

## Nexus between Sustainable Competitiveness and Supply Chain Digitalization of Listed Oil and Gas Marketing and Production Firms (LOGMAPF) on Nigerian Exchange Group

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### Abstract

Digitalization plays a vital role in today's society and firms cannot afford not to be digitalized. The Sustainable competitiveness and digitalization of supply chains of listed oil and gas marketing and production companies on the Nigerian Exchange Group (NGX) were the main subjects of this study. The population and the sample size under examination consist of nine (9) listed oil and gas marketing and production firms on NGX since the listed oil and gas marketing and production firms on the Nigerian Exchange Group. This research used a basic random sample technique, and a sample frame of frame of forty-five (45) respondents per firm, and four hundred and five (405) management staff members took part in the survey. Original materials, such as questionnaires, provided information that was used to obtain primary data for the study. 405 respondents were given a 5-point Likert scale questionnaire; 385 of those copies were returned and were functional copies, yielding a 95% response rate. The hypothesis was tested using the basic regression approach. The findings showed that productivity is strongly, positively, and significantly impacted by supply chain digitization. Accordingly, the study concludes that supply chain digitalization significantly affects listed oil and gas marketing and production enterprises in Nigeria's ability to remain competitive over time. To achieve lasting competitiveness, it also recommends that the management of these organizations implement enough supply chain digitization projects to link with productivity.

**Keywords:** Competitiveness, Sustainable, chain, Digitalization, Supply

## Introduction

Companies should be able to create and employ tactics, resources, operations, and procedures that are distinctive, as well as simple distribution channels, given the intense competition and rapid advancements in technology. "A supply chain is the entire network of people, resources, and organizations involved in turning raw materials into a finished product that goes to the customer." "The typical supply chain process includes

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the following links (or nodes): raw material supplier, manufacturer/processor, distributor, retailer, and customer. This process moves in one direction (known as downstream). Raw materials flow through the supply chain and become a final product that the consumer purchases. These links are connected by logistics that move materials and finished products from one node to the next." (<https://blog.hubspot.com/sales/supply-chain-process>). Thus, by combining e-commerce with supply chain operations (i.e. digitalization), a business may procure equipment and raw materials, make the goods, and deliver them to clients or merchants on schedule, at the correct location, with no any disruptions. Customers will be more satisfied and costs will be reduced as a result. Additionally, by selling goods and services online, e-commerce enables firms to easily connect with a broad spectrum of clients. Consequently, the merchants in the channel of delivery will be eliminated as a result of incorporating e-commerce into the chain of supply, enabling the company to sell and deliver goods to clients directly. Transactions proceed more quickly as a result.

Due to the significance of sustainable competitive advantages for the long-term prosperity of businesses, a wide range of strategies, including supply chain digitalization, are included in the accessible literature, considering both its content and its sources. The foundation of digitization of supply chain is a set of key competences needed to integrate disparate industrial skills and connect torrents of technology. Digitalization of the supply chain (DSC) is the outcome of a predetermined set of skills that add up to a forward-thinking, collaborative, and relational use of technology by a particular supply chain that aims to transport certain goods and service offerings to realize sustained competitiveness. Firms are forced by supply chain digitization to consider supply chain coordination and collaboration as essential components of their creative strategy. The management of these suppliers, both upstream and downstream, as well as the complete supply chain, unquestionably supports value creation for clients (Kähkönen, & Lintukangas, 2012; Huemer, 2006; Corsten, & Kumar, 2005; Dyer, & Singh, 1998). Also, the widespread use of digital technology has been facilitated by declining computing prices, cheaper storage, and increasingly inexpensive internet (Ozili, 2018). As a result, today's global population prefers to engage and communicate with their friends, family, colleagues in business, and everyone else via online platforms and gadgets. As a matter of fact, according to market forecasts, 30% of the global populace presently has access to the internet, with 68% of them actively using social media (Kaplan & Haenlein, 2010).

Many digital technologies, including Man-Machine Learning, Artificial Intelligence, Cloud Computing platforms Blockchain, the Internet of Things, Big Data, and many more applications, are essential to enhancing the supply chain in several industries (Li, Herdem, Nathwani, & Wen, 2023). The aforementioned technologies falls under the category of DSC technologies, which help certain businesses, achieve significantly improved performance in increasingly challenging domains. DSC is a supply chain built on internet-enabled capabilities key in supply chain management (SCM). With its distinct embedded system and methods, a DSC facilitates excellent consumer engagement with products, controls and oversees real-time inventory levels, transports machinery and locations, aids in planning, and implements inclusive business performance (Althabatah, Yaqot, Menezes, Kerbache, 2023). All industries and organizations are impacted by these new technologies. The effects of these developments are particularly seen in supply chains.

