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Barriers to Technology Adoption Among Maritime Industry Stakeholders in Nigeria

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Abstract

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MPhil, Walden University, 2020

MS, State University of New York, Maritime College, 2015

BS, Thomas Edison State University, 2013

Dissertation Submitted in Partial Fulfillment

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Abstract

A literature gap exists regarding why Nigerian maritime industry stakeholders remain slow to accept new technologies to improve the maritime sector's capacity to drive national sustainable development. The purpose of this qualitative single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. A single case study with an embedded unit design was used to address the literature gap, and qualitative data from 12 semi-structured interviews, reflective field notes, and archival data were collected to provide answers to the central research question. This study was framed by Yang's concept of maritime shipping digitization and Wiafe et al.'s concept of technology acceptance in the maritime industry in developing countries. Thematic analysis of data from the interviews revealed 16 themes encased in the following five coding categories: (a) technology adoption standards as compared to global industry standards, (b) barriers to technology adoption and maritime digitization, (c) technology acceptance factors influencing maritime industry stakeholders, (d) resources needed for new technology adoption to meet global industry standards, and (e) how Nigeria's maritime sector can drive national sustainable development. The results of this study have the potential to promote positive social change by offering recommendations on how the Nigerian maritime sector may contribute to national sustainable development through reforms and strategic responses related to the adoption and use of updated technologies.

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Dedication

This study is dedicated to God my Father in heaven for the inspiration, direction, and support in this journey. I also dedicate this study to my mother, Cecilia Ikpogu and my late father, Anthony Ikpogu who inspired me to pursue higher goal of academic excellence – I am grateful for instilling in me and my siblings the value of education, perseverance, and hard work. Finally, I would like to dedicate this dissertation to my family, siblings, professional associates, and friends who understood and supported me through this journey to achieve this personal and professional goal.

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Chapter 1: Introduction to the Study

A lack of updated technology is one of the most significant challenges for the maritime industry's digitization in Nigeria, which accounts for over 60% of total seaborne traffic in volume and values in West and Central African regions (Ajibo et al., 2019; Dahou & Chalfin, 2020). Nigerian maritime industry stakeholders' key business goal is to link maritime transportation and the government's national sustainable development strategies (Chidi et al., 2020; Raimi, 2019). The continued use of outdated technologies in the Nigerian maritime sector has led to weak national revenue mobilization and infrastructure problems in the nation's seaports (Ali & Odularu, 2020). Lack of updated technology acceptance among Nigerian maritime industry stakeholders may have driven the sector's weakened capacity to drive national sustainable development (Faith, 2019; Onugha & Onuoha, 2019). Full capacity use in the Nigerian maritime sector is necessary to achieve a higher rate of output, employment, income, investment, best use of capital resources, and a continuous supply of goods (Bueger et al., 2020; Chidi et al., 2020).

A literature gap exists in identifying the barriers to accepting updated technology in the Nigerian maritime industry (Onugha & Onuoha, 2019). The lack of research in the Nigerian maritime industry has left an information gap for policymakers on technology adoption and acceptance in this specific context (Aluko & Odularu, 2019). Given the low rate of effectiveness, efficiency, and productivity of the Nigerian shipping industry in comparison to accepted global maritime practices (Ekeada et al., 2018; Uche et al., 2018),

a more in-depth understanding is needed of why Nigerian maritime industry stakeholders remain slow to accept new technologies (Aluko & Odularu, 2019; Onifade, 2020).

In this chapter, I present the background literature leading to the formation of the problem statement and description of the gap in the scholarly literature. I present a logical alignment between the problem statement, the purpose of the study, the research question, and the study's conceptual framework. Points of significance, assumptions, limitations, and definitions of key terms used throughout are also presented.

Background of the Study

Advances in technology in various industries have led to increased product and process flexibility, quality, and efficiency measures such as delivery, lead time, inventory, return on equity, set-up time, consistency, and reliability, all of which have improved competitiveness (Ellingsen & Aasland, 2019). The Nigerian maritime industry faces challenges of technology adoption for improved efficiency due to lack of technical capacity to produce high-tech equipment used in the industry, and this has undermined the coastal and inland shipping (cabotage) regulation that aims to transfer technology to Nigerians (Ajibo et al., 2019). Nigeria's location could benefit strategically from the maritime trade along the coast of West Africa and the Gulf of Guinea; however, these challenges impede the full realization of the maritime industry's capacity to boost the Nigerian economy. Tapping into the gains provided by technological advancement would translate to economic growth from the industry (Chidi et al., 2020).

The maritime industry's productivity in Nigeria is impacted by inadequate infrastructure that undermines port services' efficiency and effectiveness (Ekeada et al.,

2018). Technology adoption in the industry may enhance Nigeria's economic trajectory and digital trade facilitation in the era of Industrial Revolution 4.0, where labor-intensive manufacturing processes are giving way to artificial intelligence (AI) and robotics (Odularu, 2020). The Nigerian maritime players could adopt global maritime policies to increase productivity by focusing on four key areas of maritime governance: (a) ports, (b) offshore exploitation, (c) security, and (d) environment (Dahou & Chalfin, 2020). Transforming the industry will address some of Nigeria's challenges, such as the legal and regulatory framework, marine pollution, safety and security, workforce development, and funding (Faith, 2019).

The Nigerian maritime industry is vital to the country's socioeconomic development as it provides enormous employment opportunities and income to the nation. Effective change management needs technology acceptance to improve organizational effectiveness in the maritime industry in Nigeria (Onugha & Onuoha, 2019). Adopting information and communication technology (ICT) will facilitate communication between interrelated actors in the maritime industry and provide maritime monitoring authorities with an effective means of administering taxes and other financial activities (Wiafe et al., 2019). Technology acceptance could also address some problems and challenges in the industry, such as:

> insecurity, inadequate infrastructure, bureaucracy, weak laws, corrupt practices, inadequate capital for investment and maintenance of ships, poor incentives for investors, lack of indigenous carrier vessels, sea unworthiness of such indigenous

vessels where they are available, and poorly integrated water transport systems (Chidi et al., 2020, p. 6).

The vast area of water along the coast of Nigeria provides opportunities for fisheries, natural and mineral resources exploitation, and water transport. The sector's enormous economic potential calls for developing new international policy instruments to secure the seas and promote blue economy growth across Africa's coastal areas (Dahou & Chalfin, 2020). Effective change management is needed to harness the enormous resources and reoccurring challenges facing 21st-century managers in building organizational effectiveness (Onugha & Onuoha, 2019). Tapping into the current global conversion to digital trade will immensely root out malpractices within the maritime industry and improve operation efficiency, raising the nation's gross domestic product (GDP) (Odularu, 2020).

In terms of operations management within the maritime industry, digital technologies offer potential to improve integration between stakeholders and support information sharing, communication, and managerial processes (Agrifoglio et al., 2017). Digital technology is a significant driver for organizational efficiency and effectiveness. An example of technology that has boosted efficiency in the industry is the Nigeria Integrated Customs Information System (NICIS). NICIS is used by Nigerian Customs to ensure compliance with international regulations, surveillance on all ships, and improved operational efficiency in the industry (Wiafe et al., 2019). Digital technology is a vital infrastructure and access unlocks the potential for growth, wealth, and jobs in delivering the benefits of global trade (Ali & Odularu, 2020).

The shipyard's technological infrastructure is a critical factor in the maritime industry's realization of its cabotage objective, which requires cabotage vessels to be 100% owned by Nigerians, 100% manned by Nigerians operating from a 100% built-in Nigerian shipyard, and registered in Nigeria (Ajibo et al., 2019). For an efficient maritime supply chain, blockchain technology—a decentralized, shared, encrypted repository database—facilitates maritime logistics by providing shipping companies, port operators, freight forwarders, shipping agencies, and other maritime shipping supply chain operators with real-time tracking of cargo status, improving visibility in the global supply chain and reducing customs clearance time, costs, and risks (Yang, 2019). Lack of research regarding the reasons for inadequate technological infrastructures is a challenge that weaken the capacity of the maritime transportation industry in Nigeria to play a critical role in the economy and growth of the nation (Faith, 2019).

Problem Statement

The use of updated technologies continues to be one of the most significant challenges of the maritime industry's digitization in developing countries of Africa (Dahou & Chalfin, 2020; Yang, 2019), including Nigeria, which accounts for over 60% of total seaborne traffic in volume and values in West and Central African regions (Ajibo et al., 2019). Nigerian maritime industry stakeholders' key business goal is to create a link between maritime transportation and the government's national sustainable development strategies (Chidi et al., 2020; Raimi, 2019). Even though the Nigerian government has initiated programs for the digitalization of the maritime industry (Odularu, 2020), the continued use of outdated technologies in the sector has led to poor

national revenue mobilization and weakened Nigerian infrastructure seaports (Ali & Odularu, 2020). Maritime industry challenges in Nigeria may be due to problematic attitudes and behaviors regarding the acceptance of updated technology among industry stakeholders in various African nations (Wiafe et al., 2019). The social problem is low technology acceptance and use among Nigerian maritime industry stakeholders has led to the maritime sector's weakened capacity to drive national sustainable development (Faith, 2019; Onugha & Onuoha, 2019).

Research into technology acceptance has been focused predominantly on ICT usage in Nigeria in the educational sector (Yakubu & Dasuki, 2019), the hotel industry (Olugbemi et al., 2020), and e-banking (Omokugbo & Festus, 2020); there is inadequate empirical research on technology acceptance in the maritime industry (Wiafe et al., 2019). A literature gap exists in identifying the barriers to accepting updated technology in the Nigerian maritime industry (Onugha & Onuoha, 2019). Given the low rate of effectiveness, efficiency, and productivity of the Nigerian shipping industry in comparison to accepted global maritime practices (Ekeada et al., 2018; Uche et al., 2018), a more in-depth understanding is needed of why the Nigerian maritime industry stakeholders remain slow to accept new technologies (Aluko & Odularu, 2019). The specific management problem is that the barriers to technology acceptance among Nigerian maritime industry stakeholders continue to weaken the maritime sector's capacity to drive national sustainable development remain poorly understood (Chidi et al., 2020; Nsan-Awaji, 2019).

Purpose of the Study

The purpose of this qualitative single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. The findings of this exploratory study may address the literature gap on why Nigerian maritime industry stakeholders remain slow to accept new technologies for improving the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). To address this gap, and aligning with the qualitative paradigm, I used a single case study with an embedded unit design (Yin, 2017). Information from 12 semistructured interviews, reflective field notes, and archival data were collected through multiple sources to answer the research question (Stake, 2010; Yin, 2017). I used triangulation of data sources to establish the trustworthiness of the researcher's analysis and findings on the phenomenon under study (Guion et al., 2011; Merriam & Tisdell, 2015).

Research Question

How do Nigerian maritime industry stakeholders describe their barriers to technology acceptance?

Conceptual Framework

This empirical investigation aimed to advance research and understanding of the challenges stakeholders face in maritime industry digitization in developing African nations. This study was framed by two key concepts that focus on aligning with the purpose of the study to gain a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders: (a) Yang's (2019) maritime

shipping digitization and (b) Wiafe et al.'s (2019) concept of technology acceptance in the maritime industry in developing countries. Both concepts formed the study's framework in relation to the maritime industry (Wiafe et al., 2019; Yang, 2019), originating in theoretical studies extending Rogers's (1995) innovation diffusion theory, which provided a theoretical lens to evaluate the effect of the three factors of (a) culture, (b) policy, and (c) cost in any research related to ICT adoption. Roger's diffusion of innovations (DOI) theory as an extension of unified theory of acceptance and use of technology (UTAUT) and technology acceptance model (TAM) is discussed further in Chapter 2.

Maritime Shipping Digitization

With the progress of international trade and globalization and an increasingly turbulent environment (Chang & Lai, 2017), shipping remains the principal global trade transportation model providing low-cost, efficient transportation services while concurrently operating with mostly outdated delivery processes (Lieber, 2017). Given this background research, Yang (2019) defined the concept of maritime shipping digitization as using disruptive technologies to reduce transportation costs and shape global trade prospects and provide companies with a higher degree of competitive advantage. Yang (2019) applied the TAM to explore potential applications and future improvements to maritime digitization. Maritime informatics is a new research stream, and scholars contribute to this research gap by analyzing the acceptance of updated digital technologies for logistical and security operations within the maritime sector (Olagunju et al., 2020).

Technology and the Maritime Industry in Developing Countries

Wiafe et al. (2019) wrote that the concept of technology acceptance in the maritime industry remains loosely defined, given that research in maritime informatics is still early (Bueger et al., 2020; Watson & Lind, 2016). Wiafe et al. (2019) explained the results of their research on technology acceptance in the maritime industry in Ghana, the first research of its kind within the context of a developing African nation, using UTAUT (Venkatesh et al., 2003). Digital technologies have the potential to improve integration between stakeholders and support information sharing, communication, and managerial processes, and researchers who have examined technology acceptance adopted several theoretical views to investigate these factors (Wiafe et al., 2019).

Nature of the Study

In this qualitative study, I sought to address the study's purpose and provide data for answering the central question. As a researcher, I chose to ground this study in the constructivist paradigm, assuming that people, such as the study participants, construct their social reality (Denzin & Lincoln, 2005). A quantitative method was inappropriate for the study because quantitative research designs are used to examine relationships, test theories, standardize reporting, and collect quantifiable data (Harkiolakis, 2017). A mixed-methods approach was not appropriate because quantitative data would not be needed to answer the study's research question (Bryman, 2017). The research problem and the study's nature required a qualitative methodology to explore a human dilemma embedded in a complex social process (Merriam & Tisdell, 2015). Given that the study's purpose called for a deeper understanding of the barriers to technology acceptance among

Nigerian maritime industry stakeholders, an exploratory single case study with embedded units (Yin, 2017) was used to meet the study goals.

Qualitative researchers aim to explore people's lived experiences within a specific context and from a constructivist viewpoint while interpreting interactions between the individuals and the environment (Cooper & White, 2012). Qualitative research also presents opportunities to analyze business decisions and explore the reasons behind various aspects of behavior within organizations, particularly Nigerian maritime industry stakeholders (see Klenke, 2016). Qualitative case studies play a central role in the business field, which is more closely aligned with postpositivist methods than other qualitative designs, with multiple sources of data to produce an in-depth contextual body of knowledge (Eriksson & Kovalainen, 2015; Yin, 2017).

Using a qualitative approach to review additional evidence and research findings enables researchers to assess specific cases from various perspectives while relying on available data (Baxter & Jack, 2008; Stake, 1995). A single case study can be used to study individuals living in a particular social context as embedded units of the study (Yin, 2017). The unit of analysis, which may be a case study, may be a person, event, entity, or other unit of analysis (Noor, 2008), was the Nigerian maritime industry.

To identify and select information-rich cases related to the phenomenon of interest in qualitative research, I used purposeful sampling (Stake, 2010; Tracy, 2019). Although there are various purposeful sampling strategies, it appears that horizontal network sampling can be used as one of the more common forms of recruiting participants in qualitative social research (Geddes et al., 2018). Participants for this case

study were recruited using purposeful criteria and network sampling strategies and were screened with the following inclusion criteria: (a) adults over the age of 18, (b) minimum of 3 years' experience as a stakeholder in the Nigerian maritime industry, and (c) possess knowledge regarding technology challenges of the maritime industry in Nigeria (see Robinson, 2014). I conducted 12 in-depth face-to-face individual interviews with Nigerian maritime industry stakeholders and continued the interviews until data saturation occurred. Schram (2006) recommended a range of five to 10 participants for a qualitative study, stating that a larger sample size may weaken an in-depth investigation of the phenomenon under study. Data from the interview transcripts were analyzed through thematic analysis to identify themes. I triangulated interview data themes with data from reflective field notes and archival data related to the Nigerian maritime industry to support the trustworthiness of findings and make recommendations for further research (Guion et al.., 2011).

Definitions

Maritime digital technologies: Technologies such as blockchain technology, which is a decentralized, shared, encrypted repository database. This database facilitates maritime logistics by providing shipping companies, port operators, freight forwarders, shipping agencies, and other maritime shipping supply chain operators with real-time tracking of cargo status, improving visibility in the global supply chain and reducing customs clearance time, costs, and risks (Yang, 2019).

Maritime industry: Companies and organizations whose activities supply innovative products and services related to the business of designing, constructing,

manufacturing, acquiring, operating, supplying, repairing and/or maintaining vessels, or parts thereof; of managing and/or operating shipping lines and customs brokerage services, shipyards, dry docks, marine railways, marine repair shops, shipping, and freight forwarding services and similar enterprises (Benson & David, 2018).

Maritime industry stakeholders: Shippers, carriers, terminal operators, intermediaries, industry organizations, fishers, and maritime workers union members within the maritime sector. Also included as maritime stakeholders are government agencies responsible for maritime administration, policymakers, and local communities hosting a national or regional maritime industry (Future Industry Workers, 2020).

Maritime shipping digitization: Blockchain-based technology applications that facilitate maritime shipping records by keeping real-time track of the status of cargo, improving visibility in the global supply chain and reducing customs clearance time, costs, and risks (Yang, 2019).

Seaport infrastructure: Wharves, berths, jetties, warehouses, hard-stand facilities, roads, rail spurs, and other infrastructure support mechanisms to facilitate the movement and storage of customer cargo and commodities (Ali & Odularu, 2020).

Sustainable development: The ecological, social, and economic consequences of business activities (Singh et al., 2018).

Technology acceptance: Critical factors and contingencies that predict behavioral intention to accept and use a technology (Venkatesh et al., 2003).

Unified theory of acceptance: The technology acceptance model used to explain user intentions to use an information system and consequent usage behavior (Venkatesh et al., 2016).

Assumptions

The focus of this study was on revealing barriers to technology adoption in the maritime industry in Nigeria. Assumptions in research refer to a researcher's beliefs that can influence or shape the study; assumptions should be thoughtfully examined to ensure they do not lead to questionable results or findings with a low level of trustworthiness (Tracy, 2019). In this study, the first assumption was that the lack of adequate technological infrastructure undermines the maritime industry's efficiency and effectiveness to deliver to its potential. The second assumption was that maritime stakeholders are reluctant to adopt the necessary technology due to the transparency technology offers. The third assumption was that those study participants who participate in interviews would be unbiased and free from any subjectivity based on assurances of their responses' confidentiality.

The fourth assumption was that the research participants would provide open and in-depth accounts of their experiences about barriers to technology adoption in the industry. The fifth assumption was that the research participants would be knowledgeable of the subject under study and provide clear and candid answers to the interview questions related to the maritime industry. The sixth assumption was that the participants would give accurate and transparent information relevant to the study and provide accurate and helpful quality data. The seventh assumption was that interview data from

the participants would be accurately recorded and transcribed. The eighth assumption was that the qualitative data analysis tools used to synthesize and analyze the qualitative data would be the most appropriate and effective tools for unraveling the purpose of the study and yielding accurate results.

Scope and Delimitations

This study's specific scope was maritime industry stakeholders' experience, about the barriers to technology acceptance among Nigerian maritime industry stakeholders. Purposeful sampling was appropriate for identifying and selecting information-rich cases related to the phenomenon of interest in qualitative research, and so it accomplished this task (Stake, 2010; Tracy, 2019). Although there are various purposeful sampling strategies, it appears that horizontal network sampling is appropriate for recruiting participants in qualitative social research (Geddes et al., 2018). Participants for this case study were recruited using purposeful criteria and network sampling strategies and screened with the following inclusion criteria: (a) adults over the age of 18, (b) a minimum of 3 years' experience as a stakeholder in the Nigerian maritime industry, and (c) possess knowledge regarding technology challenges of the maritime industry in Nigeria (see Robinson, 2014).

I conducted 12 in-depth face-to-face individual interviews with Nigerian maritime industry stakeholders and continued the interviews until data saturation occurred. The recommendation of five to 10 participants for a qualitative study to avoid the chances of weakening an in-depth investigation guided this study (Schram, 2006). To identify themes, the interview transcripts were analyzed through thematic analysis. The interview

data themes were triangulated with data from reflective field notes and archival data related to the Nigerian maritime industry to support the trustworthiness of findings and make recommendations for further research (Guion et al., 2011). The boundaries of the study include the maritime industry in developing countries of Africa. The study's findings are transferable to other transportation industries, such as air and rail transport, in Africa's developing countries.

Limitations

Limitations of a study include potential shortcomings or weaknesses beyond a researcher's control, which may be related to the chosen research design, statistical model constraints, funding constraints, or other factors that may affect the results and conclusions of the study (Theofanidis & Fountouki, 2018). The limitations of this study included accessibility to recruiting participants due to distance, Nigeria's poor internet or communication connectivity, and difficulty in participant selection due to specific inclusion criteria. Other limitations included possible biased opinions of maritime industry stakeholders, partner site agreement, possible difficulty recruiting participants for interviews, and costs associated with traveling to Nigeria from the United States to conduct the study.

A researcher's reflexivity is another factor that could affect the results of a study. Reflexivity is an attitude to systematically attend to the context of knowledge construction at every step of the research process (Lane & Roberts, 2018). Due awareness of the systematic process involved in the study prevents researcher bias that may arise from the researcher's background experience about the topic. To enhance the study's

validity, triangulation of data from various sources provided consistency in forming themes or categories (Guion et al., 2011).

Significance of the Study

Advances in ICT have provided more opportunities for digitizing the maritime industry to improve operational efficiency by applying the new technology to their operations. Evidence suggests that an information system provides a platform for communication between interconnected players in the maritime industry to be more effective (Awang et al., 2020; Reni et al., 2020; Yang, 2019) and offers opportunities for developing countries to boost economic benefits (Heeks, 2010; Kotelnikov & Kim, 2007). This study may help advance an understanding of the barriers to technology acceptance and use of updated technologies by Nigerian maritime industry stakeholders to create a link between maritime transportation and the government's national sustainable development strategies (Chidi et al., 2020; Raimi, 2019). Collected empirical data can help address the literature gap on why Nigerian maritime industry stakeholders remain slow to accept new technologies that may improve the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019).

Significance to Practice

Strong potential exists for the Nigerian maritime industry to bring about enormous economic benefits. However, to reap these benefits, the industry must operate efficiently and resourcefully (Odularu, 2020). Many scholars have used samples from industrialized countries that show different cultures and sociopolitical challenges in analyzing the role of attitude and behavioral issues in technology acceptance within the

maritime industry in Africa. Research is necessary that analyzes technology acceptance and creates frameworks that adapt to specific cultural settings or design limitations (Rahayu & Day, 2017). Most research work on technology acceptance and use in the maritime industry has taken place in industrialized countries, with only one applied study conducted in Ghana where researchers attempted to unravel these constructs' role in African countries (Wiafe et al., 2019).

In this decade, the connectivity between ships and shore will be dominated by digital technologies that will drive operational efficiency and automation and safety and security issues and reduce the environmental impact of shipping activities (Agrifoglio et al., 2017; Morrall et al., 2016). These issues are significant to practice for shipping companies and the public sector in offering new business opportunities to software-house and information system developers employed in the maritime industry (Pahl & Cordova, 2020).

The lack of research in the Nigerian maritime industry has left an information gap for policymakers on technology adoption and acceptance in this specific context (Aluko & Odularu, 2019). Offering empirical data and professional practice recommendations by answering this study's research question may inform Nigerian business and technology leaders on the training needed to develop a technologically skilled workforce in the maritime industry (Chidi et al., 2020). Maritime employees trained on updated technologies can help support Nigeria's compliance with global maritime practices and the use of updated technology for enhanced maritime business practices (Faith, 2019).

Significance to Theory

This study may be significant in making an original contribution to the theoretical literature on barriers to technology acceptance among Nigerian maritime industry stakeholders that continue to weaken the maritime sector's capacity to drive national sustainable development (see Chidi et al., 2020; Nsan-Awaji, 2019). Updated technology adoption continues to be one of the most significant challenges of the maritime industry's digital transformation in developing countries of Africa (Dahou & Chalfin, 2020). The continued use of outdated technologies in the national maritime sector has led to low national revenue mobilization and has weakened the infrastructure of Nigerian seaports (Ali & Odularu, 2020).

The maritime industry in developing countries lags in technology adoption and is generally averse to change (Dahou & Chalfin, 2020). In Nigeria, risk aversion and the technology adoption gap across industries occur or many reasons, including the variability of a company's leadership expertise, the uniqueness and nature of specific industries, and corrupt business practices (Uche et al., 2018). In the past, scholars have attempted to measure factors of technology adoption decision using the theory of reasoned action (TRA) by Fishbein and Ajzen (1975) and quantitative methods, leading to contradictory conclusions on how the decision to deploy technology is a function of a variety of factors. Researchers have recommended the use of UTAUT as a theoretical lens to further explore the technology acceptance process in the African maritime industry in Nigeria (Hye et al., 2020; Nsan-Awaji, 2019; Venkatesh et al., 2012).

Significance to Social Change

Technology can affect social change as it drives the transformation of business practices (Andres et al., 2013). Barriers to social change through African countries' technological progress have strengthened corrupt business practices, preventing progression in the business (Amavilah, 2016). Among various countries that have seen significant variations in the rise in oil revenue, Nigeria has risen faster but has fallen behind in promoting and supporting social change, such that inequality of both income and wealth remains widespread (Elwereflli & Benhin, 2018).

