

Full Length Research

Enhancing Warri Port Operations in Nigeria: Information and Communication Technology as an Enabler

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Purpose

The aimed of the study is to examine ICT use for enhanced port operations, being a strategic asset that could be properly harnessed for the benefits of maritime business. Port operations, considering the traffic of vessels and safety of cargoes requires that information and communication technology (ICT) be integrated to enhance port performance.

Design/methodology/approach

The study used the survey method to sample 40 Warri port staff drawn from a population of 50 through a total enumeration and purposive sampling techniques.

Findings

The study found that ICT facilities / infrastructure such as desktop computers, laptops, printers, scanners, networking, etc. are available and applied to some areas of the port. These were used in office operations at the Accounts, Audit, ICT, Communication and Media (Public Relations), Tariff and Billings Departments. ICT application has enhanced ports activities in accounting / auditing services such as preparing spreadsheet, reporting activities, communication and information transfer, searching of work related issues on the internet, etc., which was facilitated by the ICT skills possessed by staff. Some of the challenges faced are delayed container maintenance, delayed ship repair/maintenance, difficulty in tracking vessels, marine appraisals and not providing ICT training for staff after employment.

Originality/value

Ports help to enhance the economic activities of any nation. Warri Port management should engage in building staff capacity on the utilization and management of information systems for enhanced and efficient performance.

Keywords: Warri Ports, Delta Nigeria, ICT in ports, Maritime Transport, Shipping, Port Enhancement

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INTRODUCTION

The maritime sector in Nigeria comprises of ports, shipping, dockyards, Inland Water Transport (IWT) and all marine related activities. It is the main means of transporting goods internationally and many nations rely on ports as the major source of revenue. At present, the maritime industries are expanding bringing benefits to people across the world by enhancing trade within and among nations, thereby allowing the movement of goods

from one nation to another. According to the International Centre for Trade and Sustainable Development (ICTSD), about 90% of world trade (by volume) and 60% (by value) is transported by the sea (Uzoigwe, 2016). Similarly, the United Nations Conference on Trade and Development reported that 80% of global trade (by volume) and 70% (by value) is carried out by sea and handled by ports worldwide (Review of Maritime Transport of UNCTAD, 2017).

Maritime trade came to be with the development of sea

ports as a result of ancient civilizations. In modern times, ports survive or decline, depending on current economic trends. Shipping is the most cost-effective and eco-friendly way to move goods and raw materials all around the world (Moan, 2019). Ports with international traffic have customs facilities, which regulate the types of goods/cargoes that enter and leave a country. The maritime industry globally accounts for over 70% of transportation requirements of the world. As a result, global seaborne trade increased by 4.3%, with the total reaching over 9 billion tons in 2012 for the first time ever, despite the global economic crisis and container traffic, and 10.7 billion tons in 2017 (Review of Maritime Transport of UNCTAD, 2018). Achieving high standards trade in boosting Nigeria's economy requires a center of coordination to facilitate business transactions and the ports cannot be undermined.

A port is a maritime facility which may comprise one or more wharves where ships may dock to load and discharge passengers and cargo. The terms "port" and "seaport" are used for different types of port facilities that handle ocean-going vessels, and river port is used for river traffic, such as barges and other shallow-draft vessels. Ports usually have specialised functions. While some tend to cater mainly for passenger ferries and cruise ships; some in container traffic or general cargo; and some ports play an important military role for their nation's navy.

Port operations are an aspect of the maritime industry services, which is mainly concerned with the transportation of goods and services for modern globalized economies (Steenken, Voß & Stahlbock, 2004). The maritime sector is of critical significance in any economy; and port operations are a necessary tool to enable maritime trade between trading partners, the infrastructure and operations of port facilities and shipping services. The efficacy of this is by the shipping of goods from one point or region to the other, thereby playing a vital role in today's Nigerian economy. No doubt, the maritime sector plays a major role in the exploitation, distribution and export on Nigeria's ocean resources (News Express, 2018) and the merchant navy, offshore oil subsector, commercial fishery and cruise companies have added impetus to the growth in the industry.

Nigeria has a growing shipping sector and has the highest tonnage in Africa but is plagued by many challenges - low level of indigenous participation in the shipping sector, non-implementation of the Cabotage Act, etc. Nigeria as a cargo owning nation generates more than 70% of the cargo throughput in West and Central Africa. However, foreign shippers still dominate the industry thereby building the economy of other nations to her detriment.