The participants in a supply chain, such as vendors, partners, businesses, and dealers, produce, utilize, and distribute information and knowledge to one another (Ványi, 2012). The widespread use of the Internet and the accessibility of various digital communication tools have also had a substantial impact on

consumers' purchasing habits and purchasing habits, which has put a lot of strain on supply chain managers. Farida & Setiawan (2022) state that businesses have a strong conviction that they can ensure or achieve firms continued success and expansion through enhanced productivity and competitive edge by digitizing their procedures. According to Porter and Heppelmann (2015), digitization is expected to become increasingly important in overseeing and developing worldwide supply chains, primarily for businesses dynamically engaged in value-adding activities and those involved in manufacturing and logistics systems. The majority of businesses today operate in complicated business settings that are marked by quick technical advancement and ongoing change (Kraus, Jones, Kailer, Weinmann, Chaparro-Banegas, & Roig-Tierno, 2021). Perifanis and Kitsios (2023) opined that only by incorporating contemporary technology into their operations can organizations achieve maximum client retention, great customer happiness, reduced operating expenses, and increased productivity. This will drastically change into a more efficient, flexible, and responsive supply chain that may shorten lead times and boost product availability for long-term supply chain operation. Then, it becomes abundantly evident that, in the modern era, supply chain digitization has proven to be an important tool for companies to maintain practical alliances and marry a massive value connection with other organizations. Regularly, new and innovative digital technologies emerge that have the potential to impact almost every aspect of business development and operations worldwide. Hence, supply chain digitization aims to translate diverse resources into competitive offerings of goods and services. Based on the foregoing presentations, it is noteworthy that Shahadat, Chowdhury, and Nathan (2023) claimed there is a dearth of research on the real-world industrial uses of supply chain digitization. They also pointed out that businesses with distinct experiences in trade have different supply chain digitization strategies, procedures, and practices. In this context, studies conducted in emerging nations mostly examined oil and gas corporations. Given the constant advancement of technology, a research specifically focusing on the deployment of DSC in each sector on NGX —particularly Nigeria's LOGMAPF—is imperative.

## **REVIEW OF LITERATURE AND DEVELOPMENT OF HYPOTHESIS CONCEPTUAL FRAMEWORK**

### **The Sustainable Competitiveness Concept**

Castro, Santos and Silva (2008) opined that businesses can use their unique resources to make their plans competitive. Because of these unique resources, businesses can thrive longer and become more competitive without facing pressure from outside environmental issues. A regular collection of performance traits that can help to increase a firm's competitiveness can be referred to as the requirements for achieving competitiveness. Therefore, competitiveness refers to the unmatched potential that sets a business apart from its rivals and gives them a competitive advantage in the marketplace. In determining the value of goods and services, resilient competitiveness emerges as an essential dynamic that should be planned as long-term foundational principles of competitive advantage. Thus, one of the main areas of research in strategic management has emerged is understanding the sources of persistent competitiveness (Karman, & Savanevičienė, 2021).

### **The Digitalization of Supply Chains Concept**

According to Xue, Zhang, Ling, and Zhao (2013), supply chain digitalization refers to the use of interorganizational systems (IOSs) by businesses to digitize their supply chain partners' transaction and cooperation processes. Supply chain digitalization is the collection of systems that support dealing processes and communications between international distribution companies and their supply chain partners (Cecere,

2016; Bhargava et al., 2013). DSC allows companies to fulfill the goal of offering and sending the appropriate products at the appropriate moment. Digital technology that links to client responsiveness can power this process. This is due to the availability of smart products like smartphones, tablets, and portable electronics that can translate each electronic information, required by current systems and provide permission for electronic data exchange between the supply chain and company participants.

### **Productivity Concept**

When comparing the inputs and outputs of resources, productivity metrics are simply measures of the inputs and outputs of a single or combination of inputs that allow comparisons across time, between plants, or to another model (Callen, Morel & Fader, 2010; Usubamatov et al., 2010). Productivity is the outcome of how firm management systems deal with external environmental factors. At its core, productivity is the idea of speeding up operations to improve efficiency in a variety of ways (Obrenovic, Du, Godinic, Tsoy, Khan, & Jakhongirov, 2020). This study uses productivity and innovativeness as the metrics to measure lasting competitiveness. Consequently, this study uses total systems thinking to define productivity as a measure of the effectiveness of listed oil and gas companies' subsystems to show the degree of actual achievement relative to the level that can be attained in a particular external environment. In the upstream operations, even though the drilling business is known for its technological progress, the classic image of "roughnecks"—all-black laborers with oil-stained faces manipulating equipment on a rig—has not evolved much over the previous few decades and Nigeria oil and gas sector is not an exception. Digital readiness in the upstream oil and gas industry lags substantially behind in comparable sectors. Hence, productivity in upstream is yet to experience benefit of digitalization. Globally, oil and gas firms are aware of the potential benefits of digitization for their downstream activities. Oil and gas companies benefit from digitizing downstream operations. By increasing capacity without sacrificing efficiency, digitalization can play a key role in enhancing safety and traceability in midstream operations. As one of the metrics used to assess competitive performance, productivity has a big influence on competitiveness at the corporate level. Productivity based on digitalization rest on the downstream and midstream operations because of lack of readiness for digitalization in the upstream operations.

