Technologıcal Advancements in Nıgerıa's Marıtıme Trade: A Framework for Enhanced Effıcıency and Growth

ETO, G. M.[1,*] iD

[1]School of Maritime Transport Studies, Maritime Academy of Nigeria, Oron

ABSTRACT

The paper reviews how technological advancement is central to the growth of Nigeria's maritime trade and examines the critical importance of technological advancement to the enhancement of efficiency in the maritime sector. It evaluates eight objectives that mirrored the research problem and adopts cross-sectional survey design to examine the population of study. Out of a population of 603, Taro Yamane formula was used to determine the sample size of 264. In order to analyze the data gathered, descriptive statistics was used. The study adopted simple random sampling technique due to its ease of use and accuracy of representation. From interviews, literature review, media reports and critical stakeholders' opinions, the study identifies various unethical practices and gaps that hinder efficiency of maritime trade in Nigeria as well as the challenges confronting the maritime sector, which modern technologies could help to resolve. The study establishes the relationship between technological advancement in Nigeria and maritime trade and identifies numerous benefits of deploying modern technologies in the quest to optimize maritime trade in Nigeria. Consequently, the study recommends, among others, that the Federal Government of Nigeria should ensure that the seaports adopt modern technologies and encourage them to subscribe to full digitalization and automation in order to make the Maritime Single Window and the Port Community System optimally functional for efficient maritime trade.

1. INTRODUCTION

The volume of economic activities within the global Blue Economy is currently estimated at over $1.5 trillion annually and this is expected to double to $3 trillion yearly by 2030 in order to support over 3 to 4 billion people (Gillsater, 2018). Thus, with the Blue Economy potential estimated at $296 billion in Nigeria, the country needs strategic integration of modern technologies into her maritime industry to address issues bordering on shipping development, maritime logistics constraints, maritime environmental

concerns, safety and security in order to optimize maritime trade. The adoption of modern technologies would foster innovations, sustainability and resilience in the Blue Economy (Anthony, 2024). This would help to improve the logistics performance of the country in terms of ability to track and trace shipments, timeliness of delivery, competence and quality of logistics services and efficiency of the clearance process (Eto, 2023a).

The Federal Ministry of Marine and Blue Economy posits that the Blue Economy in Nigeria has the capacity to (1) generate up to ₦6 trillion in annual revenue, (2) create over 200,000 jobs annually in the short term, and (3) has the potential to contribute up 16% to the nation's GDP in the medium and long term (The Federal Ministry of Marine and Blue Economy, 2024). This projection concerning the huge potential of the Blue Economy sector is good omen for the national economy at large. However, in order for Nigeria to be part of the enormous global Blue Economy (and optimize maritime trade), the country needs to invest in modern technologies in the sector and deploy innovations so as to harness her vast potential (Dentons, 2024).

Furthermore, it has rightly been observed by critical stakeholders that new technologies on their own cannot deliver the desired quantum of maritime trade, thus the absence of well-articulated policy, regulatory framework and viable blue print for driving the Blue Economy in Nigeria must be addressed in order to achieve the optimum result.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Conceptual Clarification

Maritime trade

Maritime trade is the lifeblood of the global economy, representing the backbone of international commerce by sea. It has to do with the movement of goods and commodities across oceans, connecting distant nations, fostering economic growth, and supporting countless industries worldwide (Sinay Maritime Data Solution, 2023).

Automation is the automatic execution of tasks without periodic interference. Digitization is the process of converting information into digital (electronic copy, computer-readable) format, while digitalization is the integration of digital technologies (tools, systems and devices that can generate, create, store or process data) into business operations to optimize processes, enhance customer experiences, and drive innovation.

Automation and digitalization are vital for enhancing shipping efficiency and provision of quick, reliable and smooth information transfer. The automation and digitalization of operational processes would help the newly introduced Maritime Single Window (MSW) in Nigeria to leverage on the opportunities presented by the Africa Continental Free Trade Agreement (AfCFTA) in Nigeria.

The Relationship between Maritime Trade in Nigeria and Advancement of Technology

The maritime sector in Nigeria contributes an insignificant amount to the GDP and yet over 80% of Nigeria's international trade is conducted by sea (Onwuamaeze, 2022). accordingly, Stears Business (2020) cited in Ogoun (2022), asserts that in a 2020 study, it was found that irrespective of the fact that the maritime transport sector contributes to over 80% of the international trade of the country; the sector only accounts for a mere average of 1.6% of the country's GDP between 2016

and 2020. However, Eto (2023a) affirms that the country's maritime trade has greater potential for better performance if modern technologies are deployed.