Further research is required to understand the deeper causes of slow economic growth and social change in Nigeria, and the research should include innovative technology adoption to improve overall business growth in all industrial sectors, as well as the vast Nigerian maritime industry that accounts for over 60% of total seaborne traffic in West and Central African regions (Ajibo et al., 2019). The present picture of the maritime sector's economic growth and performance remains incomplete, given the lack of research documenting the voices of Nigerian maritime industry stakeholders (Fadun & Saka, 2018). This study is significant to promoting positive social change as it offers recommendations on how the Nigerian maritime sector may contribute to national sustainable development through reforms and strategic responses related to the adoption and use of updated technologies (Chidi et al., 2020; Raimi, 2019).

Summary and Transition

In Chapter 1, I identified the specific problem as the barriers to technology acceptance among Nigerian maritime industry stakeholders that continue to weaken the

maritime sector's capacity to drive national sustainable development remain poorly understood (Chidi et al., 2020; Nsan-Awaji, 2019). The purpose of this qualitative single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. The conceptual framework was based on two key concepts focused on aligning with the purpose of the study to gain a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders: (a) Yang's (2019) maritime shipping digitization and (b) Wiafe et al.'s (2019) concept of technology acceptance in the maritime industry in developing countries. A qualitative exploratory single case study with embedded units was appropriate to investigate the barriers to technology acceptance (Yin, 2017).

The study's data came from semistructured interviews, reflective field notes, and archival data and were triangulated to ensure trustworthiness in the findings. This study's findings may show that barriers to technology acceptance among Nigerian maritime industry stakeholders weaken the maritime sector's capacity to drive national sustainable development. Technology acceptance in the Nigerian maritime industry may bring about positive social change by transforming business practices and removing corrupt business practices that undermine economic growth.

In Chapter 2 of this study, I focus on the literature search strategy used to conduct a review of the current literature and the conceptual framework, synthesizing other scholars' findings on barriers to technology acceptance in the maritime industry and providing a summary of the chapter.

Chapter 2: Literature Review

The specific management problem is that the barriers to technology acceptance among Nigerian maritime industry stakeholders that continue to weaken the maritime sector's capacity to drive national sustainable development remain poorly understood (Chidi et al., 2020; Nsan-Awaji, 2019). The use of updated technologies continues to be one of the most significant challenges in the digital transformation of the maritime industry in developing countries of Africa (Dahou & Chalfin, 2020; Yang, 2019). Nigerian maritime industry stakeholders' key business goal is to create a link between maritime transportation and the government's national sustainable development strategies (Chidi et al., 2020; Raimi, 2019). Maritime industry challenges in Nigeria may be due to problematic attitudes and behaviors on accepting updated technologies among industry stakeholders in developing African nations (Wiafe et al., 2019). Scholars have identified a literature gap regarding why Nigerian maritime industry stakeholders remain slow to accept new technologies (Aluko & Odularu, 2019; Onugha & Onuoha, 2019).

The purpose of this qualitative, single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. In Chapter 2, I explain the literature search strategy and the conceptual framework that framed the research. In the literature review, I present a synthesis of knowledge and critical analysis on barriers to technology acceptance among maritime industry stakeholders in the West and Central African regions, specifically in Nigeria's local context.

Literature Search Strategy

This literature review's objective was to analyze and synthesize scholarly literature on barriers to technology acceptance among Nigerian maritime industry stakeholders. I searched databases that included the Walden University library, Google Scholar, ProQuest Central, EBSCOhost, ABI/INFORM Collection, ScienceDirect, SAGE Premier, Academic Search Complete, Business Source Complete, PsycNET, SpringerLink, and Emerald Insight. I used search engines—Google and Bing—to find peer-reviewed journal articles relevant to the study. My strategy for searching the literature included identifying essential concepts of the search, keywords, related terms, and the selection of appropriate databases.

The keywords I used in the searches included *barriers to technology adoption, fourth industrial revolution, ICT adoption, maritime digitization, maritime industry, maritime infrastructure, maritime technology, technology acceptance, technology adoption,* and *technology adoption theory*. Other key terms included *maritime industry leaders, maritime industry stakeholders, Nigeria seaports and port infrastructures,* and *policymakers*. The terms used in the search related to the research method included *case study triangulation, qualitative study, sampling strategy, semi-structured interview*, and *single case study*.

My strategy was to search for peer-reviewed journals within the last 5 years on barriers to technology adoption in the Nigerian maritime industry, including seminal works of literature and published books. I checked all articles using Ulrich's Periodicals Directory to confirm whether the journals were peer-reviewed (Grimes & Morris, 2006).

I also searched the Nigerian Maritime Administration and Safety Agency (NIMASA) websites to obtain information on the maritime industry's challenges in adopting new technologies.

In this literature review, I present a synthesis of prior research related to technology adoption barriers in the Nigerian maritime industry. I identify and document the literature gap on barriers to accepting updated technology in the Nigerian maritime industry. I also synthesize scholarly literature on the Nigerian maritime sector's state, maritime digitization, ship registry, administration, shipyard and dry dock infrastructure, and safety and security in the maritime industry. In conclusion, I summarize what is known and what is not known in the management and technology adoption literature related to the study's specific topic.

Conceptual Framework

This study was framed by two key concepts that focus on aligning with the purpose of the study to gain a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders: (a) Yang's (2019) maritime shipping digitization and (b) Wiafe et al.'s (2019) concept of technology acceptance in the maritime industry in developing countries. This empirical investigation aimed to advance research and a deeper understanding of the challenges stakeholders face in maritime industry digitization in developing African nations.

Maritime Shipping Digitization

With the progress of international trade and globalization and an increasingly turbulent environment (Chang & Lai, 2017), shipping remains the leading global trade

transportation model providing low-cost, efficient transportation services while concurrently operating with mostly outdated processes of delivering goods (Lieber, 2017). Yang (2019) defined his concept of maritime shipping digitization as using disruptive technologies to reduce transportation costs and shape global trade prospects and provide companies with a higher degree of competitive advantage. Maritime informatics is a new research stream and Yang (2019) recommended that scholars contribute to this research gap by analyzing the acceptance of updated digital technologies for logistical and security operations in the maritime sector (Olagunju et al., 2020).

Yang (2019) applied TAM to explore potential applications and future improvements to maritime digitization. TAM was developed by Davis (1989), and two pragmatic constructs (perceived ease of use and perceived usefulness) have been widely verified in various fields (Dwivedi et al., 2019). Researchers using the TAM as a theoretical lens to investigate technology acceptance in the maritime industry have found that perceived usefulness affects practitioners' decisions on technology acceptance (Agrifoglio et al., 2017; Sohn & Kwon, 2020). Using the TAM model in empirical studies on technology acceptance is recommended because of its degree of applicability of new information technology in developing countries (Kamble et al., 2019; Zayyad & Toycan, 2018).

Technology Acceptance and Use

The concept of technology acceptance in the maritime industry remains loosely defined (Wiafe et al., 2019), given that research in maritime informatics is still at an early

stage (Bueger et al., 2020; Watson & Lind, 2016). Wiafe et al. (2019) attempted to

provide theoretical propositions to answer how acceptance and use of digital systems in

the maritime industry of developing economies may lead to higher profitability for the

maritime industry through increased operations efficiency and greater safety activities.

The maritime industry is an interesting field for investigating new digital technologies

(Agrifoglio et al., 2017). Digital technologies can improve integration between

stakeholders, supporting information sharing, communication, and managerial processes,

and researchers who have examined technology acceptance have adopted several

theoretical views to investigate these factors (Wiafe et al., 2019).

Wiafe et al.'s (2019) research on technology acceptance in the maritime industry

in Ghana was the first of its kind in the context of a developing African nation using

UTAUT (Venkatesh et al., 2003). UTAUT is used to describe the variance of technology

acceptance behavior and considered organizational and social factors as drivers for

technology use behavior (Venkatesh et al., 2016). Wiafe et al. (2019) recommended the

UTAUT as a theoretical lens in investigating the maritime industry in developing

countries because scholars have been relatively successful in extending the model to

other domains to achieve desirable results (Dwivedi et al., 2019).

Authors initially grounded both UTAUT (Venkatesh et al., 2003) and the TAM

(Davis, 1989) in Rogers's (1995) DOI theory, which helps an organization to decide

whether to adopt or reject an innovative idea and is one of Rogers's significant

contribution to innovation theory. While developing DOI theory, Rogers also considered

the difference between people and innovation. Rogers (2003) defined diffusion as "the

process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 206). Rogers concluded that the rate of adoption is affected by five factors: "(i) perceived attributes of innovation (ii) type of innovation-decision (iii) communication channels (iv) nature of the social system [and] (v) extent of change agent's promotion" (p. 206).

<div align="center">**Literature Review**</div>

Maritime Industry Technological Infrastructure in Nigeria

During a visit to the minister of transport, the president of the Association of Marine Engineers and Surveyors, Charles Uwadia, expressed dismay over the state of the maritime industry in Nigeria and inferred that Nigeria's maritime sector was trailing those of developed nations by over 50 years (Uwadia, 2016). There is a lack of in-depth technical input in the maritime policies in Nigeria, and the industry is challenged in meeting international best practices and realities. The decline in standard, quality, and profitability of the Nigerian flagships is traceable to the low technical standards caused by reluctance to comply with national and international standards and regulations (Igbozurike, 2020; Uwadia, 2016).

The Nigerian shipping industry owned and operated 27 multipurpose ships in the 1980s but experienced a disastrous downturn in the early 1990s that led to the liquidation of the national carrier Nigeria National Shipping Line in 1996 (Damachi & Zhaosheng, 2005). The collapse of the Nigeria National Shipping Line, primarily due to poor management, undermined the industry's capacity to participate in international shipping and limited the industry's capacity to attain the gains expected from shipping (Buhari et

al., 2017). This collapse created a vacuum filled by foreign carriers as the indigenous private shipping companies lacked the resources and standard ships to effectively compete with their foreign counterparts in international shipping (Damachi & Zhaosheng, 2005). Maritime transportation in Nigeria could be a top revenue earner, but to achieve this, the sector must use available technology for improved maritime business to meet global maritime practices and compliance (Chidi et al., 2020).

The limitations of available shipbuilding companies are another mitigating factor in the industry (Nwokedi et al., 2019). The current Nigerian maritime industry capacity for shipbuilding, recycling, and repairs is inadequate due to several factors, such as lack of funding, lack of skill and technical know-how, excessive taxing, bureaucratic and regulatory challenges, low market patronage, lack of infrastructure and ship research centers, cost and pricing constraints among others (Nwokedi et al., 2019). These factors have affected the viability of indigenous shipping companies, shipyards, and ship repair facilities in Nigeria (Igbozurike, 2020; Nwekeaku & Atteh, 2016).

Nigeria's shipbuilding capacity cannot meet its shipping needs (Nwekeaku & Atteh, 2016). The Nigerian indigenous shipping companies' inability to build and own viable ships undermines the cabotage laws enacted to protect indigenous shipping companies from foreign domination and encourages indigenous participation. Additionally, Nigeria's shipbuilding capacity further erodes the protection of shipping infrastructure for national security, ensuring safety in the marine environment, and adding value and capacity to the local economy (Okon & Edem, 2019).

The Nigerian maritime industry's inadequate technological infrastructure for efficient and fast services accounts for low productivity in the Nigerian seaports (Ekeada et al., 2018). The lack of adequate technology enables counterproductive work behavior among maritime workers in Nigeria (Uche et al., 2018). These unproductive work behaviors include theft, fraud, falsification of documents, under declaration of goods with insider connivance, espionage, pilferage, diversion of imported goods, imported vehicles' vandalism, illegal bunkering, unsafe acts, sabotage, and poor service quality (Uche et al., 2018). The lack of adequate repair and maintenance facilities for vessels in Nigerian seaports contributes to vessels being abandoned due to the high cost of transporting to a foreign shipyard in addition to the cost of repair (Onifade, 2020). The availability of the proper technological infrastructure will immensely transform the industry in Nigeria. Nevertheless, although shipping remains the leading global trade transportation model providing low-cost, efficient transportation services, developing nations continue operating their shipping industries with mostly outdated technological processes (Lieber, 2017).

For a seaport to operate at an optimal level, the seaport must have the capacity to handle the volume of cargo traffic needed by the country (Onifade, 2020). The capacity to handle cargo traffic entails having the right cargo processing facilities and having competent personnel handle all shipping transactions to ensure optimal ship turnaround, cargo loading, and offloading to generate income (Onifade, 2020). Nigeria accounts for about 60% of the shipping activities carried out in West Africa (Chidi et al., 2020). Unfortunately, this industry is dominated by foreign vessels due to a lack of indigenous

vessels to transport goods (Ndikom et al., 2017). Between 2009 and 2012 an estimated loss of 4.1 billion to 7.5 billion dollars for ship calls to Nigeria and a loss of about 2.25 billion dollars from the export of the country's crude oil were reported (Chidi et al., 2020).

Emerging international maritime trends have posed significant challenges for shipping operations and administration in Nigeria (Ndikom et al., 2017). Moreover, maritime trade is impacted by the developments in the world politico-economic sphere, as in many other industries (Nsan-Awaji, 2019). International shipping is responsive to events in the world economic environment. A dislocation of the external environment's activities could trigger a demand for transport to be impaired or heightened (Nsan-Awaji, 2019). Generally, the world economic outlook, the trend in industrial production, and the global market determine the demand for tonnage transport in the shipping sector (Michail, 2020).

As a result of China's rising integration into the world economy, which has shaped developments in other regions, global trade growth is now linked to growth in the global gross national product, unlike before (Weinhardt, & ten Brink, 2020). Developments in China are now considered essential growth factors for the tanker, chemical, bulk, and container trade. The external environment of Nigeria's ports is increasingly more competitive. The forces of globalization and rapid advances in transport technologies and recent developments in the shipping industry have impacted ports' operations and their bargaining position relative to shipping lines (Nsan-Awaji, 2019).

Barriers to technology acceptance among Nigerian maritime industry stakeholders continue to weaken the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). Updated technology adoption continues to be one of the most significant challenges of the maritime industry's digital transformation in developing countries of Africa with weak technological infrastructure within their shipping industry (Dahou & Chalfin, 2020). The continued use of outdated technologies within the national maritime sector has led to low national revenue mobilization and weakened Nigerian seaports (Ali & Odularu, 2020).

Globalization ushered in market liberalization policies advanced by most countries and strategies and implemented by many transactional corporations to improve competition in the international trading environment (Nwokedi et al., 2019). These overarching trade policies and strategies have exerted pressure on ports a vital link in international trading logistics to improve operational performance. Advances in transport technologies and recent developments in the shipping industry have driven ports to reorganize and restructure their operations. Nigerian port authorities have also updated infrastructure through changes in cargo handling methods, port facilities, labor, management, and technology and intensified inter-port competition (Nsan-Awaji, 2019).

Maritime Industry and Economic Development in Nigeria

The maritime industry presents a substantial potential for the Nigerian economy, classified as a mixed economy considering its status as a significant oil-producing and exporting country (Igbozurike, 2020). The industry has played a vital role in the country's economic development accounting for about 95% of the vehicular means of

Nigeria's international trade. The industry is vital to the national economy as a strong catalyst for socioeconomic development that contributes immensely to Nigeria's national GDP. This GDP to the Nigerian economy is manifested through freight transportation, promotion of trade and commerce, revenue generation, creation of job opportunities varying from skilled to unskilled, institutional development, international relations, and tourism (Benson & David, 2018).

The maritime industry impacts various aspects of the marine economy, such as shipping (marine transportation/shipbuilding/ship repairing), oil and gas (minerals), fisheries/ aquaculture (living resources), and defense (Military/ Government) (McIlgorm, 2009). The maritime industry also includes marine construction, manufacturing (equipment), marine tourism (leisure services), marine services (mapping, surveying, consulting), marine research and education (Future Industry Workers, 2020; McIlgorm, 2009). An efficient maritime transport system plays a critical role in the development of the country's international trade by transforming the local markets into national, regional, and international status, allowing for economies of scale in areas that promise comparative advantage as well as the potential for generation of employment opportunities (Benson & David, 2018).

The marine economy, aka the ocean economy, is strategic to global economic growth and development as it offers excellent opportunities for global trade and commerce, and is a freeway to strategic and military dominance, and serves as a source for fish protein, energy, and minerals (Potgieter, 2018). The maritime industry plays a significant role in the economy of many nations. For Nigeria, the maritime industry is the

backbone of its economy as it is well located to benefit enormously from the maritime trade along the coast of West Africa and the Gulf of Guinea (Chidi et al., 2020). Nigeria's maritime industry has increased its revenue earning over the years, with statistics showing a reported revenue of $1.99 billion in 2009 alone on a 3% levy on freight only. An estimated 150,000 workers in the maritime sector in 2013 contributed about 40% to its GDP (Alkali & Imam, 2016).

The maritime industry accounts for 60% of total seaborne traffic in volume and values in the West and Central African regions (Ajibo et al., 2019; Dahou & Chalfin, 2020). Marine-based activities create jobs and wealth through the people and businesses directly or indirectly involved in these activities giving rise to a multiplier effect in economic activities as goods and services are interchanged from other sectors, and wages are spent (McIlgorm, 2009). The roles of maritime transportation to Nigeria's economic development are seen by its direct, indirect, and induced impact on its GDP. The direct impact includes value added to the GDP, industry revenue, and profits, the indirect include demands on goods and services needed in the industry, and the induced include the multiplier effects created by the increased purchasing power of the employees in the sector (Chidi et al., 2020).

The maritime industry is the world economy's lifeblood, as it is the power behind global trade and economic growth that handles 90% of world trade (Agabi et al., 2019). The global maritime industry ranks as the second largest industry after the oil and gas industry, and it plays a vital role in the growth, development, and transformation of the nation's economic well-being. Nigeria's location is strategic to benefit enormously from

the maritime trade within the West Africa and the Gulf of Guinea. Nigeria's strategic location offers excellent potential to translate to economic growth from the industry (Chidi et al., 2020).

The industry provides an economically and environmentally sustainable movement for cargo and passengers in remote underprivileged communities. These marginalized communities are accessible through inland waterways transportation, and the inland waterways include inland channels, rivers, lakes, waterborne traffic canals, and protected tidal waters (Emmanuel et al., 2018). Seaports at the hinterland accessible by the inland waterways provide support for economic activities in these areas and provide the vital link between sea and land transport. These ports play a crucial role in supporting local industries in safe and cheap means of exporting and importing their finished goods and raw materials and job creation, enhancing the people's social well-being (Dwarakish & Salim, 2015).

The economic impact of maritime transport is vast as it stimulates foreign trade through foreign exchange earnings via import and export of goods and provides the cheapest means of transporting many goods over a long distance. The sea is the gateway that connects the entire world: the sea provides a natural waterway that requires less investment in infrastructure, and the ships provide an opportunity to move enormous tons of freight at once (Naletina & Perkov, 2017). The maritime seaports are a significant factor in the country's economic development, expressed as GDP. Seaport is an essential sector for job creation for the people and an accelerator of the regional and national

economy by stimulating or influencing other businesses associated with the port (Zaucha & Matczak, 2018).

Technology Policy Compliance in Developing Countries

Advances in technology have significantly transformed many industries by increasing performance and achieving substantial competitive advantage (Wiafe et al., 2020). Disruptive technologies have transformed the players, patterns, and possibilities of the global economy by empowering businesses through e-commerce, 3D printing, online payments, The Internet of Things (IoT), and other technologies (Suominen, 2017). New technologies offer many benefits to goods and services to which they are applied, such as cost reduction and creating new products irrespective of where the consumers live in the world (Rodrik, 2018). Measures shall be put in place to avoid damages when information systems fail due to intrusion agents—hackers and malware software that could harm the system—when harnessing the benefits of technology in businesses in developing countries like Nigeria (Wiafe et al., 2020).

Organizations need to embrace technologies that can control and manage the risks associated with these complexes to gain a competitive advantage in an ever-dynamic world brought about by globalization, deregulation, environmental changes, technological changes, complicated financial model, and corporate governance changes (Saeidi et al., 2019). Suominen (2017) argued that technology unlocks new efficiencies and gains for companies and consumers, sharpens specialization, boosts exports, and adapts to international markets. The productivity and growth derived from technology efficiencies enable small- and medium-sized enterprises to address unemployment

challenges and poverty and limit cross-border trade in developing countries (Suominen, 2017).

The dysfunctional maritime security in the African continent has enabled illegal activities across Africa's coastal borders and has negatively impacted developmental progression in the continent (Olagunju et al., 2020). The coast of West and Central Africa is known for multinational syndicates involved in illegal bunkering; piracy; illegal, unreported, and unregulated fishing; human trafficking; narcotics; and firearms smuggling; and all sorts of insecurity, all aimed at destabilizing the region in recent times (Abiodun & Dahiru, 2020). The ICT drones can curtail the nefarious activities monitoring and policing ungoverned spaces by alerting the government when criminal activity occurs in such places (Ukwuoma et al., 2020). ICT can also serve as a tool for interagency collaboration and data gathering in ungoverned spaces in the Nigerian maritime industry.

IT has improved developments in various ways, such as living standards, a better life for all, welfare externalities, economic growth, sustainable growth, and financial access in developing countries (Asongu et al., 2019). New technologies such as Big data, GPS, drones, and high-speed communication have enabled improved extension services (Rodrik, 2018). IT is a strategic business tool that enables organizations to position for growth in the chosen marketplace, lower the cost of doing business, and enhance organizational survival (Bankole et al., 2017). A survey conducted by Bankole et al. (2017) shows that IT infrastructure is critical to the liquefied natural gas (LNG) shipping industry's sustenance by ensuring seafarers' retention who depend on IT services to

maintain contact with the outside world while serving onboard the ship for 3–6 months voyage.

The maritime industry stakeholders benefit from ICT in increasing safety and sustainability using Sea Traffic Management (STM), an information exchange infrastructure that provides predictable collaboration and shares information to enhance safety and sustainability (Lind et al., 2016). The eMAR project is another ICT developed to support the European Commission's e-Maritime initiative and develop an e-Maritime Strategic Framework and streamline further maritime operations (Morrall et al., 2016). Big data, the Internet of Things (IoT), cloud computing, and autonomous vehicles/systems are potential disruptive ICTs impacting the maritime transport and supply chains, bringing about an increase in productivity, cost reduction, and quality improvement (Balan, 2018).

Lind et al. (2016) posited that STM enables all maritime transport actors to plan and utilize their resources efficiently to enhance competitiveness. STM improves efficiency by leveraging information on shorter routes, just-in-time arrivals, shorter port calls to improve performance, and improved situational awareness in ship operations to ensure navigation safety (Lind et al., 2016). The eMAR project consists of the eMAR Ecosystem, the Inlecom i-Ship Intelligent Ship Reporting Gateway, and two specific interoperable platforms: the DANAOS Collaboration Platform and the InleMar Ecosystem that enable transmission of information to all relevant stakeholders (authorities, agents, shipmasters, off/onshore shipping company facilities) in an automated and smart manner (Morrall et al., 2016).

Challenges to Technology Acceptance in the Industry

The level of knowledge hampers technology acceptance in the maritime and related skills in technology needed to improve the industry performance (Wiafe et al., 2019). The widespread acceptance of blockchain technology, a significant driver of the digital economy, is restricted by the insufficient knowledge, awareness, and benefits that the technology provides (Upadhyay, 2020). The guiding factors to technology acceptance include the perceived usefulness, the extent to which the user believes that the technology would enhance his or her job performance, as well as the perceived ease of use, the extent to which the user believes that the technology will not require much effort to use (Liu et al., 2018). Yuan et al. (2017) argued that perceived ease-of-use of technology is directly affected by technology self-efficacy and playfulness, while perceiving ease-of-use directly affect perceived usefulness.

Wiafe et al. (2019) argued that the attitude towards use and behavioral intention to use technology include performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). Guzzo et al. (2016), in their study of e-commerce adoption, observed that social influence among users, technology usability, perceived usefulness, trust, perceived risk, and satisfaction encourage users' acceptance and frequency of using the technology. PE refers to outcome expectation, job-fit, relative advantage, and extrinsic motivation, EE refers to individuals' opinion in the ease of technology use, SI refers to other users' opinion that affects individuals' intention to use technology, and FC refers to the availability of resources for technology usage (Wiafe et al., 2019)

Advances in technology create a sense of uncertainty and loss of control among the employees; thus, the resistances and lack of support represent a major behavioral challenge to technology acceptance (Hwang et al., 2016). Human capabilities to use technology are essential to adopting new processes as new technology's practical knowledge may enhance its acceptance (Brock & Khan, 2017). Ensuring that the workforce has the essential competency for technology use will require an effective workforce and information technology (Yuan et al., 2017). Learning capabilities are essential components for innovation and adoption of new technologies, so organizational learning capabilities (OLC) should consider organizational commitment, system perspective, openness, experimentation, transfer, and integration in their technology adoption strategies (Brock & Khan, 2017).

