
Technology Adoption and Performance of Nigerian Ports

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Abstract

The purpose of the study was to investigate the relationship between technology and corporate performance of the sea-ports in Nigeria. Data were obtained from 30 employees working in the six ports in Nigeria. The instrument used for primary data collection was the questionnaires. Six research hypotheses were proposed to test the hypothesized relationship between technology adoption and corporate performance of the sea-ports in Nigeria. Using the SPSS version 17.0, frequencies were computed to show the characteristics, and charts were exhibited on the study variables at the primary level of analysis. Subsequently, at the secondary level of analysis, inferential statistics such as Pearson product moment correlation were used to ascertain the nature and direction of the proposed relationship and for testing the stated hypotheses. The results of the study revealed a positive and significant relationship between the dimensions of technology adoption and the measures of corporate performance. Based on the above findings, it was concluded that the adoption of technology would help in the increase of performance of the ports in Nigeria. The study therefore recommends that Port managers should improve on the service quality of their ports by encouraging the use of more communication devices in order to improve performance of the ports. These communication devices should be in compliance with state-of-the-art facilities as obtainable in other highly rated ports. Port managers should also improve on the service quality of their port by recommending improve computerization of the port activities in such a manner that it will aid the performances of the port operators

Background of the Study

Many efficiency bottlenecks in the Nigerian port are related to coordination issues among different stakeholders. For instance, about 48% of container ships arrive more than 12 hours behind schedule and congestion exacerbates costly waiting time in ports (Levander, 2015). According to the ESCAP-World Bank Trade Cost Database, about 60-80% of trade costs worldwide are non-tariff measures of which transport services represent an important part (ESCAP/World Bank, 2015). Related inefficiencies, such as trade procedures, business and regulatory practices and constraints, or the insufficient availability and use of information and communication technologies (ICT) contribute to these costs. In terms of paperwork, there may be up to around 200 interactions involving documentation along the supply chain, and the shipper and consignee may deal with as much as 20-30 entities to arrange a shipment (Porter/Lloyd's List, 2017). Many of these interactions are time-consuming and often still take place via phone, fax or email. In this context, the lack of efficient integration of information communication technology makes it difficult to forecast or make effective operational decisions (Kenyon, 2017).

This study focuses on modern system integration and information communication technology between main stakeholders in port operations to reap efficiency gains in the supply chain. Information communication technology is a process potentially enabled by digitalisation, which implies an increased use of Information and Communication Technology (ICT). Digitalisation – the increase or adoption in use of ICTs by an organisation or industry – can be implemented in varying degrees, as it depends on the organisation's digital strategy and the breadth and quality

of implementation. Digital strategies are associated with the purposes and ways of adopting digital technologies. In the context of broader system integration and interoperability, information communication technology can be part of organisational digital strategies to simplify, speed up or automate processes related to facilitating a shipment from A to B. This also, includes the use of interfaces between businesses, individual customers and public entities. A parallel trend is the datafication of port operations. Digital technologies allow for capturing data on a range of processes where previously data had not been collected, or only collected intermittently.

Businesses in the port operations sector have realised that sustainable competitive advantage increasingly depends on the effective use of existing information and the acquisition of consistent data along the entire supply chain. Digitalisation is seen by many as a panacea or necessary step in order to stay competitive. Some have recognised that “getting smarter” is more important than growing in size. The kind of vertical collaboration that improves co-ordination at the intersection of different transport modes is increasingly seen as the new efficiency frontier in port operations. New ICTs such as sensors, communications or software can play a major role in improving this co-ordination.

With the possibilities provided by technologies and new data sources, maritime transport stakeholders are seeking new opportunities to extract value-added from more integrated services that cover the entire supply chain. Some of the major players in the shipping industry strive to become integrators of the entire chain, as some carriers seek to take on the role of freight forwarders and further consolidate their position as logistics operators (Maersk, 2016; CMA CGM, 2018). The rationale for vertical integration is obvious as it becomes more and more difficult for shipping companies to generate sustainably competitive margins by reducing maritime costs through bigger vessels (ITF, 2010).

Port authorities around the world increasingly embark on digital strategies that evolve from renters or asset managers to active digital communities. With the need for more efficiency-enhancing coordination in supply chains, port authorities increasingly grow into hubs of physical and information flows among different stakeholders. In the light of growing worldwide competition, ports see the necessity to become more dynamic actors in order to avoid the risk of decreasing significance. As public authorities, some see their natural role as a neutral platform that facilitates coordination among different stakeholders. In the light of the above the study evaluates the modern technology of port operation and performance of Nigerian ports.

Statement of the Problem

Prior to concession, Nigerian seaports were considered inefficient and unsafe due to massive cargo thefts (wharf rat phenomenon) and among the most expensive ports in the world. Also, the ports in Lagos were notorious for congestion that led to the continuing imposition of congestion surcharges and the high cost of imports, resulting in long turnaround times for ships and increased container dwell times (Leigland & Palsson, 2007). Instead of the international standard of 48 hours ship turnaround time in most Asian and European ports, as observed by Ducruet and Merk (2012), it took weeks to load and unload ships in Nigeria ports. There were also problems of over bloated workforce, excessive port charges and too many agencies involved in cargo clearing. In addition, the port infrastructure and superstructure had become obsolete

and in a state of disrepair and in need of rehabilitation. The government was unwilling to provide the enormous financial outlay required in financing the restoration of port infrastructure due to existing operational inefficiency and corruption, therefore the need for external financing became apparent. In order to mitigate these problems, government decided to introduce the private sector, to bring in expertise in the operation of the ports through concession contracts.

These massive reforms were undertaken in the belief that the reforms that improve operational efficiency of ports are likely to bring down total logistics costs and in turn improve the competitiveness of the Nigerian economy. The most valuable tool for bringing cost-cutting efficiency gains and improvements in the overall performance of the ports is the introduction of modern technology in port operations. Modern technology can be introduced into the ports through information communication and technology applications (Estache, González, & Trujillo, 2002).

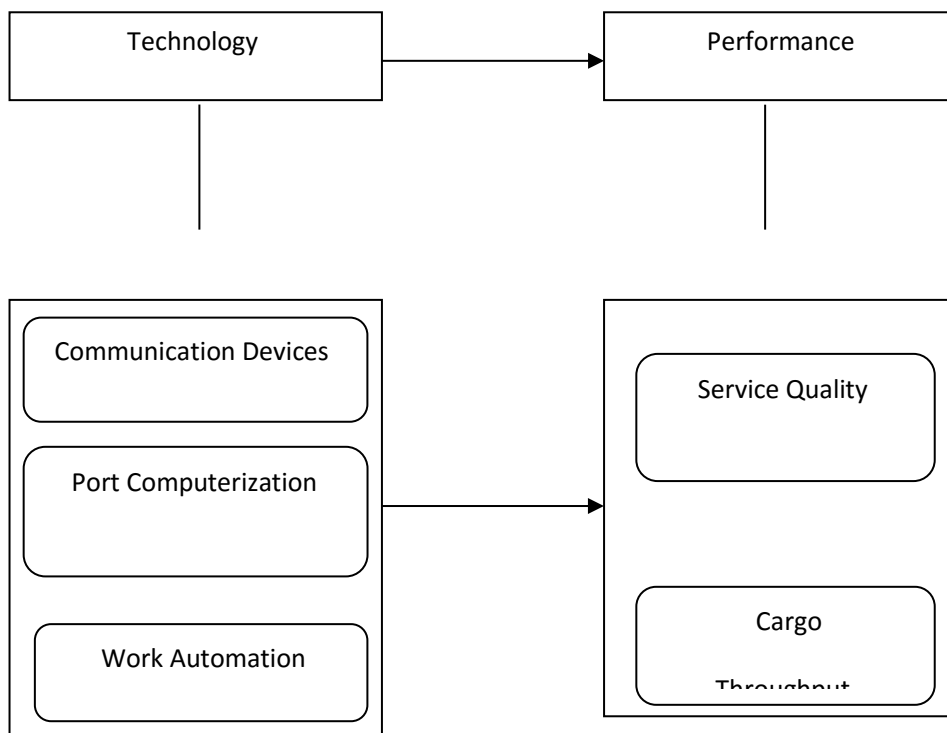


Figure 1: Conceptual Framework of Technology and Performance of Nigerian Ports

Instrumental Theory

The theoretical starting point for the study analysis is the well-established literature on new technology adoption. This literature points to delays in the adoption of new technologies and differences in adoption rates across firms, industries and countries (Gallear, Ghobadian &

O'Regan, 2008). The existing theoretical models focus on a number of factors explaining this delay and the variation in the adoption rates including uncertainty about the characteristics of the new technology. Instrumental theory offers the most widely accepted view of technology. It is based on the common sense idea that technologies are "tools" standing ready to serve the purposes of their users. Technology is deemed "neutral," without evaluative content of its own. However, what does the notion of the "neutrality" of technology actually mean? The concept usually implies at least four points. First technology, as pure instrumentality, is indifferent to the variety of ends it can be employed to achieve (Levander, 2015). Thus, the neutrality of technology is merely a special case of the neutrality of instrumental means, which are only contingently related to the substantive values they serve. This conception of neutrality is familiar and self-evident. Secondly, technology also appears to be indifferent with respect to politics, at least in the modern world, and especially with respect to capitalist and socialist societies. A hammer is a hammer, a steam turbine is a steam turbine, and such tools are useful in any social context. In this respect, technology appears to be quite different from traditional legal or religious institutions, which cannot be readily transferred to new social contexts because they are so intertwined with other aspects of the societies in which they originate (Gallear, Ghobadian & O'Regan, 2008).

