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Effect of Information Technology on Effective Cargo Delivery of Ports in Niger Delta, Nigeria

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ABSTRACT :

This study examined the effect of information technology on effective cargo delivery of ports in Niger Delta, Nigeria. Information technology (independent variable) was examined with these dimensions: work automation, port infrastructure system, and communication devices. The dependent variable was measured with effective cargo delivery. The study was anchored on the use of Information Technology Theory. Cross-sectional survey research design was used for the study. The sources of data were mainly primary and secondary methods. The key research instrument for collection of primary data was structured questionnaire. The population of the study consisted of four (4) ports in Niger Delta. The study used descriptive and inferential statistical tools to analyze the data to achieve the research objectives and used Pearson Product Moment Correlation Co-efficient (r) to test the hypotheses with the help of SPSS 25.0. Partial Correlation was used to test the moderating variable. The reliability of the research instrument was validated with Cronbach Alpha threshold at 0 .70. The study found that Ports in Niger Delta are very skillful in work automation, which provides veritable opportunities to obtain effective operations that lead to effective port performance in Niger Delta. The study revealed the importance of work automation on cargo service quality satisfies ports' stakeholders. The study concluded that as ports in Niger Delta use work automation to operate digitally by adopting information technology in all areas of their works, effective cargo delivery is significantly and positively improved, and sustained the protection of the ports and information systems menace is positively and significantly guaranteed. The study recommended that port authorities and stakeholders in Niger Delta should prioritize increased investment in information technology infrastructure. This includes not only work automation but also modern equipment that will improve the entire port systems. By enhancing these technologies, ports would improve on work automation leading to effective cargo delivery, for optimize port performance.

Key words: Information Technology, Work Automation, Port Infrastructure, Effective Cargo Delivery, Niger Delta

Introduction

The effect of Information technology on effective cargo delivery of ports in Niger Delta have been assessed, traceable to tailor towards the utilization of modern technology infrastructure , which significantly improves role of logistics chains facilitating economic growth between countries and nations involve in international trade. With the increase of cargo volumes, more than 80 percent of the world's merchandise trade transport are carried out by vessel (UNCTAD, 2019). Consequently, Niger Delta ports of Nigeria are regarded as one of the trade hub positioned at strategic points interfacing with other ports within Nigeria and viable gulf of guinea at large. The present of automation systems become highly critical in galvanizing port effective cargo delivery as they become competitive hubs attracting larger volumes of cargo per limited time in their operations. However, this progressive trend satisfies port stakeholders' and other port users engaging in international trade business in Nigeria.

The port infrastructure system have been instrumental as they improve port multidisciplinary system heightening port generated revenues as strong economical function, creating geographical space and trade through effective cargo delivery among ports in various dimensions. Due to modernization, and rapid growing demand for the maritime transport and logistics services, sustainability and the importance of sustainable development have gained an increasing concern from academics, industry, society and the entire business community globally. Thiwanka, *et al* (2020).

However, many ports in the world trade strongly gain their potentials from information technology infrastructure which gradually improves their performances in the development of business strategies. Over the last decade, quests for seaport sustainable development in Nigeria have gained an increasing concern from academics, industry, society and the business community. Seaport performance in the Sub- Saharan Africa enhances the port environment, society and produce efficient and competitive dimensions in the maritime sector to assure synergies and coherence, despite the fact that no intention to list them among the high rate performing seaports in the world trade. About 95% of modern vessels in the world fleet have integrated system that store vast amounts of data for maximum efficiency drawn from appropriate size of network to improve maritime logistics operations in most ports, influencing shipping companies and other stakeholders operations to greater range, increase at the strategic, tactical and operational level which will consist a forward-thinking procedure to leverage the advantages of Industry in more competitive way with other neighboring ports within West Africa, and the world trade.

Communication devices contribute beyond half of Africa's improved economic and social performance through improved telecommunications that would bridge the benchmark between western ports and Nigerian ports domiciled in the sub-Saharan. So, the emergence of fuzzy analytic network process (FANP) model on the adoption of information technology provides advanced and seamless options in the consideration of geographical location of ports as basic parameter. Yau *et al.,* (2020).