The Nigerian Ports Authority (NPA) is a federal government agency in charge of ports operation in the country. Its major activity is to control ports in Nigeria,

which include the Lagos Port Complex and Tin Can Island Port in Lagos; Calabar Port, Delta Port, Rivers Port at Port Harcourt, and Onne Port. Operations of the NPA are carried out in affiliation with the Ministry of Transport and the Nigerian Shippers' Council. NPA, which started operations in April 1955 as enabled by Ports Act of 1954 (Periscope, 1982) was managing only the Lagos and Port Harcourt ports while some private companies managed the remaining Nigerian ports. The Burutu, Calabar and Warri ports (Delta Ports) came to be in 1969, taking control of the Warri port from John Holt and Burutu port from UAC. However, by the early 1970s, the Lagos port was battling congestion, hence in 1973, the corporation entered into an agreement with the World Bank to finance expansion of facilities within the ports. In the same vein, ports reform programme was put in place to reduce inefficiency at the ports, which led to the concessioning of about 24 terminals to private operators. This makes NPA to act as the landlord and provide common user facilities, technical oversight and other marine services.

The Warri port as the headquarters of the Delta Ports control other ports in the central zone of Nigeria. These ports are located in Warri, Burutu, Koko, and Sapele. Also located on the main Warri riverside are markets and jetties used by local traders, which act as a transit point for local transport and trade. The functions of the zone are as follows;

- i. Establishing various standards and criteria for the purpose of monitoring and coordinating the operating performances and efficiency of the port;
- ii. Maintenance of ports infrastructure;
- iii. Appointment, promotion and discipline of senior staff cadre;
- iv. Providing training programmes for all categories of staff;
- v. Pilotage, towage, lighterage, and firefighting;
- vi. Operation and maintenance of vessels and crafts and dockyards workshop, floating ducks, dry ducks and waterways; and
- vii. Collating vital operational statistics and forwarding same to the corporate headquarters.

Therefore, the Delta Ports are engaged in the movement of goods by sea, which is mainly for export and import by major companies. There are local boats which are used for movement from one location to another.

Port facilities are considered working places, industrial areas, storage, production, and handling areas that fall under general rules and legislation issued by the countries and international organizations (Polemi, 2018). Commercial seaports are considered critical facilities for a country's economy since any disruption of their services could cause damages in the economy, to the safety of people, and a lack of basic services. Some of these

facilities include channel ports, control tower, anchorage, berthing, loading/unloading, harbour, storage, tug boat, fire, safety and security and utilities (Periscope, 1982).

Ports represent a mix of public and private goods. Public goods include those that are inherently non-divisible and non-consumable, such as public safety, security, and a healthy environment on the one hand, and coastal protection works necessary to create port basins on the other hand. Private goods are both consumable and divisible and their use entails a minimum of economic externalities. They generate direct economic benefits (private goods) through their operations, as well as additional indirect benefits (public goods) in the form of trade enhancement. Port operations are businesses in their own right and should be managed to achieve optimal utilization of capital.

As a matter of strategic development policy, many ports encourage the co-development of various value-added services through franchising, licensing, and incentive leasing. Today, ports seek to attract enterprises that extend their logistics chains or provide them with specialized capabilities to add value to cargoes that are stored and handled in the port. General services that many ports attempt to develop include chandelling, ship repair, container maintenance, marine appraisals, insurance claims inspections, and banking services. So, modern port operations are facilitated by ICT deployment and there are several areas that ICT could be deployed in the Warri ports. Hence, this study investigates enhancing Warri port operations with ICT as enabler.

This will be relevant to NIMASA in the aspect of providing the training and certification of requisite personnel in areas of shortfall related to ICT application in ports, the management and staff of the NPA, Warri in formulating policies for efficient and effective port operations, particularly in the deployment, utilization and optimization of ICT in enhancing the operational performance of ports, It will also help port management to appreciate information systems usage and the attendant implications, thereby making staff more efficient in services rendered, allied companies or agencies providing services in the port will key into the application of ICT to enhance services, which will increase customers/user's patronage of the port. It will expose the positive effects of information systems usage on ports performance.