Nigerian ports handle 100 million metric tons of cargo annually and there is 60% reduction in cargo clearance time due to automation (Eto, 2021). Thus, if modern technologies are adopted in the maritime industry, there is a strong relationship between maritime trade in Nigeria and advancement of technology. It will enhance efficient cargo handling, maritime logistics management as well as improve cargo tracking and monitoring.

2.2 Operational Variables in the Conceptual Framework

The following are the variables (new technologies) that would enhance maritime trade in Nigeria

1. Monitoring and Surveillance Systems to boost Maritime Security

The Deep Blue Project

For the purposes of monitoring and surveillance to boost maritime security, investment in appropriate systems is essential. Thus, to secure the maritime space for peaceful maritime trade, the Federal Government initiated the Deep Blue Project, which is an integrated surveillance and security architecture aimed at combating maritime crime in Nigeria's waterways and the entire Gulf of Guinea (Business and Maritime West Africa, 2019).

The Command, Control, Computer Communication and Information, known as C4i

serves as the base for situational intelligence and the Deep Blue Project is designed to enhance safety of lives at sea, enforce implementation of maritime regulations and prevent illegal activities in Nigeria's Exclusive Economic Zone. The project promises to ensure safety of the maritime

space for trade, other economic activities, wealth creation and national economic development (Eto, 2021).

Maritime technological tools will aid Nigeria's efforts in protecting the marine ecosystems. Sensors, satellites and monitoring systems can be deployed to track water quality, detect pollution, study coastal and marine biodiversity, and implement effective conservation measures (Dentons, 2024).

2. Maritime Renewable energy sources

The abundant renewable energy resources in Nigeria can play significant role in transforming the Blue Economy. Investment in renewable energy sources will help to (1) reduce the carbon blue print in Nigeria's maritime sector (2) enhance healthier marine environment (3) facilitate the generation of clean energy to underserved communities (4) create more job opportunities and (5) help to diversify the overall energy supply in Nigeria.

3. Biotechnological Solutions

Bio-fouling management strategies are technology solutions aimed at combating incidence of accumulated aquatic organisms on surfaces and structures submerged or exposed to such aquatic environments. Examples are invasive aquatic species which threaten the marine biodiversity. Bio-fouling poses increased frictional resistance for vessels plying waters affected by bio-fouling. It makes it harder for vessels to maneuver and stay on course, thus increasing fuel consumption and greenhouse gas emissions. Accordingly, Nigeria needs to invest in anti-fouling and biotechnological solutions to combat the threats of bio-fouling in the maritime space.

4. Blockchain technology

Blockchain technology has been increasingly utilized in the maritime industry to enhance transparency, visibility, security, and efficiency across different domains such as supply chain management, vessel

registration, and cargo tracking. The core concept of blockchain involves a decentralized digital ledger that provides a secure and transparent way of recording transactions.

Blockchain technology can enhance maritime trade in the following ways:

i. Secure Documentation: Blockchain-based digital documentation reduces paperwork, increases transparency, and ensures tamper-proof records.

ii. Smart Contracts: Automate payment, insurance, and cargo release processes, reducing losses and improving supply chain visibility.

iii. Identity Verification: Secure authentication of parties involved in trade, reducing fraud and increasing trust.

iv. Compliance: Automated compliance with regulations, reducing errors and penalties.

v. Supply Chain Optimization: Improved data sharing and collaboration among stakeholders, optimizing routes, and reducing costs.

vi. Cargo Insurance: Blockchain-based insurance policies can be triggered automatically, reducing claims processing time and increase access to finance.

vii. Port Clearance: Streamlined port clearance processes, reducing congestion and waiting times.

viii. Data Analytics: Blockchain-based data analytics can provide insights on market trends, improving decision-making.

5. *Automation and Digitalization through Deployment of ICT Based Systems*

The Nigerian Port Process Manual (NPPM) lays much emphasis on port automation in order to minimize costs of port operations in the country, decrease the long dwell time, eliminate corruption, arrest indiscriminate dumping of empty containers and reduce perennial port congestion (Eto, 2023b).