A greater competitive ports' increase, attract the improvement of new and current ways of utilizing geographical area, infrastructure, services, and would identify the stronghold emerging from information technology, which are considered as primary consolidated domains of modern port with regard to its capability to interface, collaborate and compete with different ports (UNCTAD, 2019). Ports' problems were initially fixed with individual Information Communication Technology ICT solutions adopted by each decision-makers, which developed efficiencies in the three major port flows: cargo, information, and finance. However, new advantages and barriers are associated with the initiation of shared emerging ICT between decision-makers within ports.

Before twentieth century, ports and harbors were devastated with severe competition for market share and achieving a higher efficient and secure flow of goods worldwide. High performing ports are performing smart technologies to properly manage operations, meeting new challenges in maintaining sustained, secure, and energy-efficient facilities that relieve environmental consequences. In this regard, a new concept has arisen called smart port (Molavi *et al.,* 2020).

Hence, smart ports been paraphrased as parts of port with seamless terminal operations, warehousing, logistics, yard and port transportation closely inter-connected with wireless network or spatial network, providing undiluted and viable information for daily production, supervision in line with government national maritime policies in the essence of ports reformation (Li, *et al.,* 2018).

Considering the fact that ports are vital transportation link in the value chain, about 95% of the total goods in international trade are dominantly shipped by sea as import and export goods for various purposes, their compatibility with information technology is drawing serious attention in most developing countries like Nigeria. Ports in developing countries should be considered to adapt to the contemporary trend, technology dynamics in global trade modern business operation to achieving effective cargo delivery. Huge investment is made on human capital, institutional and technological dimensions to enable their traders and service providers take advantage of new business opportunities to capture growth opportunities, remain competitive derivable from the improvement of digitalization and ports revolution in international (UNCTAD, 2019).

Statement of the Problem

In Nigeria, many studies have proved the significant role of information on effective cargo delivery and yet, many Nigerian ports still rely on outdated information technology systems that engender inefficiencies and high turnaround time. Therefore, ports in the Niger Delta region need to be improve, to enable them gain strong competitive position both in the regional and global market (UNCTAD, 2021).

Ports failing to work in line with information technology (IT) systems, would be vulnerable to inefficiencies in data sharing and communication. Most Nigerian ports have been susceptible vulnerable to cyber-attacks, which may disrupt operations and compromise sensitive data. The large amount of data generated in Nigerian ports' face high range of inconsistencies, and there is often a lack of effective data management strategies that apparently affect port users. The potential benefits of automation, port infrastructure, and communication devices for artificial intelligence in Nigerian ports operations could not be achieved as a result of challenges of integrating these technologies with existing information technology (IT) systems. Poor connectivity and communication infrastructure can be considered to hinder the effective use of information technology (IT) systems in Nigerian ports. Training and skills development meant for effective use of IT infrastructure can be put aside neglecting to embark ports personnel on skill development mainly in the Niger Delta, Nigeria. The hope that the effect of information technology would improve effective cargo delivery in conformity with implemented global maritime regulations in international trade remain area of focus.

Aims and Objective of the Study

This study aims to investigate the extent information technology relate to effective cargo delivery of ports in Niger Delta and therefore, the following specific objectives would be attained:

1. To determine the extent to which work automation relate to effective cargo delivery of ports in Niger Delta, Nigeria.
2. To determine the extent to which port infrastructure relate to effective cargo delivery of ports in Niger Delta, Nigeria
3. To determine the extent to which communication devices relate to effective cargo delivery of ports in Niger Delta, Nigeria.

Research Question

1. To what extent does work automation relate to effective cargo delivery of ports in Niger Delta, Nigeria?
2. To what extent does port infrastructure relate to effective cargo delivery of ports in Niger Delta, Nigeria?
3. To what extent does communication devices relate to effective cargo delivery of ports in Niger Delta, Nigeria?