### **Supply chain digitization**

Supply chain digitization, also referred to as transformation of supply chain digital, entails the modification of traditional analog supply chain processes into digital ones. This involves the creation of a centralized master data set that integrates information obtained from different sources within the supply chain, which include internal historical sales data, consumer point-of-sale data, socioeconomic indicators such as unemployment rates, and external data sources like Google trends or competitor pricing. Software plays a pivotal role in this transformation, whether it is off-the-shelf solutions, custom-made software, or a combination of both, serving as the primary tool to facilitate the digitization process. The objective is to guarantee timely delivery, enhance customer support, and minimize expenses by means of enhanced efficacy, transparency, and cooperation. This software focuses on computerization and intelligence for business processes include: The goal is to ensure on-time delivery, improve customer service, and reduce costs through better efficiency, visibility, and collaboration.

**Planning:** Planning initiates the supply chain process by devising strategies to meet client needs and desires effectively. The primary objective here is to formulate a plan that optimizes profitability. Companies must strategize the management of all necessary resources for goods production and service delivery. The

key goals of supply chain management encompass both planning and establishing a comprehensive set of performance metrics.

**Sourcing and Procurement:** Following planning, sourcing or procurement takes precedence. This stage focuses on establishing robust relationships with suppliers of essential raw materials. It involves selecting appropriate strategies for product delivery, payment, and shipment, as well as identifying reliable suppliers. Businesses must carefully select their suppliers to ensure the availability of goods and services for production. Supply chain managers are tasked with developing pricing, delivery, and payment protocols with suppliers to govern and enhance these relationships, along with establishing relevant performance metrics. Subsequently, by integrating these processes, supply chain managers effectively manage their inventory of goods and services, encompassing activities such as receiving and inspecting cargo, transporting them to manufacturing sites, and authorizing supplier payments.

**Manufacturing:** The production of goods requested by customers constitutes the third phase of supply chain management. During this phase, products are manufactured, inspected, packaged, and prepared for delivery. Supply chain managers meticulously plan the production, testing, packaging, and delivery preparation processes. This stage is highly metric-intensive, enabling businesses to evaluate factors such as worker productivity, production output, and quality standards effectively.

**Delivery:** Delivery marks the fourth phase, where goods are dispatched to clients at specified locations. This phase primarily involves logistics, encompassing the receipt of customer orders and planning the logistics of product delivery. Businesses collaborate to manage customer orders, establish warehouse networks, select carriers for transporting goods to clients, and implement invoicing systems for payment collection.

**Returns Management:** The final phase of supply chain management is returns management. Here, buyers return damaged or defective goods to the provider, necessitating businesses to address customer inquiries and grievances. This phase often poses challenges for businesses, requiring supply chain planners to establish a responsive and adaptable network to receive returned items and expedite the return process for customers encountering issues with delivered goods.

### The Chain of Supply for Oil and Digitalization

Supply chain management within the petroleum industry is described as "the arrangement, synchronization, and continual enhancement of sequentially organized activities encompassing upstream, midstream, and downstream operations" (Chima, 2007). Consequently, the oil supply chain comprises three distinct functional sectors: upstream, midstream, and downstream. At the parlance of business, "downstream" and "upstream" denote the position of an oil or gas company within the supply chain. The proximity to the end user determines whether a function or company is situated further downstream. Upstream elements of the supply chain pertain to activities involving the extraction or production of raw materials. The upstream businesses locate deposits of natural gas and oil and work to extract these resources from the subsurface. These businesses are frequently referred to as exploration and production firms. The downstream link in the supply chain for oil and gas is represented by refiners (Muhindo, Zhou, & Mzuzza, 2014).

The term "exploration and production" refers to the upstream portion of the oil and gas industry, which includes activities linked to the discovery, extraction, and production of natural gas and crude oil. Well, drilling, deposit identification, and subsurface raw material recovery are all part of upstream oil and

gas activities. Related services consisting rig operations, feasibility evaluations, equipment rentals, and extraction chemical supplies are also included in this industry. The upstream oil sector largely contains wells: where to put them, how far and deep to drill them, and how to layout, construct, run, and maintain them to maximize returns on investment while maintaining the least amount of environmental impact (<https://www.strategyand.pwc.com/gx/en/insights/2018/drilling-for-data/drilling-for-data.pdf>).

Some activities are included in this stream:

- Appraisal; geological operations, geophysical seismic, geophysical, and aerial examination
- Drilling for assessment purposes: drilling test wells and wild cat well
- Manufacturing and exploitation
- Deactivation and regeneration

In the oil and gas sector, digitalization is anticipated to have significant, long-term implications. New technological advancements are making it possible to link supply chains, boost productivity, and achieve significant cost reductions. The need to maintain economic security and future-proof industries in the wake of the pandemic, coupled with pressure from environmental agendas, may make digitalization the answer for assisting suppliers and purchasers in striking a balance between productivity and financial and environmental gains.