Eighteen years after port reforms, which introduced port concession, manual processes are still being used by Nigerian Port Authority in the issuance of authority card to port users, and most shipping companies and terminal operators use manual means for cargo clearance processes. The Nigerian Customs Service rated the automation level of some shipping companies and terminal operators in the first quarter of 2021 as follows (Eto, 2023b):

Grimaldi Shipping 88%
Ocean Network: 75%
CMA CGM 60%
PTML: 92%
BUA: 75%

When a port is automated, it becomes smart and the ease of doing business would be assured.

The digitalization of maritime information exchange (which will minimize human interface) centres on the need for accuracy, safety and environmental protection. It gives the assurance that critical stakeholders are able to communicate effectively through harmonized data standards (News Desk, 2024).

The aim of an organization that implements automation and digitalization is to focus on simplifying tasks by reducing human intervention. This is highly desirable in the maritime industry because automation and digitalization of processes and procedures in the industry would mean:

i. Smart port to entrench paperless, time-saving and cost-efficient port operations;

ii. Enhancing port's smartness to optimize productivity and help to meet port users' expectations due to increased efficiency and lower port costs;

iii. Considerable reduction of human interface, along with the negative tendencies that make organizations to fall short of the required standard with attendant high trade costs;

iv. Fostering innovation;

v. Facilitation of the efficient use of maritime resources;

vi. Attraction of more investments in maritime infrastructure that would trigger sustainable industrial development and technological progress.

vii. Contributing to trade facilitation as it would help to lower trade costs, which include: shipping, demurrage, storage fees, insurance, haulage, container costs, import duty, regulatory fees, levies, taxes and corruption (Gbowa, 2024).

Furthermore, automation in the Port industry would facilitate (1) cargo management (2) information sharing (3) trade facilitation (4) transport and logistics integration (5) provision of value adding services to ships and their cargo on both seaside and landside. Automation is equally required at the inland dry ports (being part of the port system) where selected seaport activities are executed (Eto, 2023a).

The role of seaports keeps changing due to the globalized and deregulated environment, and technological changes such as containerization and the development of intermodal logistics, which emphasize door-to-door services.

Maritime Single Window: Platform for Digitalization of Maritime Information Exchange

Maritime Single Window, which is facilitated by digitalization, would boost maritime trade and help to lubricate the wheels of the Blue Economy in view of the numerous advantages. Under the Convention on Facilitation of International Maritime Traffic (FAL), which espouses digitalization

and automation, the International Maritime Organization (IMO) compels governments to adopt a unified digital platform (known as the Maritime Single Window) for exchanging information with ships during port calls.

Maritime Single Window (MSW) ensures that all necessary data is shared seamlessly and digitally between ships, ports and government agencies onshore.

Maritime Single Window: Platform to Enhance the Port Community System

The MSW would facilitate the Port Community System, which is a strategic move towards the ease of doing business as it aims to achieve (1) transparency (2) save cost (3) improve efficiency (4) make the ports more trade friendly (5) improve processing of Ship Entry Notice and ship turnaround time among other processes supporting trade operations.

6. Data Analytics

This has to do with utilizing data analytics and visualizing tools to gain insights on markets trends, optimizing routes and improving supply chain management.

7. Cyber-security

Ensuring the security and integrity of digital systems and data to prevent cyber threats and protect sensitive information.

8. Internet of Things (IoT)

This involves integrating IoT sensors and devices to monitor vessel performance, cargo conditions, and environmental factors.

9. Artificial Intelligence (AI)

Applying AI algorithms to predict maintenance needs, optimize vessels performance, and enhance decision-making.

10. 5G Connectivity

This entails leveraging high-speed, low-latency 5G networks to enable real-time communication, monitoring, and control.

2.3 Challenges Associated with Adopting Technological Changes

In the view of Sinay Maritime Data Solution (2023), inasmuch as the International Maritime Organization (which is the main

regulator for the shipping industry) is committed to developing a regulatory framework, there are other extraordinary challenges associated with the development of maritime technologies, which include:

1. Unlocking the full potential of the new technologies may be challenging for some companies, particularly small and medium-sized enterprises (SMEs), as digital transformation requires specific and costly resources.

2. The inability of regulations to fall in step with modern technology, policies will obstruct innovations.

3. With the increased use of connectivity, one critical aspect is to ensure that all digital systems are secure and protected against cyber risk. As a matter of fact, cyber-attacks can result in major financial and operational losses. This is particularly true with respect to technologies such as autonomous vessels.