Research Hypotheses

The statement of hypotheses of this study are stated in null form:

- **HO_1:** Work automation does not significantly relate to effective cargo delivery of ports in Niger Delta, Nigeria.
- **HO_2:** Port infrastructure does not significantly relate to effective cargo delivery of ports in Niger Delta Nigeria.
- **HO_3:** Communication devices do not significantly relate to effective cargo delivery of ports in Niger Delta, Nigeria.

Literature Review

This research work is made up of theoretical, conceptual, empirical review presented by some authors in a bid of reviewing most former related literatures complying with the formulation of hypothesis providing a distinct gap analysis for assessment of numerous ideas presented by different scholars.

Theoretical Review

Information Technology Theory

This theory came in existence in the early 20th century emerged with innovative based model, engendered by various level of dynamics in the evolution of information technology. According to Widyanti et al., (2020), states that the use of this theory by students and professionals may change their personality potentials in building of information technology. In this type of learning, students and port users are developed for competencies resulting to activations of their performance in the use of modern information technology equipment.

Castellano et al., (2019) used a Data Envelope Analysis (DAE) strategy to assess the impact of information technology for communication in ports. Yang and Yang (2021) display effectiveness and superiority in the combination of artificial intelligence relevance to port supply chain that evaluate the impact in the use of industry technologies in most ports in advanced nations like the Republic of Germany, city of Los Angeles, Hamburg, and Rotterdam for significant position of information technology on port performance.

Conceptual Review

The conceptual review of this study provides many ideas on work automation, communication devices, port infrastructure system, and effective cargo delivery that present deep understanding to scholars.

Information Technology

Information technology becomes dynamic as competition among ports in the global trade increases. The quest for better business opportunities and comparative advantage have been considered paramount among ports prepared employing different strategies with the use of information technology having significant impacts on port performance.

Considering the demographic and psychological characteristics of different entities, information technology brewed many tentacles forming information communication technology. Therefore, the transformation of ports with the adoption of Information Communication Technology (ICT) are highly utilized and would not be overemphasized considering their wide range polarity alongside with Information micro-electronics computer, and related technologies including microchip and microprocessor-based technologies (Oyewole, 2019).

Work Automation

Ballot, (2016) explained that there are great range and various automation levels that differs from port to port, determines by the potential and capacity of the port, their geographical position, the volume of cargo they accommodate, and their economic values. Through the growth of mega-ports, the tentacle developed on work automation has increased beyond a reasonable doubt. Development of work automation and its evolution is unveil, cut across various maritime organizations globally, with modern cargo handling equipment providing seamless operation. Efficiency is gained from automation in determining movement of cargo per hour for loading and discharging container from and to a vessel.

Port Infrastructure

Port infrastructure refers to as functional structure of port, and critical materials move economic base of a society, nation and as well as organization. Therefore, unleash optimum performance to benefit port users, communities, and nations in diverse ways. So, the basic attribute to competitiveness are established by infrastructure efficiency for economic growth. Statistics shown that Nigeria spends over $2 billion on freight annually, to foreign ship owners either for exportation of oil or importation of finished goods. It was estimate that offshore rigs and support vessels, coastal Cabotage trade and import and export trade amounts to over $20billion. With available port infrastructure system, Nigeria would capture competitive advantage with utmost potentials, gaining greater foreign exchange, earnings job and wealth creation with high indigenous shipping capacity among nations in the Gulf of guinea (Gog), and the globe at large. Zhao *et al.,* (2020) argued that most research conducted some studies on port performance and productivity are based on quantitative measures of infrastructure system for assessment of port performance.

Communication Devices

According to Kim *et al.,* (2018), radio communication devices improve ports operational efficiency, reducing errors, and slow communication in the process of intra communication. Most scholars explicate that mobile communication devices such as smart phones, and tablets have largely spread with high popularity in ports environment with high band communication capacities to disseminate text messages, email, and internet access despite their physical location within the port premises (Kim *et al.,* 2018). Mobile communication devices found very critical to improving information sharing and decision making in port operation (Veenstra *et al.*, 2020). They stated that ports' administration employs mobile communication devices as tool to oversight and coordinate operations in remote location as transit to improve ports operations by satisfying the need of port users and other valuable stakeholders in the port market. Wireless Sensor Networks (WSNs) communication devices facilitate port performance in this contemporary world.