The transfer of technology, on the contrary, seems to be inhibited only by its cost. Thirdly, the socio-political neutrality of technology is usually attributed to its "rational" character and the universality of the truth it embodies. Technology, in other words, is based on verifiable causal propositions. Insofar as such propositions are true, they are not socially and politically relative but, like scientific ideas, maintain their cognitive status in every conceivable social context. Hence, what works in one society can be expected to work just as well in another. Lastly, the universality of technology also means that the same standards of measurement can be applied in different settings (Bitner, Brown, & Meuter, 2000). Thus, technology is routinely said to increase the productivity of labor in different countries, different eras and different civilizations. Technologies are neutral because they stand essentially under the very same norm of efficiency in any and every context. Given this understanding of technology; the only rational stance is unreserved commitment to its employment. Of course, we might make a few exceptions and refuse to use certain devices out of deference to moral or religious values. Reproductive technologies are a case in point. Even if one believes that contraception, abortion, test tube babies are value neutral in them, and, technically considered, can only be judged in terms of efficiency, one might renounce their use out of respect for the sacredness of life (Bitner, 2000). This approach places "trade-offs" at the center of the discussion.

"You cannot optimize two variables" is the fundamental law of the instrumental theory of technology. There is a price for the achievement of environmental, ethical or religious goals, and that price must be paid in reduced efficiency. On this account, the technical sphere can be limited by nontechnical values, but not transformed by them (Bitner, et al., 2000). The instrumentalist understanding of technology is especially prominent in the social sciences. It appears to account for the tensions between tradition, ideology and efficiency, which arise from socio-technical change. Modernization theory, for example, studies how elites use technology to promote social change in the course of industrialization. In addition, public policy analysis

worries about the costs and consequences of automation and environmental pollution. Instrumentalism provides the framework for such research (Gallear , 2008).

Resource Based Theory

Resource based theory (RBT) has been used by different scholars whose attention is in studying ICT impacts and organization performance. As Musabila (2012) noted, RBT was pioneered by Penrose (1959) and it has in recent years gained popularity in ICT research studies. Different scholars, for example, Chowdhury (2006); Bharawaj (2010) argue that the unique resources are the main sources of competitive advantage and organization performance. Researchers have identified various ICT resources, such IT capabilities, IT infrastructures and IT human resources (Bharadwaj, 2010). While according to Wu, Sengun, Daekwan and Tamer (2006), assert that IT-enabled supply chain capabilities, which are firm-specific and hard-to-copy across organizations. These capabilities can serve as a catalyst in transforming IT-related resources into higher value for a firm. Gu and Jung (2013) defined resources as stocks of available factors that are owned or controlled by the firm. Based on previous studies; ICT resources in this study are defined as a multidimensional term which integrates software and hardware which enhance telecommunication functions.

Concept of Technology Adoption

Everyday across the globe scientists are working day and night developing different technologies that will help man in the production of goods and services in the most efficient and effective way. This view was also verified in Lai (2016) wherein he stated that there have been a number of researchers addressing the consumers' adoption of new technologies. This is why in the current business order; technology adoption is considered a smart response to the alarming wave of globalization and business environmental changes. Therefore, technology adoption has been defined as the acceptance, integration, and use of new technology in society (Lovelock, 2001). Similarly, Al Moustapha (2019) refers it a sociological model that explains the acceptance of a new product or innovation, according to the demographic and psychological characteristics of defined adopter groups. Incidentally most these technologies come in the form of information communication technology. Hence, Chairae, Widarto and Pujani (2015) allude that nowadays, the adoption of ICT by industries cannot be denied. Information and communications technologies (ICTs) cut across a variety of technologies including: computer, microelectronics and related technologies including microchip and microprocessor-based technologies; multimedia and other information processing technologies and systems; telecommunications technologies and infrastructure (fixed line, wireless, satellite based and mobile infrastructure); and communication network technologies and infrastructure (including local and wide area communications and computer networks for voice, data and video), (Dzidonu, 2010).

Other technologies that form part of modern technology include: broadcasting networks and technologies including radio and TV networks; production-based technologies including those used in computer-integrated sea ports and production systems and operations, robotics technologies, biotechnology-related equipment and systems; and the Internet as a globally-based delivery platform incorporating elements of computers, telecommunications, communications technologies and networks and other multimedia development and delivery technologies to form an integrated multimedia transmission and communication delivery infrastructure and platform with a global reach (Dzidomu, 2010). According to Unwin (2009) in Figure 2.1, ICT is a broad term that covers a wide range of technologies; these technologies are associated with three main sets of interconnected processes: capturing of information, its storage, and ways in which people access and share it. Underlying all these, there has to be a physical infrastructure in place that enables them to operate and be connected, and a regulatory mechanism to ensure that there are common standards in place for communication to be possible between devices.

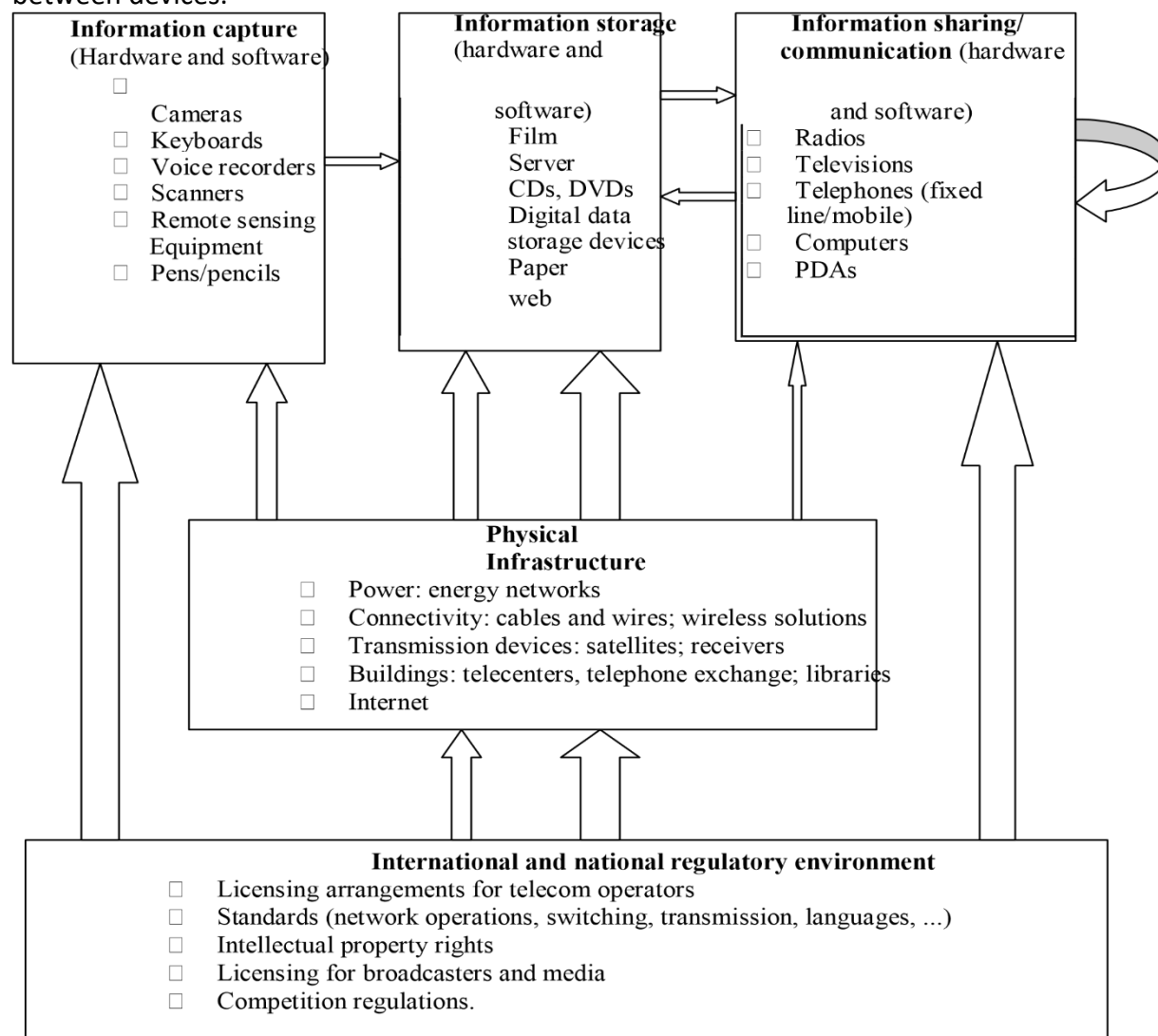


Figure 2.1: Framework for conceptualizing information and communication technologies.

