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Determinant Port-related Factors Affecting the Flow of Shipping Trade and Logistics in Nigerian Seaports

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Abstract: The need to eliminate bottlenecks to port operations in Nigeria was a fundamental goal of the port privatization about 2 decades ago. Current trends in ports management; however, suggest existence of numerous inefficiency challenges reflected in long ship turnaround time, increasing trend of cargo dwell time, high cargo pilferage risk rate, poor condition of port infrastructure and superstructure, multiple charges and government agencies, cumbersome cargo clearance & examination procedures, port congestion related delays particularly in Apapa and Onne ports, etc. The study identifies the decisive port-related factors constraining the flow of shipping trade in Nigerian ports using a survey to obtain data on the influence of the identified factors on the flow of shipping trade in Nigerian ports. The Principal Component Analysis (PCA) was used to analyze the data obtained. The results indicate that high cargo pilferage risk profile, long ship turnaround time and increasing trend of cargo dwell time constitute the significant port-related factors constraining the flow of shipping in Nigerian ports. It can be concluded that terminal operators should prioritize solutions to the problems of high cargo pilferage risk profile, long ship turnaround time and increasing cargo dwell time, which constitute the major constraints to the flow of shipping trade.

Keywords: Port-related, factors, shipping trade, port logistics

1. Introduction

Seaports are seen as gateways into national economies as they facilitate shipping trade flows and enhance handling of logistical material and operations across all sectors of the national economy. This is because the service, manufacturing, trade and extractive sectors of the national economy in one form or another depend on the seaports for shipping and export - import of raw materials, finished and semi-finished products, which helps maintain the national economy. Transportation and shipping form an integral part of the logistics functions, seaports represent very important nodes in the transport, logistics and supply chains of all industrial sectors responsible for shipping and delivery of orders to the consignee's warehouses across supply chain networks. They represent an interface at the waterfront/seashore where land, air, rail, water and pipeline transport modes meet (multimodal transport interface); and at which the maritime transport mode feeds other modes and is itself fed with cargo/consignments, passengers from other modes [1,2]. Thus, port operations significantly affect shipping trade and maritime logistics and operations by influencing costs, time, output, efficiency, safety and security risks associated with the use of maritime transport mode, in cargo handling and delivery, in the global logistics and supply chain sector.

Maritime logistics, in the context of this study similar to port logistics, is an integrated concept aimed at addressing all aspects of logistics and supply chain challenges associated with maritime transportation and the delivery of goods via the seaports. Its focus is to improve and/or maximize the efficiency, cost-effectiveness, time, safety and security service, quality, utility/customer satisfaction, etc., associated with the use of maritime transport and seaports in the delivery of consignments by shippers and freight forwarders. According to [3,4], logistics as a process refers to planning, execution and managing the movement of products and information, from one point to another, aimed at achieving cost effectiveness, time optimization, performance maximization, utility maximization and customer satisfaction. As a broader concept, logistics covers several business and administrative activity areas and functions, such as: transportation, inventory management, order processing, warehousing, customer services, handling, packaging, labeling, information management, returned product management, salvage scrap disposal, and site/location selection [5].

In the maritime industry, the complex nature of the maritime sub-sector requires the incorporation of the logistics functions and activity areas when addressing the numerous challenges and bottlenecks to efficiency in service delivery and port-user satisfaction in the sub-sector. For example, all maritime-related fields, such as ship ownership, chartering, shipping agencies, brokering, freight-forwarding, stevedoring, supply management, port operations, etc. are separate operating units. However, they are integrated in the functions of port/maritime logistics [5]. Within the port operations as such, it shall be

noted that port logistics sector as an aspect of maritime logistics is associated with the application of the logistics functions in port operations, management and administration to achieve the core goals of logistics (cost effectiveness, time optimization, utility maximization and customer satisfaction, performance improvement, etc.) as mentioned above. Thus, many factors related to port operations and activities included in port logistics as a unit of maritime logistics influence the efficiency, cost, effectiveness, time, safety and security, service quality, utility/customer satisfaction, etc., based on the use of ports by shippers and freight forwarders [6-8].