Digital readiness in the upstream oil and gas industry lags substantially behind in comparable sectors. Even though the drilling business is known for its technological progress, the classic image of "roughnecks"—all-black laborers with oil-stained faces manipulating equipment on a rig—has not evolved much over the previous few decades and Nigeria oil and gas sector is not an exception. However, take a look at an automotive manufacturing facility nowadays. Robots have now substantially taken the position of rows of workers assembling individual car parts. It is evident how the two photos differ from one another. Nevertheless, there is a great deal of anticipation and curiosity in the advantages that digital solutions might offer. While numerous oil and gas businesses are experimenting with new digital methods of operation, nobody can declare that they have yet "figured it out." The following fundamental guidelines should be taken into account by businesses when creating their digital business models:

Technology alone cannot solve problems through digital transformation. It is a technologically driven, business-led transformation.

To complete this change, digitalization must be integrated into all facets of the operating model, including vision, strategy, process, culture, and behaviors.

Holistic digital solutions are required. A company's operational ecosystem, which includes its suppliers and external partners, must be digitally enabled in all of its facets.

Businesses must create their own digital transformations since there isn't a sector-specific "best practice" model that can be imitated.

It is crucial to strike the correct balance between technological (software engineers and data scientists) and technical (engineers) skills.



For a considerable amount of time, numerous upstream businesses have been utilizing aspects of digitization, which is characterized as the strategic commercial value of data-based technologies such as artificial intelligence, cloud computing, and the Internet of Things (IoT). Because businesses are more concerned with cutting costs and increasing efficiency in operations in a time of comparatively low oil prices, the trend favoring digital innovation is growing rapidly across the industry. Smaller E&P firms are beginning to investigate digital transformation on the other end of the spectrum. They are starting by establishing pilot programs throughout their companies to determine the most effective ways to implement digitalization and to pinpoint the critical digital skills that still require development. In many of these instances, the perceived danger of new competitors served as a catalyst for interest in digital transformation in addition to cost-cutting concerns. The rise of non-traditional businesses with unique, industry-leading digital skills worries traditional operators. Cognite, a technology business that specializes in upstream operations in the Norwegian portion of the North Sea, and Baker Hughes General Electric, which was established in 2017 with the goal of industrializing digital capabilities, are two excellent examples. This somewhat piecemeal approach to date has resulted from the industry's well-known sensitivity to catastrophic hazards. Owing to the heightened sensitivity of offshore operations to environmental, health, and safety concerns, operators must ensure that digital technologies can be used without jeopardizing operations. The sector also has to deal with a complicated range of issues, such as geographically distributed assets, legacy assets that might be experiencing a long-term production decrease, and the distinction between operator status—that is, partner status in an E&P project—and operator position—that is, the lead business (<https://www.strategyand.pwc.com/gx/en/insights/2018/drilling-for-data/drilling-for-data.pdf>).

Why, however, are we witnessing a slow awakening in this field? From a technological standpoint, the industrial Internet of things (IIoT) and the rise of data analytics are creating new avenues for process optimization. By using "digital twin" technology, businesses can now digitally replicate actual assets like fields and equipment and create scenarios to improve everything from production to maintenance. Statoil has developed a digital duplicate of the offshore field Johan Sverdrup in order to facilitate process enhancements and troubleshooting.

The expansion of cloud computing services additionally makes it possible for businesses to handle enormous volumes of data at comparatively low costs. When you take into account the industry's strong emphasis on enhancing efficiency along with these technological advancements, it becomes clear why businesses are becoming more and more intrigued by the possibilities presented by digital solutions. The picture of oil employees handling drill pipes on platforms may drastically change in a few years. There is a possibility of increasing automation in drilling, performance monitoring, and production optimization. When final investment decisions are made, the simulation of "first oil," or the first quantity of oil to emerge from a field that is being commercially drilled, is supported by the use of augmented reality and digital twins. This could revolutionize the process of making judgments. Using drone technology and predictive maintenance together could lead to operational excellence and significantly more efficient utilization of assets (<https://www.strategyand.pwc.com/gx/en/insights/2018/drilling-for-data/drilling-for-data.pdf>).

Transportation infrastructure for crude oil, and petroleum products, and storage is referred to as midstream. The midstream oil and gas segment, as its name suggests, consists of the operations and infrastructure situated in between the downstream and upstream downstream oil and gas segments. In the oil and gas supply chain, midstream activities serve as a bridge between extractors and consumers by storing,



processing, and distributing goods. There was a bit of a bottleneck in the midstream industry during the pandemic between robust upstream supply and feeble downstream demand. These operators were feeling the pressure of ramping back up to satisfy producers and customers as demand starts to pick up again. Activities may involve the transportation, storing, and processing of natural gas and crude oil. The majority of the time, refining assets and key consumption regions is not situated in the same geographic region as oil and gas reserves. A significant portion of midstream operations involve transportation, which might involve the use of rail cars, pipelines, tanker ships, and truck fleets.