THE PROBLEM

Ports engage in large scale operation as the volume of cargoes and ship traffic could affect its efficiency and turnover, which could either attract or deter more business transactions. The ease or proficiency of turning out ships and its lay period/time would influence merchants' choice to patronize the port. Hence, available port facilities for business transactions in facilitating the

promptness in time the vessel master notify the port of his arrival, berthing, loading/unloading and departure is of necessity. However, it seem that vessels spend more time beyond her lay periods. Also, the security of cargoes in the cause of loading and unloading is threatened, particularly for a large volume of goods. Sea pirates and hijackers could attack the vessel as well and cart away with valuables. The issue of indemnity and who is liable becomes a challenge in ports. These may be as a result of ICT not yet deployed to most aspects of Warri port operations. More so, some areas where it is deployed, it seems ICT has not impacted on the operations as there is still delayed service operations. Hence, the category of personnel carrying out the services need to be examined through this study to ascertain their ICT skills and how ICT can enhance Warri port operations.

OBJECTIVES OF THE STUDY

The aim of this study is to investigate the enhancement of Warri port operations with ICT as enabler. The specific objectives are to;

- i. find out the ICT facilities available for operations in Warri ports;
- ii. know the areas technology is applied to Port operations;
- iii. examine the skills processed by personnel using ICT in Port Operations;
- iv. determine how ICT enhance Port Operations; and
- v. know the challenges of ICT application to Port Operations.

RESEARCH QUESTIONS

The following research questions have been raised to guide this study;

- i. What are the ICT facilities available for operations in Warri port?
- ii. Which areas of port operations is technology applied?
- iii. What skills do personnel using ICT in port operations process?
- iv. How has ICT enhanced Warri port operations?
- v. What are the challenges of ICT application to port operations?

LITERATURE REVIEW

In order to improve on the operations of the ports, it is inevitable to use modern information and communication technologies (ICT). The effective and efficient use of modern ICT tools to produce, manipulate, store,

communicate, and disseminate information in solving key problems and for freight transportation management cannot be undermined. Port inefficiencies and the manual operation of port services brought to bear the need for the logistic sector to focus on the implementation of integrated information systems to improve services. There are several types of port. These include (Dasgupta, 2019);

i. **Dry port:** A dry port is an inland intermodal terminal directly connected by road or rail to a seaport and operating as a centre for the transshipment of sea cargo to inland destinations.

ii. **Fishing port:** A fishing port is a port or harbour for landing and distributing fish. It may be a recreational facility, but it is usually commercial. A fishing port is the only port that depends on an ocean product, and depletion of fish may cause a fishing port to be uneconomical.

iii. **Inland port:** An inland port is a port on a navigable lake, river (fluvial port), or canal with access to a sea or ocean, which therefore allows a ship to sail from the ocean inland to the port to load or unload its cargo. An example of this is the Warri Port, which allows ships to travel from the Atlantic Ocean several thousand kilometers inland to the ports.

iv. **Seaport:** A seaport is further categorized as a "cruise port" or a "cargo port". Additionally, "cruise ports" are also known as a "home port" or a "port of call". The "cargo port" is also further categorized into a "bulk" or "break bulk port" or as a "container port".

v. **Cargo port:** Cargo ports handle different cargo, which has to be loaded and unloaded by very different mechanical means. The port may handle one particular type of cargo or it may handle numerous cargoes, such as grains, liquid fuels, liquid chemicals, wood, automobiles, etc. Such ports are known as the "bulk" or "break bulk ports". Those ports that handle containerized cargo are known as container ports. Most cargo ports handle all sorts of cargo, but some ports are very specific as to what cargo they handle. Additionally, the individual cargo ports are divided into different operating terminals which handle the different cargoes, and are operated by different companies, also known as terminal operators or stevedores.

vi. **Cruise Home Port:** A cruise home port is the port where cruise ship passengers board (or embark) to start their cruise and disembark the cruise ship at the end of their cruise. It is also where the cruise ship's supplies are loaded for the cruise, which includes everything from fresh water and fuel to fruits, vegetables, champagne, and any other supplies needed for the cruise. "Cruise

home ports" are very busy places during the day when the cruise ship is in port, because off-going passengers disembark their baggage and on-coming passengers board the ship in addition to all the supplies being loaded.

vii. **Port of call:** A port of call is an intermediate stop for a ship on its sailing itinerary. At these ports, cargo ships may take on supplies or fuel, as well as unloading and loading cargo while cruise liners have passengers get on or off ship.

viii. **Smart Port:** A smart port takes complete advantage of space, produces higher revenues, saves natural resources and benefits from the technology accessible to the logistics community. Smart ports usually deploy cloud-based software as part of the process of greater automation to help generate the operating flow that helps the port work smoothly. At present, most of the world's ports have somewhat embedded technology, if not for full leadership.

ix. **Warm-water port:** A warm-water port is one where the water does not freeze in wintertime. Because they are available year-round, warm-water ports can be of great geopolitical or economic interest.