4. The industry still suffers a lack of technical expertise when it comes to implementing emerging technologies, as well as understanding and assessing the safety and security implications. Governments, port authorities, shipping company and other transport leaders have to promote marine science technology knowledge sharing at a global level.

2.4 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 technology on logistics and supply chain management. The author focuses mainly on secondary data for collecting data relating to various technologies used in logistics and supply chain management. The author arrives at the conclusion that technology is a medium to enhance supply chain competitiveness and performance by optimizing the overall effectiveness and efficiency of logistics system.

Additionally, Heaver (2015) examines the effects of information technology on port performance in Nairobi (Kenya). Data was drawn from 10 firms in the logistics industry 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 logistics firms in Nairobi. The author identifies the significant impact of information technology on port operations with the assurance of guaranteeing profitability and growth. In another study, John and Saxe (2017), confirm the effect of information technology on port's warehouse management. With Jomo Kenyatta University of Agriculture and Technology as the case study, the authors use descriptive research design. The target population was 930 from which a sample size of 50 was drawn. The sampling technique used was the stratified random sampling method. Data was collected using questionnaire and informal interviews. Result indicates that information technology has positive effect on port's warehouse management. Similarly, Somuyiwa and Adebayo (2011), also analyze the impact of ICT on logistics activities of shipping companies in Southwestern Nigeria. Both descriptive and inferential statistics were utilized to analyze the data. Findings from the study reveal that ICT has strong correlation with logistics activities.

3. METHODOLOGY

The study used cross-sectional survey design on a population that included exporters, importers, freight forwarders, haulage and logistics companies, and seaport terminal operators. Simple random sampling technique was used owing to its ease of use and accuracy of representation. In order to analyze the data gathered, descriptive statistics was used.

3.1 Population of the study

S/N	Respondents	Population
1	Importers	302
2	Exporters	175
3	Freight forwarders	68
4	Haulage/Logistics Companies	38
5	Seaport Terminal Operators	20
	Total	**603**

Source: Researchers Computation, (2024)

The study used primary and secondary sources of data. Questionnaire and structured interview were the instruments used for sourcing primary data. The study adopted the Taro Yamane formula to determine 264 as the sample size, out of population of study of 603.

In determining the sample size for this research, the Taro Yamane's formula given as *(equation. 1)* was used:

$$n = \frac{N}{1 + N(e)^2} \quad \text{... (equation 1)}$$

Where:

n = sample size
N = population size (603)
e = level of significance (our level of significance is chosen at 5%)

Applying the formula at significant level of 5%;

$$\frac{603}{1 + 603(0.05)^2}$$

$$\frac{603}{1+1.5075}$$

$$\frac{603}{1+1.51}$$

$$\frac{603}{2.51}$$

$$= 240$$

Therefore, the sample size = 240. However, 24 (i.e.10%) is added to accommodate non-response and this brings the sample size to 264. From the above calculated value, a sample size of 264 was drawn at 95% confidence level and 0.05 error rate.

3.2 Sample Size Determination

The sample size for the study was 264. Below are the numbers of questionnaire that were administered to each group of respondents. Probability proportional to size (PPS) method was employed in selecting the sample size of respondents from each of the selected group of respondents. Probability proportional to size is a sample selection method in which the probability of selection for a sampling unit is directly proportional to a size measure. This was utilized in order to have an equal sample size representation and adequacy of the respondents in each of the group of respondents. The formula used to achieve this representation from each group of respondents is as follows:

Number of questionnaire $\times$ population of each group of respondents

Grand total

Table 2: Sample Size Determination

S/N	Respondents	Population	Proportion	Sample size
1	Importers	302	$\frac{264\,(302)}{603}$	132
2	Exporters	175	$\frac{264\,(175)}{603}$	76
3	Freight forwarders	68	$\frac{264\,(68)}{603}$	30
4	Haulage/Logistics firms	38	$\frac{264\,(38)}{603}$	17
5	Seaport Terminal Operators	20	$\frac{264\,(20)}{603}$	9
	Total	**603**		**264**

Source: Researcher's Computation (2024)

4.0 RESULTS AND DISCUSSION

4.1 Summary of Questionnaire Distributed

The questionnaire distributed and the number of copies retrieved is presented in Table 3.