Effective Cargo Delivery

Brouer *et al* (2017) opined that effective cargo delivery of data packets in a network environment proposed a machine learning-based approach to forecast and curtail cargo dwell time of goods in the ports. There was a big understanding that the historical data models, and optimization of network traffic reduce dwell time, improve port network performance.

Effective cargo delivery reduces customs clearance process, documentation scrutiny, cargo inspections significantly contribute to brisk service in cargo clearance and expunge cargo dwell time in the port operational business environment. The effective cargo handling processes, engenders decongestion at terminals facilities, and improve equipment life to prolong port operation tasks ahead. The adequate road or rail infrastructure, and decongestion in transport networks results to facilitate cargo movement and curtails cargo dwell time. Jones, *et al.,* (2020) identified average dwell time as basic parameter used in measuring effective cargo delivery, as cargo remains at port facility before release of cargo and transportation.

Empirical Review

The study investigate relationship between information technology and effective cargo delivery to enhance connectivity and port operational performance, workable to reduce dwell time of cargo, using port of Rotterdam as case study. The study came up with patters modern port devices assess which enable personnel achieve real-time data, efficiently synergize, and make informed decisions, ultimately contributing to improved port performance metrics. Li *et al., (*2018) carried a study on communication technologies. Evidence from a longitudinal study investigates the impact of communication technologies on port resilience, in the time of disruption and emergencies. The study demonstrates advanced communication technologies to facilitate information exchange that will enhance coordination of cargo not suffering longer dwell time at ports, to attain better performance status.

Gap

The literature review of this study shown that that this work does not in any way appears in relative literature required as concept of writings associated with information technology and effective cargo delivery of ports in Niger Delta, Nigeria.

Methodology

This research used cross sectional survey design, paraphrased quantitative analysis. The collection of data is carried out with questionnaire distribution, and interview of respondents. The condition of the survey approach provides a clear picture in the process for clarity purpose. Therefore, this research is conducted taking time as great priority making the work qualified as a cross- sectional study. This pattern was used as a result of time constraint of this study. The target population of the study is made up of personnel working among each of the four Niger Delta ports in Nigeria. Hence, the selected population of the study was 1,396 port staff working.

Methods of Data Collection

Data were gathered from either the primary or secondary sources to obtain analysis of the study. The primary sources are made up of information collected with the administration of research structured questionnaire as instrument. The secondary sources were gotten from existing data gathered from significant materials such as journals, googles, and magazines associated with this study that were so critical to the researcher's use in a related work. According to Liang *et al* (2018), there are two best ways in which data can be obtained in research. Firstly, non-survey approach, where data are taking by not considering the involvement of researcher's link with the subjects. Secondly, survey approach *requires* direct collection of data linking the researcher and subjects as many questions are raised by the researcher at the response of the subjects.

Data Analysis Techniques

This study employed frequency distribution, percentages scaling, ranking, rations and other statistical tools to draw analysis with the aim of obtaining major objective of the research. Basically, Pearson's Product Moment Correlation Co-efficient was used to achieve objectives of 1, 2, and 3, altogether test the hypotheses formulated in the study with the formula given below:

$$r = \frac{n(\Sigma x\, y) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2]\,[n\Sigma y^2) - (\Sigma y)^2]}}$$

For 't' we have:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Where;

r = correlation coefficient

n = number of observations

x = independent variable

y = dependent variable

The analysis of this study will be carried out quantitatively with the application of statistical package for social sciences (SPSS) version 25.0.
However, it was shown that partial correlation measures the degree of association between two random variables Partial Correlation statistical tool was used to test the moderating variables, in the process of amending effect of one or more variables in the study (Cooper & Schindler, 2014). Regression analysis was employed to test the extent of relationship between individual and collective variable(s.