Therefore, the application of ICT in shipping and ports operations could enhance the following (DNVUSA, n.d.);

i. **Improved Safety:** Better communication systems can facilitate ship movement or sail in the waters and properly relate with the ports authority. Information systems will aid the maritime industry against pirates and hijackers. Ships can use these to immediately plan out routes that can prevent the triumphant entry of unwanted individuals.

ii. **Faster Cargo Processing:** Global trade has intensified the need for bigger and better cargo ships. Apart from an increased carrying capacity, the cargo trade can also benefit from a more efficient processing system. Information technology allows cargo ships to deliver their goods faster. The weight of all the cargo is precisely determined using monitoring systems. Ships can send cargo-related information to each other to prevent any delays in container ports.

iii. **Advanced Navigation:** Ships no longer need to rely on paper maps and an old compass. Marine navigation in the information age involves satellite communication, radar, radio, GPS, and digital maps. The variety of technologies allows ships to find the safest and fastest route even during undesirable weather conditions.

The maritime industry has greatly benefited from information technology — and it will continue to do so as long as global trade and the demand for seafood, energy,

and better water transport exist. The Smart Port used information technology (IT) extensively to create a high-tech port and therefore, will tremendously enhance port operations.

The application of Information and Communication Technology (ICT) in logistics has been promoted as a means to enhance logistics competitiveness (Feng & Yuan, 2006). ICT is therefore, considered as an enabling tool for the safe and efficient freight transportation systems (Giannopoulos, 2004). According to Haugland (2014), a revolution in ICT will be an evolution in shipping industry. The shipping industry has long traditions of continuously adopting and adapting to new technology with new technology pathways that would transform the industry. Over the next few decades, developments in ICT will heavily impact shipping by creating a more connected, integrated and efficient shipping industry (Haugland, 2014).

ICT facilitates understanding on the state of the system in real time and therefore help to manage and change on-line paths, vehicle flows, orders and deliveries (Agbesi, 2013). In doing this, there is a need of suitable decision modules based on detailed models that can track the state changes of the various system components and determine performance indices typical of the tactical and real time management, such as utilization, traffic indices and delivery delays (Ramstedt & Woxenius, 2006; Xu & Hancock, 2004). When ICT systems are used in port operations, there will be improved performance of the whole systems in terms of efficiency and time spending.

ICT can be employed in collecting, storing, processing, presenting and distributing relevant data and information to the participants in maritime transport. The integration of modern technology in shipping is called smart ships and its use in ports is called smart port. The 'Smart Port' uses information technology (IT) extensively to create high-tech port operations (Attia, 2016). The key factors contributing to the success of the IT and communication infrastructure in the smart port are the ability to meet the changing demands of users and to keep up with the rapid developments in IT and the ability to accommodate new technology developments without having to constantly restructure (Steenken, Voß & Stahlbock, 2004).

Smart Port is set to strengthen significantly through a range of innovative communication technologies, which will increase interconnectivity and enhance the port's overall competitiveness. Smart Port can harness the use of mobile technology and wireless connectivity to enhance communications, productivity and crew welfare at the maritime center. These include providing 3G/4G broadband mobile telecommunications technology access for vessels operating within waters of the port and the immediate maritime community. The availability of low-cost, secure wireless 3G/4G broadband service and WiMAX network to users within 15 km of the coastline will enhance network coverage across the port to benefit the

maritime community (http://ec.europa.eu/research/transport/projects/index_water_en.htm). Wi-Fi services at the port and launching new mobile application for the maritime community and members of the public to conveniently access maritime information and services on their mobile phones will further enhance passenger experience and business operations at ports.