Digital technologies have a potential to significantly alter the way in which administrative, logistics, ship, terminal and port operations function together, in at least five areas (figure 2.1). These areas include the administrative procedures related to a shipment where for instance technologies such as distributed ledger technologies (DLT) could help to make processes in the port operations chain smoother. A second area of deployment for new technologies is overall supply chain oversight and control, i.e. by providing visibility via storage systems such as cloud-based platforms, and hardware and software that allow cargo tracking and real-time status updates. Navigation and maintenance of vessels can profit from a variety of technologies, such as Internet of Things (IoT) applications that are based on connected sensors for instance on vessel equipment. This could become useful for diagnostics, navigation, maintenance, and scheduling of arrivals at ports to allow for more predictability.

Port operations and co-ordination, as well as the interface between port and inland, will similarly profit from ICT applications and other technology that allows leveraging more data, such as temperature, tidal data or pollution levels. Shippers and freight forwarders could most likely profit from the innovation in all five categories (see Table 2.1), whereas carriers would benefit most from opportunities in administrative tasks, booking allocation, ship management, navigation and maintenance. Carriers could also harness the direct benefits of better information communication technology, notably when better voyage planning and lower waiting times can lead to fuel and energy savings. In the five main areas listed, selected examples of hardware and software could allow for broader data collection, data analysis, and information management.

In terms of financial impact, the World Economic Forum (2016) estimates that USD 1.5 trillion is at stake for logistics companies as a result of digital transformation of the sector worldwide through 2025. For maritime freight companies, they estimate potential savings of operating costs at USD 50 billion as a result of the adoption of analytics. The study expects a threefold increase of the use of analytics by 2025. Wide-spread use of control “towers” with centralised monitoring and control functions are expected to lower total waiting times by around 25% and lead to additional savings for the maritime transport sector of around USD 20 billion (WEF/Accenture, 2016). However, there are some challenges attached to estimating the financial impact of the adoption of ICTs, especially since the deployment of ICTs depends to a large extent on the definition of the scope of application and the potential of organisational adaptation. Reaping the financial benefits of the adoption of advanced ICTs is dependent especially on the ability to effectively share information and better integrate and harness information among a variety of port operations stakeholders.

Electronic Devices

Electronic devices refer to any electronics, mechanical, or digital equipment that captures visual or aural images, including cameras, computers, tape recorders, video recorders and cellular telephones. It also refers to objects capable of communication and computation which range from simple sensor nodes to home appliances and smartphones (Stojkoska & Trivodaliev, 2017). According to Kjos Miesner and Chesnut (2010) the use of electronic devices (e-devices)

such as laptop computers, smart phones, and tablets in daily activities is increasingly observed. Interestingly, this trend tends to be common among individual and organizational, which shows the extent of its collective acceptance and adoption by the society. Today, electronic devices play important role in the organization as many organizations have adopted and integrated into their operational life. This new infrastructure is not just helping people do things better and faster than in previous eras, but it is enabling new ways of control, coordination, and collaboration on activities more readily, at lower costs, governed by the law of diminishing costs. That is, because of the properties of digital goods, the cost per unit of marginal or additional output incrementally decreases, whereas the amount of all other factors of production stays constant. As digital resources become accessible, processed, transferred, and stored regardless of location or time, borders and geographical distances are no longer as critical as they once were, and wholly new, invisible electronic spaces are now available.

In Africa, particularly in Nigeria, one of notably development of ICT is, increases in telephone users. According to Telegeograph (2013) reported that, Nigeria's fixed and mobile phone subscribers were 21.158 million, 25.827 million and 26.9788 million, in 2010, 2011 and 2012, respectively. According to Unwin (2009), the subsequent dramatic rise in the use of mobile phones was enabled by the construction of numerous base stations to increase cell density and thus permit users seamlessly to access networks wherever they wanted to. The increase of telephone users has a negative impact on traditional letters, as it was reported by Makuburi the Director of Postal Affairs in Nigeria Communications Regulatory Authority; technological changes in ICTs have had a substitution effect on private letter mail (Makuburi, 2011).

Port Computerization

The concept of computerization is associated with equipping something with or the usage of and automation by computers and software. However, Port computerization refers to one that in which its major work is done by computer. Study shows that the last ten to fifteen years have witnessed a constellation of important changes of the production process such as the extensive use of computer-aided production technologies, the advances in information and communication technologies, the emerging of new ideas how to organize firms, changes in the skill requirements of labor and changes in employee preferences toward more flexible working conditions. Based on this, today there is observed role of complementarities in modern business management through the adoption of socio-tech management system. Bresnahan et al. (2002) expressed this when they stated that the use of ICT, new organizational practices and human capital build a complementary system of activities. The effects of technology over the course of human history are well documented (Bradley, Madnick & Kim, 2016). Through the computerization of workplace, such as the Nigerian Ports, it is believe that it will impact positively on their performance at all level. This is as Cascio and Montealegre (2016) contend that if technology adoption enables people at work, it should foster self-motivation and well-being, key elements

of self-determination theory; enhance productivity; and promote job satisfaction, organizational commitment, and citizenship behaviors among workers.

Computerization of the workplace reduces error rate of rate of an organization due accuracy and speed in information dissemination and storage for future. It makes use of communication gadgets such as hardware and software. Communication hardware and software's involves; radios, televisions, telephones (fixed line/mobile), computers and PDAs. According to Goodwill Foundation Society (1998-2013), a computer is an electronic device that manipulates information, or "data." It has the ability to store, retrieve, and process data. Furthermore, it was reported by Study mode (2012), Computer has become very important nowadays because it is very much accurate, fast and can accomplish many tasks easily. Otherwise to complete those tasks manually much more time is required. It can do very big calculations in just a fraction of a second. Moreover, it can store huge amount of data in it. We also get information on different aspects using internet on our computer.

Work Automations

Any kind of development in a specified field needs people who are skilled and experts even though work automation is in vogue. In order to have this there must be cost incurred in order to facilitate the progress of ICT development; things like training, short courses, and building of universities or establishment of certain department or center which will be responsible for providing ICT education so that, it can provide people who are experts in ICT use. As it was reported by Bharawaj (2010), Organizational human resources generally comprise the training, experience, relationships, and insights of its employees.

Therefore, in the field of ICT, a person who is responsible for ICT facilities is called a system administrator. The System Administrator (SA) is responsible for effective provisioning, installation/configuration, operation, and maintenance of systems hardware and software and related infrastructure. This individual ensures that system hardware, operating systems, software systems, and related procedures adhere to organizational values, enabling staff, volunteers, and Partners (supporting advancements, 2013). Investment in ICT facilities including software and hardware has been given consideration to many organizations regarding to their operations. Initial implementation of ICT facilities may involve a lot of money and an organization can incur loss, but in a long run an organization may get a lot of profit. However, the cost of investing ICT may include buying new products, repairing and running cost (Jean, Sinkovics & Kim, 2012). The impact of ICT investment on performance has become a matter of both academics and practitioners like Whangu and Jung (2013). As it reported by Bharawaj (2010), Investments in ICT include but not limited to: managers' time and support, investment in skills and organizational change, planning and implementation; redesign of products and production systems; new management and quality-control systems; formation of work groups, new organizational hierarchies, implementation of incentive schemes and training staff and managers with general and specialized IT/ICT expertise.

The Concept Modern Port Operations

In broad terms, a port can be defined as an entity (organisation) that provides services and facilities for ship turnaround (Trujillo & Nombela, 1999). In short, it provides facilities for loading and offloading cargo from vessels. Although this pedestrian view of ports may not be an up-to-date view of the contemporary port today, it captures the critical role of a port that has not been undervalued. The significant interest in ports and the services they provide revolves around efficient loading and unloading of cargo. However, the role of modern ports as of today is captured in the United Nations conferences on trade and development's (UNCTAD) definition; Seaports are interfaces between several modes of transport, and thus they are centres for combined transport. Furthermore, they are multifunctional markets and industrial areas where goods are not only in transit, but they are also sorted, manufactured and distributed. As a matter of fact, seaports are multidimensional systems, which must be integrated within logistic chains to fulfill properly their functions. An efficient seaport requires, besides infrastructure, superstructure and equipment, adequate connections to other transport modes, a motivated management, and sufficiently qualified employees" (Trujillo & Nombela, 1999, p. 4).