In Nigeria, trend of ship turnaround time, cargo pilferage-risk-profile, delays caused by port congestion, increasing trend of cargo dwell time trend, cumbersome cargo examination procedures and bottlenecks, multiplicity of government agencies and charges, poor state of port infrastructure and superstructure, etc., have been identified in many publications as factors that negatively affect the efficiency of the ports industry as well as that increase the cost and risk of shipping goods through Nigerian ports [9,10]. However, it is possible that the above port-related factors negatively influencing shipping trade and logistics materials flow through the ports can be overcome or significantly reduced by the application of available logistic tools and functions. To achieve the proposed elimination or reduction at the level of negative influences imposed by the limiting factors, empirical evidence and information is needed on which of the numerous factors constitute a significant factor and major clog in the wheel of operational progress, efficiency and flow of shipping trade through the seaports.

Here, expert input of shippers and freight forwarders as major stakeholders and consumers of port services becomes very important in identifying the factors that inhibits their choice of ports for import and export and thus the efficiency and effectiveness of supply chain networks connected to Nigerian seaports. Since the goal of each port operator is to maximize port efficiency, cost-effectiveness of cargo handling and delivery of consignments via the ports, time savings, improvement of supply chain safety and security related to the port, service quality improvement, utility and customer satisfaction; shippers and freight forwarders remain the most important ports users to benefit from the application of functional logistics strategies, tools and principles, in the achievement of these goals, and as such, would lead to the determination of significant factors that hindering the consumption of the aforementioned benefits. These obstacles need to be addressed in order to maximize the benefits in using port services for shippers, freight forwarders and operators [11].

When analyzing the influence of the identified factors, [12-14] state that Ship Turnaround Time (STRT) as a port-related factor that influences the flow of shipping trade via the ports denotes the total time that a vessel spends at a port from its arrival to departure [11]. Higher STRT increases the risk of delay and disruption in delivery of shipments and cargo to the shippers' warehouses in the

hinterland markets, which could result in stock-out and scarcity in the domestic markets, price inflation, shutdown, etc., besides other negative economic effects. Similarly, increasing Cargo Dwell Time (CDT) implies a situation of delay in the movement of goods and an indication of the existence of port congestion. Nigerian ports are known to have the highest cargo dwell time in the West African sub-region and this is viewed as a serious factor that hampers efficient shipping trade flow and declining utility and satisfaction of port users [13]. Other identified factors include:

Cumbersome Cargo examination procedures and bottlenecks and the plethora of government agencies (about 32) including the Nigerian Customs Service, all of which cause avoidable delays in the clearing of imported goods and consignments, and many port charges and rates [13-16].

As stated above, the identified challenges to shipping trade flow through the ports arose from the inability and delay in the implementation of the functional port logistics strategies in Nigerian ports. Therefore, port operators, even in the post-privatization era, seem not to have seriously resorted to deliberately maximize the utility and satisfaction of port and port services users. Cost of port services, time of doing business in port show a continually increasing trend, while customer satisfaction or port service quality are very low and even declining. It is a sign of the lack of serious competition among terminal operators in seaports to improve customer satisfaction and conditions of port as ways to improving their productivity and possibly disadvantaging competitors by attracting more port users. It also indicates the failure of the port privatization to achieve one of the most important objectives of increasing the competitiveness in the ports industry in Nigeria. To reverse the trend, ports and terminal operators must adopt functional port logistics strategies by which they must aim to address the cost, time, utility and customer satisfaction, etc., challenges of the ports [18-20].

To over the challenge posed by the identified port-related factors to the flow of shipping trade via the seaports, there is a need, from the perspective of the professional shippers and freight forwarders, to determine the principal factors influencing the flow of shipping trade and logistics materials through the ports in Nigeria. This will provide the basis for port performance improvement through the elimination of the major port-related bottlenecks that affect the flow of shipping trade and logistics materials through the ports.

2. Data and Methods

The study was designed to determine the significant port-related factors that affect shipping trade in Nigerian ports resulting from non-adoption and delays in the strategic implementation of functional logistics principles, in overcoming the challenges of the ports and improving consumer use and satisfaction related to using port services. The study used survey research design. A questionnaire was

used as survey instrument to gather data from shippers and freight forwarders concerning the influence of the seven identified port-related factors, on their individual decision to deliver their import and export consignments through the ports. Each question was calibrated on a 100% scale so that the total sum of each respondent's rating of the influence of each identified port-related factor that inhibits port efficiency maximization is lower than 100%, which is the sum of the aggregate effect of the individual port factors affecting the flow of shipping trade and logistics materials in the ports. Purposive random sampling technique was used, focusing primarily on shippers and professional freight forwarders. About 32 questionnaires were properly filled in and responded to, which accounts for about 77% of the total questionnaires distributed to members of professional associations of shippers and freight forwarders. Principal Component Analysis (PCA) was used to analyze the data. The reliability of the instrument was tested by using the test-retest reliability measure which gave a correlation coefficient of 0.76, indicating that the dataset was reliable. The analysis was implemented using SPSS version21 analytical software.