According to Balan (2018), the future of the maritime industry will bring new growth opportunities, among which are the progressive adoption of advanced information and communication technologies (ICTs), which were applied in diverse areas from maritime and air transport to warehousing and that many companies have already embraced new ICTs. Waterborne (2016) asserts that on the horizon 2030, the ICT maritime opportunities are related to connectivity and automation.

Some of such organisations taking advantage of the opportunities are Maersk Line, the largest shipping company worldwide. Maersk Line appointed Ericsson – leading provider of technology and services to develop the Remote Container Management (RCM) by means of end-to-end systems integration and deployment of mobile and satellite communication to its fleet of container vessels (Ericsson, 2012). Others are the German seaport of Hamburg, which is the most important German port and Europe's third largest container port (Ferretti & Schiavone, 2016), Singapore Strait is one of the most important shipping waterways in the world, which plays a vital role in the international transport of containers, bulk cargo and crude oil (Kang, Meng & Liu, 2018); Piraeus Container Terminal is the fastest growing port of Europe (Tsertou, Amditis, Latsa, Kanellopoulos & Kotras, 2016); Puerto de La Luz seaport in the Canary Islands (Mirović, Miličević & Obradović, 2018); liner shipping company (Lee, Aydın, Choi, Lekhavat & Irani, 2018); manufacturing company which is a manufacturer of branded products as a global market player (Wu, Chen & Tsau, 2017); ship owners and port authorities (Zaman, Pazouki, Norman, Younessi & Coleman, 2017).

The need to provide services to boost its operations, particularly in the integration of technology cannot be overemphasized. As such, for an industry that highly values capacity and efficiency, information technology is inevitable. Maritime workers need to quickly communicate with each other on the vessel, with those on other ships and with others on land. Similarly, is communication within the port and particularly in documentation, data transfer, storage and retrieval, protection and safety of information and for real-time business transactions

METHODOLOGY

The methods and procedures used in the study is descriptive research design of the *ex post facto* type. The

population of the study consists of 50 port staff in various departments where ICT is applied. The respondents is made up of staff in top management, administrative and field workers, which were drawn from the department of Accounts, Internal Audit, ICT, Media & Communication (Public Relations) and Tariff & Billing. Since the population is relatively small, total enumeration sampling technique was used making a sample size of 50, which

was used for the study. However, the sample of five (5) departments was selected by purposive sampling technique. This is because these departments were those that had integrated ICT in its operations, which are related to the study. The major instrument used for the study was a self-designed questionnaire and descriptive statistical methods such as frequency count and percentages were used to analyze the research data relating to the research questions.

Presentation of RESULTS

The data obtained revealed that of the 50 copies of questionnaire administered to the respondents, 40 copies were the valid ones retrieved and used, making 80% return rate. The returned valid copies of questionnaire according to their departments are shown in Table 1. While presenting the results, it should be noted that all data were collapsed as a single entity for each category of respondents. This was done to reflect the concept of the study so as to bring out the variable, ICT application in ports operation.

Table 1: Questionnaire Retrieved

Department	Top Management staff	Administrative staff	Field staff	Total	Percentage of Response (%)
Accounts	1	10	3	14	35
Internal Audit	1	4	2	7	17.5
Information and Communication Technology	1	2	1	4	10
Tariff and Billing	2	10	-	12	30
Media and Communication (Public Relations)	1	2		3	7.5
Total	6	28	6	40	100

Source: Field Work, 2019

From the table above, the respondents constitute 6 (15%) top management staff and field workers respectively and 28 (70%) administrative staff. This goes to show that the caliber of the respondents is such that can make good representation of the organization. They are made up of 3 (7.5%) respondents from Communication and Media department (Public Relations), 4 (10%) from Information and Communication department, 7 (17.5%) from Audit department, 12 (30%) from Tariff and Billings department and 14 (35%) from Accounts department.