Furthermore, other definitions by authors such as Notteboom and Winkelmanns (2001b) focused on the role of logistic networks while De Langen (2002) added the role of ports in industrial networks to the definition. The later definitions show that the functions of modern ports have become complex and diversified, i.e. they have become centres of agglomeration of economic activities. Nevertheless, the primary role of seaports remains loading and unloading cargo; the other activities are regarded as value-adding, as they are not the main activities. Therefore, the importance of seaports to the economy hinges on the ability to facilitate international trade flows as the bulk of domestic and international trade is carried by sea. Seaborne trade depends on ports for its operations, as it acts as maritime/land transport (railways, road or inland navigation) interface. It implies that for efficient maritime transports, ports need to perform the core role of lifting up and putting down of cargo efficiently. Despite the complex and diversified nature of modern ports, they render the following services: cargo services, vessel services, infrastructure, marketing, management and security. Table 1 shows the different services and the activities involved in each category.

Table 1: Port functions

Service	Activities
Cargo services	Stevedoring, Long shoring, Equipment operations, Transit storage; Receiving and delivery, Cargo tracking, Assembly and processing (consolidation, bagging, packing, mixing); Storage and warehousing; Transfer to land transport.
Vessel services	Navigational aids, Pilotage, Towage, Mooring, and Bunkering, Utilities, Reception facility (garbage removal), Stowage, Anchorage, Buoys, Launch services and Vessel repair.
Infrastructure	Hydrographical surveys, Dredging, Repair and maintenance, Engineering design, Port construction, Equipment procurement.
Marketing	Market research, Promotion and sales
Management	Billing accounting, Data processing, Staffing

Security

Security forces, Fire and rescue, Pollution control

Source: Adapted from Cheon (2007b).

The functions reveal that multiple services are provided within the port area. More often, these services can be provided by independent firms working in the port and the services can also be provided by a single firm in the case of small ports. The space limitation reduces the number of feasible operators within a port area. Sometimes, only a single operator can be accommodated in the case of small ports in remote locations (Trujillo & Nombela, 1999). The agency that normally coordinates the activities and ensures the proper use of common facilities takes care of safety and general design of port facilities is called the port authority. The next section discusses the role that port authorities play in the port industry.

Port authorities

The governing body in-charge of ports is often referred to as a port authority, port management or port administration. The administration or governance of ports is of crucial importance for the organisation, coordination and control of port activities (Cullinane & Song, 2002). A commission of the European communities, 2001, defined a port authority as the entity, which whether or not in conjunction with other activities has its objective under national law or regulation, the administration and management of port infrastructures, and the coordination and control of the activities of the different operations present in the port. De Monie (2004), observed that the term port authority connotes a public form of port management. However, it is used as a generic term to describe the body with the statutory responsibility of managing a port's water and landside domain. While Verhoeven (2010) argued that, irrespective of the ownership and management entities to which port authorities belong, they are hybrid entities that contain some elements of both public and private law. Therefore, they are conferred with an exclusive right of administrative action and in some cases even criminal law competence and at the same time they are undertakings that compete (Verhoeven, 2010). These far-reaching attributes flow from the fact that seaports possess both public utilities and private enterprise characteristics (Meersman & Van de Voorde, 2002).

Port authorities can exist at all tiers of government, be it national, regional, provincial or local. Although the most prominent is the local port authority, that is an authority that exercises jurisdiction over the port area. National port authorities exist in countries such as Aruba, Nigeria, Sri Lanka and Tanzania (World Bank, 2007b). The traditional roles or functions of port authorities are classified into three categories; landlord, regulator and operator (Baird, 1995; Baltazar & Brooks, 2001). These three broad classifications are in tandem with the legal status of port authorities (Van Hooydonk, 2002). Other classifications do exist, but they are still linked to the three major broad categories. Regardless of whether the port authority owns the land, or manages it on behalf of the national or local government, the functions of ports outlined previously in Table 2.1 are carried out or coordinated by the port authorities. For instance, the landlord port authority performs the duties of the landlord of the port. As the administrative responsibility of the Landlord port is vested with the Landlord port authority (Baird, 2000; Baltazar & Brooks, 2001; Van Hooydonk, 2002). Likewise the operational and regulatory roles of

ports, although the landlord function is regarded as the most important function of a modern-day port authority from the value chain perspective (Dooms & Verbeke, 2007).

The statutory roles of national port authorities, as listed in the United Nations Conference on Trade and Development (UNCTAD) Handbook for Port Planners in Developing Countries UNCTAD (2016) are as follows: (a) the approval of a port investment plan in line with the national plan maintained by the authority; (b) setting of the port's financial policy which will bring a return on investment; (c) infrastructural funding and to advise government on funding alternatives; (d) regulation of rates and charges by setting a tariff policy that will protect the public interest; (e) set the labour policy, which is impartial, to minimise friction between labour unions and management; (f) licensing of third parties to provide certain services to the port; (g) collect, collate, analyse and disseminate information on port activities and sponsor port research when necessary and (h) provide legal advice to local port authorities.

The changing role of the port environment, due to privatisation, has altered the traditional role of port authorities. It has been so much, that Goss (1990a) has questioned the need for port authorities, recommending repositioning and development of new strategies. Notwithstanding the necessity of establishing public port authorities have been called into question. The prevailing situation globally favours having one, either at a local or national level, depending on the size of the country (Juhel, 2001). It is necessary to have a clearly identifiable public partner that represents the public interest, to act as a partner to the private sector in negotiating and implementing new operational strategies for the port industry. The absence of such authority, that can be accessible locally, could be an obstacle to the development of a viable public-private partnership. Moreover, the new envisaged roles apply mainly to port authorities in developed countries, as the developing countries are still struggling to fulfill the traditional roles.

Port operators

As there are roles for central governments and port authorities, so also port concessionaries (such as stevedoring firms, cargo handling companies, and terminal operators) play key roles in the port communities. Terminal concessions are granted to companies with different backgrounds. The award of the concession to private entities expands their activities to terminal operations, so they become terminal operators. The private entity form an important strand in the concession process, as its success, or otherwise, depends on the experience, behaviour and the performance of the private parties (Theys, Notteboom, Pallis, & De Langen, 2010). There are many classifications of terminal operators in the literature; the most recent is Farrell (2012), which identified 11 groups based on the geographical reach and activities of the entities involved in concessions. They include: Global terminal operators (GTO), Regional terminal operator (RTO), Stevedores (STE), Shipping lines (SL), Freight transport companies (FT), Construction companies (CC), Equipment manufacturers (EM), Property developers (PD), Industrial conglomerates (IC), Public authorities (PA) and Financial institutions (FI).

There is another proposed classification of terminal operating companies by Bichou and Bell (2007), namely: terminal operating shipping shippers (TOS). This group engage mainly in bulk

cargo operations, examples include oil companies such as Shell, or cement companies such as Dangote. Another group is the terminal operating shipping lines (TOSL) that operate port facilities by acquiring long-term concessions or leases. An example of this is APM terminals, where the parent company is the Maersk shipping line. There are also terminal operating port authorities (TOPA), which have expanded their activities by operating ports or terminals in other countries as their base. Lastly in this classification, is the terminal operating companies (TOC). This group are made up of companies that undertake activities in logistics, property development, or related business ventures and have extended to international port operations and management. Companies in this group include HPH, ICTSI and SSA Marine. The TOCs are also regarded as transnational terminal operating companies (TTOs) by Slack and Frémont (2005). Parola and Musso (2007) categorised terminal operating companies into three broad groups, the pure stevedores, integrated carriers and hybrid terminal operators.

Nevertheless, the two most outstanding concession participants are the GTOs and the shipping lines involved in concessions. The role of GTOs is critical to port operation as literature has revealed that international terminal operators are the dominant players in the cargo handling industry, especially of containers. The top ten terminal operators handle 64.4% of total world cargo (Notteboom & Rodrigue, 2012). The GTOs successful inroad into port operations can be attributed to the strategic importance of seaports and the need to secure reliable supply chains (Farrell, 2012). Also, Farrell (2012) was of the view that due to size, reputation and independence, the international terminal operators are better placed to attract business to ports. The presence of GTOs in many ports provides the ease of switching equipment and management resources around the world, hence the flexibility to respond to market changes. In addition, Notteboom and Rodrigue (2012), described GTOs as market seekers that pay particular attention in selecting their locations.

