study revealed that majority over 90% of the respondents agree and/or strongly agree that establishment of new port, continuous involvement of public private participation in port operations, establishment of inland port, and increasing funding of existing port by the government will go a long way in combating operational and management characteristics problems particularly delay, congestion, theft and sharp practices, inefficiency and underutilization of Apapa Lagos port as well as ports with similar problems in developin nations including Nigeria.

Tab. 7 Perceptions on Suggested Measures Combating Congestion in Apapa Port

Note: SD- strongly disagree; D-disagree; A- Agree; SA-Strongly agree; T-total

	SD	D	A	SA	Total
Suggested Measure	%	%	%	%	
Establishment of new port		-	3	97	100
Port concessioning (public-private participation)		-	7	93	100
Establishment of inland port		-	4	96	100
Increasing funding of the existing port.		3	25	72	100

Source: [11], Author's Fieldwork, 2014

3.5 Findings on Hypotheses Testing

Further investigations were conducted through hypotheses testing to show the statistical disparity between seaport performance factors in pre and post concession periods of Apapa Lagos port. The result of hypotheses unveiled that there is a significant difference in cargo throughput, turn-around time and berth occupancy in pre and post concession period of Apapa port. This indicated the level of disparity that exists between the two periods in terms of the level productivity in pre and post concession periods in Apapa port. Having the tested result between the two periods for cargo throughput 't' calculated as 2.386 > 't' tabulated 2.31, turn-around time 't' calculated as 2.965 > 't' tabulated 2.31 and berth occupancy 't' calculated as 2.682 > 't' tabulated 2.31 at 5% level of significant.

Tab. 8 Significant Difference in Turn-Around Time in Pre and Post Concession Period of Apapa Port (Cargo throughput 'X', Turn-around time 'Y', and Berth Occupancy 'Z')

Cargo throughput	Mean	N	Std. Deviation	T	Df	Sig.
Pre-concession period	10.07	9	654931.69690	2.386	8	.035
Post concession period	20.07	9	5047045.375			
Turn-around time	Mean	N	Std. Deviation	T	Df.	Sig.
Pre-concession period	15.60	9	5.12835	2.965	8	.041
Post concession period	9.200	9	1.30384			
Berth occupancy	Mean	N	Std. Deviation	T	Df.	Sig.
Pre-concession period	68.90	9	10.45873	2.682	8	.023
Post concession period	63.54	9	2.46941			

Source: Author's Field Survey, 2012

't' is significant at 5%

From the data analysis in Table 8, it can be deduced that there is a clear and statistical difference between port productivity in terms of cargo throughput, turn-around time of vessels, and berth occupancy rate of the port in the pre and post concession period. Hence, there is statistical significant difference between cargo throughput (sig. 0.035), turn-around time (sig. 0.41) and berth occupancy rate (sig. 0.023) in pre and post concession periods of Apapa port.

4 RECOMMENDATIONS AND CONCLUSION

Based on the above findings, it is pertinent to make strategic recommendation that will revitalize the Nigerian seaports. Therefor the study thus recommends that: total mechanization in cargo handling should constitute a policy trust and strict adherence; there is need for continuous introduction of new mechanization of cargo handling equipment with less maintenance cost in the Apapa ports due to the high rate of demand in the port; the federal government should continue improving the structure and infrastructural development of the port; the port agencies should implement strict policies that will help to checkmate sharp practices and delays in the Nigerian seaport; high tariff in the port should be moderated

to enhance and encourage shippers and friends patronage and more effort should be made by the maritime regulatory body to ensure the strict adherence to the cabotage Act so domestic carries can be more productive and have better capacity utilization.

The study discussed extensively on the assessment of seaports productivity in pre and post concession periods of Nigerian with reference to Apapa port. The study showed that there is a clear difference in the productivity level of two periods (pre and post concession period). This was however justified by valid indices that were used as a yardstick to compare the productivity of the two periods. Those indices includes efficiency of the services rendered by the port, productivity level of the port, improvement in the structure and infrastructural development in the port, problems affecting the productivity of the port, as well as the rate of cargo throughput, turn-around time of vessels and berth occupancy rate at the port. It is however concluded that there exist a significant difference in the level of productivity between the two periods with clear evidence as shown in the study.

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