Trust and privacy concerns are also contributory factors in technology acceptance. Mobile commerce (m-commerce) technology, for example, provides services such as asset tracking, directory and city guides, emergency services, entertainment, navigation, location-sensitive billing, and location-based advertising services, risk- and safety-related services, and traffic updates (Jang & Lee, 2018). There are also security and privacy concerns when the computing power has enormous power to modify the data, and when the participating individual wishes to remove his data. When a cyber-attack or failure happens in the system, it leads to privacy leakages and other vulnerabilities (Upadhyay, 2020). Stakeholders' interests, an intricate logistics system, and institutional diversity contribute to the identified challenges to technology acceptance, which include high cost of licensing fees for software and consultancy services, ICT training, lack of trust,

government legislation, organizational size, and infrastructural deficits (Ezenwa et al.,
2020).

The contemporary digital era of shipping, also known as Shipping 4.0, comprises
the Internet of Things (IoT) technology, Big Data Analytics (BDA), and cloud computing
(Aiello et al., 2020). This new technology requires four factors to ensure its success; the
factors include technology availability and its robustness, organizations expected benefits
and support, enabling environment and favorable policies, and security of technology
infrastructure (Lambrou & Ota, 2017). Virtual reality technology, an interactive,
immersive, and intuitive learning environment, is another contemporary technology
making inroads in various industries such as logistics and transport, manufacturing,
product design, construction, healthcare, art appreciation, and education. Wong et al.
(2017) noted that learners' receptivity to IT experience is an essential factor in reaping
these virtual reality technology benefits.

The high cost of developing, implementing, and maintaining digital systems
contributes to blockchain technology challenges in the maritime industry (Gausdal et al.,
2018). Gausdal et al. (2018) identified other challenges: the poor internet connectivity at
offshore facilities, out-of-touch decision-makers, the organization's technology-oriented
culture, the lack of investment initiatives, the low level of blockchain diffusion through
the supply chain, and risk aversion. Brock and Khan (2017) noted that certain OLC
factors must ensure successful technology acceptance, top management commitment,
shared perspective of shared identity and clear objectives, knowledge transfer and

collective learning from individuals and organizations, and an open mindset to test new ideas.

Outdated Technologies in Maritime Transportation

Digital technologies provide opportunities to improve efficiency and gain a competitive advantage (Vial, 2019). The maritime industry needs to be innovative in technology and engineering to stay competitive (Gausdal et al., 2018). Digital transformation of industries is an effective means of unlocking every nation's full potential of economic activities by tapping into the strengths of data sciences, AI, and related financial instruments that will generate development through improved efficiency and equity (Castellano et al., 2019). Data and innovation are critical to digital trade for the maritime industry. As Nigeria is a signatory to the Africa Continental Free Trade Agreement (AfCFTA), blockchain technology is now available to facilitate maritime logistics (Odularu, 2020).

Such digital facilitation of maritime logistics can provide shipping companies, port operators, freight forwarders, shipping agencies, and other maritime shipping supply chain operators with real-time cargo status tracking (Odularu, 2020). A lack of updated technology, including blockchain, can undermine Nigeria's global supply chain visibility, thereby decreasing customs clearance time, costs, and risks (see Yang, 2019). Digital technology infrastructures may create low-cost solutions in the industry. Such cost savings can drive traditional jobs to be unbundled into tasks and assigned to qualified, low-cost bidders worldwide, invariably removing middlemen (Ali & Odularu, 2020). The growth of world merchandise in 2017 and 2018 was 4.7% and 4.4%, respectively (Pahl &

Cordova, 2020); this growth could increase by adapting strategies and capabilities

provided by ICT to boost logistical capabilities. The adoption of updated digital

technologies is a critical success factor in the port industry. Empirical evidence

demonstrates that advanced knowledge infrastructures support port efficiency and

competitiveness, for example, through intelligent transport systems, such as sensors,

actuators, and platforms (Castellano et al., 2019).

Digital technology drives growth and development and supports trade creation,

efficiency, and access to the market by facilitating data movement across borders (Ali &

Odularu, 2020). Adopting updated technologies is a significant driver of change in the

operations management strategies in many fields such as automation and industrial

manufacturing, supply chain management, agile manufacturing, lean production, and

total quality management (Agrifoglio et al.., 2017). Continued use of outdated

technologies in the Nigerian maritime industry will deprive the industry of the

opportunity to increase productivity and lower the marginal cost of producing and

distributing goods and services (Ajagunna et al., 2020).

Blockchain technology provides unchangeable, decentralized, and time-stamped

record-keeping attributes critical to enhancing efficiency and improving performance if

adopted in the maritime industry (Gausdal et al., 2018). Blockchain technology in the

industry can improve efficiency and effectiveness in the maritime supply chains by

eliminating electronic and paper-based processes that undermine efficiency and create

trust in the system (Ajagunna et al., 2020). The use of outdated technology in the industry

lowers port performance from cargo handling operations, contributing to port congestion

and increasing ship operators' costs. The inadequacy of ship repair and maintenance facilities contributes to the high cost of ship repairs and ship abandonment due to the high cost of transporting to a foreign ship repair facility (Onifade, 2020). The use of updated technology will enhance the capacity-building efforts in the maritime environment comprising of a wide range of formal and informal activities, actors, institutions and policy sectors, and a potentially wide variety of issues, including government legitimacy, political stability, public participation, and community empowerment (Bueger et al., 2020).

Digital technology provides a wide range of maritime logistics and electronic data exchange applications from ship to ship and from land to ship. These applications can transform traffic, port logistics, and just-in-time shipping and improve navigation and communication efficiency, safety, and data security (Fruth & Teuteberg, 2017). Odularu (2020) argued that digital technologies reduce business operations costs by creating a global digital infrastructure that eliminates the middlemen. Traditional jobs are broken down into tasks and assigned to qualified and low-cost bidders across the globe. Digital platforms provide significant potentials for improving, monitoring, controlling, and planning port operation processes to improve sea-land logistics and operational efficiency in the port's networks (Castellano et al., 2019). Blockchain technology application such as the blockchain documentation transaction system (BDTS) provides a smart bill of lading (B/L) that is extremely fast, safe, reliable, and cost-effective for processing shipping documents across the globe. BDTS creates trust and interaction among issuers, carriers, importers, exporters, and other stakeholders (Jović et al., 2019).

Updated Maritime Industry Technology in Nigeria

The tightening of the regulatory environment for digital trade regarding data movement, infrastructure, and connectivity is among the challenges facing digital technology in Nigeria's maritime industry, as it presents difficulties accessing and interpreting the data (Odularu, 2020). The Nigerian maritime industry's core national infrastructures are not on par with the international standard, resulting in state authorities transferring port assets and operational oversight to the corporate port concession. Such a move is evident in AP Moller-Maersk's operating partnership in Nigeria and other African countries, thereby encouraging foreign dominance in the sector (Dahou & Chalfin, 2020).

The Nigerian maritime industry has suffered from undue interferences from the government, resulting in an inconsistent segmented shipping policy document. The country lacks a comprehensive maritime policy that will reshape, redirect, and restructure the industry and check counter-productive measures (Ndikom & Olusegun, 2019). Implementing the cabotage laws in the Nigerian maritime industry is hampered by the government's inability to promote and grow the indigenous shipping fleet, thereby rendering the law ineffective and encouraging foreign domination of the nation's maritime trade (Okon & Edem, 2019). The maritime industry is a capital-intensive business due to the high level of technology involved in ship construction and repairs. The government-administered cabotage vessels finance fund (CVFF) provides no specific amount allotted to this fund, thereby making the initiative to promote indigenous shipping ineffective (Nwekeaku & Atteh, 2016). Adding to the challenge is the limitation

posed by local investors' inability to access loans for financing investment in maritime

transportation, which foreign investors exploit with the capital base to proceed in the

business (Lloyd et al., 2020).

Risk and uncertainty to new technology contribute to the challenges of using

updated technology in the industry, primarily when focusing on monetary value and

inconsistent governance processes such as information, metrics, and decision support

tools (Ellingsen & Aasland, 2019). The problem of insecurity arising from maritime

piracy and its potential adverse effects impact the industry. Insecurity increases the

industry's losses to high international insurance rates, thereby eroding the capital industry

that could be expended in technology to increase efficiency (Lloyd et al., 2020). There

are also technology-based challenges related to poor interoperability of logistics systems,

security, data protection challenges, and policy-based challenges that deal with ICT

innovation applications passing through regulations and institutional forces shaping the

organizational activities (Ezenwa et al., 2020).

Advanced technology will bring about efficiency, productivity, and operational

functioning of all the maritime industry sectors, eliminating fraudulent and unwholesome

practices that have made the nation's ports highly unattractive, unfriendly, and less

competitive (Ndikom & Olusegun, 2020). Nze et al. (2020) argued that administrative

bottlenecks and corrupt practices contribute to the seaports' inefficiency, noting that the

private operators are making investments in port cargo handling equipment to augment

the port's outdated equipment. Technological infrastructures can increase the industry

performance by dredging the seaports and channels to accommodate large vessels that

will facilitate economies of scale and construction of port access roads or rail lines to eliminate traffic grids at the ports, thereby reducing congestion and reducing the current diversion of goods to neighboring countries to beat the traffic at Nigerian ports (Onifade, 2020).

Negligence from the government contributes to the industry's challenges in using advanced technologies to improve efficiency and generate revenue for the economy. This is evident from the lack of commitment to invest in infrastructure to improve performance (Abayomi, 2017). Infrastructural investments such as dredging the seaports and navigable water channels will improve the inland waterways with about 10,000 tons of barges and flat bottom ships (Nsan-Awaji, 2019). Dredging will deepen the water level to attract bigger ships like the Capesize, post-Panamax vessels, triple-E vessels, and supertankers (Abayomi, 2017).

Massive capital investment is also needed to construct substantial port facilities such as quays, jetty, and warehouses to enhance economic growth and innovation (Onifade, 2020). The inadequacy of significant technological infrastructure in cargo handling equipment and other port infrastructure in the Nigerian ports causes delays and increases its cost (Nze et al., 2020). Workforce development in the industry is also hindered by a lack of investment in advanced technology to meet international standards, and has resulted in using skilled foreign workforce to fill the gaps, causing a massive capital flight out of the country (Lloyd et al., 2020).

Barriers to Acceptance of Updated Maritime Technology in Nigeria

Resistance to change is one of the industry managers' barriers to using updated technology because of the impacts of implementing the desired technology (Love & Matthews, 2019). Onugha and Onuoha (2019) argued that 21st-century managers face the challenge of mastering change and taking advantage of the change to build organizational effectiveness. Organizational change has also hampered the lack of technical expertise and the inability to manage technology adoption (Smuts et al., 2017). Readiness for change and capacity for change contributes to the barriers because organizations need to have the capacity to continually change in response to internal and external shifts, as early adoption of technology may not yield expected results (Onugha & Onuoha, 2019).

The Nigerian maritime industry is also hampered by policy, institutional, regulatory, and legal framework that undermines its ability to align with the world economy and implement the port reforms needed to actualize its potential fully (Faith, 2019). For instance, the Nigerian Cabotage law aims to promote Nigerians' indigenous participation in the industry but adopt both protectionism and liberalism policies, making it contradictory (Nwekeaku & Atteh, 2016). The four pillars of the cabotage law require vessels built in Nigeria, vessels registered in Nigeria, vessels wholly manned vessels, and vessels wholly owned by Nigerians (Okafor et al., 2020). Unfortunately, the industry does not have sufficient capacity to build ships that meet the law's requirements, as the major shipyard, Niger Dock, has resorted mainly to ship repairs (Nwekeaku & Atteh, 2016).

Stakeholders in the industry, such as the port agencies' employees, exploit the weak enforcement of maritime corporate governance to exercise discretional powers to discourage technology use to improve the system (Zhang et al., 2018). The weak governance equally leads to a lack of government commitment, a lack of infrastructural development, and a lack of a competent workforce to empower technology-driven initiatives (Owusu Kwateng et al., 2017). The ineffective implementation of the maritime industry policy leads to an ill-defined standard operating procedure that encourages corrupt practices among the industry players (Nwekeaku & Atteh, 2016). In the absence of a coherent policy, the industry stakeholders do not have adequate coordination or collaborative agenda to improve the industry performance, thereby resorting to self-aggrandizement efforts.

The industry is also impacted by the human and institutional capacity to adopt new technologies, lack of skilled human resources, viable institutions, technological infrastructure, financial and material resources, and reasonable work practices (Gerald et al., 2019). The industry is guided by international rules and regulations that respect the tenets of a holistic institutional framework. Unfortunately, the Nigerian maritime industry does not have the needed capital to develop and establish an enduring holistic institutional framework that maximizes the maritime port industry (Buhari et al., 2017). The industry's effectiveness can improve by focusing on short-term goals and sustainability, concern for the environment, corporate culture, talent management, leadership, innovation, strategy, engagement, and communication (Onugha & Onuoha, 2019).

Nigerian Shipping Industry and Global Maritime Best Practices

Ship Building

A shipbuilding company is a huge investment and requires much technological know-how. Niger-Dock is the most prominent Nigerian shipbuilding company, and currently, this company can only meet the demands for ship repairs; thus, Nigeria depends on foreign shipyards and technology for its shipping industry (Nwekeaku et al., 2016). Compared to other maritime nations, the United States has 124 shipyards classified as active shipbuilders and 200 shipyards classified as active ship repair yards or capable of shipbuilding, but not actively engaged in shipbuilding (The Maritime Executive, 2015). China's shipbuilding industry has about 78 shipyards, which are dominated by two Chinese conglomerates China State Shipbuilding Corporation (CSSC), which controls about 30 shipyards in the east and the south, and China Shipbuilding Industry Corporation (CSIC), which controls about 48 shipyards in the north and the west (Pike, 2019).

Ship Ownership

As with many other nations, Nigeria encourages local participation in maritime transportation through the Cabotage Act to stimulate, empower, and reposition the indigenous shipping companies for active participation in coastal shipping transactions (Nwekeaku et al., 2016). Incidentally, the primary criteria for the local capacity to benefit from this law are the capacity to build ships locally; unfortunately, the industry cannot build ships locally due to the limited capacity of the shipyards' inadequacy. Ship ownership is a capital-intensive venture and so requires a partnership among stakeholders

to collaborate. The industry stakeholders in Nigeria cannot partner to form formidable

shipping companies where every member will see themselves as part and parcel of the

decision-making process to achieve a common goal towards a viable shipping industry

(Uche et al., 2018). In addition to the lack of local capacity in shipyards, foreign ship

acquisition is capital intensive. When acquired, foreign-built ships face another

administrative challenge of being blacklisted because they were not locally built

(Nwekeaku et al., 2016). In the U.S., institutional investors trade and hold larger blocks

of equity ownership of shipping companies that generate a large amount of capital for the

industry, enhancing firm stock prices and financial performance (Tsouknidis, 2019).

Other countries employ many ship financing leasing models in the world, such as

Germany's KG (Kommanditgesellschaft) fund, United Kingdom's tax leasing, and the

Norwegian KS (Kommandittselskap) system (Zhang & Shen, 2017).

Nigerian Maritime Industry and National Sustainable Development

The maritime industry is significant to the economic growth and development of

Nigeria (Chidi et al., 2020). The industry can create wealth, reduce unemployment,

promote skills acquisition, and encourage entrepreneurship (Afolabi, 2015). The Nigeria

Ministry of Transport noted that the Nigerian maritime sector is of strategic importance

to the growth and stability of the nation's economy as a result of its contribution to the

upstream sector of the oil industry, which accounts for about $8 billion freight cost yearly

(Salau, 2018). The maritime industry is a strong catalyst for socioeconomic development

due to its immense contribution to the national GDP through transportation of freight,

promotion of trade and commerce, revenue generation, creation of job opportunities both

skilled and unskilled, institutional development, international relations, and promotion of tourism (Benson & David, 2018).

Chidi et al. (2020) argued that Nigeria being a coastal nation, can generate huge revenues from local and international transportation of persons and goods on water, positively impacting its economic development. The industry has the potential to reduce the country's over-reliance on petroleum as a significant revenue earner if effectively harnessed and exploited. The maritime sector is characterized as a "colorful blue gold" that can effectively transform Nigeria's economy towards real growth and development (Afolabi, 2015). The maritime sector plays a crucial role in the mass movement of people, information, raw materials, and finished products from one place to another to build and maintain a society (Ndikom & Olusegun, 2019). Inland water transportation provides the most economical, energy-efficient, and environmentally friendly means of transporting cargoes from place to place within the Nigerian coastal areas (Nsan-Awaji, 2019).

Shipbuilding and repair facilities are vital sources of employment and economic activity in every nation (Babatunde, 2020). For instance, U.S. shipbuilders delivered 1,074 vessels in 2016, generated $23.9 billion of labor income, and supported 402,000 jobs from private shipyards (Shipbuilders Council of America, n.d.-a). The Nigeria maritime industry can play a crucial role in the socioeconomic transformation of the country by establishing a standard shipyard that could create massive employment for the country's jobless youths. Again, shipyards and ship repair facilities help the country maintain its national and economic security (Bolaky, 2020).

On national security, the U.S. shipyards have enabled the United States to maintain a proud tradition of building the military vessels instrumental to the U.S. maritime presence worldwide (Shipbuilders Council of America, n.d.-b). On the economic security, the U.S. Maritime Administration noted that U.S. Shipyards supports over 100,000 direct shipyard jobs across the United States, produces $7.9 billion in direct labor income, and contributes $9.8 billion in direct GDP to the national economy. For each shipyard job created in the United States, there are 2.6 jobs created in the associated domestic supplier base across the country, which generates $23.9 billion in income and $36 billion worth of goods and services each year (Shipbuilders Council of America, n.d.-a).

A robust maritime seaport in Nigeria will greatly facilitate international trade as merchandise exports are vital factors that countries depend on for sustainable economic development (Jouili, 2019). For instance, in the United States, seaports play a vital role in local and regional economies as they generate business development and create employment for over 13 million Americans, including those that work at the port and those employed in global trade and import/export support services (U.S. Ports Archives, n.d.). Merchandise exports enable better use of resources, increase producers' efficiency, and earn foreign currency for the country. The maritime industry plays a crucial role in the country's merchandise export by improving seaport infrastructure, the quality of performance logistics, and shipping connectivity (Jouili, 2019). The American Association of Port Authorities estimates that U.S. business activities associated with waterborne commerce add more than $3 trillion to the American economy, and seaport

activities alone add tens of millions of dollars in federal, state, and local tax revenues (U.S. Ports Archives, n.d.).

A well-developed maritime infrastructure will boost economic growth and development to checkmate the losses incurred by the Nigerian maritime industry (Babatunde, 2020). In their research, the Nigeria Port Authority reported in 2017/2018 that Nigeria loses about $7 billion in revenue annually due to inefficiencies and the weak infrastructure of Nigerian seaports (Aluko, 2019). A comprehensive value chain analysis is needed to boost the seaports' performance. Seaport infrastructure shall include mode facilities such as the road, rail, pipelines, conveyor system, and associated ICT facilities on logistics and transport supply chain performance (Onwuegbuchunam, 2019). The value that efficient maritime infrastructure provides will enhance transportation to the seaports and export Nigeria's agricultural products to the foreign markets, thereby increasing the farmers' revenue earnings.

Maritime transportation provides a means for achieving a competitive advantage in international trade (Babatunde, 2020). Ocean transportation is the cheapest and most economical mode for transporting large quantities of raw materials and commercial goods (Naletina & Perkov, 2017). Nigerian southern borders are open to the Atlantic Ocean, providing a vast opportunity for low-cost transportation of the country's raw materials and finished products to the international markets in large shipments. Also, the Nigerian climate being warm all year round means that maritime trade can occur uninterrupted at any time of the year (Founder's Guide, 2019).

Maritime transport has also become a medium for tourism through cruise ships that offer traveling worldwide on ships and having all the fun and entertainment that tourist resorts provide (Wondirad, 2019). The cruise ship industry is noted as the fastest-growing segment of the tourism sector, accounting for over 30 million passengers transported across the world and over 1.11 million jobs created in 2019 (Nhamo et al., 2020). The Nigerian maritime industry can play critical roles in growing this industry sector, generating revenue for the economy, and serving as a sustainable income source (Bolaky, 2020). Maritime transport also benefits from building good international relations because of the many parties linked in maritime routes and trades. Almost all countries, including landlocked countries, have an economic and strategic interest in maritime transportation, so maritime transport can play a pivotal role in establishing ties with different countries (Founder's Guide, 2019).

COVID-19 Pandemic and Nigeria's Maritime Industry

As with every aspect of human endeavor, the COVID-19 pandemic impacted the Nigerian maritime industry. The pandemic took a toll on human life and caused significant disruption to economic activity globally, which resulted in unprecedented global health and economic crisis (Humphreys et al., 2020). The outbreak imposed enormous economic and human costs on the cruise ship industry, causing the value of the shipping companies' stock to fall by up to 80% in March 2020 due to the suspension of cruises (Nhamo et al., 2020). The outbreak also created a massive humanitarian issue for about 1.2 million seafarers that work at the maritime fleet on the high sea on approximately 50,000 commercial vessels (Humphreys et al., 2020). The disruptions

created by this pandemic impacted the Nigerian maritime industry. Port authorities restricted several ships from coming to the ports due to the fear of spreading the virus.

The restriction on ships' movement in and out of the ports presented many challenges to the industry's operational performance. When Nigeria recorded positive test cases on six workers on an offshore support vessel, preventive measures were put in place to reduce the workforce on maritime, offshore facilities by changing the crew rotation from the 14-day rotation to 28-day crew rotation to check the spread of the virus (Owolabi et al., 2020). NIMASA issued a Healthcare Marine Notice that prohibited international marine vessels or any member of ships' crew and/or passenger with a travel history from visiting a COVID-19 affected country entering a Nigerian port (Ojuawo et al., 2020). The prohibition of vessels from coming into the ports resulted in a decline of ship calls to African ports of about 10-15% (Humphreys et al., 2020). COVID-19 pandemic impacted seafarers' health and welfare as several seafarers who were at the end of duty needed to disembark and return to their home countries, and those on leave needed to embark on the ship to make a living.

Ship crewing arrangements got impacted when foreign crews employed on vessels operating in Nigeria could not travel because of commercial flights' suspension. To make matters worse, even when seafarers are allowed to travel to Nigeria, they must undergo 2 weeks of mandatory quarantine after passing the initial COVID-19 test (Ojuawo et al., 2020). The measures to contain the virus's spread severely affect many sectors and communities that depend on global and cross-border value chains and trade (Humphreys et al.., 2020).

These measures have an impact on maritime companies' charter party agreements. For instance, companies make important considerations concerning the effect of COVID-19 on obligations under the contracts, relying on force majeure as a protection or a defense to nonperformance of contract terms, and factors necessary to make a successful force majeure claim (Adetuyi & Williams, 2020). The COVID-19 outbreak adversely weakened the maritime industry's capacity to provide social and economic opportunities and benefits through access to markets, employment, and other investments (Nwaeze, 2020). All these measures added extra cost to every aspect of maritime business operation and affected its economy.

Seaworthiness of ships is a fundamental requirement of every sea-going vessel, and every shipowner and agent are obligated to ensure that their vessels meet this requirement. The COVID-19 outbreak presents a challenge to the vessel's seaworthiness when the cargo loaded on a vessel is damaged due to fumigation. Vessels shall maintain COVID-19 seaworthiness by ensuring that vessels that transited a COVID-19 contaminated port are fumigated before arrival at the destination port (Anand, 2020; Ojuawo et al., 2020). Off-hire clauses in the time charter agreements are another issue affecting the industry in a COVID-19 era. The clause relieves the vessel charterer from paying hire when the ship's use is compromised without the need to prove the breach of the charter to the owner (Ojuawo et al., 2020).

The pandemic also affected shipowners' insurance coverage by raising questions about whether insurance policies taken out by marine vessel operators and shipowners cover the losses incurred directly or indirectly from COVID-19 (Ojuawo et al., 2020).

The COVID-19 outbreak has substantially impacted ship delivery and re-delivery clauses in the time charter party agreement. Charter Party agreement determines when the obligation to pay hire will arise and end (Ogwu, 2020). As a result, parties to the time charter will need to clarify the impact COVID-19 will have on late delivery and re-delivery of vessels, such as the charter's right to cancel the charter for late delivery and the shipowner or charter's recourse to force majeure in case of late delivery or re-delivery of vessels (Ojuawo et al., 2020).

Summary and Conclusions

In Chapter 2 of this study, I presented a synthesis of knowledge and critical analyses of the extant literature within the topic area of the barriers to technology acceptance among Nigerian maritime industry stakeholders. The use of updated technologies is one of the most significant challenges of the maritime industry's digitization in developing countries of Africa, including Nigeria, which accounts for over 60% of total seaborne traffic volume and values in West-Central African regions. Nigerian maritime industry stakeholders are aware of how important their industry sector remains in supporting the government's national sustainable development strategies. The problem remains that low technology acceptance and use among Nigerian maritime industry stakeholders has led to the maritime sector's weakened capacity to drive national sustainable development. The lack of research within the Nigerian maritime industry has left an information gap for policymakers on technology adoption and acceptance within this specific context. Future studies, empirical data, and professional practice

recommendations are needed to inform Nigerian business and technology leaders on developing a technologically skilled workforce in the maritime industry.