Presentation and Analysis

This area of the study entails analysis of the results coupled with its presentation based on the data obtained for effect of information technology on effective cargo delivery of ports in Niger Delta.
The researcher was highly supported by his research assistant in terms of administering copies of the instrument used (questionnaire) by available respondents met in the study. However, given time interval between 22nd July 2024 to 22nd August, 2024) to respondents for to glance through available instruments of the study without element of prejudice.
Thorough refining of data collected was carried out to obtain rational status of the study and the rationale behind reliability of the instrument in the evaluation of its conceptuality and constructs that were investigated in the study. To achieve this, a Cronbach alpha using the Nunnally and Bernstein's (1994) threshold, alpha values targeting the examination of constructs and items for reliability was used, proved as understated:

Table 1: Test of Reliability

Construct	No of items	Alpha(α)
Work Automation	5	0.891
Communication Devices	5	0.864
Port Infrastructure System	5	0.785
Cargo Service Quality	5	0.819
Effective Cargo Delivery	5	0.698
Ship Service Optimization	5	0.907
Total		4.964
Mean Reliability	4.964÷ 6	0.827

Source: Survey Data, 2024, and SPSS Window Output, Version 25.0

With the alpha results shown in the above table, the instrument is considered reliable on the subject matter examined in this study. The data collection instrument was tested for reliability using Cronbach's Alpha and the study is within the acceptance range of 0.70 and above as the overall reliability test of instruments is 0.826. This is achievable, conforming with Bo and Junqing (2020) stating that the use of the SPSS software package would be significant in testing how reliable are the instruments. Validity test was done, employing the service of professional on the subject with investigative approach, pears review and supervisor's ratifying to find that the instruments are purposeful and expected to measure the design of the study. The variables at the dimension and measures at the criterion work in line with the constructs that have alpha values above the Nunnally threshold of 0.7 in which are considerably reliable for accurate results.

Data Presentation and Analysis

Table 2: Questionnaire Analysis

Options	Frequency	Percentage Performance
Administered Questionnaire	290	100.0
Retrieved Questionnaire	179	91.0
Unretrieved Questionnaire	28	7.1
Invalid Questionnaire	9	1.9
Valid Questionnaire	**276**	86.0

Source: Field Survey (2024).

In this study, a total number of three hundred and eleven (506) copies of questionnaire were distributed to managers, accountants, operations managers, supervisors and general staff in the four Niger Delta ports. Some copies of the questionnaire distributed were duly completed, while some were not completed, some were not returned due to respondents' unavailability. Table 2 reveals that two hundred and seventy six (276) representing 86.0% of the questionnaires administered were duly completed, returned and valid. This indicate a high rate of response basically for the study.

In this study however, the demographic contents of the respondents are made up of present job status, level of experience and academic qualification.

This study requires the presentation of respondents' job status in the ports to prove reliable information level of personnel instruments administered. It was carried out to facilitate the study in order to assess the degree of assimilation among personnel about the effect of information technology on performance of ports in Niger Delta region of Nigeria. Table 3 below shows the various responses from the respondents on their present job status.

Table 3: Highest Academic Qualification of the Respondents

	Frequency	Percentage Performance
National Diploma	29	10.5
B.Sc. /BA/B. Ed/HND	167	64.0
Masters and above	66	25.8
Professional certificate	14	6.3
Total	**276**	**100.0**

Source: Field Survey (2024).

The pattern of distribution to respondents followed with highest academic qualification in Table 4.5 indicating that thirty (29) respondents representing 10.5% were National Diploma holder, one hundred and sixty-four (167) respondents representing 64.0% had B.Sc./BA/B.Ed/HND, sixty-seven (66) respondents representing 25.8% had Masters degree and above degree while fifteen (14) respondents representing 6.3% had professional certificates. Implying that greater percent of the respondents were with B.Sc./BA/B.Ed/HND education certificate holders.