3. Results

The result of the Principal Component Analysis (PCA) implemented using SPSS analytical software is shown in Table 1 below. The result shows the decisive port-related factors that affect efficient flow of shipping trade and logistics material through the ports in Nigeria. It indicates that high cargo pilferage risk profile has Eigen value of 3.072, the Eigen value of the increasing cargo dwell time is 1.566, while long ship turnaround time has Eigen value of 1. 083. Similarly, poor condition of port infrastructure and superstructure, cumbersome cargo examination procedures and bottlenecks, plethora of charges and agencies and delays caused by port congestion each has Eigen values of 0.729, 0.327, 0.23 and 3.867E-007 respectively. Table 1 below shows more detailed information on the Eigen scores of each factor.

Table 1 Major Port-Related Factors Affecting Flow of Shipping Trade and Logistics Materials in Nigerian Ports Sector. Source: authors.

	Initial	Extraction
Cargo pilferage profile	1.000	.893
Ship turnaround time	1.000	
Cargo dwell time	1.000	.828
Cargo examination bottlenecks	1.000	.840
Multiple agencies and charges	1.000	.854
Poor port infrastructure	1.000	.750
Delays due to port congestion	1.000	.723

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.072	43.887	43.887	3.072	43.887	43.887
2	1.566	22.375	66.262	1.566	22.375	66.262
3	1.083	15.478	81.739	1.083	15.478	81.739
4	.729	10.409	92.148			
5	.327	4.669	96.818			
6	.223	3.182	100.000			
7	3.867E-007	5.524E-006	100.000			

Component Matrix[a]

	Component		
	1	2	3
High pilferage risk	-.529	-.345	-.467
Ship turnaround time	-.745		
Cargo dwell time	-.907	.052	.052
Cargo examination bottlenecks	.631	-.654	.118
Multiple agencies and charges	.843	-.354	.133
Poor port infrastructure	-.529	-.020	.685
Delays due to port congestion	.272	.714	.373

Note: Extraction Method: Principal Component Analysis.[a]
3 components extracted.

The results indicate that only three (3) factors (high cargo pilferage risk, increasing trend of cargo dwell time and long ship turnaround time) are significant and as such, they represent the major obstacles to flow of shipping trade in Nigeria seaport. Detailed discussion of results is carried out in Chapter 3 below.

4. Discussion of Findings

The results show that high cargo pilferage profile/risk, increasing trend of cargo dwell time, and long ship turnaround time, Eigen value for each of them exceeding 1 (Eigen value>1), constitute the major port-related factors affecting the efficient flow of shipping trade and logistics material through the ports. High risk of cargo pilferage risk achieves the highest Eigen value of 3.072 and as such, remains the major obstacle to the smooth flow of shipping trade and logistics materials through the ports. It shall be noted that poor condition of port infrastructure, cumbersome cargo examination procedures and bottlenecks, large number of charges and agencies and delays related to port congestions, each of them achieving Eigen value lower than 1 (e.g: 3.867E-007<1); does not significantly affect the flow of shipping trade and logistics materials in the ports.

The implication of the above findings for port operations and logistics is that in order to improve or maximize port utility and user satisfaction in the use of port services, port terminal operators and port authorities must first address the high cargo pilferage risk profile of Nigeria ports, the long ship turnaround time, and increasing trend of cargo dwell time in the ports. This can be achieved by the application of strategic and functional logistics and management tools in port operations. This will subsequently ensure that the negative trend and influences of the above significant port-related factors on shipping trade handled through the ports is reversed while port productivity and efficiency is improved.