A literature gap exists in identifying the barriers to accepting updated technology within the Nigerian maritime industry. Maritime employees trained to a high level of updated technologies can help support Nigeria's compliance with global maritime practices and the use of updated technology for enhanced maritime business practices. Given the low rate of effectiveness, efficiency, and productivity of the Nigerian shipping industry compared to accepted global maritime practices, a more in-depth understanding is needed of why Nigerian maritime industry stakeholders remain slow to accept new technologies.

Given that today's global maritime industry finds itself caught in a virulent coronavirus pandemic, it is more critical than ever to update maritime technologies across developing nations. Restriction on Nigerians' ships' movements due to the COVID-19 pandemic has presented many challenges to the industry's operational performance. In Chapter 3, the research method for qualitative, single case study research is discussed. Following that, recruitment, participation, and data collection procedures are presented and applied to the current research strategy. Finally, the data analysis plan is addressed, as well as the ethical procedures and the trustworthiness of data within the study.

Chapter 3: Research Method

The purpose of this qualitative, single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. To address the study's purpose, I used a single case study qualitative methodology, with the unit of analysis being the Nigerian maritime industry. I conducted 12 in-depth face-to-face individual interviews with Nigerian maritime industry stakeholders and continued the interviews until data saturation occurred. I used triangulation of data sources to establish the trustworthiness of my analysis and findings on the phenomena under study (Guion et al., 2011; Merriam & Tisdell, 2015).

The lack of research in the Nigerian maritime industry left an information gap for policymakers on technology adoption and acceptance in this specific context (Aluko & Odularu, 2019). Empirical data and professional practice recommendations may inform Nigerian business and technology leaders on the training needed to develop a technologically skilled workforce in the maritime industry (Chidi et al., 2020). This study is significant to promoting positive social change by offering recommendations on how the Nigerian maritime sector may contribute to national sustainable development through reforms and strategic responses related to adopting and using updated technologies (Chidi et al., 2020; Raimi, 2019).

This chapter provides a detailed presentation on the following: research methodology and design rationale, the participant selection strategy, the researcher's role in data collection and analysis processes and procedures, assumptions and limitations of the study, ethical considerations, and trustworthiness issues.

Research Design and Rationale

Asking the right questions is a prelude to obtaining appropriate answers (Browne & Keeley, 2014) and is essential to understanding the studied problem (Morgan et al., 2017). Therefore, a researcher must develop a suitable question to address the purpose of the study. In alignment with this study's purpose, the central research question is: How do Nigerian maritime industry stakeholders describe their barriers to technology acceptance?

The creation of a link between maritime transportation and the national sustainable development strategies is a business goal of Nigerian maritime industry stakeholders (Chidi et al., 2020; Raimi, 2019). The Nigerian maritime industry provides enormous potential for economic growth for the country; however, the continued use of outdated technologies has limited its ability to drive national sustainability goals and weakened Nigerian seaports' infrastructure (Ali & Odularu, 2020). Updated technology can increase the Nigerian shipping industry's effectiveness, efficiency, and productivity to an acceptable global maritime practice (Ekeada et al., 2018; Uche et al., 2018). However, a clear understanding of why Nigerian maritime industry stakeholders remains slow to accept new technologies needs to be explored (Aluko & Odularu, 2019).

Technology adoption will improve the industry's competitiveness through product and process flexibility, quality, and efficiency (Ellingsen & Aasland, 2019) and will enhance safety and sustainability in sea traffic management (Lind et al., 2016) and improve effectiveness and trust in the maritime supply chains (Ajagunna et al., 2020). The industry stakeholders who benefit from the industry's technology status quo exploit

the weak enforcement of maritime corporate governance to discourage technology use to improve the system (Zhang et al., 2018).

The literature review's insights revealed that Nigeria's maritime industry has been trailing developed nations for over 50 years (Uwadia, 2016). There is a decline in Nigerian flagships' standards, quality, and profitability due to the industry stakeholders' low technical standards in complying with national and international standards and regulations (Igbozurike, 2020; Uwadia, 2016). Digital technology is transforming every industry and providing effective means of unlocking every nation's full potential of economic activities by tapping into the strengths of data sciences, AI, and related financial instruments that generate development through improved efficiency and equity (Castellano et al., 2019).

Barriers to technology adoption among the industry stakeholders immensely weaken the sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). The industry struggles with a low rate of effectiveness, efficiency, and productivity of the Nigerian shipping industry compared to accepted global maritime practices (Ekeada et al., 2018; Uche et al., 2018). Therefore, there is a need for a deep understanding of why Nigerian maritime industry stakeholders are reluctant to adopt new technologies to improve performance (Aluko & Odularu, 2019).

I selected the qualitative method for this study because it aligned with the study's purpose of exploring the barriers to technology acceptance among Nigerian maritime industry stakeholders. A quantitative method was inappropriate for this study because quantitative research designs are used to examine relationships, test theories, standardize

reporting, and collect quantifiable data (Harkiolakis, 2017). A mixed-methods approach was not appropriate because quantitative data would not be needed to answer the study's research question (Bryman, 2017). The research problem and the study's nature required a qualitative methodology to design a study to explore a human dilemma embedded within a complex social process (Merriam & Tisdell, 2015).

The study's purpose called for a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders, and an exploratory single case study with embedded units (Yin, 2017) satisfied the study goals. The qualitative method enables researchers to explore people's lived experiences within a specific context and from a constructivist viewpoint while interpreting interactions between the individuals and the environment (Cooper & White, 2012). Qualitative case studies play a central role in the business field. These studies align with postpositivist methods more than other qualitative designs, with multiple data sources to produce an in-depth contextual body of knowledge (Eriksson & Kovalainen, 2015; Yin, 2017). Using an explorative single case study provided a deep understanding of industry stakeholders who remain slow to accept new technologies to improve the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019).

Role of the Researcher

The researcher's role involves seeking to understand social constructivism's principles about the body of knowledge and individual self-discovery when gathering data from participants (Merriam & Tisdell, 2015). Skills that enhance a researcher's role include active listening, concentrating on the participants' behaviors, asking relevant

questions, understanding the research topic, paying proper attention to the data, respecting participants, and using multitasking and ethical procedures (Yin, 2011). In this study, my role as a researcher was to interview Nigerian maritime industry stakeholders about their experience of the barriers in adopting new technologies to improve performance.

I am not a participant in this research and did not assume any other role except a researcher investigating the study's questions. I did not have any personal relationships with the participants and did not have power over or control of the participants who shared their stories. The only connection I had with some participants was that I worked with them as colleagues on ships about 13 years ago when I worked in the same company. These individuals have risen to the industry's managerial level, and they provided valuable insights into the research question. My role was that of an observer, recorder, and analyst of the qualitative data (Chesebro & Borisoff, 2007).

As a qualitative researcher, I represented the primary instrument through which data were collected and analyzed in the research (Denzin & Lincoln, 2011). Furthermore, I saw myself as an active player in the research and inquiry process (Ravitch & Carl, 2016), from the planning stage to collecting data, analyzing data, and reporting findings (Sanjari et al., 2014). I ensured the data collection method was reliable and verifiable and that the data-gathering instruments yielded accurate results. I created field notes and kept records of data collection activities during the study to ensure the results' validity (Kumar, 2019; Ledford & Gast, 2018).

To ensure objectivity, a researcher must fully disclose and reveal personal reactions and experiences if they are relevant (Wolcott, 1994). In this regard, a potential bias stemmed from the fact that I had a shared background with participants regarding having worked at the same company in Nigeria many years ago. However, as a researcher, I ensured that my shared background had no power or control over what the participants revealed. My role and influence in providing meaning and interpretation of the data were consciously applied not to interfere with that of the participants (Saldana, 2016). Again, to ensure trustworthiness and reduce the likelihood of research bias, interviews were audiotaped, and findings were validated through member checking (Carlson, 2010). Further, field notes were used during data collection, and only responses received to the study questions were analyzed.

Methodology

An exploratory qualitative single case study was well suited for this study as it includes a variety of data sources such as direct observation, interviews, documents, artifacts, and other sources (Eisenhardt, 1989; Yin, 2017). This study aimed to gain a deep understanding of Nigerian maritime industry stakeholders' barriers to technology adoption. This method helped me address the literature gap regarding why maritime industry stakeholders in Nigeria remain slow to accept new technologies (Aluko & Odularu, 2019; Onifade, 2020). An exploratory case study provides a rich and in-depth understanding of a problem that has not been adequately studied, thereby providing breakthrough insights (Patton, 2015). The qualitative research method provides a researcher with a deep understanding of a subject grounded in a conceptual framework

(Cooper & White, 2012). A single case study involves exploring a case to gain a holistic, real-world view and emphasize intensive investigation and analysis of a unit root to realize a meaningful contribution to knowledge by confirming, challenging, or extending a theory (Yin, 2017).

The purpose of this study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. There was a need to understand why Nigerian maritime industry stakeholders remain slow to accept new technologies (Aluko & Odularu, 2019). The low rate of effectiveness, efficiency, and productivity of the Nigerian shipping industry compared to accepted global maritime practices were questions for further research (Ekeada et al., 2018; Uche et al., 2018). An exploratory case study is appropriate in probing a problem that lacks a detailed preliminary investigation (Maslach, 2017). A case study can generate a holistic view where data from multiple sources, such as participants' experiences, generate a comprehensive view of the phenomenon (Merriam, 1998; Yin, 2017). An exploratory case study may generate a holistic view of the Nigerian maritime stakeholders' perceptions regarding technology acceptance to increase performance and efficiency. The study results may provide industry stakeholders with information about how the barriers impede the adoption of technology to increase the capacity to drive national sustainable development.

Purposeful sampling is appropriate for identifying and selecting information-rich cases related to the phenomenon of interest in qualitative research (Stake, 2010; Tracy, 2019). Although there are various purposeful sampling strategies, horizontal network sampling is appropriate for recruiting participants in qualitative social research (Geddes

et al., 2018). Participants for this case study were recruited using purposeful criteria and network sampling strategies and screened with the following inclusion criteria: (a) adults over the age of 18, (b) a minimum of 3 years' experience as a stakeholder in the Nigerian maritime industry, and (c) possess knowledge regarding technology challenges of the maritime industry in Nigeria (see Robinson, 2014).

I conducted 12 in-depth face-to-face individual interviews with Nigerian maritime industry stakeholders and continued the interviews until data saturation occurred. The recommendation of five to 10 participants for a qualitative study guided this study (Schram, 2006). To identify themes from the interviews, transcripts were analyzed through thematic analysis. The interview data themes were triangulated with data from reflective field notes and archival data related to the Nigerian maritime industry to support the trustworthiness of findings and make recommendations for further research (Guion et al., 2011). The boundaries of the study include the maritime industry in developing countries of Africa. The study's findings are transferable to other transportation industries, such as air and rail transport, in Africa's developing countries.

Participant Selection Logic

The target population for this case study was Nigerian maritime industry stakeholders. I solicited potential participants who met the study's inclusion criteria through email invitation and a recruitment letter on LinkedIn to my professional network. Purposeful criteria and snowball techniques were the sampling strategies as these enabled me to choose participants who provided rich information relevant to the research question (Maxwell, 2013; Palinkas et al., 2015). Snowball sampling helps identify other

participants who meet the selection criteria by asking identified key participants to refer

to other potential participants for the study (Merriam & Tisdell, 2015). Ravitch and Carl

(2016) argued that snowball sampling involves asking one or few relevant and

information-rich participants for additional relevant contacts who can provide different

perspectives. The snowball sampling strategy enabled me to recruit quality participants

who were challenging to reach using other sampling strategies (Noor, 2008).

Participants for this study were recruited and screened based on the following

inclusion criteria: (a) adults over the age of 18 years, (b) with a minimum of 3 years'

experience in the maritime industry in Nigeria, and (c) who have knowledge related to

technology in the maritime industry (Robinson, 2014). Potential participants who did not

meet the inclusion criteria were excluded from the sample list. I conducted 12 in-depth

face-to-face individual interviews with maritime industry stakeholders in Nigeria. A

range of five to 10 participants is recommended in a qualitative study to avoid weakening

an in-depth investigation of the phenomena under study due to the large sample size

(Schram, 2006). The logic was based on related studies in business and management

subject areas grounded in an interpretation of participant recruitment for case studies

(Yin, 2017). Examples include Neubert (2016) on tech firm owners, Brown (2017) on

airport managers, and Hamlett (2014) on manufacturing managers.

The purposeful selection of maritime industry stakeholders was the specific

procedure to identify, contact, and recruit participants. I identified the initial set of

participants from a pool of former colleagues I worked with within the maritime industry

over 13 years ago who are still in the industry. I also identified participants referred by

the initial set of participants by searching and reviewing their LinkedIn website profiles.

Again, I carried out a network sampling of my professional network active on LinkedIn

and prescreened maritime industry professionals who meet the inclusion criteria. I sent an

email to the prescreened participants and sought their interest in participating in the

study. I established an initial chat with the participants, who responded positively to

further their suitability and knowledge of maritime technology and its adoption. I sent a

consent form via email to the participants who finally met the inclusion criteria to

participate in the research voluntarily.

Despite the proposed range of sample size in this study, the number of actual

participants was determined by the achievement of data saturation. Data saturation points

to diminishing returns in qualitative samples (Mason, 2010) when additional data from

study participants do not provide new themes (Houghton et al., 2013). As the fieldwork

progresses, the number of participants is flexible until the full realization of the answers

to the research questions (Stake, 2010). Achieving data saturation is essential to achieve

data saturation; otherwise, it may affect the study result's trustworthiness (Fusch & Ness,

2015).

Instrumentation

In a case study, the objective of using specific instrumentation is to collect data

from multiple sources and provide sufficient data collection instruments to answer the

research question (Yin, 2017). Considering the various forms of questions developed

related to the research topic, it was essential to examine all the responses and

participants' characteristics and selection in the data analysis process. Therefore, it was

vital to ensure that instrumentation protocols align with the study's purpose and contribute original data to the study's conceptual framework (Halkias & Neubert, 2020).

The appropriate instrumentation produced themes to support insights from studying the barriers to technology acceptance among Nigerian maritime industry stakeholders. Three sources of data were utilized throughout this study: (a) a semistructured interview protocol (see Appendix B) whose items were designed and standardized by previous researchers, (b) archival data in the form of government and industry reports (Yin, 2017), and (c) reflective field notes (Phillippi, & Lauderdale, 2018), which were kept by the researcher throughout the entire data collection process.

Interview Protocol

This study's interview guide (see Appendix B) involved semistructured questions grounded by the two conceptual models framing this study: (a) Yang's (2019) maritime shipping digitization, and (b) Wiafe et al.'s (2019) concept of technology acceptance within the maritime industry in developing countries. The semistructured interview consisted of a guide of specific questions and protocol to delineate the process. The interview centered on eight well-chosen questions grounded in the conceptual framework and the reviewed literature presented in Chapter 2 (see Rowley, 2012). Potential participants were asked about their availability for an interview via a recruitment letter (Appendix A) informing interviewees of the research's fundamental nature and purpose. A consent form was provided to potential participants, and the researcher used a semistructured interview format (Appendix B). The participants' questions focused on semistructured questions completed in approximately 20–40 minutes (Yin, 2017).

Olaniyan (2020) developed the interview questions in an open-access study exploring a qualitative single case study to understand the perceptions of construction project managers in Nigeria and basing each item from the theoretical literature, the authors' knowledge of technology acceptance within industries in Nigeria, and previous conceptual frameworks explaining technology acceptance in the Nigerian context grounded in Rogers's diffusion of innovations theory (Usman & Said, 2014; Waziri et al.'s (2017). Both the UTAUT (Venkatesh et al., 2003) and the TAM (Davis, 1989) used to build my study's conceptual framework were initially grounded by the authors in Rogers's (1995) diffusion of innovation theory, which helps an organization to decide whether to adopt or reject an innovative idea.

While developing the diffusion of innovation theory, Rogers also considered the difference between people and innovation. Rogers (2003) defined diffusion within his seminal theory as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 206) and concluded that the rate of adoption is affected by five factors: "(i) perceived attributes of innovation (ii) type of innovation-decision (iii) communication channels (iv) nature of the social system [and] (v) extent of change agent's promotion" (p. 206).

Waziri et al. (2017) developed the model of factors influencing IT adoption in Nigerian construction organizations leading to Olaniyan's (2020) adoption of their interview protocol items. In adopting these interview items to collect data for his case study of Nigerian construction project managers, Olaniyan's initial assumption aligned with those of previous studies that innovative technology has been a driving force behind

organizational performance through stimulation of an effective communication system among the members of organizations as well as inter-organizational collaborations (Olaniyan et al., 2020). My study followed this line of conceptual thinking which aligned with my study's purpose and the central research question. Given that the interview protocol questions were validated via two previous studies, no pilot study was required to duplicate this process.

By allowing me to reach participants in distant locations, online interviews additionally aided the process of replication (see Gray et al., 2020). The validity of this study's instrumentation depends on the matter of transferability. Transferability is similar to external validity, as both methods are involved with how the outcomes of one study can be useful to other settings (Merriam & Tisdell, 2015). This poses a challenge for many qualitative studies, as findings are usually limited to specific settings and individuals (Shenton, 2004). As a result, it is plausible that this research's outcomes will apply to individuals beyond the participant group.

Archival Data

During fieldwork, triangulation, an analytic technique and a central aspect of case-study research design, was used and later data analysis (Yin, 2017). Triangulation is a methodological technique for corroborating or conflicting ideas and data; and plays a vital role during the qualitative research process (Guion et al., 2011). I triangulated the results of the qualitative interviews with archival documents. The archival documents included government and industry reports concerning the maritime industry in Nigeria, media reports from the domestic and foreign press documenting issues identified in the

raw data from the interviews. I also reviewed databases of updated issues about the technical capacity within Nigeria's maritime industry. I utilized these three archival data sources for methodological triangulation to answer the research question and add credibility and trustworthiness to the study results. This method was used in similar studies such as that of Neubert (2016) and Sanders Muhammad and Halkias (2019), in which a case study design used archival data to triangulate interview data to answer the study's research questions.

Reflective Field Notes

How observation is used in research depends on the research question and the paradigm supporting a qualitative investigation. This study was grounded in the interpretivist paradigms and used unstructured observation in reflective field notes as an evidence source for triangulation purposes (Merriam & Tisdell, 2015). Reflective field notes obtained from online data sources—the semistructured interviews carried out via Zoom—were the third instrument used for data collection from this study's participants (Merriam & Tisdell, 2015). Online platforms are now commonly used in research to collect data, uphold a highly unbiased atmosphere, and avert personal reflexivity by depriving the interview interaction of contextual information. Reflective field notes also have the advantage of offering a personal account of the researcher's reflections about observing the data collection experience (Flick, 2019).

Online data collection, also referred to as netnography, consists of interactions, interviews, and introspection (Kozinets, 2017; Merriam & Tisdell, 2015). When online data collection interactions are recorded and saved as they occur, reflective field notes

become more significant than observational field notes in this case study's design. Reflective field notes often provide critical insights into how online social interactions may detect the reasons behind the participants' cultural values rather than offer a more typical recording or description of them (Kozinets, 2017). Field notes that include critical reflection can guide future data collection efforts in the current study, create a record of the study unfolding over time, and add value to the data analysis process. When digitized and well organized, they can be searched by keyword and reorganized by topic, time frame, or participant.

I developed netnographic field notes in the tradition of reflexivity to use as triangulation prompts during the data analysis process, a common practice in a study driven by a qualitative study purpose and research methods (Kozinets, 2017). This method was used in similar studies such as that of Neubert (2016), in which the researcher used case study observational research methods within real-world settings where the reflective field notes fall into a sequential order of data collection, data analysis, and synthesis (Yin, 2017).

Transferability determines this study's instrumentation; it relates to external validity as both concerns how research can be beneficial in a different context or setting (Stake, 2010). Transferability can be a factor that motivates future researchers to carry out further investigations and highlight the possibility that this research study's findings could be valuable to other individuals beyond the participants' population group (see Klenke, 2016; Shenton, 2004).

Procedures for Recruitment, Participation, and Data Collection

These processes began after obtaining formal institutional review board (IRB) approval from the Walden University IRB to conduct the research. I began the recruitment process by sending email invitations to potential participants I identified and pre-screened on LinkedIn. The use of social media sites as a recruitment tool for human research is gaining popularity and becoming a norm (Gelinas et al., 2017), and when compared with other traditional methods such as newspapers, flyers, and word of mouth, it is quick, less expensive and enhances visibility in the process (Whitaker et al., 2017)

I emailed the recruitment letters with informed consent and demographic forms as an attachment to the email. The demographic forms provided the range for the participants' age rather than their exact age to protect their privacy. The informed consent explained the nature and purpose of the study, the risk and benefits of being a participant in the study, and the potential positive social change that the study will bring to society. The informed consent clearly stated that participation was voluntary and that participants could withdraw their participation from the study at any time. The informed consent also informed the participants about how their privacy will be protected by ensuring confidentiality and anonymity throughout the research process. After providing the information on the consent form, I asked participants to express their consent to participate in the study by signing the consent form or respond, "I consent," using my email designated for the study. Upon receiving the consent form, I prepared an interview timeline using Microsoft Project Software to schedule each participant's date and time accepted as the best available time for the interview.

Based on the conceptual framework of the study, I developed a set of semistructured interview questions. I made arrangements for a quiet place devoid of distractions and loud background noise that may interfere with audio recordings. To avoid weakening the phenomenon's investigation through a large sample size, I would select five to 10 participants for this study (Schram, 2006). Data organization and analysis started as the participants were being interviewed and continued until data saturation was achieved. Ravitch and Carl (2016) argued that data saturation is a point in data collection where no "new" themes are found and where you continue to see recurring patterns or concepts in the data.

Data collection for this study was through in-depth, semistructured face-to-face interviews with maritime industry stakeholders and experts in Nigeria. The interview was conducted via Zoom (Gray et al., 2020), recorded for transcription, and lasted between 20 and 40 minutes. I also took notes of participants' responses and observational cues during the interview to gain a more in-depth insight into the participant's views (Gray et al., 2020; Seitz, 2016). The researcher's notes enhance research validity when triangulated with other data collection methods (Lub, 2015). Interviews with industry players ensured that information collected aligns with respondents' experiences, observations, and opinions rather than structured, defined, and restructured questions formulated by a theoretical proposition (Yin, 2017).

During the interviews, I asked open-ended and probing questions specific to the participants' identified group explored in the study. This questioning style allowed the participants to provide depth and detail and clarify ambiguities (Rubin & Rubin, 2012).

This strategy of questioning and response recordings ensured the validity and reliability of data collection. To ensure the study result's trustworthiness, biases were monitored as the interviews progressed to minimize their influence (Tracy, 2019). I used Microsoft Excel spreadsheets to organize questions, collect data, store data, and code/categorize data thematically (Bree & Gallagher, 2016). To ensure privacy, collected data were stored in a secured location with a private password only known to the researcher.

At the end of the interviews with all the selected participants, the interviews were transcribed to ensure precise and explicit recording of the interviewee's responses to allow for thematic analysis (Yin, 2017). I sent a transcribed copy of each participant's responses to each participant and requested them to review, scrutinize, and authenticate their responses as being the participant's original contribution to the research during the interview. Following the best practice for qualitative research, the transcribed data will be kept confidential and destroyed after 5 years. To strengthen the trustworthiness, I compared multiple sources of evidence obtained from field notes and archival documents (Merriam & Tisdell, 2015; Yin, 2017) and triangulated the results of the qualitative interviews with reflective field notes archival documents. The archival documents included reports of technology acceptance for improved efficiency in the Nigerian maritime industry. The archival documents came from websites of public maritime sector institutions in Nigeria. During the interview, the observational notes were made by focusing on the participant's pretexts, subtexts, personal emotions, and contingencies (Yin, 2017). The observational notes provided insights into nonverbal cues during the interview (Kozinets, 2017).

Data Analysis Plan

Data analysis consists of data organization and management, immersive engagement, writing, and representation (Ravitch & Carl, 2016). Qualitative data analysis transforms written data such as interviews, field notes, and archival documents into findings and conclusions. Case study data analysis is a combination of procedures for examining, categorizing, tabulating, testing, and converging case study evidence to produce empirically based findings (Yin, 2017). In qualitative studies, piles of unanalyzed data during data collection are common challenges confronting researchers (Maxwell, 2013). The research rigor of case studies is increased by the interweaving of data collection and data analysis. In this study, I conducted both data collection and data analysis simultaneously to prevent this scenario. Before data analysis commenced, I prepared a detailed description of the research setting (Yin, 2017).

I began the process of data analysis by reviewing and examining the data to determine what was worth investigating by reading through the interview transcribed data and other documents that are to be analyzed (Maxwell, 2013), determined and followed a specific analytical technique appropriate for the data, coded the interview data, and interpreted the findings. The data analysis allowed me to identify emerging themes and patterns that helped explain the central research question of how Nigerian maritime industry stakeholders describe their barriers to technology acceptance. When the emerging themes were categorized, findings emerged that helped me achieve a deeper understanding of Nigerian maritime industry stakeholders' barriers to technology acceptance to increase the industry performance (see Yin, 2017).