Table 4. Descriptive Statistics Analysis of Work Automation as a Dimension of Information technology

Questionnaire Items	SA	A	D	SD	Mean	Std. Dev.
Work automation allows organizations to consolidate infrastructure from multiple systems, databases, and applications into a single location, making it easier to access and perform effectively and efficiently in the port	122 (43.9)%)	110 (39.6%)	25 (9.1%)	19 (6.1%)	3.00	1.21
Automation on ports generally generate cloud based software to support in providing efficient operational flows that assist the port function without hitch	116 (40.8%)	105 (36.8%)	31 (11.4%)	24 (8.3%)	3.23	0.73
There are great range and various automation levels that differ from port to port, hinging on the potential and capacity of the port, their geographical position, the volume of cargo they accommodate, and their economic values.	105 (37.2%)	105 (37.8%)	35 (12.8%)	31 (11.3%)	3.10	0.64
Work automation enables job efficiency, standardization, and enrichment, ensuring that the outcome is accurate, consistent, and reliable for optimized port operations	117 (46.3%)	114 (41.0%)	14 (5.3%)	19 (7.0%)	3.15	1.19
Automated equipment digitalized are used in the carriage of containers of various tonnage in port terminals fulfilling customers' service deliveries in the port business environment with the support either unmanned horizontal transportation or unmanned yard cranes.	117 (42.4%)	101 (37.0%)	33 (9.0%)	19 (7.0%)	3.07	0.79

Source: Field Survey (2024).

Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

Table 4 presents the univariate analysis of response rates on work automation as measured on a five- item instrument and scaled on a four point modified Likert scale. The results on the table showed that greater number and percentages of the respondents agreed/ strongly agreed with all the questionnaire items on work automation. In other words, the questionnaire items on work automation have the weighted mean ratings of 3.00, 3.23, 3.10. 3.15 and 3.07 that are above criterion mean of 2.5 and are therefore accepted. This means that there is sufficient statistical evidence to infer that the respondents are in agreement with the questionnaire items on work automation.

Table 5 Descriptive Statistics Analysis of Port Infrastructure System as a Dimension of Information technology

Questionnaire Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Dev.
Port service is mostly achieved when the infrastructure system is automated and this enhances port performance	110 (46.4%)	101 (35.7%)	15 (8.9%)	54 (8.9%)	3.00	1.16
Port infrastructure system provides a significant and positive nexus between provincial economics and value-added activities at ports	108 (37.7%)	108 (37.8%)	38 (12.8%)	22 (7.0%)	3.23	0.79
Port infrastructure system contributes greatly to effectiveness and efficiency of operations, giving room for effective ship calls time bound at ports	86 (31.1%)	140 (50.4%)	27 (9.3%)	25 (9.3%)	3.10	0.57
Port infrastructure system improves economic growth as strategies of port influences the expansion of assets in which influence the economic benefits of cities and towns in the area of employment, production, and high standard of living.	91 (32.5%)	135 (48.2%)	30 (10.7%)	24 (8.6%)	3.15	1.19
Variation in port infrastructure development is a clear indication of improved productivity, customers' and stakeholders' new status, and port governance	100 (35.7%)	118 (42.1%)	32 (12.4%)	30 (10.7%)	3.07	0.79

Source: Field Survey (2024).

Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

Table 5 presents the univariate analysis of response rates on port infrastructure system as measured on a five- item instrument and scaled on a four point modified Likert scale. The results on the table showed that greater number and percentages of the respondents agreed/ strongly agreed with all the questionnaire items on port infrastructure system. In other words, the questionnaire items on port infrastructure system have the weighted mean ratings of 3.00, 3.23, 3.10. 3.15 and 3.07 which ae above criterion mean of 2.5 and are therefore accepted. This means that there is sufficient statistical evidence to infer that the respondents are in agreement with the questionnaire items on port infrastructure system.

Table 5 Descriptive Statistics Analysis of Port Infrastructure System as a Dimension of Information technology