Table 2: Background Information

Item	No. of Response	Percentage Response (%)
Gender		
Male	28	70
Female	12	30
Total	40	100
Age		
18–25 years	-	-
26–35 years	9	22.5
36–45 years	13	32.5
46–50 years	5	12.5
51–60 years	13	32.5
Total	40	100
Qualification		

Table 2. Continuation

Diploma	5	12.5
B. Sc./HND	30	75
M. Sc./MBA	5	12.5
Total	40	100
	Experience	
1-5 Years	8	20
6-10 Years	-	-
11-15 Years	3	7.5
16-20 Years	12	30
21 Years and Above	17	42.5
Total	40	100

Table 2 shows the demographic data of the respondents. There are 28 (70%) males and 12 (30%) females whose age range between 26 and 60 years. Nine (22.5%) respondents are within 26 – 30 years, 13 (32.5%) are within 36 – 45 and 51 – 60 years respectively while 5 (12.5%) are within 45 – 50 years of age. The respondents are designated as senior managers, managers, principal officers, system analysts, etc. with qualifications in Diploma and Masters (5, 12.5%) respectively and B. Sc./HND (30, 70%). Their years of working experience range from 1 – over 21 years with a majority (29, 72.5%) falling within 16 -21 years and above.

Table 3: Availability of ICT Facilities in Warri Port

ICT Facilities	No of Response (Yes)	Percentage of Response (%)	No of Response (No)	Percentage of Response (%)
Desk top Computer(s)	28	70	12	30
Laptop computer(s)	18	45	22	55
Printer	24	60	16	40
Analogue Telephone	6	15	34	85
Digital Telephone	24	60	16	40
Modern	12	30	28	70
Tele-facsimile	2	5	38	95
Photocopying Machine	18	45	22	55
Scanner	24	60	16	40
Internet Connectivity	26	65	14	35
LAN Network	20	50	20	50
WAN Network	16	40	24	60
CCTV	10	25	30	75
Monitoring Systems for weight determination	10	25	30	75

Table 3 revealed the ICT facilities available in Warri ports. They range from desk top computers (28, 70%), laptops and photocopying machine (18, 45%) respectively, printers, digital telephone and scanners (24, 60%) respectively, LAN network connectivity (20, 40%) and internet connectivity (28, 85%) among a few others. This implies that some ICT facilities are available in Warri ports. However, CCTV, monitoring systems (30, 75%) respectively, Telefacsimile (38, 95%) are not available.

Table 4: Areas ICT is Applied in Warri Port

Areas ICT is applied in port operations	No of Response (Yes)	Percentage of Response (%)	No of Response (No)	Percentage of Response (%)
Anchorage	4	10	36	90
Ship Repair/Maintenance	4	10	36	90
Container maintenance	2	5	38	95
Marine Appraisals	10	25	30	75
Insurance Claims Inspections	8	20	32	80
Accounting and Banking services	22	55	18	45
Auditing services	20	50	20	50
Human resource management	18	45	22	55
Pilotage/Berthing bookings	16	40	24	60
Vessels Berthing/sailing clearance	14	35	26	65
Communication / Information Transfer	16	40	24	60
Traffic control and reporting vessels position	18	45	22	55
Customs control & clearance	8	20	32	80
Control Tower	14	35	26	65
Safety and Security	12	30	28	70

From Table 4, it is shown that ICT is applied mainly to accounting (22, 55%) and audit (20, 50%) departments respectively and slightly in human resource and traffic control and reporting vessels position (18, 45%) respectively. The result further revealed that ICT is not adequately applied in Container maintenance (38, 95%), Anchorage and Ship Repair/Maintenance (36, 90%) respectively, Customs control & clearance and Insurance Claims Inspections (32, 80%) respectively, Marine Appraisals (30, 75%) and Safety, Security (28, 70%), Vessels Berthing/sailing clearance (26, 65%) and Pilotage/Berthing bookings and Communication / Information Transfer (24, 60%) respectively. However, the use of ICT in port operations would facilitate access to information as indicated by the respondents (38, 95%).

Table 5: ICT Skills Possessed by Personnel in Warri Port

ICT Skills Possessed by Personnel	High/%	Average/%	Low/%
Using Computers effectively and efficiently	26 (65%)	14 (35%)	-
Network operations	32 (80%)	7 (17.5%)	1 (2.5%)
Sending/Receiving Email	38 (95%)	-	-
Invoicing/receiving payments electronically	22 (55%)	10 (25%)	-
Spreadsheet usage	18 (45%)	5 (12.5%)	2 (5%)
Internet browsing	24 (60%)	2 (5%)	-
Moving goods by conveyors	4 (10%)	4 (10%)	6 (15%)
Finding information on work-related materials	14 (35%)	6 (15%)	-
Communicating with fellow employees	16 (40%)	10 (25%)	-
Communicating with customers	10 (25%)	14 (35%)	-
Communicating with other companies	10 (25%)	10 (25%)	4 (10%)
Preparing reports	18 (45%)	8 (20%)	-

The table above shows the skills possessed by port personnel in the application of ICT to port operations. The results reveal that the respondents possess high ICT skills in Sending/Receiving Email (38, 95%), network operations (32, 80%), effective and efficient use of computers (26, 65%), Internet browsing (24, 60%) Invoicing/receiving payments electronically (22, 55%) and Spreadsheet usage and Preparing reports (18, 45%) respectively.