The research setting is a physical, social, and cultural site where a researcher conducts a study and studies the participants' natural settings (Halkias & Neubert, 2020). I prepared a detailed description of the research setting before data analysis began, and this assisted me in making sense of meaning during the interpretation of the findings (Merriam & Tisdell, 2016). To ensure the study's repeatability or reproducibility if another researcher conducts it under similar settings, I documented and presented all the conditions under which the study occurred. I developed the codes grounded in the conceptual framework. I connected the result of the data analysis with the central research question and concluded in such a way that anyone could check with clarity the entire research process that leads to the conclusion (Stake, 2010).

Data analysis requires a rigorous approach when applying any of the five analytical techniques—pattern matching, explanation building, time-series analysis, logic models, and cross-case synthesis for case study research (Yin, 2017). This study employed a rigorous approach and adopted pattern matching logic that answered my case study's "how." Pattern matching happens when the predicted pattern is compared with the empirical pattern. I predicted the study's findings by critical propositions that emerged from the literature review and my knowledge of technology adoption through my professional maritime industry experience. The empirically based pattern is the pattern of the conclusions revealed from data analysis (Yin, 2017).

The objective of pattern matching is to examine whether the empirically based pattern matches or differs from the predicted pattern. If the empirically based pattern and the predicted pattern differ, then there are rivals, and the researcher must explain to

justify the rival. Yin (2017) argued that if the empirical and the predicted pattern show some resemblances, it indicates the original explanation's acceptability, strengthening the case study's internal validity. In this study, to align with Yin's procedure for pattern matching, I compared the empirically based pattern with the predicted pattern, examined the extent of the matching, offered rival explanations where necessary, interpreted the result, and concluded. Thematic analysis is the core process of pattern matching in identifying, examining, and pinpointing similarities, relationships, and differences in the data (Ravitch & Carl, 2016) and offers an effective and reliable data approach in a qualitative study (Tracy, 2019).

In qualitative inquiry, a code is a symbolic construct generated by the researcher to capture the summative or the essence of every statement in the transcript of data (Saldaña, 2016). A word or summative short phrase could represent a code assigned to individual data in data to initiate qualitative research analytic (Tracy, 2019; Saldaña, 2016). Upon serving all the participants with a copy of their transcript for validation, I commenced the initial review of the data and began the coding. I conducted two cycles of coding, the pre-codes and the actual code. The pre-coding provides the basis for coding and allows for comparison of the pre-code with the code, and once the codes were determined, I transitioned the codes into categories for thematic analysis. Saldaña (2016) argued that coding is a cyclical act, where correctly attempted coding is rarely achieved during the first cycle. I carried out the coding activities using a Microsoft Excel template.

I used content analysis techniques for primary data. From the information emanating from in-depth interviews, I first identified codes in the main content and

created categories from the identified codes. Using manual coding, I developed the splitting up or categorizing of common codes, phrases, and words within the participants' responses. Using a pattern-matching technique, I continued with the content analysis from primary and secondary data and proceeded with triangulation by exploring patterns of similarity or difference among themes generated by the analysis (Yin, 2017).

The identified themes symbolize recognized patterns, reasonable and practicable agendas of the researcher, commonalities, and the research question (Yin, 2017). Using the coding analysis that recognizes similar relationships within several cases, I classified several themes with codes connecting data collections and combining themes across a few methodologies such as journals, interviews, and discussions (Saldana, 2016). The triangulation of data collection sources guarantees rigor in evaluating data collected and improves the study's overall quality (Yin, 2017).

Attitude is usually passed across using signs conveyed verbally, with body language, and so on (Stake, 2010). To enhance the development of context-based reports of unspoken character, I recorded these signs in several ways to allow for a more comprehensive memory. I provided records of electronically transcribed research participants' responses to the respective participants to examine and verify the accuracy of interpretation and assess the researcher's reflexivity and perspective (Merriam & Tisdell, 2015).

The next step was interpreting the data analysis results, which involved comparing various themes from the data analysis generated through multiple sources (interviews, field notes, and archival data) and comparing the findings with the

theoretical proposition generated from the literature review. Yin (2017) argued that the study findings generalization to the theoretical propositions established from the literature is the strength of case studies. As a result, this study was framed by two key concepts, Yang's (2019) maritime shipping digitization and Wiafe et al.'s (2019) concept of technology acceptance within the maritime industry in developing countries, and both focused on aligning with the purpose of the study to gain a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders.

To validate the study's findings, I compared the findings with similar studies (Stake, 2010). Discrepant cases are data that are out of congruence with the pattern or explanation emerging from the data analysis (Stake, 2010); discrepant cases are also referred to as disconfirming evidence, negative cases, or outliers (Ravitch & Carl, 2016). Analyzing, interpreting, and reporting discrepant cases is essential as it may help the researcher broaden, revise, or confirm the patterns emerging from the data analysis and further improve the study's credibility (Maxwell, 2013). Reporting the case study is the final step of a case study research (Yin, 2017). I reported the outcome of the case study by using thick descriptive narratives and presented to my research audience a holistic picture of the barriers to technology acceptance among Nigerian maritime industry stakeholders that weaken the maritime sector's capacity to drive national sustainable development.

Issues of Trustworthiness

In qualitative research, trustworthiness is the level of confidence the researcher demonstrates in their findings. Merriam and Grenier (2019) described a research study's

trustworthiness as balanced and fair while considering multiple perspectives and interests. The researcher's sources and methods to produce the findings must be trustworthy using four criteria: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). A later addition to these criteria—authenticity by Guba and Lincoln (1994)—has yet to yield wider acceptability among qualitative researchers.

Credibility

Credibility in a study is considered the most crucial criterion (Polit & Beck, 2014) and can be found in confidence in the study's truth and the findings (Lincoln & Guba, 1985). Credibility is achieved through persistent observation of the researcher to avoid bias, prolonged engagement in understanding participants' perspectives, and member checking (Billups, 2014; Morse, 2015). The researcher needs to demonstrate that the presented findings represent the phenomenon's accurate picture (Shenton, 2004). The concept of credibility is analogous to internal validity in quantitative research (Connelly, 2016). The techniques for establishing a study's credibility include triangulation, prolonged engagement, peer debriefing, and member checking (Lincoln & Guba, 1985). This study used triangulation, prolonged engagement, and member checking to achieve a credible study.

Triangulation of Data

Data triangulation is the process of achieving consistency in findings through corroboration by converging data from multiple sources (Yin, 2017). There are four common types of triangulation: methodological triangulation, data triangulation,

investigator triangulation, and theoretical triangulation (Guion et al., 2011).

Methodological triangulation is used to ensure consistency of findings by using different

data collection methods, and data triangulation is used to ensured consistency in findings

using different data sources within the same method (Lincoln & Guba, 1985).

Investigator triangulation is used to ensure consistency in findings involving multiple

researchers or analysts in a single study. Theoretical triangulation is used to ensure

consistency in findings involving the inclusion of a range of different theories to frame a

study (Guion et al., 2011).

The quality of case study results is strengthened by using multiple sources of

evidence. Any inherent weakness from a single source is avoided by converging data

from multiple sources. Using the triangulation of data, I achieved a case study report that

is well developed, rich, and comprehensive (see Lincoln & Guba, 1985). The conceptual

models with which I grounded this study were Yang's (2019) maritime shipping

digitization and Wiafe et al.'s (2019) concept of technology acceptance within the

maritime industry in developing countries. In this study, I used methodological

triangulation to triangulate data obtained through the Zoom interview method with

reflective data obtained from the field observation method and data obtained from the

archives to support the trustworthiness of findings and make suggestions for further

research (Gray et al., 2020; Guion et al., 2011).

Prolonged Engagement

Prolonged engagement involves spending sufficient time in the field to arrive at a

comprehensive understanding of the social and cultural setting in which a phenomenon is

being studied, including the participants involved in the study (Lincoln & Guba, 1985).

Through prolonged engagement, I developed an in-depth understanding of the barriers to

technology acceptance among Nigerian maritime industry stakeholders that weaken the

maritime sector's capacity to drive national sustainable development. Prolonged contact

enhances creditability and trust in a study, as the researcher becomes so immersed in the

study so that the context and settings generate findings that become clearer and more

appreciated (see Lincoln & Guba, 1985).

Member Checking

Also known as participant validation as a means to establish validity, member

checking is the process of asking the participants to check, review, verify, and confirm

the accuracy of their statements as shown in the interview transcript (Lincoln & Guba,

1985; Tong et al., 2013). Through member checking, the researcher can genuinely

understand the participant's actual perception and truth during the interview. The

downside of member checking is that some participants may not recapture verbatim what

they said and how they responded during the interview (Merriam & Tisdell, 2015).

Transferability

Transferability is the extent a study's findings are transferable to other contexts,

settings, and participants (Stake, 2010). The researcher needs to provide enough details of

the context and the setting encountered during the fieldwork so that another researcher

can assess whether the current environment is similar to other settings (Yin, 2017). The

assurance of transferability was critical to my study. The findings from my study on

technology adoption barriers among Nigerian maritime industry stakeholders may be

used to discuss technology adoption barriers with stakeholders in other sectors of the Nigerian economy or with stakeholders in the maritime industry of other developing African countries. I used a thick description to establish the transferability of this study.

Thick Description

The philosopher Gilbert Ryle first introduced the idea of thick description (Ryle, 1949). Thick description became established in the 1970s as a qualitative method for investigating implicit social practices in their specific contexts by anthropologist Clifford Geertz (Geertz, 1973). Since the 1970s, thick description has become a well-established concept and practice as a qualitative empirical approach (Stokes et al., 2016). Thick description enables the researcher to give a detailed account of fieldwork and constructs social and cultural experience patterns, providing a reference point for users of the transferable report to other times, settings, and people (Sergi & Hallin, 2011). I achieved transferability in this study through a thick description of the entire research process, method, participants, contexts, settings, data samples, and the sampling method (Houghton et al., 2013).

Dependability

Dependability in qualitative research ensures that the study's findings are consistent and can be repeated and measured by the standard with which the study is administered, scrutinized, and presented (Yin, 2017). Dependability in the research process occurs when the findings' consistency over time can be reproduced by other researchers (Billups, 2014; Korstjens & Moser, 2018). Dependability of results is essential to the study's trustworthiness, as the research audience must be guaranteed that

if other researchers review the data, they will arrive at the same conclusion. In qualitative studies, the data collection procedures, analysis, and interpretation leading to the findings are reliable and dependable. In this study, I used the audit inquiry technique to establish dependability.

Audit Inquiry

The audit inquiry technique involves the researcher's process detailed account, from data collection to the research findings. Before I began coding, I first ensured that the interview transcript produced from the digital recorder represented the participants' responses during the interview. I accomplished this by listening to the participants' interview responses several times, comparing them with the transcript, and sending a copy of the participant's transcript for validation. I made a detailed account of how the data are collected, categorized, themed, and interpreted, including the decisions that I made to arrive at the findings, and reviewed the report several times to ensure there was no omission from the study. Dependability can also be achieved by obtaining a researcher who is not involved in the study to examine the data process and the findings independently to evaluate accuracy. The audit inquiry could gather additional data that might offer more robust findings (Lincoln & Guba, 1985).

Confirmability

The last criterion to establish a research study's trustworthiness is confirmability and often judged by external researchers. The confirmability criterion aims to prove that the research findings are derived from the participants' narratives and other data sources for the study, rather than the researcher's biases, motivation, or interest (Lincoln & Guba,

1985). Establishing confirmability proves that study results are not the figments of the researcher's imagination or bias but derived from data (Connelly, 2016). The confirmability criterion advances neutrality, impartiality, and the data's precision, interconnecting dependability because both confirmability and dependability can be established simultaneously (Houghton et al., 2013; Walker, 2012). I used an audit trail and reflexivity to achieve confirmability (Lincoln & Guba, 1985).

Reflexivity

Reflexivity includes self-awareness and analytic attention to the researcher's role while conducting a qualitative research study (Lambert et al., 2010; Palaganas et al., 2017). Throughout this study, I exercised reflexivity by being aware of my contribution to constructing meanings from the participants' experiences through the research process (Ackerly & True, 2019; Denzin & Lincoln, 2011). In this study, I kept a reflexive journal notebook on my bias and values and how they may affect my research decisions in all the study phases (Korstjens & Moser, 2018).

Ethical Procedures

Walden University requires all doctoral students to obtain approval from Walden University's IRB before data collection can commence, as a requirement to achieve and maintain ethical practices in research works. I adhered to all IRB requirements necessary to access the participants and the data for this study. The IRB requires that participants involved in studying human subjects are protected from harm or injury in any way during a study (Jacob & Ferguson, 2012). I applied to IRB and kept a record of my application

approval number issued by the IRB. With IRB approval, I accessed the research site, reached out to participants, and collected data.

Participation in any research involving human subjects is voluntary, and as a researcher, I was under the obligation to achieve this through informed consent. Informed consent is a procedure that requires that the participant in a study understand the research information, process, risk and voluntarily indicate a willingness to participate in the study. I developed an informed consent form and forwarded it to each participant to sign and return the form to me electronically via an email address designated for the study. The consent form served as an opportunity for the participants to ask me questions and clarify any issues about the study and its process.

The conduct of a study must adhere to the highest ethical standard, and the researcher must take full responsibility for the scholarship, professionalism, and appropriateness of the methodology adopted for the research (Yin, 2017). The study's research ethics comprised all aspects of research design, ranging from research goals, research questions, validity, and methods (Maxwell, 2013). Additionally, originality and referencing others' scholarly works appropriately to avoid plagiarism is part of the researcher's ethical obligation to observe and comply. I aimed to establish a trusting relationship with the participants and address the participants' privacy and confidentiality of the views and perceptions that they expressed in the study (Palys & Lowman, 2012).

The following is a list of the highlighted ethical actions I took to comply with the ethics of conducting human subject research:

1. I did not engage in pressure or undue influence, or undue motivation, such as offering value to get the research participants' involvement.

2. Participation was voluntary, and the participants were informed of their rights to withdraw unconditionally and at any time from the study.

3. I addressed anonymity by randomly allocating pseudo names in place of participants' actual names during data collection and analysis.

4. In case of an audit inquiry, I provided a pseudonymous copy of the report to the external researcher to secure the participants' identities.

5. I addressed confidentiality by signing off on consent letters with a promissory guarantee to individual participants that their personal information and identities will be protected from the public. The demographic form did not ask for participants' exact age but a range of age to ensure the participants' critical demographic information privacy.

6. I addressed the ethics of respect to participants by involving the participants while scheduling the interview. The participants had the right to dictate the interview date and times most convenient for them.

7. I addressed the ethics of no psychological harm to the participants by being psychologically meticulous while asking probing questions. I did not probe participants' personal life experiences but probed participants' professional life experiences to bring depth to the study.

8. I informed the participants of the interview protocol and the data collection devices such as Zoom and voice recorder before they were used and asked them to express their concerns.

9. I obtained approval from the IRB before data collection could begin.

10. I asked the participants to validate their responses as recorded in the transcript before data processing.

11. I allowed the participants to access a copy of the research paper before publication to confirm that their privacy was genuinely covered in the report.

12. I dealt less with hard files of data and more with electronic files. Where hard files are involved, such as interview notes, print photographs, audio, or video files, I securely locked them away in a cabinet that I can only access. All electronic files are password protected and encrypted.

13. I will erase, incinerate, and destroy all data, both hard and soft, collected after 5 years and inform the participants accordingly.

Summary

In Chapter 3 of this study, I elected to use a qualitative single case design over other qualitative designs such as ethnography, grounded theory, phenomenology, and narratives and substantiated the rationale for adopting the research design. As a qualitative researcher, I discussed my function as a research instrument, an observer, a recorder, and an analyst of qualitative data rather than as a participant in the study. I identified the potential for research biases that may arise from the study and discussed how such biases would be moderated through reflexivity.

The single-case design was grounded into an appropriate methodology for selecting and recruiting the participants using the criterion-based snowball strategy and collecting research data from multiple sources (interview, archival data, and reflective field notes). The interview protocol was grounded in the conceptual model framing the study by Yang's (2019) maritime shipping digitization and Wiafe et al.'s (2019) concept of technology acceptance within the maritime industry in developing countries, adequately aligned with the purpose of the study.

The thematic analysis of the field data to produce empirically based findings and how they will be interpreted using pattern matching was presented. The credibility, transferability, dependability, and confirmability of data results were addressed to support the study's overall trustworthiness. I also highlighted the ethical actions necessary to achieve the ethics of conducting research that involves human subjects, mandated by the IRB. Chapter 4 provides a detailed description of the research setting, demographics, data collection, data analysis, evidence of trustworthiness, and the study results.

Chapter 4: Results

The purpose of this qualitative single case study with embedded units was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. Meeting the purpose of this exploratory study may address the literature gap on why Nigerian maritime industry stakeholders remain slow to accept new technologies for improving the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). The specific management problem was that the barriers to technology acceptance among Nigerian maritime industry stakeholders that continue to weaken the maritime sector's capacity to drive national sustainable development remain poorly understood (Chidi et al., 2020; Nsan-Awaji, 2019). I used 12 semistructured interview questions to answer the central research question of how Nigerian maritime industry stakeholders describe their barriers to technology acceptance.

When triangulated with archival data and reflective field notes, the findings generated from the interview data provide deep insight into technology acceptance barriers among Nigerian maritime industry stakeholders. Scholars have written that when barriers to technology acceptance of updated technologies by Nigerian maritime industry stakeholders are better understood, recommendations can be made for renewed professional practice and technology policy to better support the interface between Nigeria's maritime transportation and the government's national sustainable development strategies (Chidi et al., 2020; Raimi, 2019). To answer the research question, I followed recommendations in the extant literature that updated empirical data is needed to address

the literature gap on why Nigerian maritime industry stakeholders remain slow to accept new technologies that may improve the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019).

In this chapter, I describe the research setting, participant demographics, data collection procedures, data analysis procedures, and evidence of trustworthiness, and I present the study results. I conclude the chapter with a summary and transition to Chapter 5.

Setting

Potential participants for this study were identified via my LinkedIn professional networking platform and through snowball sampling (Merriam & Tisdell, 2015). I searched for and reviewed potential participants' profiles to determine if they met the following inclusion criteria: adults over the age of 18, a minimum of 3 years' experience as a stakeholder in the Nigerian maritime industry and possess knowledge regarding technology challenges maritime industry in Nigeria. After screening the participants for the inclusion criteria, I reached out to them via email to solicit their voluntary interest in participating in the study. In the email, I explained the procedure for the interview, the interview method, and the interview duration. Once a participant showed interest, they were sent the recruitment letter (see Appendix A) and the informed consent form). The recruitment letter contained a section to validate the potential participant's eligibility to participate based on the inclusion criteria for the study. After receiving a reply saying, "I consent," I set up the interview date and time that best worked with the participant's schedule.

I began with eight potential participants initially sourced from the LinkedIn professional networking platform. Seven agreed to participate, and one declined due to a busy schedule and work overload. Four participants who agreed to be interviewed became the source for the other five recruited through snowballing. All the participants interviewed work in the maritime sector in Nigeria; one resides in Europe, and the rest reside in Nigeria.

I began data collection by conducting interviews with the selected participants and collected audio-recorded interview data using the Zoom audio-only platform with the participants' consent. Each of the interviews was planned to last for 20-45 minutes, in which I sought to gather information-rich conversational evidence on the eight semistructured interview questions used for the study. The semistructured interview protocol was structured such that participants were fully engaged during the interview process and openly expressed their views on the phenomenon of discussion. The shortest duration for an interview was 21 minutes, and the longest was 44 minutes. During the interviews, some of the participants wanted clarity on whether the scope of the study covered foreign-flagged ships that visit the Nigerian ports for a short period, and I explained to them that it included any maritime-related activity in Nigeria that required the use of updated technology. There was no evidence of fatigue from any of the participants throughout the interviews.

All the interviews were conducted in privately chosen settings of the participants, and there was no evidence of prolonged interruptions or disruptions from their family members. Most of the interviews were conducted at nighttime, but some participants

were available during the day. During the interviews, poor internet connectivity in Nigeria was experienced, which impacted the interview and the audio recordings. However, each time it happened, I paused the recordings and waited until connectivity improved before continuing with the interview and the recordings. During the interviews, I took reflective field notes, although they were not rich because the interviews were audio only, and the participants' responses were most representative of my observations.

Demographics

The demographic composition of the 12 participants is presented in Table 1. I assigned the unique participants pseudonyms from P1 to P12 to conceal their identities and maintain confidentiality in line with human subject researcher ethics. Of the participants who were interviewed, 67% were males, and 33% were female. Eighty-five percent of the participants occupied senior management positions within the maritime industry, and 15% occupied operational and other related positions. Eighty-three percent of the sample had practical experience on ships as seafarers and sailed as master mariners and chief engineers on ships, 8% had experience in naval architecture and ship construction, and 8% in maritime journalism. In terms of educational achievement, 8% had a national diploma, 33% had a higher national diploma, 8% had a bachelor's degree, 42% had a master's degree, and 8% had a doctorate.

Following the Pew Research Center (2019) generational age classification, the data from Table 1 show that 50% of the research population sample were members of the millennial generation, and 50% were part of the Generation X age group. None of the

participants were within the infant or elderly age categories. There were no vulnerable

participants, as required by Walden's IRB.

Table 1

Participants' Demographics and Characteristics

	Professional background	Level of education	Current title	Gender	Years of experience	Age (years)
P1	Master mariner	Higher national diploma	Ship captain/mooring master	Male	21	41–45
P2	Master mariner	Master's degree	Offshore installation manager	Male	23	36–40
P3	Marine engineer	Master's Degree	Marine surveyor	Male	31	51–55
P4	Marine engineer	Higher national diploma	Head terminal & vessel quality assurance	Male	22	46–50
P5	Marine engineer	Master's degree	General manager technical & operations	Male	19	36–40
P6	Marine engineer	National diploma	Deputy technical manager	Male	18	41–45
P7	Chief mate/navigation officer	Master's degree	Shipping legal & regulatory compliance advisor	Female	15	36–40
P8	Naval architect	Doctorate	Consultant on maritime sustainability	Male	14	36–40
P9	Marine engineer	Higher national diploma	Marine engineer	Female	3	21–25
P10	Marine engineer	Bachelor of science	Marine engineer	Female	4	31–35
P11	Marine engineer	Higher national diploma	Head refit engineer	Male	21	41–45
P12	Maritime industry journalist	Master's degree	CEO/executive producer	Female	20	41–45

Data Collection

The Walden University IRB granted me the approval to start collecting data on

March 9, 2021 (IRB Approval No. 03-09-21-0676300) and expires on March 8, 2022. I

began data collection with the first interview on March 25, 2021, and continued until

April 11, 2021, when the 12th participant was interviewed. The data collection technique used for the study included semistructured interviews, reflective field notes, and archival data.

Initial Contact

I searched for and reviewed potential participants' profiles on the LinkedIn professional networking platform to determine if they met the inclusion criteria. I began with eight potential participants initially sourced from LinkedIn. Seven agreed to participate; one declined. Four participants became the source for five additional participants through snowballing technique.

Once a participant showed interest, I sent them the recruitment letter (see Appendix A) and the informed consent form. The recruitment letter contained a section to validate the potential participant's eligibility to participate based on the inclusion criteria for the study. After receiving a reply saying, "I consent," I set up the interview date and time that best worked with the participant's schedule.

Interviews

The interviews were conducted via the Zoom videoconferencing software using the audio-only feature to record each interview. Zoom provides a cost-effective and convenient alternative to in-person interviews, as it was developed to facilitate long-distance or international communication, enhance collaborations, and reduce travel costs for business (Gray et al., 2020). Also, an additional recording device was available to ensure an alternative means of accessing the interview recordings in a software glitch.

The additional recording device was useful because I could not download two of the recordings from Zoom.

Each interview began with appreciation for the participant's participation followed by a brief overview of the study. All the interviews were conducted in privately chosen settings at the participants' chosen time and when there were no prolonged interruptions or disruptions. Two interviews were conducted at the participants' workplace on the ship, and the rest were conducted in the participants' homes. I used the interview protocol (see Appendix B) to guide the interview, ensuring consistency in the interview process for the 12 participants. In some cases, and when prompted, I used probes and follow-up questions to elicit an information-rich explanation.

The primary data collection tool used in the study was a semistructured interview with focused open-ended questions. The interview questions explicitly addressed the dissertation topic to evoke answers based on the participants' experiences. The interviews centered on eight well-chosen questions grounded in the conceptual framework and the literature presented in Chapter 2. For a qualitative single case study with embedded units, the minimum number of interviews is five participants. However, I conducted more than five interviews and reached data saturation at 10 participants, with repetitive information in the 11th and 12th interviews (Halkias & Neubert, 2020; Schram, 2006).

The interview process took 17 days to complete all 12 interviews, with a variation in response time from participants consenting and scheduling interviews due to their workload and time zone differences. The process consisted of identifying the participants, obtaining consent, conducting the interviews, and following up with the transcripts. The

interviews were planned for 20–30 minutes each, but the average time for the interviews was 31 minutes. After the interviews, I used Rev.com for transcription. When the transcription was complete, I often listened to the audio recordings, made corrections, and added reflective notes. I sent the transcribed data to the participants to confirm that the transcription of their interview responses represented their views during the interview. All 12 participants validated their interview responses; two responded to validate the transcripts. One participant made minor changes that did not significantly change the transcription contents, and the rest of the participants did not respond.