Furthermore, the market segment for single-user terminals operated by global container carriers is expanding rapidly (Wiegmans, Hoest, & Notteboom, 2008). The growth is possible because shipping lines strive to secure terminal capacity at major locations globally through vertical integration of shipping lines into port operations. It provides the shipping lines the control of their global door-to-door services. The assumption is that the operation of terminals by shipping lines will result in efficiency gains, delivery of better service and reduction in port charges (Slack & Frémont, 2005). Another advantage derivable from shipping lines operating port services is throughput guarantee, resulting from the vertical integration in the supply chain. According to Farrell (2012), although many new companies have entered the terminal operation market, only very few outside the shipping companies are successful. That notwithstanding, shipping lines are keener on locations with the potential for high-value additions in the overall supply chain (Notteboom & Rodrigue, 2012). Typically, most port operators are private firms that pursue conventional microeconomic objectives, such as profit maximisation, growth and additional market share. The creation of an enabling environment for port operators to freely pursue such objectives ensures the achievement of benefits of a market-orientation in ports. The nature of a port service confers it with unique economic characteristics, explained in the following section.

Administrative Structure of the Nigerian Port Authority (NPA)

Figure 2.2 shows the current administrative structure of the Nigerian Port Authority (NPA). The managing director (MD) who is responsible for decision-making is appointed by the President on the advice of the Minister of FMOT and also the board members. The executive directors (ED) (Marine, Engineering, Finance & Admin) assist the MD with administrative affairs, port management and operation, and port construction and maintenance. In addition, the EDs are assisted by general managers (GM) that deal with the day to day running of the ports. The organisational structure of the NPA shows that the administration is top-heavy. For instance, the ED Marine is assisted by 5 GMs, the ED Engineering by 4 and ED Finance and Administration by 4. This massive number of high-profile personnel is still being maintained by the NPA after relinquishing most of the operational responsibilities to the private sector.

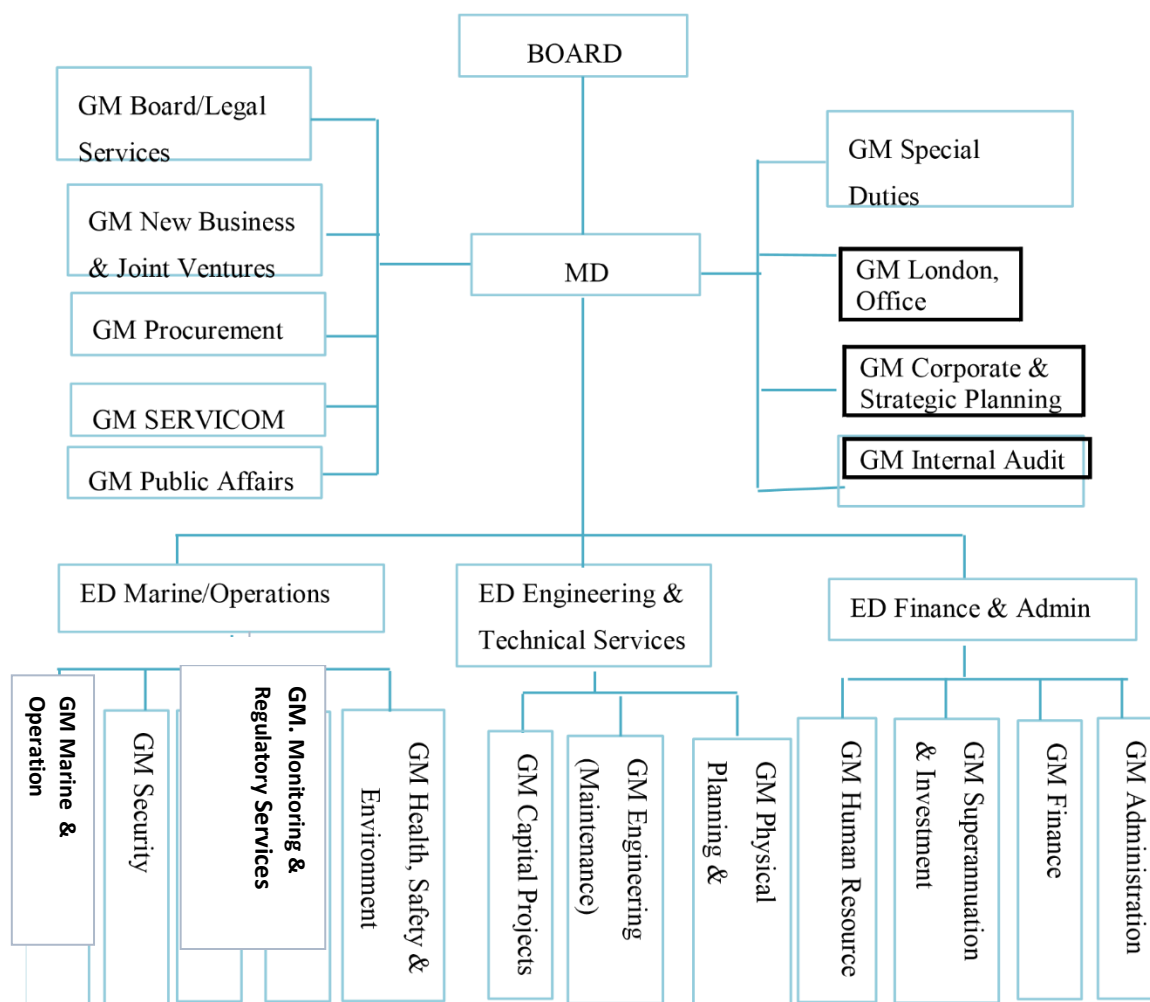


Figure 2: Organisational structure of Nigerian Ports Authority (NPA)

Source: NPA Website, 2019

The administrative structure of the NPA resonates as a public enterprise structure and its accompanying shortcomings. The adverse effect of running the NPA as an agency under the

FMOT, with the attendant political patronage, is evident in the rate of turnover of MDs of the authority after the concession program. As at July, 2012, 6 different Chief Executive Officers (CEOs) have been in control of the NPA after concession started in 2006. The running of port authorities as public enterprises has been criticised by Chen (2009) in the study of Taiwanese port authorities. The study highlighted the irregularities due to government intervention, financial restrictions, bureaucracy and civil servants' attitudes towards institutional change. Goss (1999), questioned the rationale for the involvement of public authorities in ports, as they are not responsive to market forces and hence do not act commercially. For example, the Nigerian ports authority is still an agency under the Federal Ministry of Transport as such lengthy procedures are still involved for the budget approvals. It impacts on the efficiency of responding to the needs and requests of customers. As such the Nigerian ports authority lacks the flexibility to respond to any changes in the market environment and the proactiveness required to ensure contestable markets. That is necessary to tame the anti-competitive behaviour of operators and ensure that the gains from the concession are transferred to the stakeholders.

The present administrative structure still maintained by the NPA after the introduction of the Landlord model of port administration, poses a significant challenge to the success of the reform process. Since the Royal Haskoning BV of the Netherland, the concession adviser, observed prior to the concession that, the over-centralisation of the NPA administration is not suitable to run an efficient port it as is enmeshed in too much public sector bureaucracy and political interference (Leigland & Palsson, 2007). Therefore, it recommended the unbundling of the NPA into two autonomous port authorities, alongside the adoption of the Landlord model of port administration, as part of the concession programme.

Eight years after the reforms took effect, Nigeria has not gone beyond the proposition stage. The two most important bills, the New Ports and Harbours and the Transport Commission Bills are not yet passed into law by the national assembly. The non-passage of these bills implies that the transfer of terminal operations to the private sector could be considered illegal, as the New Ports and Harbours Bill which redefined the duties of the NPA has not been passed into law. It constitutes a major challenge as observed by the terminal operators (Oghojafor et al., 2012). It is evident from the analysis of the different ownership and privatisation models that port ownership and administration differs from country to country. It is also obvious that no country concession its entire national ports at once. The trend shows that only container terminals in most of the countries are transferred to the private sector while the other cargo types remain in the public domain. It is also observed that the pace of privatisation is gradual, even the UK with the most advanced forms of port reform phased its privatisation process. Another observation is that the governance structure of ports differs and, in most countries, it is devolved to state and local authorities. Again, in some countries, for example, the Port of Singapore it is corporatisation that is being practised. No country still maintains public national port authorities after concession; rather responsibility is devolved to autonomous municipal, regional or provincial port authorities. However, the Nigerian port concession was regarded as the most ambitious and far-reaching concession that have taken place globally by Ocean Shipping consultants (2008), as the operations of the national ports were transferred to the private sector within a year. This review also shows that both corporatisation and privatisation as methods of

injecting the private sector ideals into the ports can be successful, if well managed. For example, the Port of Hong Kong and Port of Singapore, with similar geographical and cultural backgrounds adopted opposite approaches to privatisation. While Hong Kong is private sector dominant, the Singapore port authority is corporatised and performs all the port operations. However, the two ports are among the top 5 efficient ports globally. Therefore, it is evident that the primary decision factor is that the port system should tally with the general system of government and the beliefs of the people, for an efficient port operation, not the type of privatisation *per se*. Liu (1995) argued that the concept of best port that is applicable to all situations does not exist and therefore port organisations should not be treated as if they were mechanical, rather than social bodies. In conclusion, due to different port governance configurations, privatisation, though a universal concept, should be modelled to suit the socio-economic characteristics of each country.