Table 6: Impact of ICT in Port Operations

Impact of ICT in port operations	No. of 'Yes' Response	Percentage of Response (%)	No. of 'No' Response	Percentage of Response (%)
Reduced the lay period and lay time of vessels	14	35	-	
It has enabled communication between the ports and its clients	14	35	2	5
Detection of vessels problems for easy repair/maintenance	6	15	6	15
Cargo manifest transfer	16	40	2	5
Make for easy payments/business transactions	18	45	-	
Facilitate Insurance Claims	6	15	4	10
Facilitate accounting and banking services	20	50	2	5
Facilitate auditing services	20	50	2	5
Build the reputation of the port	16	40	-	
Brought about growth and development of the port	14	35	-	
Improved Invoicing & accounting processes	18	45	-	
Passenger manifest transfer	16	40	2	5
Container & cargo monitoring	6	15	2	5
Berthing & docking control	6	15	6	15
Efficient Sailing schedules	8	20	6	15
Improved Security services	10	25	4	10
Estimated & actual arrival/depart times	8	20	4	10
Improved safety	8	20	4	10
Faster cargo processing	8	20	4	10
Advanced navigation	12	30	4	10
Real time management	14	35	4	10

Table 6 shows the impact of ICT in port operations. From the result, the application of ICT only impacted a limited areas of port operations; making for easy payments/business transactions and Improved Invoicing & accounting processes (18, 45%) respectively, facilitate accounting and banking services and auditing services (20, 50%) respectively. However, the impact of ICT is not much felt despite the fact that it will build the reputation of the port, cargo manifest transfer and Passenger manifest transfer (16, 40%) respectively.

Table 7: Challenges of ICT Application in Port Operations

Challenges of ICT application in port operations	No. of 'Yes' Response	Percentage of Response (%)	No. of 'No' Response	Percentage of Response (%)
Lack of ICT knowledge	4	10	24	60
Not providing ICT training after employment	16	40	12	30
Delayed Ship Repair/Maintenance	8	20	12	30
Delayed Container maintenance	8	20	12	30
Marine Appraisals	16	40	8	20
Insurance Claims Inspections	12	30	8	20
Accounting and Banking services	4	10	16	40
Auditing services	8	20	16	40
Security threat	8	20	8	20
Misplacement of goods and cargoes	12	30	8	20
Delayed boarding	8	20	12	30
Longer time of loading and unloading	8	20	6	15
Difficulty in Tracking of vessels traffic	8	20	6	15

From the above table, the challenges faced by port staff were revealed. The result shows that providing ICT training for staff after employment was a problem. 16 respondents (40%) stated this along with marine appraisals respectively, 12 (30%) respondents stated insurance claim inspections and misplacement of goods and cargoes respectively while eight respondents (20%) stated auditing services, delayed ship repair/maintenance, delayed container maintenance and security threat respectively as the challenges they face.

DISCUSSION OF FINDINGS

A critical look at the results presented shows that only a few departments have ICT integrated in Warri port operations; Communication and Media department (Public Relations), Information and Communication Technology, Audit, Tariff and Billings, Accounts and Human Resources departments. There are qualified personnel in their diverse fields who possess ICT skills to carry out their responsibilities even with the integration of modern technologies. There were more males than female staff categories with majority ranging between 26 and 45 years of age. This goes to show that Warri ports have a vibrant workforce of human agility to cope with the rigours of port operation. Only a few of them are close to the retirement age. They are designated as senior managers, managers, principal officers, system analysts, etc. with Diploma, B. Sc./HND and Master degrees who

have worked for between 16 -21 years and above.