Nevertheless, the primary emphasis of the midstream sector lies in the gathering system. Gathering systems serve as storage facilities for oil and natural gas, temporarily housing hydrocarbons until they can be conveyed to the refinery. It is at the refinery where these hydrocarbons undergo processing, transforming them into marketable products. By increasing capacity without sacrificing efficiency, digitalization can play a key role in enhancing safety and traceability in midstream operations. For example, real-time data can be remotely obtained from a pipeline or transport terminal to track the supply status, spot leaks or spills during transit, and prevent possible mishaps. As each element of the infrastructure facilitating goods transportation, including valves, pipes, and more, becomes capable of being "smart," the midstream sector emerges as a promising avenue for gaining insights into system functionality and productivity. In 2018, Chuck Miller, a senior executive at manufacturing giant Emerson, **stated** that the midstream industry should prioritize digital transformation over cost-cutting. This involves reevaluating antiquated business models and strategically implementing technology to bring about changes. Currently, a lot of businesses are unable to meet their decarbonization commitments because they do not know where and when mishaps like this occur. The International Energy Agency estimates that the oil and gas sector released about 70 million metric tons of methane into the atmosphere in **2020**. Although governments have committed to reducing this amount, there are insufficient instruments to locate the leaks. To prepare operators for undercapacity and avoid unnecessary losses, for example, increased sensing capabilities could help predict and stabilize production variability. Similarly, connecting infrastructure links through blockchain and data sharing would increase transparency and traceability in the industry. Artificial intelligence (AI) techniques can also be used to model infrastructure and products to identify possible problems, optimize supply, and find leaks. Businesses may realize increases in productivity and environmental impact in addition to increased efficiency by averting such mishaps and losses. Blockchain can cut down on operating expenses and delays in the traceability of oil and gas products, saving money and time while also benefiting the environment. The oil and gas industry is poised to undergo a supply chain redesign due to the substantial advantages of digitalization. It appears that enterprises are waiting for a surge of investment that will propel digital solutions to the forefront of their business models. Although adopting these technologies won't provide a magic bullet for solving environmental issues, it will assist businesses in becoming more productive and less polluting as they adjust to a changing business climate (<https://www.offshore-technology.com/features/oil-gas-digitalisation-supply-chain/>).

A margin firm is the downstream section. The disparity between the price at which products made from crude oil are sold and the price at which crude is transported to the refinery is known as the margin. Refineries and marketing are examples of operations in downstream stages. With the use of these services, crude oil is transformed into useful goods like fuel oils, gasoline, and petroleum-based goods. Marketing services facilitate the transfer of energy businesses' completed goods to merchants or final consumers.

The following are examples of downstream operations:

Gas and crude oil processing and refining;

Trading and supply;

Marketing and distribution.

Therefore, given the structure of the oil business, one can state that it is complicated and demands careful planning and stringent management, which include:

The accessibility of appropriate information for different stakeholders at appropriate times

Integrating the supply chain for each participating organization with suppliers and providers

Enterprise company solutions for handling logistics, cost management, resource monitoring, and transportation via multiple modes

The accessibility of newly designed IT solutions as well as vendor-supplied off-the-shelf solutions

Analyzing market demand and providing the best-fitting items to suit consumer wants

Arranging delivery so that the products "do not lie behind" or, in the opposite situation, there is no unmet demand for the products

Given the intricate nature of supply management in the oil industry, information technology is now critical to the smooth operation of an unrestricted information flow. To maximize the petroleum product supply system, all links in the logistics chain of product promotion, from refineries that process oil to commercial middlemen selling petroleum products to particular consumers, must be considered. This involves building a successful channel of communication among firms petroleum-based substances product producers, trading firms, intermediaries, and financial structures within the framework of joint supply chains, with transportation firms serving as an intricate bringing-together connection. These concepts are implemented within the logistics concept of the supply chain.

### Supply Chain Management (SCM)

The creation of a sales network that ensures essential commodities get shipped at the lowest possible cost to the appropriate location at the appropriate time is known as supply chain management. The idea behind supply chain management is to establish the best possible lines of communication with suppliers and end consumers, particularly: analyze consumer demand and provide items that best suit their needs; process orders as well as inquiries promptly; schedule delivery so that there is no unmet demand for goods or, in the opposite scenario, that the goods "do not lie behind"; cultivate enduring connections with distributors and consistently broaden your sales network.

The configuration, coordination, and ongoing improvement of a sequentially ordered set of operations are known as supply-chain management, or SCM. Supply chain management seeks to deliver the best possible customer service at the lowest feasible cost. Anyone who makes use of a process's output is considered a customer. For any business that prioritizes customer service, the customer's client is crucial. Thanks to advancements in information systems and communication technology, there are now more options to coordinate activities across a supply chain, especially in complicated businesses like the oil industry.

Supply-chain management choices can engage all activities by integrating operations management with other operations functions. A particular segment's needs for customer service will be met by successful supply chain management, which will also improve customer service by reducing request processing times and increasing product availability. Additionally, supply chain management will foster interactions with downstream supplier networks that generate value for end users and effectively transmit information about delivery, inventory management, and just-in-time systems as well as structural partnership on vendor-managed inventory, outsourced services, and bringing together plants. When supply chain management is successfully implemented in the dynamic global business environment, participating organizations can observe the true essence of supply chain management. Hazards are everywhere, and they have a big impact on how business management makes decisions.