Questionnaire Items	SA (%)	A (%)	D (%)	SD (%)	Mean	Std. Dev.
Port service is mostly achieved when the infrastructure system is automated and this enhances port performance	277 (46.4%)	100 (35.7%)	25 (8.9%)	25 (8.9%)	3.00	1.19
Port infrastructure system provides a significant and positive nexus between provincial economics and value-added activities at ports	109 (38.9%)	109 (38.9%)	39 (13.9%)	23 (8.2%)	3.23	.079
Port infrastructure system contributes greatly to effectiveness and efficiency of operations, giving room for effective ship calls time bound at ports	87 (31.1%)	141 (50.4%)	26 (9.3%)	26 (9.3%)	3.10	0.57
Port infrastructure system improves economic growth as strategies of port influences the expansion of assets in which influence the	91	135	30	24	3.15	1.19

economic benefits of cities and towns in the area of employment, production, and high standard of living.	(32.5%)	(48.2%)	(10.7%)	(8.6%)		
Variation in port infrastructure development is a clear indication of improved productivity, customers' and stakeholders' new status, and port governance	100 (35.7%)	118 (42.1%)	32 (11.4%)	30 (10.7%)	3.07	0.79

Source: Field Survey (2024).

Key: *SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree*

Table 5 presents the univariate analysis of response rates on port infrastructure system as measured on a five- item instrument and scaled on a four point modified Likert scale. The results on the table showed that greater number and percentages of the respondents agreed/ strongly agreed with all the questionnaire items on port infrastructure system. In other words, the questionnaire items on port infrastructure system have the weighted mean ratings of 3.00, 3.23, 3.10. 3.15 and 3.07 which ae above criterion mean of 2.5 and are therefore accepted. This means that there is sufficient statistical evidence to infer that the respondents are in agreement with the questionnaire items on port infrastructure system.

Table 6 Descriptive Statistics Analysis of Communication Devices as a Dimension of Information technology

Questionnaire Items	**SA (%)**	**A (%)**	**D (%)**	**SD (%)**	**Mean**	**Std. Dev.**
Communication devices prevent unauthorized access, eavesdropping, or communication breaches, thereby safeguarding sensitive information.	121 (43.2%)	101 (36.1%)	23 (8.0%)	31 (11.0%)	3.00	0.68
Implementing communication devices can enhance an organization's trustworthiness and reputation.	107 (38.0%)	103 (37.0%)	29 (10.6%)	37 (13.7%)	3.23	0.68
By using effective communication devices digital signatures or certificates, it becomes difficult for malicious actors to forge or tamper with them, enhancing trust and port computerization processes.	96 (34.5%)	277 (46.1%)	28 (10.7%)	22 (8.1%)	3.10	0.55
Complex communication devices, excessive port computerization requirements, or frequent key management tasks can negatively impact user acceptance and adoption.	100 (36.0%)	109 (39.0%)	38 (13.9%)	29 (10.6%)	3.15	1.28
Communication devices are made up of digital system popularly known as cluster of applications of big data from Automatic Identification System (AIS) use in maritime or port operation	118 (42.0%)	97 (35.3%)	32 (11.2%)	29 (11.0%)	3.07	0.73

Source: Field Survey (2024).

Key: *SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree*

Table 6 presents the univariate analysis of response rates on communication devices as measured on a five- item instrument and scaled on a four point modified Likert scale. The results on the table showed that greater number and percentages of the respondents agreed/ strongly agreed with all the questionnaire items on communication devices. In other words, the questionnaire items on port infrastructure system have the weighted mean ratings of 3.00, 3.23, 3.10, 3.15 and 3.07 which are above criterion mean of 2.5 and are therefore accepted. This means that there is sufficient statistical evidence to infer that the respondents are in agreement with the questionnaire items on communication devices.

Table 7: Descriptive Statistics Analysis of Effective Cargo Delivery as a Measure of Performance optimization of Ports in Niger Delta

Questionnaire Items	**SA**	**A**	**D**	**SD**	**Mean**	**Std. Dev.**
Cargo service quality requires a holistic approach that combines technical safeguards, robust policies and procedures, regular audits and assessments, and a security-conscious organizational performance.	123 (43.9%)	103 (36.8%)	23 (8.2%)	31 (11.1%)	3.14	1.21
Applying optimization of data transfer techniques, and increasing the potential of network band	108	104	30	38	3.01	0.91