Table 3: Copies of Questionnaire Administered

Number of copies of Questionnaire Distributed	Number of copies of Questionnaire Retrieved	% of Copies of Questionnaire Retrieved
264	**258**	**97.72**

Source: *Field survey* (2024)

A total of 264 copies of the questionnaire were distributed to major stakeholders in the maritime transport sector. 258 copies were returned to represent 97.72% response rate as shown in the Table above.

4.2 Socio-economic Characteristics of Respondents

Table 3: Demographic Analysis of Respondents

Characteristics	Frequency	Percentage
Male	145	56
Female	113	44
Total	**258**	**100**

Source: Field survey (2024)

The gender distribution of the respondents is shown in Table 3. The distribution shows that 145 or 56% of the respondents were male while 113 or 44% were female. This shows that majority of the respondents were male.

Table 4: Age Distribution of Respondents

Age	Respondents	Percentage (%)
Less than 18	9	3.49
18-35	78	30.23
36-64	128	49.61
Above 65	43	16.67
Total	**258**	**100**

Source: *Field survey* (2024)

The age distribution in Table 4 shows that the number of respondents who were less than 18 years of age was 9 or 3.49%. Those whose age fell into the age bracket 18-35 years were 78 or 30.23%. Those who fell within the 36- 64 years range were 128 or 49.61%, and they happened to be the majority. The respondents whose age was above 65 years were 43 or 16.67%.

Table 5: Educational Level

Educational Level	Respondents	Percentage (%)
Primary	5	1.94
Secondary	29	11.24
Tertiary	224	86.82
Total	**258**	**100**

Source: *Field survey* (2024)

The formal education of respondents as shown in Table 5 shows that all the respondents attained various degrees of formal education. Those who only attained Primary School education were 5 or 1.94%. Those who attained Secondary School education were 29 or 11.24% and the majority of the respondents, who happened to attained Tertiary education, were 224 or 86.82%.

Table 6: Occupation Distribution

S/N	Occupation	Respondents	Percentage
1	Importers	131	50.78
2	Exporters	75	29.07
3	Freight forwarders	29	11.24
4	Haulage/Logistics firms	17	6.59
5	Seaport Terminal Operators	6	2.32
Total		**258**	**100**

Source: Researcher's Computation, (2024)

The occupation distribution shown in Table 6 indicates that 131 or 50.78% were importers. Exporters were 75 or 29.07%. Freight forwarders were 29 or 11.24%.

Haulage/Logistics firms were 17 or 6.59% and Seaport Terminal Operators were 6 or 2.32%.

Table 7: Status Distribution

Status	Respondents	Percentage (%)
Top-Level Management	83	32.17
Senior-Level Management	144	55.81
Junior-Level Management	31	12.02
Total	**258**	**100**

Source: Researchers Computation (2024)

The status distribution of respondents shown in Table 7 indicates that 83 or 32.17% were Top-Level Management. Majority of the respondents, who were 144 or 55.81%, fell within the Senior-Level Management while those who were of the Junior Management cadre were 31 or 12.02%.

4.2 Discussion of Results

Objective 1: Identify the various unethical practices and gaps that hinder efficiency of maritime trade in Nigeria.
Respondents identified the following as constituting the various unethical practices and other gaps that hinder efficiency of maritime trade in Nigeria:

Unregulated Activities

a. Cabotage violations: Foreign vessels engaging in domestic coastal trade;
b. Illegal bunkering: Unauthorized fuel sales to vessels;
c. Smuggling: Contraband goods evasion;
d. Piracy and sea robbery: Inadequate checked against maritime crime;
e. Unregistered vessels: Non-compliant ships operating in Nigerian water.

Regulatory Gaps

In the view of the different categories of respondents, the absence of well-articulated policy, regulatory framework and viable blue print for driving the Blue Economy in Nigeria are hindering maritime trade and the following are the offshoot.

a. Inadequate enforcement of maritime laws and regulations.
b. Lack of standardization in port operations;
c. Insufficient safety and security measures;
d. Inefficient cargo clearance processes;
e. Limited oversight of shipping agencies.

Corrupt Practices

a. Bribery and extortion: Unauthorized fees and charges;
b. Clearance facilitation fees: Illegal payments for speedy clearance;
c. Fake documentation: Forgery of shipping documents;
d. Over-invoicing and under-invoicing: Fraudulent cargo valuation;

e. Collusion between officials and operators.