Reflective Field Notes and Journaling

I maintained reflective field notes from the date I received my IRB approval on March 9, 2021, where I created a plan for recruiting participants, processed feedback, and recorded any contextual information relevant to the phenomenon under study. I used reflective field notes to capture striking or notable responses during the interview process and provided points for probing questions. Because the interview was on Zoom and only audio, I noted verbally expressed mannerisms, tones, or attitudes during the interviews that stood out or drew my attention. I further reflected on the interviews for inference by repeatedly listening to the interview audio recordings (Merriam & Grenier, 2019).

Transcript Review

To strengthen the trustworthiness of qualitative data, a transcript review is an essential element of the member-checking process (Birt et al., 2016; Mero-Jaffe, 2011; Merriam & Grenier, 2019). The transcribed data were sent to participants, and they were allowed to review the transcription to ensure it represented their views during the

interview (Billups, 2014). Out of 12 total participants, three replied to validate their data, while the remainder of participants' transcripts were considered validated due to their lack of response as instructed by the procedures listed in the informed consent section for member checking.

During the transcript review process, the research's accuracy and credibility were improved because member checking ensured that participants' thoughts were clearly expressed and corrected as appropriate (Yin, 2017). I removed participants' names and replaced them with pseudonyms (P1–P12) after receiving the validated transcribed data to maintain confidentiality. The transcribed data were further organized into a single Microsoft Word document and saved in a secure file under the data security plan established for the study. The verified transcribed data were used for manual hand coding and data analysis.

Data Analysis

Upon completion of the member-checking process for transcribed data with all the participants, I started data analysis. Following Saldana's (2016) recommendation, I adopted a descriptive coding strategy to assign meaning to segments of raw data collected for this study and used the emerging words from the descriptive coding for categorization and thematic analysis. The raw data transcribed and confirmed through the member-checking process presented a detailed account of the perceptions of the maritime industry stakeholders regarding the barriers to technology adoption.

In a case study, design coding drives data analysis (Saldana, 2016). The case study involves in-depth, futuristic, and holistic investigation into all aspects of the case

and provides industry-related data not anticipated by literature (Yin, 2017). This study

provided detailed information on the unexplored area of barriers to technology adoption

in Nigeria's maritime industry. The findings provided a comprehensive understanding of

the phenomenon under study in this single case study design, with the participants being

the embedded units within the case. I applied the inductive approach to the analysis

strategy for this study for themes to emerge. The inductive approach is used in qualitative

research to generate or broaden theory and allow themes to emerge from data (Saunders

et al., 2018).

I used the thematic analysis for this study to examine meanings and describe the

social reality of maritime industry stakeholders in Nigeria regarding the barriers to

technology adoption. The thematic analysis emphasizes identifying, examining, and

recording meaningful patterns within data and is propelled by the systemized raw data

coding process (Yin, 2017). The thematic analysis process I deployed while analyzing

textual data supported the emergence of themes to answer the study's central research

question (Saldana, 2016).

For the thematic analysis of the study, I used manual coding through a systematic

process framed in the descriptive coding method. The descriptive coding method enabled

me to assign meanings to raw data segments, which led to the emergence of lists of

words, phrases, or both for indexing and data categorization (Saldana, 2016). I used

Microsoft Excel software to facilitate the manual hand-coding of the participants'

transcribed interview responses. In addition to data triangulation, the coding of words and

phrases resulted in substantial recognition of patterns, while detailed attention to similarities and differences improved the study's dependability (Yin, 2017).

I used the ground-up data analysis strategy (Yin, 2017) to generate codes from the transcribed data using the inductive analysis approach (Boyatzis, 1998). The inductive analysis entails coding the data without manipulating the data to fit into a preexisting coding frame or the researcher's analytic preconceptions. In this study, a thematic analysis is considered data-driven when the codes are generated inductively (Braun et al., 2019). Using thematic analysis, I thoughtfully searched for themes important to depicting the phenomenon, which involved a meticulous process of identifying themes through readings and a sound understanding of the data (Yin, 2017).

I used Yin's procedure for pattern matching for the study (Yin, 2017). In a qualitative study, thematic analysis is the core process of pattern matching and offered an effective and reliable data approach. I compared the empirically based patterns with the predicted pattern, examined the matching range, offered rival explanations where necessary, and interpreted the result. I categorized common codes, phrases, and words within the participants' responses (Yin, 2017) and applied content analysis techniques for primary data. I first identified codes in the main content through in-depth interviews and created categories from the identified codes. I continued with the content analysis from primary and secondary data using a pattern-matching technique followed by triangulation by exploring patterns of similarity or difference among themes generated by the analysis (Yin, 2017).

The identified themes represented recognized patterns, reasonable and practicable agendas of the researcher, commonalities, and the research question (Yin, 2017). Using the coding analysis that recognized similar relationships, I classified several themes within several cases with codes connecting data collections and linking themes across a few methodologies such as journals, interviews, and discussions (Saldana, 2016). The triangulation of data collection sources rigorously evaluated data collected to improve the study's overall quality (Yin, 2017).

The next step involved interpreting data by comparing various themes from the data analysis generated through multiple sources (interviews, field notes, and archival data) and comparing the findings with the literature review's theoretical proposition. The ability to be generalized to the theoretical propositions established from the literature lies in the strength of case study findings (Yin, 2017). This study was framed by the concept of Yang's (2019) maritime shipping digitization and Wiafe et al.'s (2019) concept of technology acceptance within the maritime industry in developing countries. The alignment of this conceptual framework to the overall findings from the case study research was essential in interpreting the result to arrive at a deeper understanding of how Nigerian maritime industry stakeholders describe their barriers to technology acceptance.

Using manual descriptive coding, I was able to dig deeper into the data (Cronin, 2014) in a manner that enabled me to gain a more contextual understanding of the data (Finfgeld-Connett, 2014). Being a novice researcher, I needed a simple and effective means to analyze my data. The descriptive manual coding method answered my need as it was more effective and suitable for my data analysis than computer-assisted qualitative

data analysis software (CAQDAS). In line with Yin (2017), my data analysis comprises analysis-assemble, collect, interpret, disassemble, and conclude the data. Interviews and reflective field notes were my data sources, and the methodological triangulation improved the dependability of the results.

The five coding categories are based on the conceptual framework, and the 16 themes gleaned from the thematic analysis using Yin's pattern-matching logic and areas are listed below:

- Coding: Technology adoption standards as compared to global industry standards
  - Themes: (a) technology adoption below global industry standards; (b) noncompliance of international maritime legislation; (c) corrupt practices blocking investment in upgrading technology
- Coding: Barriers to technology adoption and maritime digitization
  - Themes: (a) lack of industry readiness for change; (b) reluctance to purchase and maintain technology among stakeholders; (c) lack of qualified professionals to operate updated technology
- Coding: Technology acceptance factors influencing maritime industry stakeholders
  - Themes: (a) corporate culture and ageism; (b) ethnic culture; (c) lack of the willingness to change

- Coding: Resources needed for new technology adoption to meet global industry

  standards

  - Themes: (a) updated and enforced government policy; (b) available funds

    to acquire new technology; (c) development and enforcement of

    anticorruption business policies

- Coding: How Nigeria's maritime sector can drive national sustainable

development

  - Themes: (a) align with international best practices; (b) public–private

    investment in maritime digitization education and training; (c) support a

    government–shipowner partnership to develop a professional IT

    workforce; (d) becoming an active player in developing Nigeria's

    knowledge-based economy

The five conceptual coding categories are grounded in the study's conceptual

framework that includes two conceptual models: Yang's (2019) maritime shipping

digitization and Wiafe et al.'s (2019) concept of technology acceptance within the

maritime industry in developing countries. Both concepts formed the study's framework

in relation to the maritime industry (Wiafe et al., 2019; Yang, 2019), originating in

theoretical studies extending Rogers's (1995) innovation diffusion theory, which

provided a theoretical lens through which to evaluate the effect of the three factors of

culture, policy, and cost in any research related to ICT adoption.

Olaniyan (2020) developed the interview questions in an open-access study

exploring a qualitative single case study to understand the perceptions of construction

project managers in Nigeria and basing each item from the theoretical literature, the authors' knowledge of technology acceptance within industries in Nigeria, and previous conceptual frameworks explaining technology acceptance in the Nigerian context grounded in Rogers's diffusion of innovations theory (Usman & Said, 2014; Waziri et al.'s (2017). Both the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) and the technology acceptance model (Davis, 1989) used to build my study's conceptual framework were initially grounded by the authors in Rogers's (1995) diffusion of innovation theory, which helps an organization to decide whether to adopt or reject an innovative idea. My study followed this line of conceptual thinking which aligned with my study's purpose and the central research question.

The purpose of research, the kind of analysis undertaken, and the intended readership are factors to consider when deciding the presentation style for a case study research finding (Boyatzis, 1998). To give voice to a previously unheard population through this purposive sample, participant quotes' personation of category and themes was used to achieve this research goal in this study (Gregory, 2020). Below is a description of the finalized coding categories and themes of this single case study with embedded units, along with respective examples of participant quotations (Table 2) to represent each of those categories and themes.

Table 2

Coding and Theme Examples

	Interview Excerpt	Category	Theme
P12	"We are far behind. Far behind in the sense that the swiftness with which we embrace new things, like you pointed out is sluggish. We are not open, and ready to act fast regarding technology adoption, probably because we have not grasped exactly what that would do for the industry."	Technology adoption standards as compared to global industry standards.	a) technology adoption below global industry standards; b) noncompliance of international maritime legislation; c) corrupt practices blocking investment in upgrading technology
P11	"The world is a global village, and the maritime industry is highly regulated. It means that legislations set by the international maritime organizations are to be enforced by various members countries. Implementation of these regulations has been an issue. So, technology has a lot to do as it concerns compliance with maritime regulations"		
P2	"The level of corruption in the nation is high such that policies are bent to suit certain individuals because this guy is our crony, or this guy is our body." In this situation, we cannot make real progress."		
P8	"My opinion about technology adoption in the maritime industry is a lack of policy to carry the people along to know exactly what the next phase is because the government fully drives the maritime industry in Nigeria. They do not give much room for the private entities that can invest in new technology and bring in new ideas."	Barriers to technology adoption and maritime digitization	a) lack of industry readiness for change; b) reluctance to purchase and maintain technology among stakeholders; c) lack of qualified professionals to operate updated technology
P5	"Cost plays a big role in it, and it is one of the reasons for the low adoption, because most times, when investing in a technology or technology improvement, unless it has to do with a company specific operation, it must interface with others, maybe the regulatory agencies, the end client, or other service providers. It means that every one of them must adapt or have the capacity to bring in that level of technology."		
P7	"Ageism is a factor in the corporate culture of the industry. The older people in the industry are heading and leading the industry, and change is a bit difficult. People tend to want to stick to what they know, so people want to do things the way it was done ten years ago, and any attempt to change things will be resisted. Sometimes people can even get a bit hostile towards change, contributing to slowing down technological advancement in the country."	Technology acceptance factors influencing maritime industry stakeholders	a) corporate culture and ageism; b) ethnic culture; c) lack of the willingness to change
P3	"Ethnic cultural influences the industry stakeholders' actions, such as the ship owners, ship operators, and charterers, because they tend to believe the advice of someone from their culture or relative. They will say this person is my tribe's man and will believe whatever he says, even if he does not know anything about ship operation."		
P4	"The government should be sincere with policies and legislation by creating rules that align with international best practices and what other based practice organizations, bodies, or nations do. The rules should be followed by strict implementation and ensuring that every case is based on merit"	How Nigeria's maritime sector can drive national sustainable development	a) align with international best practices b) public-private investment in maritime digitization education and training c) support a government-shipowner partnership to develop a professional IT workforce d) becoming an active player in developing Nigeria's knowledge-based economy
P10	"Shipowners should devise a mentorship program for their workforce to transfer skills from the experienced and skilled staff to the new ones. Mentorship will encourage young people with the required training and certificate to build on their skills and experience by putting them in a space to keep growing."		

Evidence of Trustworthiness

Credibility

Credibility was achieved through persistent observation of the researcher to avoid

bias, prolonged engagement in understanding participants' perspectives, and member

checking (Billups, 2014; Morse, 2015). To achieve a satisfactory level of credibility to

the study results, I took four steps to achieve credibility in the study. First, I informed the

participants of their voluntary choice to participate and their confidentiality regarding the

study, which enabled me to achieve conversational and in-depth responses from the

participants as they were being interviewed in a comfortable atmosphere at the location

of their choice. Second, member checking enabled the interview transcript to be reviewed

and corrected by the respective participant (Merriam & Tisdell, 2015). Third, prolonged

engagement, saturation, consistency, digital recording, and audit trail enabled enhanced

data conclusion credibility (Cooper & White, 2012; Yin, 2017). Fourth, ensuring the

inclusiveness of the participants who met the inclusion criteria of being an adult over the

age of 18, with 3 years minimum experience as a maritime industry worker, and

possessing knowledge about maritime industry business and operation in Nigeria, also

helped improve the credibility of the study (Merriam & Tisdell; 2015; Yin, 2017).

Transferability

Transferability is the extent a study's findings are transferable to other contexts,

settings, and participants (Stake, 2010). The findings from my study on technology

adoption barriers among Nigerian maritime industry stakeholders may be used to discuss

technology adoption barriers with stakeholders in other sectors of the Nigerian economy. I used a thick description to establish the transferability of this study.

I took three steps to achieve transferability in the study. First, I used thick description to detail the context, setting, and method for the research in the research design to help any researcher seeking to replicate this study within a different context in the future to make a reasonable judgment that will aid and ease the transferability (Morse, 2015). Second, the interview questions were derived from a previous study on barriers to technology adoption among construction project managers in Nigeria that provided a probability of transferability (Olaniyan, 2020). Third, I used the LinkedIn professional platform to recruit participants for the study and Zoom for the participants' interviews for this study. The Zoom platform provided a sustained unbiased environment (Yin, 2017), allowed ease of access to distant prospective participants (Seitz, 2016), and aided the replication process (Gray et al., 2020).

Dependability

Dependability in the research process occurs when the findings' consistency over time can be reproduced by other researchers (Billups, 2014; Korstjens & Moser, 2018). I took four steps to achieve transferability in the study. First, I used audit inquiry and documented a detailed research process from data collection to the research findings. Second, I thoroughly documented the semistructured interview questions (Appendix B, Interview Protocol) from which the responses were generated alongside other multiple sources used to triangulate themes. After verification, the transcripts produced from the digital recording were an accurate representation of the participants' responses during the

interview. Third, I re-emphasized the participants' inclusion criteria in the recruitment letter (Appendix A) and requested confirmation at the beginning of the interview from participants to give credence to the findings' dependability. Fourth, I used the interview protocol developed by Olaniyan (2020) to study barriers to technology adoption among construction project managers in Nigeria.

Confirmability

The confirmability criterion advances neutrality, impartiality, and the data's precision, interconnecting dependability because both confirmability and dependability can be established simultaneously (Houghton et al., 2013; Walker, 2012). I used an audit trail and reflexivity to achieve confirmability (Lincoln & Guba, 1985). I took three steps to achieve confirmability in the study. First, I constantly ensured that I was aware of my position as an instrument of the research and ensured that I did not manipulate the data. Second, Dr. Steve Tippins, being the methodology expert of my dissertation committee and served as the external auditor for my study, reviewing the study process to ensure alignment between the collected data, data analysis, research findings, interpretation, and recommendation. Third, I maintained a reflexive journal notebook, examining my conceptual lens, the explicit and implicit assumptions, preconceptions, and values, and how they affected my research decisions in all phases of the study (Korstjens & Moser, 2018).

Results

The specific research question for this single case study with embedded units was developed to provide answers emerging from the context of the natural empirical setting

(Ketokivi & Choi, 2014). The specific purpose and research question provided the direction for this study (Yin, 2017). Meeting the purpose of this exploratory study may address the literature gap on why Nigerian maritime industry stakeholders remain slow to accept new technologies for improving the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). The answer to the central research question— "How do Nigerian maritime industry stakeholders describe their barriers to technology acceptance?"—was generated by interviewing Nigerian maritime industry stakeholders regarding their perception of the barriers to technology adoption.

During the interviews and subsequent data analysis, the perception on this topic, patterns, and themes were developed from the raw materials collected to generate the results of this case study. Thematic analysis of the textual data was used to identify patterns and themes. The identification of patterns and themes was achieved by comparing the themes that emanated from the data generated through multiple sources (interview, field notes, and archival data) and comparing the findings with the theoretical proposition generated from the literature review.

The ability for the findings to be generalized to the theoretical propositions established from the literature is the strength of the case study (Yin, 2017). Considering that the study was framed by Yang's (2019) maritime shipping digitization and Wiafe et al.'s (2019) concept of technology acceptance within the maritime industry in developing countries, aligning the conceptual framework to the overall findings was essential in

interpreting the results to gain an in-depth understanding of Nigeria maritime industry stakeholders' description their barriers to technology adoption.

To validate the findings of the study, I compared it with findings from other similar studies. I checked for discrepant cases, data congruency with the patterns or trends emanating from the data analysis (Walsh et al., 2015). Analyzing, interpreting, and reporting discrepant cases is a necessary process that could assist the researcher in broadening, revising, or confirming the patterns emerging from the data analysis and further improve the study's credibility (Maxwell, 2013). In reporting the study research, which is the final step in case study research (Yin, 2017), I used thick descriptive narratives for the report. I presented a comprehensive picture of the barriers that the Nigerian maritime industry stakeholders face in technology adoption. The findings of this study were not influenced by discrepant data, as there were no significant discrepant data found or that reached data saturation.

The data used for the analysis consisted of interviews, field notes, member-checked transcriptions, and findings outlined in the seminal literature (Yin, 2017). Thematic analysis was used to categorize data from my research to understand the study participants' views, behaviors, or qualities in a natural setting to answer the central research question (Yin, 2017). Given that there is no specific procedure to develop rigorous and relevant thematic analysis, Boyatzis (1998) and Yin (2017) recommended that thematic analysis provide a logical, coherent, concise, nonrepetitive, and unassuming account of the data the identified themes.

To ensure a rigorous data analysis, I considered Yin's (2017) five analytical techniques of pattern matching, explanation building, time-series analysis, logic models, and cross-case synthesis in this process. The pattern matching logic was effective in answering the "how" of my case study research question. Pattern matching is the comparison between the predicted pattern and the empirical pattern. I predicted the study findings by deducting critical propositions that emerged from the literature review and my knowledge of technology adoption in reviewing the literature. The empirically based patterns were the product of data analysis.

The following section contains 16 themes that emerged from the thematic analysis and are defined through a summative statement delineated from the participants' responses to the interview questions. Supported by the critical insights from the in-depth interviews, the following themes are presented, intermixed with the participants' voices here concerning the response to the central research question. Table 2 reflects the relationship between the participants' responses and the emergent coded themes.

The response to each theme contains a direct quote from the participant's voice to provide contextual, detail-rich data and enhance the study results' confirmability. The reflective journals I took during the data collection were used to analyze interview responses carefully. To ensure that the results emerged from participant-driven experiences and not my predisposition, I used triangulation of findings to achieve that purpose.

Themes from the Thematic Analysis

Technology Adoption Below Global Industry Standards

This theme refers to the low internationally accepted standards rating by ships and other marine structures such as ports, terminals, waterways to ensure the effective operation of the maritime industry. The decline in standard, quality, and profitability of the Nigerian flagships is traceable to the low technical standards caused by the owners' reluctance to comply with national and international standards and regulations (Igbozurike, 2020; Uwadia, 2016). In addition, several factors such as lack of funding, lack of skill and technical know-how, excessive taxing, bureaucratic and regulatory challenges, low market patronage, lack of infrastructure and ship research centers, cost, and pricing constraints, among others, account for the inadequacy of the Nigerian maritime industry to carry out shipbuilding, recycling, and repairs in Nigeria (Nwokedi et al., 2019).

Participant 6 said:

The rate of technology adoption in the industry is low, within the range of 30 to 40%, well below average. The low rate of technology adoption has impacted the country's drive to improving the maritime sector and making the maritime sector a leading global business among other sectors within the country. So, it is low, and the need to improve and embrace technology cannot be over-emphasized.

Participant 9 said:

The ratio of technology adoption in the industry is about three to ten, meaning three for Nigeria maritime and ten for the global maritime. We know about these

technologies most times, but somehow our maritime stakeholders do not seem to

follow most of them. For instance, most offshore service vessels (OSVs) use

Dynamic Positioning (DP) system. DP helps reduce the risks of accidents at sea,

loss of life, and any other damages that could happen when a supply vessel is

operating with an Oil Rig or a floating production storage and offloading (FPSO).

For a vessel to have a Dynamic Positioning system, there are so many equipment

that need to come into place, but most ship owners do not provide this equipment,

and the flag state inspectors tend to overlook them. They do not enforce the

standards, and that is one of the problems why there is low adoption of new

technologies.

Participant 5 said:

The rate of technology adoption is low compared to other competitors because,

from experience or what is available, the present technology penetration within

the industry has not been holistic. The adoption is in the trial stage rather than the

implementation stage. For example, technology adoption in the industry will first

be accepted or led by the flag administration of that country. [NIMASA] is not

effectively advancing technology adoption in the maritime industry. For example,

many countries have gone to digital certificates acceptance and verification, but in

Nigeria is not accepted, a simple thing like the certificate of competency (COC)

verification for seafarers. It has all been trial and error. We are still at the stage of

sending an email or calling somebody to check through the file to confirm if they

issued that certificate or not.

Noncompliance to International Maritime Legislation

This theme refers to failure to meet the international maritime organization laydown rules and regulations governing the maritime industry operation. Noncompliance to international maritime legislation is impacted by a lack of understanding of the value of legislation and the cost involved in meeting regulations. Waife et al. (2019) argued that the level of knowledge hampers technology acceptance in the maritime, and related skills in technology is needed to improve the industry performance.

Participant 3 said:

The believe of most stakeholders is that if the equipment is not broken, there is no need to fix it, lack of maintenance culture. For example, the IMO regulations requires that single hull ships be phased out, most countries in Europe have implemented this regulation as far back as 5-7 years ago, but Nigeria pleaded for more time to implement this regulation. Even with more time granted to the stakeholders, they are come back to say, "Oh, these ships are still working, they are not broken, so why do we need to phase them out." They still believe that if it is not broken and they are still running from point A to point B with no serious accidents, they will continue with it. They do not want to spend money either to go and make the vessel double haul or to go and buy new vessels.

Participant 4 said:

The implementation of international maritime legislation such technological advancements are driven by the availability of some regulations, IMO, and the

likes. However, there is no effective enforcement in the developing world, like Nigeria being the focus of this study, it will be difficult for you to see mass adoption or that mass drive into the use of that technology.

Corrupt Practices Blocking Investment in Upgrading Technology

This theme refers to the human administrative bottlenecks that hinder investment in new technology from increasing performance due to the tendency to encourage corrupt practices in the industry. Technology acceptance will also address some problems and challenges in the industry such as

insecurity, inadequate infrastructure, bureaucracy, weak laws, corrupt practices, inadequate capital for investment and maintenance of ships, poor incentives for investors, lack of indigenous carrier vessels, sea unworthiness of such indigenous vessels where they are available, and poorly integrated water transport systems. (Chidi et al., 2020, p. 6)

The challenges mentioned above can be minimized by leveraging maritime shipping digitization, a disruptive technology to reduce transportation costs, shape global trade prospects, and provide companies with a higher degree of competitive advantage (Yang, 2019).

Participant 6 said:

The industry corporate culture is plagued with corruption. In this part of the world, people tend to be conservative, and they want to retain the way they do things. There is a lot of in-built face-to-face contact, which encourages corruption and kickbacks in the industry.

Participant 3 said:

The government has not played any major role. They have not taken the bull by the horn. It is not that the regulations are not there to streamline the industry, but the regulations are not enforced partly due to corruption. People tend to close their eyes once their palms are greased. If regulation is there to phase something out, or if regulation is there to see something was being used for certain time and discarded and put new one, if regulators go to ship and they call them to a corner and grease their palm, they tend to look elsewhere and say everything is okay. Also, partly because of favoritism, for example, when a ship being inspected is owned by the inspector's kinsman, or by somebody of same tribe, he will ask himself, will I stop the ship because we want to maintain regulation? The regulator will just look elsewhere.

Participant 2 said:

There is a lack of the willingness to change from the usual way of doing things and to embrace new things to improve the system. Corrupt government agents who will rather frustrate the introduction of technology that will close the loophole that enable them extort customers. Again, the government officials will frustrate any online application where the customers can do all the processing, buy the goods, present the papers, and take out the goods. The officials will not have the opportunity to extort the customer because the customer is not there physically.

Lack of Industry Readiness for Change

This theme refers to the lack of infrastructural foundation to adopt new technology. Technological innovation requires a holistic approach whereby various aspects of the industry can adapt, such as ship to the port facility, to ensure a seamless interface. However, the Nigerian maritime industry's inadequate technological infrastructure for efficient and fast services accounts for low productivity in the Nigerian seaports (Ekeada et al., 2018). In addition, the Nigerian maritime industry has suffered from undue interferences from the government, resulting in an inconsistent segmented shipping policy document. As a result, the country lacks a comprehensive maritime policy that will reshape, redirect, and restructure the industry and check counter-productive measures (Ndikom & Olusegun, 2019).