witch, will absolutely enhance the cargo service quality of ports.	(38.6%)	(37.1%)	(10.7%)	(13.6%)		
Cargo service quality can be compromised by insiders like employees, contractors, or partners who have legitimate access to sensitive information.	120 (42.9%)	99 (35.4%)	30 (10.7%)	31 (11.1%)	3.10	0.74
Quality service on cargo in various information technology systems relating to cloud-based storage system amplify several optimization models to facilitate efficient performance in the port environment.	277 (46.4%)	115 (41.1%)	15 (5.4%)	20 (7.1%)	3.27	1.23
The use of information technology devices and effective digitalized service system can offer convenience and scalability but they can introduce additional challenges in maintaining information cargo service quality.	95 (33.9%)	127 (45.4%)	29 (10.4%)	29 (10.4%)	3.03	0.95

Source: Field Survey (2024).

Key: *SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree*

Table 4.10 presents the univariate analysis of response rates on cargo service quality as measured on a five-item instrument and scaled on a four-point modified Likert scale. The results in the table showed that greater number and percentages of the respondents agreed/strongly agreed with all the questionnaire items on cargo service quality. In order words, the questionnaire items on cargo service quality have the weighted mean ratings of 3.14, 3.01, 3.10, 3.27 and 3.03 which are above the criterion mean of 2.5 and are therefore accepted. This means that there is sufficient statistical evidence to infer that the respondents are in agreement with the five questionnaire items on effective cargo delivery.

Interpretation and Discussion of Findings

This study presents findings made from the analyses of the results in the previous chapter. However, the study therefore, analyze the findings to draw the conclusions. The study interprets and discusses the findings in four areas based on the dimensions of the study's predictor variables against the criterion variables and hence, divided into four sections concerned with the relationship between information technology involving work automation, port, port infrastructure system, communication devices and effective cargo delivery of performance optimization of Niger Delta ports.

Positive and Significant Relationship between Information technology Involving Work Automation, Port Computerization, Communication Devices, Port Infrastructure System and Effective Cargo Delivery

The study found a strong positive and significant relationship between work automation, port computerization, communication devices, port infrastructure system and effective cargo delivery. A diagnostic examination of the findings reveals that moderate positive and significant relationship exists between work automation, port computerization, communication devices, port infrastructure system and effective cargo delivery. A critical assessment of the finding reveals that a strong positive and significant relationship exists between work automation and effective cargo delivery (r=0.627); there is a moderate positive relationship between port computerization and effective cargo delivery (r=0.589);, there is a strong positive relationship between communication devices and effective cargo delivery (r=0.669); and there is a weak positive and significant relationship exists between port infrastructure system as a dimension of information technology and effective cargo delivery (r=0.498); as a measure of port performance. In all, there is strong, moderate and weak positive and significant relationship between work automation, port computerization, communication devices, port infrastructure system and effective cargo delivery. The full import of this finding is that Ports in Niger Delta use work automation, port computerization, communication devices and port infrastructure system to achieve effective cargo delivery. This is in line with work of Moody (2019). Work automation make great hubs for port's other information technology efforts, as it can be integrated with nearly every other tool or platform to attend to potential customers promptly for optimal performance (Jovi´c et al., 2019). Every port with effective communication devices tries to outsmart others in port operational performance. Every time ports in Nigeria introduce new product and services, their computerization credentials seem to be on high gear and by so doing they promote their productivity level and mobilize customers and stakeholders that would end u The results from the correlation reveal a significant positive association between various components of information technology—specifically work automation, port computerization, communication devices, port infrastructure systems, and effective cargo delivery—of ports in Niger Delta in Nigeria. The findings indicate that advancements in these areas are interconnected, highlighting a synergy that can enhance overall port performance.

Conclusion & Recommendations

The findings from the study reveal that information technology significantly influences various performance parameters of ports in Niger Delta of Nigeria. The strong and positive associations among work automation, port infrastructure, communication devices, and basic focal point service such as cargo service quality and effective cargo delivery of ports in the Niger Delta of Nigeria. Recommends that port authorities should take information systems infrastructure serious by making huge investment that will facilitate work automation, port infrastructure, communication devices aim at realizing optimum performance on cargo service quality and effective cargo delivery among users' of ports in Niger Delta region of Nigeria.

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