Globally, oil and gas firms are aware of the potential benefits of digitization for their downstream activities. However, they frequently run into difficulties when attempting to initiate and carry out digitalization projects in their primary operations that would yield quantifiable returns on investment. Due to the rapid advancement of technology and the intricacy of downstream operations, refiners and petrochemical companies are the only ones who can fully benefit from digitalization if they take a methodical, structured approach. Drawing from our expertise working with oil and gas firms, this strategy is divided into three main sections (<https://www.strategyand.pwc.com/m1/en/reports/2019/digitizing-downstream-oil-and-gas-operations.pdf>). Companies must first link their digitization efforts to the functions that have the greatest potential value in order to prioritize their efforts. This entails implementing smart fire and health, safety, security, and environment (HSSE) services; integrating the supply chain digitally; and placing a strong emphasis on operations and maintenance excellence. Secondly, businesses must develop core competencies in areas like cyber security, technological architecture, personnel and culture, and data and analytics. Building these competencies will set the company up for continuous digital transformation, independent of underlying technological modifications. Thirdly, downstream oil and gas industries should adopt a more agile approach to IT adoption as opposed to the conventional method, which involves large-scale programs that take years to finish. They must specifically evaluate their level of digital maturity across a few chosen business areas, trial a few new technologies related to business priorities, and expand the efforts that have shown to be useful and beneficial. If things are done correctly, the downstream oil and gas industries will undergo a technological revolution. Refining and petrochemicals, two downstream businesses of oil and gas industries, have traditionally embraced technology to enhance operations. These businesses have created cutting-edge methods for managing and modeling intricate operations as well as for interpreting data to enhance performance. With many corporations strategically pushing to increase the downstream portion of the oil and gas value chain, notably petrochemicals, converting to digital has even greater potential. Most management teams in the oil and gas industry are aware that digitalization is not just a possibility but also a must. We have discovered that oil and gas companies benefit from digitizing downstream operations in the following ways: lower operating costs; increased throughput; fewer unplanned shutdowns; increased plant efficiency; improved HSSE performance; and increased worker productivity. It's challenging to quantify these advantages. The majority of businesses in the sector deal with similar problems.

The first is strategy. A lot of businesses lack a defined plan for integrating a digital strategy throughout the whole company. They rush to invest in the newest digital services rather than analyzing specific business challenges and creating a business case for implementing technical solutions. It seems

sense to have such an impulse. Technology companies inundate CEOs with sales presentations for striking solutions that demonstrate how new technologies can revolutionize business models and improve operations. But because that kind of rushed approach is driven more by the solutions than by the underlying business demands, it has serious drawbacks.

Organizational issues are also faced by oil and gas firms. An excessive amount of emphasis is placed on conventional project management techniques, which are slow and cascading, as opposed to agile methods, which promote cooperation and expedite execution. Many struggle with data governance and management since there aren't established procedures for gathering, removing, cleaning, and visualizing data in ways that produce insightful information. Organizations are unable to acquire the proper mindset and skills necessary to embrace new technology because of cultural barriers. Sometimes those that push the envelope don't take risk concerns like cyber security seriously enough. Businesses are aware of the "what" of emerging digital technology; but, they must also comprehend the "why" and "how" before committing any capital. But if these typical problems aren't resolved first, businesses run the danger of squandering time and resources on appealing but unsuitable technologies. Even worse, they run the risk of being shut out of more appropriate future technology. The downstream oil and gas industry is less digitally mature than other industries as a result of these challenges in achieving digital transformation.

## **UNDERPINNING THEORETICAL FRAMEWORK**

### **Resource Based View Theory**

The Resource-Based View, which asserts that a firm's resources and abilities determine its performance results, provides the theoretical foundation for this investigation. This hypothesis, which originated in the discipline of strategic management, contends that a firm's resources and capabilities are what drive competition. Anything that a business has or acquires is a resource, and as long as these resources are important in and of themselves, they will be able to devise strategies that create value and that competitors will find difficult to imitate (Lee, 2013; Shaughnessy, 2013; Selznick, 1957; Selznick, 1952; Selznick, 1949). According to the resource-based idea, a business's edge over its rivals mostly stems from its ability to tender a collection of useful tangible or intangible resources that it has at its disposal (Jawed & Siddiqui, 2019).