Participant 8 said:

There are issues about the local content law, access to services and access to partnership. The local content law is not strong enough, there are loopholes that are not giving the ship owners comfort, that people with foreign vessels are still doing things that the Nigerian vessels are supposed to be doing. There is limited access to services in terms of infrastructure, like floating dock, shipyard, repair yard, and where they can maintain and service their vessel. Again, the access to a partnership. The partnership is very key because ship ownership is a big investment. You need banks that understand how that operates, but the Nigerian banks have limited experience in the shipping industry. I consult for few banks, am not going to mention the name here. They do not know much about vessel

purchase and valuation before joining their team, and these banks and the Central

Bank of Nigeria are supposed to support the vessel owner. The understanding is

not there. It is a massive barrier for them because you need a good bank to

support the purchase of a vessel. Not a bank that will say, 'Bring in 80%.' Or

'Give us a surety that will cover almost 100% of the vessel', when a project that

the vessel will be doing can bankroll that, the shipowner will be looking around

running to raise funds that are not even supposed to be.

Participant 6 said:

To begin with, we do not have the foundation to build on, so yes, it is going to be

costly to start up. The cost of acquiring the infrastructure and implementation will

be high because we do not have the technological infrastructure to build on. It will

be capital-intensive because we have little or no technological infrastructure

where we can lay the foundation to bring in technology. The state of internet

penetration in Nigeria is still low.

Participant 8 said:

Since the federal government drives the industry, the technology is not

forthcoming because everybody depends on the government to introduce certain

advancement in technology, changes in policy that will affect the creation of other

things that will lead to development in that area like what is done in Egypt,

Singapore, and other parts of the world. So, the maritime sector is waiting for the

federal government to put in a policy or have an ad hoc committee to look at how

to expand the maritime industry by injecting, inventing, or looking for ways to bring technology will optimize the maritime sector.

Reluctance to Purchase and Maintain Technology Among Stakeholders

This theme refers to the unwillingness to invest in new technology due to various factors such as cost, government policy, and lack of technology penetration. Advances in technology create a sense of uncertainty and loss of control among the employees; thus, the resistances and lack of support represent a major behavioral challenge to technology acceptance (Hwang et al., 2016). The high cost of developing, implementing, and maintaining digital systems contributes to blockchain technology challenges in the maritime industry (Gausdal et al., 2018). Gausdal et al. (2018) identified other challenges: the poor internet connectivity at offshore facilities, out-of-touch decision-makers, the organization's technology-oriented culture, the lack of investment initiatives, the low level of blockchain diffusion through the supply chain, and risk aversion.

Participant 7 said:

Cost plays a big role because the maritime industry is capital-intensive. Also, there is a lack of appreciation of the role of technology because if you appreciate what technology brings to the table, you invest the money that is required for technological advancements in the industry. Technology helps hasten processes, and to an extent, if utilized very well, will minimize human error, which in turn makes whatever operations involved cost-efficient. But if you do not appreciate that, you will probably see spending that money in technology as a burden, and then you will not spend the money.

Participant 1 said:

Cost for the big players is not a problem, but it is a challenge for the small players in the industry because of the foreign exchange rate and availability of fund. So, the small players tend to stick to the traditional way of doing things, while the big players who can afford the technology tend to seek ways to access new technologies.

Participant 4 said:

The cost element is a major determinant. Why do people have to take on cost when they do not know the benefits and no certainty that they will have profitable returns. A cost-oriented venture does not make sense because they will not go into that for fun. The way cost plays a part is in the development of this new technology; a lot goes into research for them. A lot goes in to form them and as such, a lot goes in to develop them and get them viable. The developers or the original equipment manufacturers (OEMs) are in this for business and need to recoup funds spent in developing such a technology. When you look at the developed world, there are many incentives either from the governments, from financial institutions, and even private individuals, people are interested in investing, but in the developing world, even the government shies away from assisting in bringing in new technology that would be beneficial to the society. The government is not playing a leading role in this area, and where the cost element has not been taken care of, then the users will not be interested in it in the first place.

Lack of Qualified Professionals to Operate Updated Technology

This theme refers to the availability of qualified individuals to operate and maintain adopted technology in the industry. Human capabilities to use technology are essential to adopting new processes as new technology's practical knowledge may enhance its acceptance (Brock & Khan, 2017). Therefore, ensuring that the workforce has the essential competency for technology use will require an effective workforce and information technology (Yuan et al., 2017).

Participant 1 said:

Development of manpower for navigation, engineering, and electrical technician officers to have personnel with requisite knowledge and skills to operate and maintain the new technology instead of relying on foreigners for maintenance services. Once we have knowledgeable people in these areas, it would be easier to progress in technology adoption. The development of manpower, although it may be expensive at the beginning, in the long run, is cheaper because when you have qualified people to manage your vessels, you spend less on maintenance and breakdown. If you do not develop the manpower and rely on less trained personnel to save cost, you will spend more if the technology breaks down. And then, the turnaround time will be longer because when you have a breakdown vessel, you cannot meet up to pick the cargo or to discharge the cargo. So, which is going to increase the cost of operation invariably.

Participant 5 said:

The industry needs the human capacity to operate and manage the technologies,

because locally available training does not guarantee successful use of a

sophisticated high-tech vessel or the ease of accessing the qualified personnel to

operate these technologies. Again, if the technology is acquired, training must be

provided, which adds to the running cost.

Participant 9 said:

There is a lack of a training culture to sustain workforce development in the

industry to enhance performance. If a company does not train their employees, it

is a barrier to innovation and technology adoption because it will create a

knowledge gap. Sometimes when the employers do not train their employees,

they may leave to get the training by themselves to increase their earning value.

Corporate Culture and Ageism

This theme refers to the beliefs and practices that guide the company's employees

and management in handling business transactions. Resistance to change is one of the

industry managers' barriers to using updated technology because of the impacts of

implementing the desired technology (Love & Matthews, 2019). Readiness for change

and capacity for change contributes to the barriers because organizations need to have the

capacity to continually change in response to internal and external shifts, as early

adoption of technology may not yield expected results (Onugha & Onuoha, 2019).

Participant 3 said:

The stakeholders lack the drive to adopt new technology unless the regulators

compel them. Maintaining the old and familiar way of doing things is a factor in

corporate culture in the industry. For example, recently, there was a problem with seaweed-water hyacinth in some parts of Nigeria. It is a menace for sea operators, whether boat operators or ship operators, as it covers the sea, making it difficult to know whether anything is submerged underneath, which can be detrimental to vessel operation. There was a debate among the stakeholders to acquire modern equipment that can harvest the seaweed, which can be used for other purposes like papers. However, the operators rejected the idea of modern equipment, which could have improved the harvesting process and turned the harvested water hyacinth into other products.

Participant 7 said:

Some cultures in Nigeria are built on respect. And their interpretation of respect will mean, when the older one is talking, the younger one has no say. So, you tend to see that a lot. It takes a few young individuals willing to rock the boat to push through their opinions, but if they cannot have a say, that stands in the way of any technological advancement. This attitude is carried from home into the workplace, and when it happens, it automatically means that the younger people in the organization do not have a say. The younger ones are more exposed to the industry and see what is going on and should be in the forefront to drive the required change.

Participant 12 said:

The corporate culture in Nigeria is average and could be a reason why regulatory agencies are struggling. There is a difference between people concerned mainly

about their means of livelihood and people concerned about building an enterprise that is globally competitive or even nationally competitive, it influences everything. When you go to our waters, you see foreigners, especially Chinese, involved in illegal fishing and all manner of illegal activities, all because the generality of the industry's corporate culture is far from being regulated.

Ethnic Culture

This theme refers to cultural differences of the various ethnic groups in the country and how it influences activities and businesses related to technology adoption in the maritime industry. Nigeria comprises various ethnic groups spread across different geopolitical zones with different heritage, customs, and religions that influence their decision-making.

Participant 1 said:

Ethic culture does not pose a barrier to technology adoption in the industry, but it influences the actions of the administrators at the regulatory body on how policies are applied. When you look at the regulatory body, you can see it at play there, there are reports of ethnicity issues at the regulatory body, although I do not work there, so I do not have details about it.

Participant 11 said:

Ethnicity has little to do with technology adoption because shipping is an international business. However, in terms of how the government supports ship owners, yes, the part of the country you come from as the owner can affect how your ship is inspected, how regular your ship is inspected, or how the law will be

enforced if you flout the rules. It influences the level of enforcement for ships within the country and for ships that fly Nigerian flag, even without flying Nigeria flag, and operating in Nigeria.

Participant 12 said:

Some ethnically biased people would like to award contracts to build technological infrastructure to somebody from their village or tribe, whether the person knows it or not. That would be the area you would see the ethnic bias and whether it would influence their choice of even having it at all, it will not, but they might be biased to the extent that the quality of the job now becomes another thing.

Lack of Willingness to Change

This theme refers to the attitudes and behavioral challenges that undermine technology acceptance. The guiding factors to technology acceptance include the perceived usefulness, the extent to which the user believes that the technology would enhance his or her job performance, as well as the perceived ease of use, the extent to which the user believes that the technology will not require much effort to use (Liu et al., 2018). In addition, stakeholders' interests, an intricate logistics system, and institutional diversity contribute to the identified challenges to technology acceptance, which include high cost of licensing fees for software and consultancy services, ICT training, lack of trust, government legislation, organizational size, and infrastructural deficits (Ezenwa et al., 2020).

Participant 3 said:

The primary objective for the stakeholders is to maximize profit. If they feel that adopting new technology will incur maintenance costs on the equipment, which reduces their profit margin, they will not want that. The second issue is the fear of the unknown because human beings like to stay in their comfort zone. The stakeholders do not want to try what they do not know because of uncertainty, so they remain steadfast in their comfort zone.

Participant 7 said:

There is the issue of age to a large extent. In my own experience, I see many aged people in the industry, and when it comes to ship ownership, unlike the service, there is no age limit to who can own a ship. Most times, there many older persons owning ships, and they run their company the way they want, and I see a lack of appreciation of new technology to improve performance. And sometimes, because their exposure to technology is a bit limited, the willingness to make that call to spend that money is not there.

Participant 10 said:

Government is not playing a leading role, in my opinion, because the policies they make tend to suppress growth in the industry. The problem with the Nigerian government is so much that it is affecting every industry and is affecting the maritime industry more because the blue economy is like the life to any country. So, every little thing that goes on with other industries tends to come back to the maritime sector, and not everybody knows these things.

Updated and Enforced Government Policy

This theme refers to the government policies that affect the activities and operations in the maritime industry. The Nigerian maritime industry has suffered from undue interferences from the government, resulting in an inconsistent segmented shipping policy document. The country lacks a comprehensive maritime policy that will reshape, redirect, and restructure the industry and check counter-productive measures (Ndikom & Olusegun, 2019)

Participant 2 said:

The government's role has to do with policies. The government is the policy decision-maker, so government says this is the direction we want to go and make the policies that will guide the stakeholders on the way forward. But what we see is a nonchalant government. The main thing the government needs to do is to make the policies and create a level playing field for all stakeholders.

Participant 4 said:

Government is a powerful force if you want to bring in any technology into the bare or limelight. Without the government, you cannot drive any policy successfully. The policymakers in government are supposed to be at the forefront of introducing new technologies, funding, and ways of harnessing the benefits. The government is rather taking a backstage where it is supposed to take center stage in developing and adopting technology by the policies. What are the policies that have been put forward? And even when the policies are put forward, how far do they go with the polices in terms of implementation?

Participant 5 said:

The government plays a big role in making the regulation, putting together the

regulatory framework to encourage technology adoption, they must lead the way

in certain areas. The government needs to put together a regulatory framework to

encourage technology adoption in certain areas. Digitalizing the operation of the

maritime industry for example will improve the system, eliminating the need for

people to go into the office to submit hard copy paperwork for verification of

seafarers and ships documentation. In that case, it will encourage other players in

the industry to look towards digital data automatically"

Available Funds to Acquire New Technology

This theme refers to the accessibility of funds to acquire new technology that will

improve performance in the industry. Massive capital investment is needed to construct

substantial port facilities such as quays, jetty, and warehouses to enhance economic

growth and innovation (Onifade, 2020). Workforce development in the industry is also

hindered by a lack of investment in advanced technology to meet international standards,

and this has resulted in using a skilled foreign workforce to fill the gaps, causing a

massive capital flight out of the country (Lloyd et al., 2020).

Participant 1 said:

Due to the industry's capital-intensive nature, the provision of funds to the

industry stakeholders at a cheaper interest rate is one way to develop the industry.

Most of our banks are not giving loans to the maritime industry, so the

government needs to encourage the local player to go into the big business of

crude oil lifting because foreign shipowners lift Nigerian crude oil. So, if the fund is available, the local players can participate and will be able to get vessels that are up to date and accepted for insurance purposes, class, and all the foreign bodies' standards.

Participant 1 said:

I recently read in the newspaper that the NIMASA Director-General said that the federal government have approved ship acquisition fund. The process requires working with a bank to disburse these funds to the maritime operators. The goal is to enable stakeholders access the fund at a lower interest rate. In that case, it is one of the ways to go to develop the industry so that people will be able to harness all this technology and make the acquisition to be efficient and cost effective. The only thing government is doing to assist is getting this loan at a cheaper rate rather than what is obtainable in the bank.

Participant 4 said:

The cost element is a big factor because there is a lot of interest in the maritime sector by shipowners, but one of the things they talk about year in, year out, is funds through loans. So, there should be programs in place where people can access funds to introduce new technology. The next thing is provision of adequate incentives. Access to fund is an incentive in a way and encourages people to adopt new technology by reducing tax for such people.

Development and Enforcement of Anticorruption Business Policies

This theme refers to implementing policies that checkmate corrupt practices in the industry by removing administrative bottlenecks and bureaucracy that undermine business operation. Digital technology provides a wide range of maritime logistics and electronic data exchange applications from ship to ship and from land to ship. These applications can transform traffic, port logistics, and just-in-time shipping and improve navigation and communication efficiency, safety, and data security (Fruth & Teuteberg, 2017). Digital technologies reduce business operations costs by creating a global digital infrastructure that eliminates the middlemen (Odularu, 2020).

Participant 4 said:

There is legislation to motivate people to do business in Nigeria called the Ease of Doing Business Act in Nigeria. Unfortunately, Nigeria is a difficult terrain to operate in any form of business because of the bureaucracy, the bottlenecks, and in-built delays by those in the position of authority, not just government but also civil servants. Most people share an attitude that they must get something from anything that comes from them or that is being done by them, not necessarily depending on what they are paid. This kind of attitude brings a lot of hindrances to efficient operation in the industry because the enabling environment is not there, it takes a lot of courage and resources to pull through these hindrances from starting a business and running it to full swing.

Participant 6 said:

We have a situation where the built-in face-to-face contact is seen as a means of livelihood for people who get kickback out of it. Inconsistency in policy, lack of infrastructure, insecurity which erodes investors' confidence to invest in the industry, and corrupt practices such bribes create inefficiency in the system. Certain people in the industry see technology as a way of eliminating their means of livelihood and will tend to frustrate its introduction thereby slowing down the implementation of this infrastructure and technology improvement in the maritime sector.

Align With International Best Practices.

This theme identifies and adopts tested and trusted international best practices that will suit the Nigerian maritime industry. Unfortunately, the Nigerian maritime industry's core national infrastructures are not at par with the international standard, resulting in state authorities transferring port assets and operational oversight to the corporate port concession. Such a move is evident in AP Moller-Maersk's operating partnership in Nigeria and other African countries, thereby encouraging foreign dominance in the sector (Dahou & Chalfin, 2020).

Participant 7 said:

To support technology adoption would require raising awareness and setting the direction of the shipping industry. If new technology is not adopted, the industry will sink because the ships cannot survive the new era that we are anticipating. For example, the decarbonization of shipping, the IMO is currently looking at 2030 and 2050 to reduce carbon emissions by ships. From all indications, there

must be some technological advancements by ships, by the operators, the ship staff. If we do not start to adopt technology now, we will be left out of business soon. So, raising awareness is vital because when they understand how the lack of technology will harm their business or take them out of business, they will go running after the next available technology. So, many times, people would not or do not do things because they do not know any better. So that is where awareness plays a vital role in this.

Participant 10 said:

Nigeria is way back when it comes to technology adaptation. For example, suppose you need a certificate verification, you must go physically to you get the certificate verified, because there are no means for you to authenticate it if you do not appear at the NIMASA head office in Lagos. So, why do we have internet? Why do we have emails? And why do we have young people in IT, having apps and different other things to boost the spreading of information, and one cannot authenticate a certificate wherever you are until you appear at NIMASA office. This is a problem, because in advanced countries, this can be verified or authenticated without physically going to an office. The result is that there are many people who do not have valid certificates struggling with the likes of people who do have to get to space in the maritime industry".

Participant 1 said:

There is also the issue of exposure for shipowners because most of the shipowners are not seasoned seafarers. Most of them are just businessmen who were

introduced into the business to make short-term revenue. They require a skilled workforce with the right experience to manage the industry, like what is happening in Nigeria Liquefied Natural Gas (NLNG) Limited. Outside the NLNG, it is hard to have the kind of skill sets anywhere else. And the companies in Nigeria are not like their counterparts in Europe that train their people, send them to schools, and stuff like that, so people who must fund their training themselves are limited to what they can acquire.

Public–Private Investment in Maritime Digitization Education and Training

This theme refers to creating an enabling environment to attract public–private investment to improve maritime digitization education and training. The industry is impacted by the human and institutional capacity to adopt new technologies, lack of skilled human resources, viable institutions, technological infrastructure, financial and material resources, and reasonable work practices (Gerald et al., 2019). In addition, the Nigerian maritime industry does not have the needed capital to develop and establish an enduring holistic institutional framework that maximizes the maritime port industry (Buhari et al., 2017).

Participant 2 said:

It will start with the government creating policies that support infrastructural development and a clear regulatory framework enforced evenly across the board, not the policy meant to disenfranchise one section and benefit the other. The government should create an enabling environment that will attract investors to

invest in infrastructural development by ensuring recouping and profit in their

investment no matter any future change in government policies.

Participant 7 said:

A lot of the agencies are government-controlled, so the government needs to

invest in technology to move the industry. For instance, in the company where I

work, the terminal is fully operated by the organization, so you have all the

modern technology and equipment required to run a terminal in this terminal. Due

to the terminal's location at a high-risk area at the Gulf of Guinea, surveillance is

carried out around the terminal and far out into the high sea. This is done

efficiently because of the technological capability we have at the terminal. Most

international oil and gas companies have this capability to ensure safety and quick

turnaround. But when you look at government-run facilities, these facilities will

not run efficiently without investment in technology. So, there is a clear

difference between the privately run maritime facilities infrastructures and the

government run. But then, majority of everything in Nigeria is run by the

government.

Participant 8 said:

There is a lack of understanding, awareness, and enlightenment to see what is

happening in the outside world. There is also the cost of doing the training,

maintenance and other things that comes with technology. The government

literally manages the maritime industry, and it has been stifled so that they are not

getting much money from it because of how they are handling it. The government

talks about expanding the industry by injecting new technology to make it better

but are reluctant to spend money in this regard. So, the costs play a huge role. If

you want to invest in the maritime sector, you need to open it up to the private

investors. If the federal government is not ready to do that, the private sector will

not be comfortable because they cannot control the sector to bring in their own

funds and develop the sector.

Support a Government–Shipowner Partnership to Develop a Professional IT Workforce

This theme refers to a government–shipowner partnership initiative to develop a

professional IT workforce to harness the opportunities in updated technology in

improving maritime performance. Digital technologies provide opportunities to improve

efficiency and gain a competitive advantage (Vial, 2019). The maritime industry needs to

be innovative in technology and engineering to stay competitive (Gausdal et al., 2018).

Digital transformation of industries is an effective means of unlocking every nation's full

potential of economic activities by tapping into the strengths of data sciences, AI, and

related financial instruments that will generate development through improved efficiency

and equity (Castellano et al., 2019).

Participant 1 said:

The government also needs to increase workforce training because you need to

develop the skill as you are providing the fund. The industry needs people with

the underpinning knowledge to manage the technology because if you acquire all

these electronic gadgets without trained technical experts. If there is any

malfunction, you will need to fly someone from outside the country to fix it, which will add extra cost to the cost of operation compared to their counterpart that is in Europe, where all the technicians are locally available for repairs. We need to develop the local manpower so that technical support can be sourced from the local market at a cheaper rate.

Participant 4 said:

Incentivizing shipowners to use a type of environmentally friendly technology, granting them a reduction in tax the government by 25%, is a way of encouraging the ship owners. Encouraging shipowners to invest in research & development, for example, ship owners sponsoring maritime technology innovation as a research area, these are the ways that would encourage the ship owners to play. Always look for new technology, innovations that they can bring in because they know it will be something that would win them some financial gains at the end of the day.

Becoming an Active Player in Developing Nigeria's Knowledge-Based Economy

This theme refers to the potential of the maritime industry in the economic growth and development of the country. The maritime industry is significant to the economic growth and development of Nigeria (Chidi et al., 2020). The industry can create wealth, reduce unemployment, promote skills acquisition, and encourage entrepreneurship (Afolabi, 2015). Moreover, the maritime industry is a strong catalyst for socioeconomic development due to its immense contribution to the national GDP through transportation of freight, promotion of trade and commerce, revenue generation, creation of job

opportunities both skilled and unskilled, institutional development, international relations, and promotion of tourism (Benson & David, 2018).

Participant 6 said:

The government needs to do more to support ship owners and stakeholders with financial support. The government should look into the financing of infrastructures and come to the aid of the shipowners and stakeholders with some form of support loans with low interests. The government should find ways to support ship owners in acquiring this technology to improve their business and the maritime sector. The government should encourage partnerships with various companies and sectors involved in the industry. If the government adopts these points, the maritime business will significantly improve, which will mean more revenue for the country from taxes generated by companies operating within their territorial waters.

Participant 8 said:

Let me just explain this to clearly so you understand the sustainable maritime development in Nigeria and the Gulf of Guinea. Sustainable maritime development in the Gulf of Guinea, according to World Bank, is $1.6 trillion per annum economic viability of sustainable maritime development. The whole of the Gulf of Guinea includes about seven to eight countries. When you look at the percentage of maritime activities in those countries, Nigeria is 78 to 80% of maritime activities in the region. Based on the World Bank reports, over 268,000 vessels pass through the Gulf of Guinea every year. Now, everything coming

from the East part of the world either goes to the Suez Canal or comes through the coast of South Africa, Cape of Good Hope, Gulf of Guinea, and takes about 24 days to transit if they chose to go through that route. But, if they go through Suez Canal, it takes just 14 to 15 days. Despite that, every day, we have about $5 billion of product moving through the Gulf of Guinea. About $4.5 billion of products move through the Suez Canal every day. Nigeria accounts for about 80% of cargo vessels going through the Gulf of Guinea and the maritime activities.

Participant 8 said:

The maritime sector is more than 50 times bigger than oil and gas in Nigeria. If 50% of about 265,000 vessels that pass through the Gulf of Guinea annually take fresh water, carry of maintenance, service the vessel, give all the necessary support, maritime security, maritime infrastructure, the support services for the vessel that is passing through it, annually, that is over $300 billion coming into the economy. Again, if you take a snapshot of the Nigerian water today, at any given day, there are about 6,000 vessels in Nigeria, and less than 10% of these vessels can do their services, repair, maintenance in Nigeria. The vessels need to go outside Nigeria for repair and maintenance services because of limited ship maintenance shipyards.

Participant 8 said:

If you look at the inland waterway, Singapore has 42 connectable inland waterways. Singapore is making about $7 billion in its 42 connectable inland waterways. Japan has 68 and is making around $6.4 billion annually, according to

2019 revenue Statistics. In Nigeria, we have 600 plus inland waterways, and the Nigerian Inland Waterway is making about $2 million annually. Compared with Singapore and Japan's inland waterway together, less than 20% of what we have in Nigeria. Now you can see the discrepancy in that, and you can see where we are, that we have not even started. The inability of the federal government to understand and see that maritime is the future of the country is mind-boggling. Sustainable maritime development in the Gulf of Guinea can take Nigeria out of where we are now and free from borrowing money from China that we cannot even pay and bring us to the top 10 countries in the world.

Participant 8 said:

In Africa, government drives everything; without the government driving it, nobody will; anything you do without government support is in vain. The government must take the bull by the horn and understand the maritime sector's importance. They must know that the maritime sector is far bigger than oil and gas. Everybody is looking at oil and gas, but the maritime industry is 40 times bigger than oil and gas. We are not supposed to be borrowing any money. We are not supposed to be in any state of debt with what God has blessed us with in maritime and natural resources.

Summary

In this chapter, I presented the result of the thematic analysis of 12 participants, followed by synthesizing the results to this study's central research question: How do Nigerian maritime industry stakeholders describe their barriers to technology acceptance?