Nigerian Seaports

Figure 2.3 shows the location of the six major Nigerian seaports under study. They are located in the southern part of the country. Two in Lagos State, Apapa and Tin Can and another two in Rivers State, Port Harcourt and Onne, while Warri and Calabar ports are in Delta and Cross River states respectively. Prior to concession, Nigeria had eight ultra- modern ports split into two zones for administrative purposes i.e. Western and Eastern zones under the control of the NPA. The Western zone consists of Apapa port, Container terminal port, Tin Can Island port, and a Roll on-Roll off (RORO) port. The Eastern zone comprises of the Port Harcourt port complex, Delta port complex, Onne port complex, and the Calabar port complex. These eight ports constitute the primary port system, although there are smaller ports and oil terminals that operate under the ports' complexes. After the concession, the ports operate as six complexes: Lagos port complex, Tin Can Island port complex, Rivers port complex, Delta port complex, Onne port complex and Calabar port complex, each complex having ports under its jurisdiction.



Figure 2: Map of Nigeria showing location of seaports under study
Source: Adapted from www.mapsofworld.com (2014)

Performance of Nigerian Ports

Badejo, (1994) is of the opinion that one of the fundamental issues affecting freight operations in Nigeria is lack of coordinated efforts between and within freight modes and operations. Most ports are not linked with dependable road and rail networks. This in turn hampers transport of heavy and extra-ordinary traffic, (Ikporukpo, 1993). Rapu and Ayoade, (1996) stated that one of the most important blocks of sound economic performance is the efficient delivery of goods and materials as quickly and cheaply as possible freight transport plays a key role in the economic development of both developed and developing countries of the world. Freight transport demand is a derived demand which is generated only by inputs to or outputs from agriculture, mining, construction or sea ports industry by purchasing or sales. Thus, the demand for freight is related to economic growth whether it is measured in terms of output expenditure or income. Over the years the traffic through the Nigerian ports are increasing along with the economic development of the country. It is frequently observed that queues of arriving ships are formed and sometimes ships have to wait for a longer time before berthing. This can be attributed firstly, to the mobility of the existing port facilities to match the ever-increasing global trade and secondly, some obnoxious government policies and regulations. This incessant congestion in our

ports has resulted in diversion of ships meant for Nigeria ports to other neighboring country ports. In the reforms and concessioning of 2006, Tin-Can Island Port be concessional to four different private organizations to manage. Maduka (2004) defined port congestion as massive un-cleared cargo in the port, resulting in delay of ships in the seaport. According to him, this occurs when ships spend longer time at berth than usual before being worked on or before berth. Onwumere (2008) made mention of port congestion as a situation where in a port; ships on arrival spend more time waiting to berth. In this scenario, more ships will queue at the channels and the outside bar waiting to get space at the terminal for berth age. According to him this waiting time is calculated using the service time of vessels which is one of the ways of measuring port efficiency. His view was that this is a situation whereby cargoes coming into the port are more than the storage facilities can handle.

Port congestion is a global phenomenon not limited to only Nigeria. In 2005 global map of congestion around the world Africa inclusive, the West Coast of Africa including Nigeria was there, the Eastern part of Africa, around Kenya, Southern part of Africa even the West Coast of the United States of America was there several factors attributed to this Zhang et al (2008). Maduka (2004) highlighted the factors responsible for port congestion in Nigeria and suggested ways to control congestion at the ports. According to him, there are advantages and disadvantages in port congestion. He said port congestion brought about realization for better planning, port expansion and development. He cited loss of revenue, unemployment and bad image to the country as its major disadvantages. Tom (2009) is of the opinion that Nigeria should be warned about reoccurrence of congestion in its port. According to him in spite of the various waivers conceded by the government the dwell time of consignment in the port is gradually jerking up against expected time. He cited the use of manual clearing process as one of the major factors responsible for the reoccurrence of the looming congestion. Tatchia et al (2008) has observed that performance operations in most ports of developing nations to be frustratingly slow. However, literatures have substantiated knowledge of logistics as an important ingredient of efficiency. Ogunsiji (2010) is of the opinion that adequate logistics management is the road map involved in the design of efficient and effective configuration of two important flows information and product which often facilitate distribution of a firm's products and services at the right place, right time and right price. Fawcett et al (2002) is of the opinion that conducive environment is a prerequisite for an efficient logistics system. And any country lacking a good base network of dependable transportation, warehousing communication and other related facilities would hardly be able to configure activity network for sustainable economic survival and development. Most less development countries like Nigeria lacks the expertise needed for crafting environment conducive for the development of good logistics system, have are unable to attract foreign investment a pivotal potential to global business strategy for sustainable competitive advantage. Ogunsiji (2002) is of the opinion that South African's increasing competitiveness and her ability to attract more foreign investment relative to her other African neighbours like Nigeria. With the recent increasing globalization of business, of improved logistics and management, ports are assuming strategic dimension in international business. Any country berefts of ideological redefinition of her distribution network and port logistics performance in this dynamic and ever changing global competitive market will ultimately be left lagging behind. The speedy accessibility of any container port relates to the potential for the movement of

containerized cargoes to and for the ports via the networks, i.e. cargo, through put is significantly and positively related to its degree of accessibility to other shipping services (Cullinane et al, 2005, 2006).

Madu (2011) defined infrastructure as a part of a structure, material or economic base of a society or an organization. Therefore, infrastructure can be seen as the basic structure that fosters the good performance of cities, states or countries essential services. Infrastructure as defined above can be understood as the basic structure directly responsible for the efficient functioning of the transport systems and others that support a country's economic development. Thus, the fundamental factors to competitiveness are established by economic performance, government, business and infrastructure efficiency. Statistics show that Nigeria pays over \$2 billion in freight each year to foreign ship owners either to export oil to import finished goods. He is of the opinion that off shore rigs and support vessels, coastal cabotage trade and import and export trade amounts to well over \$20billion. The consensus is that if Nigeria can gain a foothold in its shipping industry. The potentials will be enormous, the potentials includes the followings, namely job creation, foreign exchange earnings, wealth creation and indigenous shipping capacity.

Egharevba (2011) posited that Nigerian Ports Authority desire to change is borne out of the need to embrace global best practice that is to be the best not only in the sub region but indeed in Africa as a whole. She further stated that the proposed Ports Community System (PCS) in what Nigerian Ports Authority has been yearning for. She added that the organization expects the system to generate data directly from the vessels while also helping to solve truck management and control especially in the area of truck congestion at the port gate after clearance.

Iweala (2011) stated that the Federal Government has mandated all the agencies driving port operations; including the Nigerian Customs Service (NCS) to commence 24 hours service, seven days a week at the nation's ports. Customs and other port operators that now work from 9 am to 5pm would start working round the clock, so that Nigerian ports could operate like ports in other parts of the world. The objective of the above stated efforts is to reduce the time spent on clearing goods from months to 21 days and finally to 48 hours clearing in the long run. To ensure 24 hours clearing of cargoes in the port, the issue of power supply at various terminals must be addressed. Terminal operators have complained that power supply at various facilities is dependent on their own generating set and not electricity which is to be supplied by Nigeria Ports Authority as enshrined in the concession agreement Ologbese (2010). Productivity is a widely used economic concept and is the ratio of the output of a good or service to the input of one or more of the factors producing it. This ratio may be an average expressing the total output of goods divided by the total input of a factor of factors. It may also be incremental expressing the ratio of a change in output to the associated change in input, (Ndikom, 2007). The output of a port as a service facility providing the means of exchanging commodities between land and maritime transport can be measured in terms of its throughput; the amount of traffic that passes through it in a given time. Productivity is then throughput divided by the amount of factor or factors of production involved in achieving the output. Generally, any of the inputs associated

with a given productive effort can be used in the denominator of the productivity ratio. The three traditional factors of production are land, labour and capital. Element of these three factors of production can be used in measurement of port operational productivity. Port productivity can be evaluated from the stand point of the various factors of production labour, infrastructure and equipment in relation to cargo throughput. Analysis of port productivity is a prerequisite for proper port management both for current operations and for planning the replacement of equipment and for investment in new facilities.