Barney (2012), and Barney (1991), who support the robustness of this theory, assert that a firm's strategic resource holdings provide it with a strategic advantage over its rivals. These resources are logically separated into intangible and tangible categories. As can be seen from the above, the resource-based theory of the company maintains that having resources that are rare, valuable, and difficult to duplicate and non-substitutable aids a firm in standing out in a competitive market (Hart & Dowell, 2010). It goes on to advise businesses to employ internal resources to explore within for the reasons behind their marketing success. According to Bowersox et al. (2003) businesses that possess the optimal combination of resources and competences will be able to sustain a sustained competitive edge in the market. Naturally, businesses that prioritize their expertise in DSC projects, such as digital operations and digital customer experience, will outperform their rivals in terms of their resources and eventually achieve long-lasting competitiveness. This theory guides the study's investigation of how supply chain digitalization affects long-lasting competitiveness. It also adds to the body of literature already in existence by extending and adopting the resource-based view theory of the firm to examine this relationship.

### Transaction Cost Economics Theory

Recognizing when a transaction between two parties within a market or a firm is more efficient has been made possible in large part by the use of Transaction Cost Economics (TCE) theory. But as more transactions take place through digital means, there are still unanswered concerns about how TCE fits into the digital economy. However TCE uses a transaction as the unit of analysis, usually involving an upstream producer of an intermediate good and a downstream producer of a final good. Based on the characteristics of the transaction, it looks for the most appropriate organizational form, such as a market, a hierarchical structure, or a hybrid form. The adoption of the digital economy's tenets, which permit the creation of an institutional environment compliant with the demands and conditions of the present as well as a reduction in transaction costs and an overall improvement in economic efficiency, is a significant trend in the development of the corporate ecosystem. It is reasonable to argue that the structure and distribution of transaction costs among participants in an economic exchange, in addition to their level, are significant because they reveal the particular arrangement of the institutions. Consequently, the task facing state authorities is to establish and maintain a new, functional digital infrastructure, provide a digital economy with enacting regulatory acts, ensure the minimally expensive statement and protection of ownership rights, and foster the development of digital skills among the populace. It is for this reason TCE theory is adopted in this study.

### REVIEW OF EMPIRICAL EXTANT STUDIES

The association between investments in digital technologies and company performance was examined by Marco et al. (2019), who also looked into which specific technologies were more likely to be linked to higher performance and, ultimately, the expanding impact of technologies on performance. Based on average data collected in 2017 from a sample of 1,149 Italian businesses, the findings show that adopters' performance is positively impacted, and robots and laser cutting play a role in that connection.

Research on small and medium-sized businesses (SMEs), Pourmorshed and Durst (2022) examined Buyukozkan and Goçer's (2018) digitalization integration framework for the growth of digital supply chains in SMEs. More specifically, this article sheds light on how these Swedish SMEs adopted the digitalization integration framework and managed their digital supply chains through a case study design including SMEs involved in comparable supply chain. A new framework with five key components for the digitalization process— digital customer experience, digital products and services, digital operations, digital organization and culture, and digital strategy —was proposed with the help of the study's findings. Furthermore, every element consists of multiple phases, which are referred to as sub-thought-provoking activities.

In the Malaysian manufacturing industry, Lee et al. (2022) used a quantitative research design to examine the impact of the digital supply chain on the supply chain as well as organizational performance, as well as to evaluate the facilitating role of supply chain performance in that connection. The Federation of Malaysian Manufacturers directory's production companies were surveyed online via email, and a stratified sample approach was employed to gather data. All of the hypotheses have been verified by the partial least square structural equation modeling analysis of the data. According to the study's conclusion, production organizations in Malaysia should think about implementing a digital supply chain into their operational

procedures to maintain their dependability in the cutthroat market by providing access to excellent supply chain performance and the best overall firm performance.

Ikegwuru and Nwokah (2022) investigated the impact of digital supply chain implementation on supply chain collaboration in oil and gas companies in Rivers State through the Krejcei and Morgan's formula. The study employed a basic regression approach to evaluate the hypotheses at the 0.05 level of significance. The results indicated that the deployment of a digital supply chain has a somewhat, positive, and considerable impact on supply chain collaboration. As a result, the study draws the conclusion that the operation of digital supply chains has a significant impact on the collaboration of oil and gas companies in Rivers State. It also suggests that the management of these companies look at how they can create value in their current supply chains by conducting a thorough review process that will identify the advantages of digital supply chains in terms of current perceptions of ways to improve industry best practices and supply chain relationship. In addition, the oil and gas industry have to think about incorporating DSC into their work procedures in order to maintain their dependability in the cutthroat marketplace by offering optimal company practices and strong supply chain coordination at the same time.

Ikegwuru (2022) examined the adoption of digital supply chain technologies and the long-term viability of the competitiveness of oil and gas companies in Rivers State. The data analysis method used was multiple regression analysis. The components of digital supply chain technology that were examined had a strong, favorable, and noteworthy impact on sustainable competitiveness, according to the findings. Therefore, the study concludes that the ability to use digital supply chain technology effectively influences the sustainable competitiveness of oil and gas companies in Rivers State. It also makes recommendations for how the management of oil and gas companies should adapt their organizational structures and job designs to best utilize the talents of their workforce and DSCT to enhance sustainable competitiveness in their supply chain industry. Based on the literature review the null hypothesis formed as follow:

H<sub>1</sub>: there is no significant relationship between Supply chain digitalization and sustainable competitiveness of LOGMAPF on Nigerian Exchange Group.