Five conceptual categories with 16 themes emerged from the findings of this single case study with embedded units after the study was grounded in the conceptual frameworks of Yang's (2019) maritime shipping digitization and Wiafe et al.'s (2019) concept of technology acceptance within the maritime industry in developing countries. The thematic analysis provided rich data on the experiences of participants. The five codes that emerged are as follows: (a) technology adoption standards as compared to global industry standards, (b) barriers to technology adoption and maritime digitization, (c) technology acceptance factors influencing maritime industry stakeholders, (d) resources needed for new technology adoption to meet global industry standards, and (e) how Nigeria's maritime sector can drive national sustainable development.

The 16 themes that emerged from the data analysis process include the following: (a) technology adoption below global industry standards, (b) noncompliance of international maritime legislation, (c) corrupt practices blocking investment in upgrading technology, (d) lack of industry readiness for change, (e) reluctance to purchase and maintain technology among stakeholders, (f) lack of qualified professionals to operate updated technology, (g) corporate culture and ageism, (h) ethnic culture, (i) lack of the willingness to change, (j) updated and enforced government policy, (k) available funds to acquire new technology (l) development and enforcement of anticorruption business policies, (m) align with international best practices, (n) public–private investment in maritime digitization education and training, (o) support a government–shipowner partnership to develop a professional IT workforce, (p) becoming an active player in developing Nigeria's knowledge-based economy.

I demonstrated the study's trustworthiness using methods established by seminal methodology scholars (Stake, 2013; Yin, 2017). The results of the single case study were comprehensively analyzed and interpreted within the context of Yang's (2019) and Wiafe et al.'s (2019) conceptual framework to describe Nigerian maritime industry stakeholders' perception of their barriers to technology adoption. Chapter 5 will present the findings' interpretations, describe the study's limitations, and recommend further research. Finally, I will discuss the implications of the findings to social change, theory, policy, practice and provide a conclusion.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative, single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. Meeting the purpose of this exploratory study may address the literature gap on why Nigerian maritime industry stakeholders remain slow to accept new technologies for improving the maritime sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). I used a single case study with an embedded unit design (see Yin, 2017). Information from 12 semistructured interviews, reflective field notes, and archival data were collected through multiple sources (see Stake, 2010; Yin, 2017). I used triangulation of data to establish trustworthiness of analysis and findings (Farquhar et al., 2020).

A qualitative case study approach allowed me to give participants a voice to freely express their perceptions regarding the barriers to technology acceptance among Nigerian maritime industry stakeholders. This study is framed by two key concepts that focus on aligning with the purpose of the study to gain a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders: (a) Yang's (2019) maritime shipping digitization and (b) Wiafe et al.'s (2019) concept of technology acceptance in the maritime industry in developing countries. Both concepts formed the study's framework in relation to the maritime industry, extending Rogers's (1995) innovation diffusion theory, the theoretical lens that Wiafe et al. (2019) and Yang (2019) used to evaluate the three factors of culture, policy, and cost as related to ICT adoption. This empirical investigation aimed to advance research and a deeper

understanding of the challenges stakeholders face in maritime industry digitization in developing African nations.

Thematic analysis of data from face-to-face interviews with 12 participants revealed 16 themes: (a) technology adoption below global industry standards, (b) noncompliance of international maritime legislation, (c) corrupt practices blocking investment in upgrading technology, (d) lack of industry readiness for change, (e) reluctance to purchase and maintain technology among stakeholders, (f) lack of qualified professionals to operate updated technology, (g) corporate culture and ageism, (h) ethnic culture, (i) lack of willingness to change, (j) updated and enforced government policy, (k) available funds to acquire new technology (l) development and enforcement of anticorruption business policies, (m) align with international best practices, (n) public–private investment in maritime digitization education and training, (o) support a government–shipowner partnership to develop a professional IT workforce, and (p) becoming an active player in developing Nigeria's knowledge-based economy.

Interpretation of Findings

The findings of this single case study with embedded units confirm or extend current knowledge in the discipline, with each case presenting examples of issues discussed in the literature review in Chapter 2. In this section, I present and review the study's findings in the context of the coding categories that emerged from the data analysis. Next, I compare these five categories with relevant concepts from the conceptual framework and the extant literature presented in Chapter 2. Finally, I provide evidence from the 12 semistructured interviews to support how the study's findings either

confirm or disconfirm existing knowledge or extend it. Extension studies, such as this single case study with embedded units, provide replication evidence and support extending prior research results by offering new and critical theoretical directions (Bonett, 2012).

Technology Adoption Standards and Global Industry Standards

The Nigerian maritime industry faces challenges of technology adoption for improved efficiency due to lack of technical capacity to produce high-tech equipment used in the industry, and this has undermined the coastal and inland shipping (cabotage) regulation that aims to transfer technology to Nigerians (Ajibo et al., 2019). My study results confirmed that technology adoption standards in Nigeria are below global industry standards, not in compliance with international maritime legislation, and are affected by corrupt practices blocking investment in upgrading technology. Study participants reported the technology adoption rate is well below average and has undermined the maritime industry as a leading global business.

The study results align with Wiafe et al.'s (2019) theoretical propositions that using digital systems in the maritime industry of developing economies may lead to higher profitability. The participants stated that updated technology adoption might increase operation efficiency and greater safety in maritime activities for the Nigerian maritime industry. The study results extend knowledge from Dahou and Chalfin (2020) and Ali and Odularu (2020) that updated technology adoption is one of the most significant challenges of the maritime industry's digital transformation in developing countries in Africa.

Barriers to Technology Adoption and Maritime Digitization

Barriers to technology adoption among the industry stakeholders immensely weaken the sector's capacity to drive national sustainable development (Chidi et al., 2020; Nsan-Awaji, 2019). My study results confirmed that the industry lacks the readiness for change, that the stakeholders are reluctant to purchase and maintain technology, and that the industry lacks qualified professionals to operate updated technology. The study participants reported that factors such as loopholes in the local content law, lack of infrastructural foundation, and lack of clear direction from the government are among the barriers to technology adoption. This study aligns with Wiafe et al.'s (2019) conclusion that digital technologies can improve integration between stakeholders, supporting information sharing, communication, and managerial processes. The study results extend knowledge based on the works of Faith (2019), Nwekeaku and Atteh (2016), and Onugha and Onuoha (2019) that the industry is hampered by policy, institutional, regulatory, and legal frameworks that undermine its ability to actualize its potential.

Technology Acceptance and Maritime Industry Stakeholders

The guiding factors to technology acceptance include the perceived usefulness, the extent to which the user believes the technology would enhance their job performance and the perceived ease of use, the extent to which the user believes the technology will not require much effort to use (Liu et al., 2018). My results confirmed that the factors influencing maritime stakeholders' acceptance of technology include corporate culture and ageism, ethnic culture, and lack of willingness.

The study participants reported that ageism is a factor in the corporate culture because older people lead the industry and tend to stick with what they know. Participants also reported that ethnic sentiments are a factor as most ship owners, operators, and charterers tend to believe someone from the same culture. The results of this study align with Wiafe et al.'s (2019) argument that the attitude toward use and behavioral intention to use technology include PE, EE, SI, and FC. The study results extend knowledge from Ezenwa et al. (2020) and Lambrou and Ota (2017) on the perceived ease of use of technology and the factors for new technology success, such as technology availability and organizations' expected benefits.

Resources Needed to Meet Global Industry Standards

Massive capital investment is needed to construct substantial port facilities, such as quays, jetties, and warehouses to enhance economic growth and innovation (Onifade, 2020). Workforce development in the industry is also needed to meet international standards and prevent the skilled foreign workforce from filling the gaps to avoid capital flights (Lloyd et al., 2020). My results confirmed that the resources needed for new technology adoption to meet global industry standards include updated and enforced government policy, available funds to acquire new technology, and the development and enforcement of anticorruption business policies.

The study participants reported that the government needs to increase workforce training to develop skilled professionals who can operate and manage the technology and encourage shipowners to invest in research and development by reducing taxes. These study results align with Yang's (2019) concept of maritime shipping digitization as using

disruptive technologies to reduce transportation costs, shape global trade prospects, and provide companies with a higher degree of competitive advantage. The study results extend knowledge from Agrifoglio et al.'s. (2017) and Ali and Odularu's (2020) arguments that updated technologies are a significant driver of change in the operations management strategies, growth, and development.

Nigeria's Maritime Sector and National Sustainable Development

Nigerian maritime industry stakeholders' key business goal is to link maritime transportation and the government's national sustainable development strategies (Chidi et al., 2020; Raimi, 2019). My results confirmed that the maritime sector could drive national sustainable development by aligning with international best practices, encouraging public–private investment in maritime digitization education and training, supporting a government–shipowner partnership to develop a professional IT workforce, and becoming an active player in developing Nigeria's knowledge-based economy. The study participants report that the government should find ways to support shipowners in acquiring updated technology to improve their business and the maritime sector. The participants also report that the industry has great potential for the economy to a tune of about $1.6 trillion per annum economic viability of sustainable maritime development if harnessed correctly. This study aligns with Yang's (2019) concept of maritime shipping digitization as using disruptive technologies to reduce transportation costs, shape global trade prospects, and provide companies with higher degree of competitive advantage. The study results extend knowledge from Ekeada's (2018) and Nwokedi et al.'s (2019)

argument that inadequate technological infrastructure and strategies to undermine competition in the international trading environment.

Limitations of the Study

Limitations of the study include potential shortcomings or weaknesses beyond the control of the researcher, which may be related to the chosen research design, statistical model constraints, funding constraints, or other factors that may affect the results and conclusions of the study (Theofanidis & Fountouki, 2018). The limitations of this study include accessibility to recruiting participants due to distance, and Nigeria's poor Internet or communication connectivity, difficulty in participant selection due to specific inclusion criteria. Other limitations include possible biased opinions of maritime industry stakeholders and possible difficulty recruiting participants for interviews.

The researcher's reflexivity is another factor that could affect the result of the study. Reflexivity is an attitude to systematically attend to the context of knowledge construction at every step of the research process (Lane & Roberts, 2018). Due awareness of the systematic process involved in the study prevents researcher bias that may arise from the researcher's background experience about the topic. To enhance the study's validity, triangulation of data from various sources provided consistency in forming themes or categories (Guion et al., 2011).

Most of the participants were followed up closely with reminders before the interviews took place, and this caused some delays and posed additional stress for the researcher. The participants' demography was more of males than females, 67% males and 33% females. Although all the participants met the qualifying criteria, a more

balanced demography of participants might have yielded a different result. I followed the Zoom audio-only format interview method approved by Walden University's IRB, which removed any bias that may have arisen from face-to-face or in a video format on Zoom and eliminated the need to travel to Nigeria for a face-to-face interview. Finally, there may have been a chance of personal bias that could have affected the interpretation and presentation of the study results, based on my worldview, understanding, and interpretations of participants' responses. The member checking process adopted to review the transcribed version of the interview responses mitigated this limitation. The member checking process did not significantly alter participants' original statements and my transcribed version.

Recommendations

This study is the first of its kind conducted on barriers to technology adoption among the maritime industry stakeholders in Nigeria. During data collection, I took notes and maintained communication with study participants to answer any additional questions or clarify any issues they may have had. At every step of the process, I documented data to provide productive and meaningful recommendations. The advancement in technology has enabled the maritime industry to improve its performance and gain a competitive advantage. The use of updated technologies continues to be one of the most significant challenges in the digital transformation of the maritime industry in developing countries of Africa (Dahou & Chalfin, 2020; Yang, 2019).

The concepts that framed this study were maritime shipping digitization and technology acceptance within the maritime industry in developing countries, and both

originated from the theoretical studies extending Rogers's (1995) innovation diffusion

theory, which provides a theoretical lens through which to evaluate the effect of the three

factors of culture, policy, and cost in any research related to ICT adoption.

A literature gap exists in identifying why Nigerian maritime industry stakeholders

remain slow to accept new technologies to improve the maritime sector's capacity to

drive national sustainable development. Following the completion of this study, the

industry stakeholders and policymakers now have the results of the technology

acceptance barriers that have not been previously understood, which will assist in sound

decision-making in the industry. Understanding the barriers to technology acceptance and

the use of updated technologies by Nigerian maritime industry stakeholders may create a

link between maritime transportation and the government's national sustainable

development strategies (Chidi et al., 2020; Raimi, 2019).

Recommendations for Managerial Support for Nigerian Maritime Industry

During the interviews for this study, almost all the participants indicated that the

government dictates almost every aspect of the industry and sets the tone of business

activities. They also reported that inconsistency in policy and lack of effective

enforcement and implementation of applicable regulations contribute to the low

performance in the industry. The sector's enormous economic potential calls for

developing new international policy instruments to secure the seas and promote blue

economy growth across Africa's coastal areas (Dahou & Chalfin, 2020). Additionally, the

government's financial support to support this capital-intensive industry in updating

technological infrastructure has not been adequate. The industry is impacted by the

human and institutional capacity to adopt new technologies, lack of skilled human resources, viable institutions, technological infrastructure, financial and material resources, and reasonable work practices (Gerald et al., 2019).

Maritime employees trained to a high level of updated technologies can help support Nigeria's compliance with global maritime practices and the use of updated technology for enhanced maritime business practices (Faith, 2019). Maritime transportation in Nigeria can be a top revenue earner for the country; however, to achieve this, the sector must utilize available technology for improved maritime business to meet global maritime practices and compliance (Chidi et al., 2020). Suominen (2017) argued that technology unlocks new efficiencies and gains from companies and consumers, sharpens specialization, boosts exports, and adapts to international markets. Based on the government's overarching influence in the industry, there is the need for consistency in policy, effective compliance with all applicable local and IMO regulations, and efficient means of providing financial support to the industry stakeholders to upgrade the technological infrastructure.

Again, there is the need to fund research and development in innovative technology in the industry. Nigeria can also contribute to the technology advancement in the industry, rather than being a consumer country for technological innovation developed from other nations. Learning capabilities are essential components for innovation and adoption of new technologies, so organizational learning capabilities (OLC) should consider organizational commitment, system perspective, openness, experimentation, transfer, and integration in their technology adoption strategies (Brock

& Khan, 2017). I need to reiterate a point raised by one of the study participants regarding the economic viability of the Gulf of Guinea (GoG) where Nigeria is located, "according to the World Bank, GoG economic viability is $1.6 trillion per annum of sustainable maritime development", this is huge, and requires the government's sound and consistent policy to harness the economic viability that the region represents.

Recommendations for Future Research

Reoccurring themes that emerged from the participants' interviews suggested that low technology utilization in the industry has undermined the industry's capacity to drive national sustainable development. Resistance to change is one of the industry managers' barriers to using updated technology because of the impacts of implementing the desired technology (Love & Matthews, 2019). Organizational change is also hampered by a lack of technical expertise and the inability to manage technology adoption (Smuts et al., 2017). Readiness for change and capacity for change contributes to the barriers because organizations need to have the capacity to continually change in response to internal and external shifts, as early adoption of technology may not yield expected results (Onugha & Onuoha, 2019).

Future researchers could use quantitative approaches to replicate the findings of this study to validate these findings from similar or different contexts. Quick and Hall (2015) argued that the quantitative approach allows for a broader study involving more significant numbers of participants, enhances the generalizability of findings, and allows for greater objectivity and improved accuracy. Using a quantitative approach such as online surveys to validate the findings will allow more maritime industry professionals to

participate in the study. My study was limited by country, and a quantitative approach may extend the findings beyond Nigeria to generalize findings.

Future qualitative single case study researchers could replicate this research using different stakeholders or different geographical locations. Using different stakeholders or different geographical locations may present diverse perceptions of barriers to technology acceptance. Sometimes industry stakeholders who benefit from the industry's technology status quo exploit the weak enforcement of maritime corporate governance to discourage technology use to improve the system (Zhang et al., 2018). Finally, the contextual themes that emerged from this study may be considered recommendations for future research to integrate themes and analysis of each element in detail.

Implications

Implications for Positive Social Change

Nigeria being a coastal nation can generate huge revenues from both local and international transportation of persons and goods on water, positively impacting its economic development (Chidi et al., 2020). The industry has the potential to reduce the country's over-reliance on petroleum as a significant revenue earner if effectively harnessed and exploited. This study is important because it addressed an under-researched area of barriers to technology adoption in the Nigerian maritime industry and why the industry stakeholders are not taking advantage of technology to drive economic growth and development (Afolabi, 2015; Raimi, 2019). Technology acceptance in the Nigerian maritime industry may bring about positive social change by transforming and

removing corrupt business practices that keep old ways of doing business that undermine economic growth.

The maritime industry is a vital sector for socioeconomic development due to its immense contribution to the national GDP through transportation of freight, promotion of trade and commerce, revenue generation, creation of job opportunities both skilled and unskilled, institutional development, international relations, and promotion of tourism (Benson & David, 2018). This study gave voice to maritime industry professionals in Nigeria regarding their perceptions of the barriers to technology adoption, challenges of the industry stakeholders, and recommendations for removing the barriers to improve the industry performance. This study is also significant to promoting positive social change by offering recommendations on how the Nigerian maritime sector may contribute to national sustainable development through reforms and strategic responses related to adopting and utilizing updated technologies (Chidi et al., 2020; Raimi, 2019).

Implication for Theory

Similar studies to my research focused on technology adoption in the construction industry in Nigeria to address the high failure rate and abandonment of public projects (Rasaq, 2019; Usman & Said, 2014). However, scholars indicate that the maritime industry in developing countries lags in technology adoption and is generally averse to change (Dahou & Chalfin, 2020). In Nigeria, risk aversion and the technology adoption gap across industries are due to many reasons, such as the variability of a company's leadership expertise, the uniqueness and nature of specific industries, and corrupt business practices (Uche et al., 2018).

This single case study with embedded units provided a holistic picture of the perceptions of the maritime industry professionals on their perspective of the barriers to technology adoption in the industry. The findings in this study revealed the technology adoption barriers, the challenges to technology acceptance and provided opportunities for theoretical application of these findings to improve the industry performance for economic growth and development. This study is significant to theory because it provided insights and new knowledge to the barriers to technology acceptance among Nigerian maritime industry stakeholders that weaken the maritime sector's capacity to drive national sustainable development that the policymakers have poorly understood.

Implications for Policy

The maritime sector is the gateway to the Nigerian economy, and to increase its effectiveness and efficiency, a holistic adoption of technology will significantly increase the industry's output. The maritime industry stakeholders may benefit from ICT in increasing safety and sustainability using Sea Traffic Management (STM), an information exchange infrastructure that provides predictable collaboration and shares information to enhance safety and sustainability (Lind et al., 2016). Updated technology can be instrumental in checking the activities of multinational syndicates involved in illegal bunkering; piracy; illegal, unreported, and unregulated fishing; human trafficking; narcotics; and firearms smuggling; and all sorts of insecurity, all aimed at destabilizing the region in recent times (Abiodun & Dahiru, 2020). The findings of this study may bring awareness to policymakers of the barriers and challenges of technology adoption to improve the Nigerian maritime industry performance and ideas to overcome these

barriers to buoyant the industry to take its rightful place in driving the national

sustainable development. This action may bring about a policy change that will

encourage, support, and strengthen the industry stakeholders to invest in technological

innovations to improve industry performance and environmental sustainability. Such

policy change could be government-guaranteed, low-interest rates to industry

stakeholders to fund technological innovations or incentivize the companies through tax

breaks to invest in technological advancements.

Implication for Practice

The Nigerian maritime industry has a vast potential that can bring about enormous

economic benefits. However, to reap these benefits, the industry must operate efficiently

and resourcefully (Odularu, 2020). Many scholars have used samples from industrialized

countries that show different cultures and sociopolitical challenges in analyzing the role

of attitude and behavioral issues in technology acceptance within the maritime industry in

Africa. It is vital to analyze technology acceptance and create frameworks that adapt to

specific cultural settings or design limitations (Rahayu & Day, 2017). Most research

work on technology acceptance and use in the maritime industry has taken place in

industrialized countries, with only one applied study conducted in Ghana where

researchers attempted to unravel these constructs' role in African countries (Wiafe et al.,

2019).

In this decade, the connectivity between ships and shore will be dominated by

digital technologies that will drive operational efficiency and automation, safety and

security issues, and reduce the environmental impact of shipping activities (Agrifoglio et

al., 2017; Morrall et al., 2016). These issues are significant to practice for shipping companies and the public sector in offering new business opportunities to software-house and information system developers employed in the maritime industry (Pahl & Cordova, 2020). The lack of research within the Nigerian maritime industry has left an information gap for policymakers on technology adoption and acceptance within this specific context (Aluko & Odularu, 2019).

Offering empirical data and professional practice recommendations by answering this study's research question may inform Nigerian business and technology leaders on the training needed to develop a technologically skilled workforce in the maritime industry (Chidi et al., 2020). Maritime industry employees trained to a high level of updated technologies can help support Nigeria's compliance with global maritime practices and the use of updated technology for enhanced maritime business practices (Faith, 2019). The findings in this study may provide the necessary impetus for the industry stakeholders to embrace technological innovations to improve performance and profitability.

Conclusions

The purpose of this qualitative, single case study was to explore the barriers to technology acceptance among Nigerian maritime industry stakeholders. Semistructured interviews with open-ended questions were the primary research tool used to gain deep insights from the study participants (Yin, 2017). The interviews provided perceptions of maritime industry professionals on their experience in barriers to technology acceptance, thereby furthering the knowledge base on why low technology adoption in the industry

has led to the sector's insufficient capacity to drive national sustainable development. The participants provided their perspectives on the barriers to technology acceptance in the industry and its undermined productivity. The in-depth insight provided in the interviews provided themes that answered the central research question and aligned with the two key concepts framed this study: (a) Yang's 2019 concept of maritime shipping digitization and (b) Wiafe et al.'s 2019 concept of technology acceptance within the maritime industry in developing countries.

Literature abounds on how the leadership of the Nigerian maritime industry can improve technology adoption in the industry. Improvement in technology adoption in the industry will transform the industry tremendously and remove barriers that undermine efficiency and effectiveness in the sector. Further research should focus on how management and policymakers can support maritime industry stakeholders through reforms and strategic initiatives that encourage the adoption of updated technologies. Embracing updated technology will position the Nigerian maritime industry as a significant revenue earner for the country and improve the industry's capacity to drive national sustainable development.

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Appendix A: Recruitment Letter

Hello,

I am a doctoral student at Walden University, and I am inviting you to participate in my research study.

This study explores the barriers to technology adoption among maritime industry stakeholders in Nigeria, which, as you may know, is an important issue for the maritime sector's capacity to drive national sustainable development.

The purpose of this study is to gain a deeper understanding of the barriers to technology acceptance among Nigerian maritime industry stakeholders to increase the industry's performance. I believe that your experience would be a significant contribution to the study.

The study is significant, as the findings may help managers and policy-makers understand why the industry stakeholders remain slow to accept new technologies for improving the maritime sector's capacity to drive national sustainable development. Finally, this study's social change impact may result from transforming business practices and providing recommendations on how the Nigerian maritime sector may contribute to national sustainable development through reforms and strategic responses related to the adoption and utilization of updated technologies.

If you would be interested in participating in this study, please review and return the signed consent form attached to this letter. If you would like to request additional information, you may reply to this email. Thank you in advance for your consideration.

Respectfully,

Nicholas Ikpogu (Researcher)

Ph.D. Candidate – Walden University

Appendix B: Interview Protocol

Participant No: _____

Gender: _____

Age_____

Highest Academic Degree: _____

Years as a stakeholder/professional in Nigerian Maritime Industry _____

Do you have knowledge of the technology challenges facing Nigeria's maritime

industry? _____

To Interviewee:

"The interview is recorded on tape for the best possible data. Is this okay? I can

turn off the tape recorder along the way if you wish."

"Have you read the information I sent in the e-mail? Have you signed the

Informed Consent Form to participate in this study?"

"The title of this research project is *Barriers to Technology Adoption Among

Maritime Industry Stakeholders in Nigeria*. Given the low rate of effectiveness,

efficiency, and productivity of the Nigerian shipping industry compared to accepted

global maritime practices, a more in-depth understanding is needed of why the Nigerian

maritime industry stakeholders remain slow to accept new technologies to strengthen the

maritime sector's contribution to national sustainable development. The purpose of this

study is to explore the barriers to technology acceptance among Nigerian maritime

industry stakeholders. Meeting the purpose of this study may inform industry leaders and

policymakers why Nigerian maritime industry stakeholders remain slow to accept new

technologies for improving the maritime sector's capacity to drive national sustainable development."

"Do you wish to ask any questions regarding the study or this procedure before we proceed?"

Interview Questions:

1. What is your opinion on the state of new technology adoption within the Nigerian Maritime industry compared to other competitors and global industry standards?

2. What role do you believe cost plays in the state of technology adoption in the Nigerian maritime industry?

3. What role do you believe the government plays in technology adoption in the Nigerian maritime industry?

4. What do you believe are the top three barriers to Nigerian shipowners' adoption of new technology?

5. How do you believe the industry's corporate culture influences Nigerian shipowners' actions in new technology adoption?

6. How do you believe ethnic culture influences the actions of Nigerian ship owners in new technology adoption?

7. What do you believe would better support Nigerian shipowners' adoption of new technology to meet global industry standards?

8. As a final question, would you like to add any further reflections on barriers to technology adoption in the Nigerian maritime industry?

Prompts to facilitate conversations around the facts:

"Can you give me an example of that?"

"Please tell me more about that."

Thank you for your participation.