On the average, Nigeria's port performance annually is 6.9% and this has been for over 10 years. In 2011 growth rate was recorded to be 7.4% which was triggered by the non-oil sector consisting of construction, hotel and restaurants, communication, wholesale and retail businesses, fabrication and agriculture. It was forecasted that ports' performance will rise from be 7.4% in 2011 to 8.9% in 2012. 20 So far, the growth rate in the economy has been on an increase, and there has been an increase in poverty and no jobs for the unemployed. 2/3rd of the Nigerian population live on less than one-dollar USD a day and as at 2011 the rate of unemployment was 23.9%, in 2012 it was 21.1%. 37.7% consist of the age group of 15-24 who are unemployed while the age range of 24-44 who are unemployed is 22.4%. There was a youth Job creation incentive by the government of Nigeria to train youths and thus increase the rate of employed youths in the labour force of the country. The political structure is corrupt and the over dependence of the country on crude oil and gas is one of the great challenges the country is facing today. The government is trying to incorporate the private sector in the development so as to enable them assist in the growth and development of the non-oil sector.

Service Quality

According to Parasuraman, Zeithaml and Berry (1988), service quality can be defined as an overall judgment similar to attitude towards the service and generally accepted as an antecedent of overall customer satisfaction (Zeithaml & Bitner, 1996). It is also seen the ability of the organization to meet or exceed customer expectations. It is the difference between customer expectations of service and perceived service. Perceived service quality results from comparisons by customers of expectations with their perceptions of service delivered by the suppliers (Zeithaml, Parasuraman & Berr 1990). If expectations are greater than performance, then perceived quality is less than satisfactory and hence customer dissatisfaction occurs (Lewis & Mitchell, 1990). Services unlike tangible products are produced and consumed at the same time in the presence of the customer and the service producer. The presence of the human element during the service delivery process greatly increases the probability of error on the part of employees and customers. This error is due to intangible behavioural processes that cannot be easily monitored or controlled. However, although a substantial amount of service quality research has focused on service customers' perceived service quality (Cronin & Taylor, 1992; Babakus & Mangold, 1992), relatively little attention has been paid to exploring the factors that impact on service employees' behavior with regard to delivering service quality. Because service delivery occurs during the interactions between contact employees and organizations' customers, attitudes and behaviours of the contact employees can influence customers' perceptions of service quality (Schneider & Bowen, 1985). Moreover, Beatson et al. (2008) found that perceived employee satisfaction, perceived employee loyalty, and perceived employee commitment had a

sizable impact on perceived product quality and on perceived service quality. According to Zeithaml and Bitner (1996), contact employees represent the organization and can directly influence customer satisfaction, they perform the role of marketers. Whether acknowledged or not, service employees perform marketing functions. They can perform these functions well, to the organization’s advantage, or poorly, to the organization’s detriment.

Cargo Throughputs

It is worthy of note that average cargo throughput from 1956 to 2005 is 14,467,024 metric tons while the average cargo throughput from 2006 to 2012 is 67,240,231.86 metric tons. The yearly average cargo throughput of 67,240,231.86 metric tons of cargo from 2006 to 2012 over the yearly average of 14,467,024 metric tons from 1956 to 2005 shows a percentage increase of 456.69%. This shows the remarkable progress made in our port developmental efforts since the port concession era. In a nutshell, the pattern in Nigerian port traffic during the pre-concession era is sinusoidal while the post concession experienced a sharp progressive rise. The statistics on Table 2 shows that the cargo throughput increased from 46,150,518metric tons in 2006 to 77,104,738metric tons in 2012. This means that between 2006 and 2017, cargo throughput at the nation’s ports increased by over 67 per cent. This was as a result of the landlord model of port management which was adopted in 2006 that led to the concession of sections of the ports to private terminal operators, otherwise called concessionaires, and has led to the consistent improvement in cargo throughput.

Table 2 shows the inward cargo trend from 1961 to 2017. It follows the same pattern like the cargo throughput trend. The trend of cargo throughput follows the same pattern as import trend. It means then that the trend of cargo throughput is greatly determined by the trend of import or inward cargo movement. In a nutshell, the pattern in Nigerian port traffic during the pre-concession era is sinusoidal while the post concession experienced a stable and continuous growth as indicated with the blue line. The trend concurs with that witnessed in total cargo throughput which is clear evidence that the pattern of Nigeria’s port traffic is controlled by imports. During the period 1961-2017 import traffic overwhelmed exports. Table also, shows the outward cargo trend from 1961-2017 the export trend was analogous which means there was no improvement in export activities. However, small improvement was recorded from 1971-1974 with a slight upward tilt of the trend line. The situation reversed to the parallel trend from 1975-1987. This means that there was a downward tilt of the trend line. The period 1988-1999 witnessed a slight improvement in export activities with a slight upward tilt of the trend line while the trend line experienced a sharp upward movement from 2000-2017.

YEAR	INWARD	OUTWARD	THROUGHPUT
1961	1 386 480	1 356 480	2 742 960
1962	1 620 195	1 552 752	3 172 947

1962	1 680 222	1 410 552	2 090 774
1964	1 823 506	1 720 356	2 543 862
1965	2 110 440	1 482 901	2 592 241
1966	2 256 452	1 274 262	2 620 716
1967	2 250 087	1 664 421	4 014 518
1968	2 287 446	1 621 560	4 010 006
1969	2 527 720	1 820 576	4 258 206
1970	2 640 672	2 027 828	4 678 500
1971	2 852 627	1 007 824	4 851 461
1972	2 128 106	1 752 800	4 181 906
1973	2 272 681	1 562 887	2 825 568
1974	2 177 611	1 661 517	2 829 128
1975	2 710 518	1 507 964	4 227 482
1976	4 402 152	2 816 851	7 209 002
1977	5 281 466	2 821 628	8 112 104
1978	4 450 164	2 102 075	7 562 229
1979	5 256 724	2 218 696	8 475 420
1980	5 070 492	2 461 924	8 441 426
1981	8 481 284	2 518 241	10 999 525
1982	11 852 062	2 552 182	14 405 246
1983	15 694 964	2 410 808	18 114 772
1984	17 295 286	2 670 951	20 075 227
1985	15 600 280	2 256 815	17 957 195
1986	20 728 974	2 912 742	22 642 716
1987	20 072 297	2 527 422	22 611 229
1988	16 294 509	2 246 700	18 741 209
1989	12 272 417	2 278 685	14 651 102
1990	12 452 929	2 947 740	16 401 679
1991	9 851 059	2 422 520	12 274 579
1992	9 288 006	2 240 584	11 527 590
1993	7 772 258	2 402 088	11 175 246
1994	8 750 961	4 616 226	13 276 187
1995	9 228 801	6 820 256	16 169 157
1996	11 021 521	6 819 280	17 840 901
1997	12 414 501	5 487 925	18 902 426
1998	12 897 955	5 729 047	18 627 002
1999	9 570 969	4 281 879	12 861 848
2000	9 289 971	2 982 082	12 272 052
2001	10 224 200	5 251 001	15 475 201
2002	11 212 624	5 269 181	16 582 805
2003	14 286 864	5 028 854	19 225 718
2004	15 751 221	6 481 605	22 222 926
2005	19 220 496	9 702 284	28 922 880
2006	24 668 291	11 271 901	35 940 692
2007	25 544 965	25 544 965	57 472 350
2008	41 195 616	22 177 122	64 272 749
2009	45 757 149	20 018 260	65 775 509
2010	46 928 848	29 815 879	76 744 727
2011	52 022 105	21 429 592	82 461 697
2012	46 222 127	20 870 498	77 092 625
2013	50 005 602	28 276 021	78 281 624
2014	52 771 182	21 180 744	84 951 927
2015	48 111 261	29 276 277	77 287 628
2016	42 470 646	26 894 290	70 265 026
2017	42 999 988	28 426 548	71 525 626
TOTAL	913,471,484	468,416,622	1,368,271,526

Table 2 shows the volume of cargo throughput handled at the Nigerian ports from 1956 to 2012. Cargo throughput is the sum of both the inward and the outward cargo processed by the ports in the given period. There was a slow growth in cargo traffic from 1956 to 1974; and the fall noticeable in-between 1966 and 1970, as a result of the civil war, was not enough to utterly obscure the growth trend. The rise in traffic between 1975 and 1979 was significant although the rise began in 1970. The abrupt rise was not preceded by port development sufficient enough to handle the traffic. The result was the 1975-1978 congestion problems which stemmed from the massive importation of cement called 'cement armada' and other construction material for the rehabilitation of infrastructure destroyed by the civil war. Traffic dropped from 20,075,237 metric tons in 1979 to 17,957,195 metric tons in 1980, peaked again in 1981 and then suffered serious decline that coincided with the global economic recession. This downward trend can be ascribed to the austerity measures introduced by the then government with the view to revamping the ailing economy. The downward trend continued for about nine years with the total cargo throughput in 1989 falling to 13,376,187 metric tons. The traffic picked up again in 1990 only for a brief period as it fell during the country's political uncertainty of 1992 and 1993. Since 1996 there has been a rapid rise in cargo throughput culminating in an unprecedented volume in 2016 with a slight decline in 2017.