The ICT facilities / infrastructures available in Warri ports include desk top computers, laptops, photocopying machine, printers, digital telephone, scanners, LAN network connectivity and internet connectivity among a few others. These ICT facilities / infrastructures are applied mainly to accounting and audit services, human resource, traffic control, reporting vessels position, container maintenance, anchorage and ship repair/maintenance, customs control & clearance, insurance claims inspections, marine appraisals, safety & security, vessels berthing/sailing clearance, pilotage/berthing bookings and communication and information transfer.

This is in line with the study of Hadiza Bala Usman (2016) who noted that the developments and upgrades of existing port infrastructure, as well as improvements in port performance have become imperative. Also, ITU News (2017) posit that cloud technologies and more reliant on automation and ICTs will improve the future of shipping.

The respondents possessed high level of ICT skills in sending/receiving E-mail, network operations, effective and efficient use of computers, internet browsing to search for work related issues, invoicing/receiving payments electronically, spreadsheet usage and preparing reports, which confirms ILO (2012) assertion that education and training of port personnel is of great importance.

The skills possessed had impacted on port operations;

making for easy payments/business transactions, improved invoicing, accounting processes, facilitate accounting & banking services and auditing services. This supports Mlimbila, Ulingelta & Mbamba (2018) who study revealed the impact of ICT in faster discharging and loading of containers. Also, is the study of Moan (2019) showing that ICT systems automate and streamline the flow of information between the different parties in the maritime transport chain and therefore, improving their operations. Though, the impact of ICT is not much felt despite the fact that it will build the reputation of the port, cargo manifest transfer and Passenger manifest transfer.

Despite the impact of ICT application in port operations as mentioned by the respondents, some problems confront the staff. This involve providing ICT training for staff after employment, ICT is not applied to marine appraisals, insurance claim inspections and misplacement of goods and cargoes. There is also delayed ship repair/maintenance, delayed container maintenance and security threat. These are related to the findings of Ndilkon, Buhari, Okolie and Matthew (2017) who outlined some of the identified challenges.

SUMMARY

This study revealed that;

- i. The main ICT facilities / infrastructure available for port operations are desk top computers, laptops, printers, scanners, digital telephones, photocopying machines, LAN connectivity and the internet connectivity. The Warri port uses the RIMs software for tariff and billings while Oracle is used for human resource management. ICT facilities are not totally integrated in all port operations. This is revealed in the number of departments that participated in the study. ICT is mainly used for office routine activities rather than port operations such as vessel monitoring, cargo tracking, vessel traffic control, etc.
- ii. Only a few departments have ICT applications. These include, Tariff and Billings, ICT, Communication and Media (Public Relations), Human Resource, Accounts and Audit departments. Therefore, only Accounting services, auditing services and information / data transfer or communication is the area ICT is mainly applied.
- iii. The staff poses high level of ICT skills in utilizing the computers, internet browsing, sending / receiving e-mails, preparing reports, network operations and spreadsheet usage. Therefore, integrating ICT in port operations would not be a serious problem as the staff are to a large extent, would be able to operate and use ICT facilities if made available.
- iv. The application of ICT has impacted port operation in the areas where it was utilized. It facilitated

accounting and banking services, audit services, improved invoicing, etc. The respondents posit that it would make for growth and development of the port and build the reputation of the port.

v. The major challenge faced by Warri ports staff are not providing ICT training after employment, Maritime appraisals and insurance claims inspection.

CONCLUSION

From the foregoing, it can be concluded that the application of ICT in Warri port operations, integrating requisite facilities and infrastructure would make for more effective and efficient services to customers. This will no doubt encourage high patronage by ship owners, freight forwarders, and other stakeholders in the shipping business, which in turn will boost the economic activities in Warri and Nigeria at large.

RECOMMENDATIONS

Based on the findings of this research, the following recommendations are hereby made:

- i. The importance of ICT application in port operations cannot be overemphasized. Therefore, the management of Warri ports should endeavor to strategise with the aim of acquiring and deploying ICT infrastructure to all aspects of the ports so as to make for effective and efficient productivity of staff in port operations.
- ii. ICT is only mainly applied to office routines except in Accounts, Audit and Tariff and Billing where it is used for business transactions. ICT facilities should be extended into core areas of port operations such as anchorage, storage, container tracking, vessel tracking, loading and unloading of goods, etc.
- iii. Training for staff on ICT is paramount in this age of globality where new technologies emerge on daily basis. This is to prepare Warri ports for competitive advantage in the maritime industry.

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