Safety and Environmental Concerns

a. Non-compliant vessel operations;
b. Inadequate waste management;
c. Pollution from oil spills and ballast water;
d. Lack of emergency response planning.

Other Issues

a. Inadequate infrastructure: Poor port facilities and equipment;
b. Inefficient logistics: Congested ports and delayed cargo clearance;
c. Limited human capacity: inadequate training and expertise;
d. Inadequate funding: Insufficient investment in maritime infrastructure;
e. Lack of coordination: Inter-agency conflicts and overlapping responsibilities.

Objective 2: Establish the relationship between investment in modern technologies and maritime trade in Nigeria

To establish the relationship between modern technologies and maritime trade in Nigeria, respondents opined that investment in the former would lead to the following indices of efficient maritime trade:

1. Efficient cargo handling and management
2. Improved vessel traffic management
3. Enhanced navigation and safety
4. Increased transparency and accountability
5. Better supply chain management
6. Reduced paperwork and documentation
7. Improved cargo tracking and monitoring
8. Automated data collection and analysis in a centralized system, enabling better decision-making and more efficient use of resources

Objective 3: Identify the particular modern technologies appropriate for optimizing maritime trade in Nigeria.
In their various responses, respondents agreed that investing in the following modern technologies would optimize maritime trade in the country:

- ✓ Radio Frequency Identification (RFID)
- ✓ Automation and Robotic technology
- ✓ Internet of Things (IoT)
- ✓ Automatic Identification System (AIS)
- ✓ Artificial and Augmented Intelligence
- ✓ Electronic Chart Display and Information Systems (ECDIS)
- ✓ Blockchain and distributed ledger technology

Objective 4: Highlight the key performance indicators of maritime trade in Nigeria.
100% of the respondents were unanimous in identifying the following as the key performance indicators of maritime trade in Nigeria:

(1) Favourable balance of trade; (2) access to larger international markets, (3) reduced production costs due to economies of scale, (4) diversified supply chains and (5) numerous employment opportunities for local maritime businesses.

Objective 5: Identify the benefits of technological advancement in maritime trade in Nigeria.

100% of the respondents were of the view that the deployment of modern technologies in Nigeria's maritime trade would result in the following benefits:

(1) Increased efficiency and productivity (2) integrity, transparency and accountability in official transactions (3) reduced costs and improved competitiveness of Nigeria's seaports with ports of neighbouring countries (4) enhanced security and safety (4) much desired ease of doing business (5) improved customer experienced and (6) improved competitiveness (6) Better compliance with international regulations.

Objective 6: Highlight the most important steps for Government to take towards repositioning the maritime sector in Nigeria. Respondents were of the opinion that Government must address the issue of the absence of well-articulated policy, regulatory framework and viable blue print for driving the Blue Economy in Nigeria. They were of the view that when and if Government takes this essential step, it would inspire private sector participation and encourage investors to be committed to the adoption of modern technological advancement in the maritime sector for maritime trade to receive the desired boost.

Objective 7: Identify the constraints against investment opportunities in the Maritime Sector in Nigeria

Respondents were of the view that the constraints that face investment opportunities in the maritime sector in Nigeria are summarized as follows:

1. Irreconcilable differences among the association of ship owners
2. Government disregard for investment agreements; no respect for investment agreements
3. Lack of sincerity and transparency in executing recommendations when there is need for policy review
4. Lack of access to financing scheme such as the Cabotage Vessel Financing Fund
5. Port hinterland connectivity is inefficient
6. Security challenges and the incessant piracy attacks in the maritime domain
7. Lack of transparency, favouritism and nepotism discourage investors
8. Poor supervisory/regulatory functions of government agencies; improper enforcement of government policies
9. Political considerations and undue government interference
10. Poor maritime arbitration system
11. Draft restriction does not allow big vessels to berth in many of the ports, except for the recent Lekki Deep seaport
12. Inconsistency in policy implementation

Objective 8: Identify the challenges confronting the maritime sector in Nigeria which modern technologies would help to resolve.

According to respondents, the challenges facing modern technology adoption in Nigerian sector are:

1. Infrastructure limitations
2. High cost of implementation
3. Limited technical expertise
4. Cyber-security concerns
5. Regulatory frameworks
6. Resistance to change
7. Power supply and connectivity.