Empirical Studies

Previous studies on modern technology and ports' performance have mixed results; some argue that IT is an alternative paradigm to ports' performance, while some disagree. For instance, Bhandari (2017) examines the impact of the technology on logistics and supply chain management. The author mainly focuses on the secondary data for collecting data relating to various technology used in logistics and supply chain management. The author draws conclusion that technology is a vehicle to enhance supply chain competitiveness and performance by enhancing the overall effectiveness and efficiency of logistics system.

Wilson, Iravo, Tirimba and Ombui (2015) also examine the effects of information technology on Port performance in Nairobi Kenya to realize its significant impact on their operations in order to guarantee their profitability and growth. Data was collected from 10 firms in the logistic industry suppliers in Nairobi. The data was analyzed with the aid of SPSS and result shows that there is a strong relationship between IT and the performance of logistic firms in Nairobi County.

In another study, Karimi and Namusonge (2014), determine the effect of information technology on port's warehouse management. The researcher used descriptive research design taking Jomo Kenyatta University of Agriculture and Technology as a case for this study. The target population was 930 and a sample size of 50. The sampling design adopted was stratified random sampling. Data collection was done by use of questionnaire and informal interviews. Result indicates that information technology has positive effect on port's warehouse management. Similarly, Somuyiwa and Adebayo (2011), also examine the impact of ICT usage on logistics activities of sea ports companies in Southwestern Nigeria. Both descriptive and inferential statistics were employed to analyze the data. The study reveals that ICT has strong relationships between with Logistics activities. Also, Chieh-Yu and Yi-Hui (2007) investigate the impact of technological

innovation on the performance of China's Logistics Industry. The paper employs the questionnaire survey to study the factors influencing the adoption of technological innovations by logistics service providers in China as well as the influences of technological innovation on supply chain performance. Technological innovations are categorized into data acquisition technologies, information technologies, warehousing technologies, and transportation technologies. The results show that the adoption of technological innovations is significantly influenced by technological, organizational and environmental factors, and adopting innovative technologies increase supply chain performance for the logistics industry in China. Closs and Kefeng (2000), also provide empirical evidences indicating that technology has the potential to improve overall port capabilities. The study indicates that IT is a high priority for 3PL users. IT capabilities also are seen as exceptionally critical to the integration of logistics services provided by 3PLs (Baradwaj, 2010). Also, Mzoughi, Bahri and Ghachem (2008) investigate the impact of supply chain management and Enterprise Resource Systems (ERP) on organizational performance and competitive advantage in Tunisia by conducting a survey on 216 Tunisian managers. Their results show the importance of SCM and ERP systems adoption as well as reveal their positive impact on organizational performance and competitive advantage in Tunisians companies. However, the findings of Ayantoyinbo (2015) and Zakaria, Zailani and Fernando (2010) are contrary the previous studies, their studies reveal that information technology had no moderate effects on the ports' performance. In another study, Wu, Sengun, Daekwan and Tamer (2006) argue that making investments in modern technology does not necessarily guarantee the increase of enterprise performance.

Discussion of Findings

The study explored the relationship between technology and performance of sea-ports in Nigeria. The study adopted the usage of communication devices, port computerization and work automation. These dimensions are in cognizance with Closs and Kefeng (2000), who also provide empirical evidences indicating that technology has the potential to improve overall port capabilities. The measures of port performance are service quality and throughput level of the sea-ports in Nigeria. These measures are finding out to be the adequate measurement in the performance of sea-ports all over the world (Closs & Kefeng, 2000). On the relationship between the usage of communication devices and the service quality of the port authority, the study observed a positive relationship between the two variables of study. This finding is in line with Chieh-Yu and Yi-Hui (2007) who investigate the impact of technological innovation on the performance of China's Logistics Industry. The study also observed that to a very large extent, port use telephone/electronic devices when conducting its port operations. To a very large extent, staff's work input positively affected by telephone/electronic devices. This is a necessary observation for the use of such devices as telephone cannot be over emphasized. To a moderate extent, telephone/electronic devices affect port operation efficiency in Nigeria. To a moderate

extent port introduce many measures to encourage the use of telephone/electronic devices to a moderate extent the study observed that clients gain from the use of telephone/electronic devices in the course of doing services. To a very large extent port are positively affected by port computerization that leads to satisfactory port operations. Studies further observed that to a very large extent, port is positively affected by port computerization that gives profitable outcome to port operation. To a very large extent, the study observed that the quality of interaction between staff and management lead to positive and effective port computerization. To a very large extent, is port computerization a genuine encouragement in Nigeria sea-port. To a very large extent, the study observed that port value increases by giving satisfactory evaluation of work automations/systems and administration. Study observed that to a very large extent, work automations/systems administration often used key performance indicators (KPI) in your Nigeria port. This is true of the system of administration of all port management authority in Nigeria. To a very large extent, study observed that they give room for the assessment of work automations/systems administration. To a very large extent, the respondents were allowed to make variety of inputs on work automations/systems administration in their various sea-ports. Staffs of the ports have the requisite skills to give critical assessment on the issues of work automations/systems administration. Staffs are involved in open and robust discussions with the management on strategic effect of productivity in the port operation. To a very large extent the study observed that marine port is positively affected by productivity. The study equally observed that productivity is very important for Nigeria ports growth. To a very large extent the findings discovered that cargo throughputs are positively affected by the operations of Nigerian sea-ports. The study further observed that the quality of interaction between staff and customers become positive for the growth of cargo throughputs in Nigerian sea port. To a very large extent the study finds out that the increase in cargo throughputs lead to effective and efficient port operations in Nigeria and to a very large extent the study finally discovered that port operations give rooms to staff to suggest new ways or approaches on how to improve cargo throughputs.

Summary

The study investigated the association between technology and the performance of sea-ports in Nigeria. The study postulated and tested six hypotheses. The result of hypothesis one indicated a strong positive relationship between the use of communication devices and service quality of the sea ports in Nigeria. The correlation is statistically significant; hence, we reject the null hypothesis which infers that there is no significant relationship between use of communication devices and service quality of the Nigerian sea-ports and accept the alternative which state that there is a significant relationship between use of communication devices practices and service quality of the sea ports in Nigeria . The result of hypothesis two indicated a strong positive relationship between use of communication devices and throughput of the sea-port in Nigeria. The correlation is statistically significant. Hence, we reject the null hypothesis which infers that there is no significant relationship between use of communication devices and throughput of Nigeria sea-ports and accept the alternative. Hypothesis three equally indicated that there is a

moderately positive relationship between port computerization and service quality of the sea ports in Nigeria, and it is statistically significant. Hence, we reject the null hypothesis which infer that there is no significant relationship between port computerization and service quality of the sea-ports in Nigeria and accept the alternative which infer that there is significant relationship between port computerization and service quality of the sea-ports in Nigeria. The result of the tested hypothesis four indicated a moderately positive relationship between the two variables; hence, we reject the null hypothesis and accept the alternative which infers that there is a significant positive relationship between port computerization and throughput of the sea ports in Nigeria. Hypothesis five indicated a moderately positive relationship between work automation and service quality and it is statistically significant. This infer that the null hypothesis should be rejected which infers that there is no significant relationship between work automation and service quality of Nigeria sea-ports and accept the alternative. Finally, the result of hypothesis six indicated a moderately positive relationship between work automation and throughput level of the Nigeria sea-port. The coefficient is statistically significant hence we reject the null hypothesis which infers that there is no significance relationship between work automation and throughput level of the sea-ports in Nigeria and accept the alternative. By these findings the study indicated moderately positive relationship between technology and the performance of the sea-ports in Nigeria.

Conclusion

Port authorities around the world increasingly embark on digital strategies that evolve from renters or asset managers to active digital communities. With the need for more efficiency-enhancing coordination in supply chains, port authorities increasingly grow into hubs of physical and information flows among different stakeholders. In the light of growing worldwide competition, ports see the necessity to become more dynamic actors in order to avoid the risk of decreasing significance. As public authorities, some see their natural role as a neutral platform that facilitates coordination among different stakeholders. In the light of the above the study evaluates the relationship between the technology of port operation and performance of Nigerian ports. The study finds reasonable evidences and concludes that there exists a moderately positive relation between technology and the performances of sea-ports in Nigeria.

Recommendations.

Deriving from the findings of the research work, the research recommends as follows;

1. Port managers should improve on the service quality of their ports by encouraging the use of more communication devices in order to improve performance of the port. These communication devices should be in compliance with state-of-the-art facilities as obtainable in other highly rated ports
2. Port managers should improve on the service quality of their port by recommending improve computerization of the port activities in such a manner that it will aid the performances of the port operators. The computerization should assist the efforts of all the agencies/parastatals that their activities anchored around the port operations.

3. Port managers should recommend modern technology that will improve throughput level of the various seaports so as to improve the income generation activities of port thereby improving the nation's economy.
4. Port managers should recommend the computerization, work automation and system administration in such a manner that is in compliance with best practices all over the world so as to improve the throughput of the various sea-ports.

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