## **METHODOLOGY**

Using listed oil marketing and production companies on Nigerian Exchange Group (NGX) and using a deductive survey technique, this study examined the DSC and competitiveness of the nine (9) listed oil marketing and production enterprises in Nigeria that comprise the NGX oil and gas index. These companies include— Capital Oil, Total Nigeria Conoil, Seplat Energy, MRS Oil Nigeria, Oando, Japaul Gold and Venture, Eterna, and Ardova Plc. It also made use of the quantitative research approach and positivist philosophy. The population under examination consists of nine (9) listed oil marketing and production firms in Nigeria. These are gas and oil companies that are listed on the NGX. Using a sample frame of forty-five (45) respondents per firm based on the basic random sampling approach, four hundred and five (405) management staff members took part in the survey. Information from original materials—like questionnaires—was utilized to collect primary data for the research. The basic regression technique was applied to the data analysis in order to test the hypothesis.

## RESULTS

The digitalization of supply chains and sustainable competitiveness of LOGMAPF on the Nigerian Exchange Group are the subjects of this study. Since the population being studied is under forty-five (45), the sample size was determined by measuring the total population. This implies, therefore, that the study's population and sample size are the same. A response rate of 95% was obtained for the analysis out of the 405 copies of the questionnaire that were given to the respondents and 385 of them were received back and were usable copies.

### Statistical Test of Hypotheses

By examining the independent and dependent variables, simple regressions were utilized to test the hypotheses and determine the degree to which the forecaster variable influenced the dependent variable. The aim of this is to ascertain the degree to which different features of tax incentives influence foreign direct investment. The null hypotheses were stated after the test results were presented in a table format.

**The extent and direction of supply chain digitalization's influence on productivity are examined using statistical regression analysis.**

**Table 1: An overview of the supply chain digitalization regression model's impact on productivity**

Model R Estimate	R square	Adjusted Square	R std error of the	Sig.
0.855 <sup>a</sup>	.696	.694	2.104	.000

Source: Authors' computation (2024).

To investigate the impact of supply chain digitalization on productivity, the total of productivity was regressed against the total of supply chain digitalization. R has a value of 0.855. A correlation coefficient of 0.855 indicates that supply chain digitization and productivity are positively correlated. It shows that there is a significant relationship between the two variables. The independent variable's predictive ability is shown by the R<sup>2</sup> (coefficient of determination), which is 0.696. This indicates that the independent variable accounts for 70% of the variation in production. It demonstrates that every increase in productivity is 70% attributed to supply chain digitization. The moderate R<sup>2</sup> value found in the results indicates a moderate link between the explanatory variable, supply chain digitalization, and productivity. It indicates that approximately 0.30% of the variation in the dependent variable is not explained by the model. The study shows that because the P value (sig.) of 000 is smaller than alpha (0.05), DSC has an impact on the productivity of LOGMAPF on the Nigerian Exchange Group.

## DISCUSSION OF FINDINGS

This study used a quantitative research design that adhered to positivist ideology. It expands on current theory and discusses practical applications. Based on the data, the hypothesis sought to determine how supply chain digitization would ultimately affect productivity, a measure of sustained competitiveness, using a straightforward regression analysis. After being statistically verified and confirmed in the null form, the hypothesis was rejected. It was acknowledged that the alternative hypothesis, according to which supply chain digitalization had a significant impact on productivity (R=855\*\*, P=000), was correct. Specifically, it was found that DSC organized productivity, which in turn made it feasible to achieve realistic results. The

results of this study demonstrated that companies may raise service standards more quickly by incorporating digital technologies into their supply chains. By creating a digitalized, fully connected supply chain network, businesses can respond to customer requirements promptly and efficiently, which will ultimately increase productivity. Productivity based on digitalization rest on the downstream and midstream operations because of lack of readiness for digitalization in the upstream operations. This study's findings are consistent with those of Ikegwuru and Nwokah (2022), Rachinger et al. (2018), and Ikegwuru (2022), showing that digital technology has significant effects on supply chain performance. The significance of supply chain digitization and the benefits that result from its effective implementation have been demonstrated by these studies.

The results of this study demonstrate how digitization of the supply chain can help oil and gas companies in particular as well as supply networks more broadly. Digitalizing the supply chain is therefore critical to a company's ability to compete over the long term.

### CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study was to ascertain how supply chain digitization affected listed oil and gas companies in Nigeria's ability to remain competitive over the long run. This analysis demonstrated that the supply chain digitalization independent variable—discussed earlier in the study—had a favorable impact on the productivity measure of sustainable competitiveness.  $H_1$  was accepted, and the results are consistent with past research. Therefore, the study comes to the conclusion that supply chain digitalization has a significant impact on the sustainable competitiveness of listed oil and gas companies in Nigeria. It also recommends that in order to connect productivity inside their organizations and attain sustained competitiveness, management of these enterprises should implement enough DSC-compliant initiatives.

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