Based on the result of the study (see Table 1), the port-related factors limiting the efficient flow of shipping trade and logistics materials in the ports the ports are listed in order of decreasing Eigen value and influence in the bar chart below:

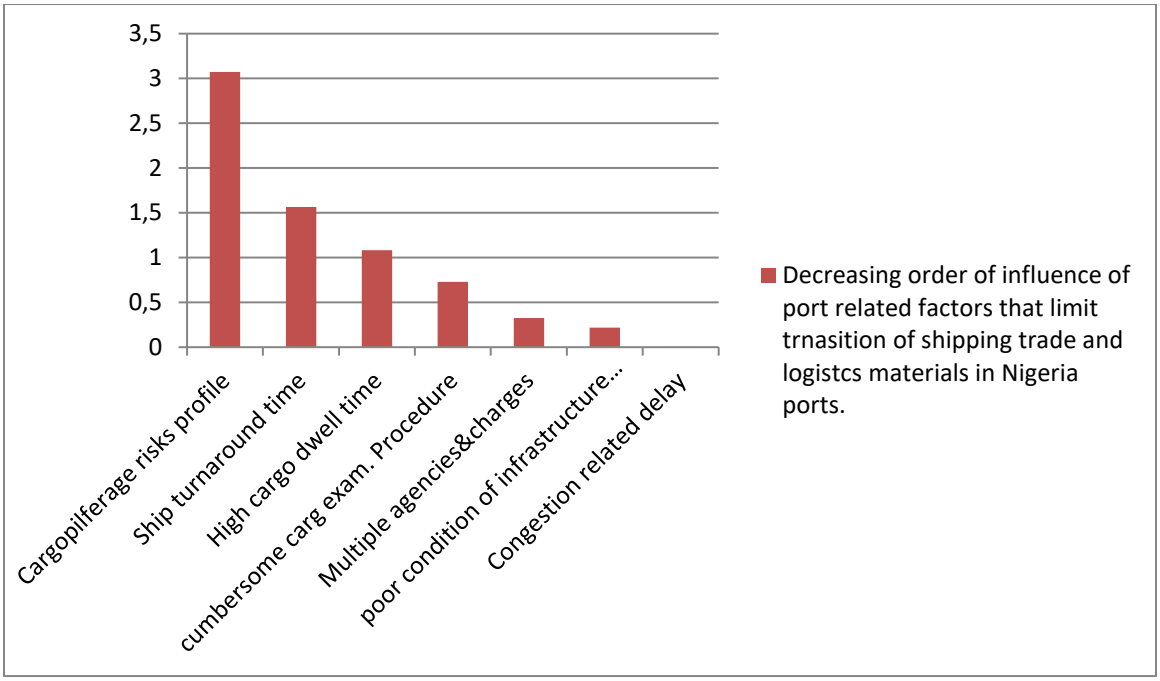


Fig. 1 Decreasing order of influence of port-related factors limiting flow of shipping trade and in Nigerian ports. Source: authors.

The result of the study indicates that the percentage mean of each of the port-related factors affecting the efficient flow of shipping trade and logistics is 20.59%, 12.48%, 12.39%, 11.84%, 10.96%, and 11.45% respectively for high pilferage risk, increasing trend of cargo dwell time, high ship turn-around time, port congestion related delay, poor condition of port infrastructure, and multiplicity of charges and agencies, with respective standard deviations of 2.90, 3.90, 5.70, 4.70, 5.15, and 3.74.

Thus, to achieve the goals of port logistics, which also include achieving cost effectiveness, reduction of cargo delivery time through the ports, improved port service quality and customer satisfaction, and improved port performance, productivity and efficiency, port authorities and terminal operators must begin by first addressing the identified significant principal factors of high cargo pilferage risk profile, increasing trend of ship turnaround time, and increasing trend of cargo dwell time.

5. Conclusion

The results of the Principal Component Analysis show that high cargo pilferage risk, increasing cargo dwell time, and long ship turn-around time, with Eigen values greater than one (Eigen value>1), constitute the principal port-related factors affecting the efficient flow of shipping trade and logistics materials through the ports. High risk of cargo pilferage risk achieves the highest Eigen value of 3.072

and as such, it remains the factor that poses the greatest obstacle to the smooth flow of shipping trade through the ports.

Based on the findings of the study, it can be concluded that poor conditions of port infrastructure and superstructure, cumbersome cargo examination procedures and bottlenecks, large number of charges and agencies and delays related to port congestions, each of them achieving the Eigen value lower than one (e.g: 3.867E-007<1); does not significantly inhibit the flow of shipping trade via the ports. Port authorities and terminal operators should thus pay greater attention to reducing the ship turnaround time, cargo pilferage risk profile and cargo dwell time in Nigerian ports as well as improve port service quality and shippers satisfaction.

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