5. CONCLUSION AND RECOMMENDATIONS

In conclusion, therefore, in order to optimize maritime trade in Nigeria, the deployment of modern technologies and innovation are imperative and this would, among others things, translate to embracing automation and digitalization of procedures. The adoption of appropriate technologies in the maritime industry has several benefits as the study shows and it would help to checkmate the identified unethical practices and gaps that hinder efficiency of maritime trade in Nigeria. Against this background therefore, the following recommendations have been made in order to optimize maritime trade in Nigeria and to make maritime businesses to contribute to a more efficient, secure and ecologically balanced Blue Economy. Based on the above findings, the following recommendations are hereby suggested.

1. All maritime industry stakeholders should foster an environment that supports innovation and which embrace new technologies.
2. It is essential that maritime regulations keep pace with new technologies, by ensuring that the policies in force do not impede innovation while still maintaining safety and security standards**.**
3. The above point requires close collaboration between all industry players, namely international and national policymakers, private and public professionals, and technology developers.
4. The Government of Nigeria should brace up to invest in modern technologies to get Nigeria ready to receive ultra large vessels at the seaports.
5. The Federal Government must recognize the various sectors of the maritime industry that require smart operational procedures, which can be enabled by modern technologies such as AI, IoT, and block chain and make necessary provisions for investment accordingly.
6. The Federal Government of Nigeria should ensure that the seaports adopt modern technologies and encourage them to subscribe to full digitalization and automation in order to make the Maritime Single Window optimally functional for efficient maritime trade.

Reference

Anthony, B. (2024). $296bn Blue Economy Achievable, say Experts. The Nation Newspaper.https://thenationonlineng.net

Bhandari, R. (2017). Impact of Technology On Logistics And Supply Chain Management. *Journal of Business and Managemen*t (IOSR-JBM).; 19-24.

Business and Maritime West Africa (2019, March 25). Deep Blue Project will End Criminalities in Nigeria's Maritime Domain – FG.

Dentons, A. (2024). The Role of Technology in Nigeria's Blue Economy. https.www.dentonsacaslaw.com.

Eto, G.M. (2021). Maritime Transport in Nigeria. Heavens Rule Heritage Ltd.

Eto, G.M. (2023a). The Principles and Practice of Port and Shipping Operations in Nigeria. Heavens Rule Heritage Ltd.

Eto, G.M. (2023b). The Performance Appraisal of the Inland Dry Ports of Nigeria. Unpublished thesis. University of Port Harcourt.

Gbowa, G. (25, July 2024). Akutah Says Nigerian Ports Have Achieved 90% Automation. Pinnacle Time.

Gillsater, B. (2018). The Potential of the Blue Economy. Worldbank.org.

Heaver (2015). Increased collaborative relationships in international logistics: Canadian and other national and corporate examples", *Maritime Policy and Management*, Vol. 42/3.

Jeevan, J. (2016). The Role of Malaysian Dry Port in the Container Seaport. PhD thesis, University of Tasmania, Australia.

John, C. and Saxe, S. (2017). Digitalization of Seaports - Visions of the Future. Fraunhofer Center for Port operations and Services (CML), 28-32.

News Desk (2024, February 1). Digitalization in Maritime Trade Will be Accelerated with the Maritime Single Window – IMO.

Ogoun, P.M. (2022). Maritime Transport as a Tool of Economic Growth of a Nation (Nigeria). European Journal Science, Innovation and Technology, 2 (3), 75-80.

Onwuamaeze, D. (2022). Expert Task NBS on Proper Capturing of Maritime Sector Contribution to GDhttps://www.thisdaylive.com/index.php/2022/09/01/expert-task-nbs-on-proper-capturing-of-maritime-sector-contribution-to-gdp/Sinay Maritime Data Solution (2023). Maritime Trade. https://sinay.ai/en/maritime-glossary/maritime-trade/

Shipping Position (2019, August 19). Maritime Safety: Intelligence Gathering Operations Commences at NIMASA C4i Centre.

Somuyiwa, A. O. and Adebayo. T. (2011). Analysis of Information and Communication Technologies (ICT) usage on logistics activities of sea ports companies in Southwestern Nigeria. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)*, 2(1): 66-72.

The Federal Ministry of Marine and Blue Economy (2024). Strategy Retreat on the Road Map and Strategic Plan for the New Federal Ministry of Marine and Blue Economy, Abuja. 11th -13th January, 2024.