

Supply Chain Digitalization and Sustainable Competitiveness of Listed Oil and Gas Companies in Nigeria

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Abstract: *This study focused on supply chain digitalization and sustainable competitiveness of listed oil and gas firms in Nigeria. The population of the study comprises eleven (11) oil and gas companies which are quoted on the Nigerian Stock Exchange. The sample size is also 11 listed oil and gas companies, since it is less than 30. The simple random sampling technique was adopted for the study, and the number of participants was three hundred and thirty (330) management staff, on a sample frame of thirty (30) respondents per firm. The primary data collected for the study consists of information gotten from original materials such as questionnaire. A 5-point likert-scale questionnaire was administered to 330 respondents. Of the 330 copies of questionnaire that were distributed to the respondents, 270 copies were returned, yielding a response rate of 82 percent. Besides, of the 270 copies of the questionnaire returned, the usable copies numbered 202 leading to a response rate of 75%. The simple regression technique was used to test the stated hypothesis. The results revealed that supply chain digitalization has a strong, positive, and significant influence on productivity. The study therefore concludes that, supply chain digitalization significantly influence sustainable competitiveness of listed oil and gas firms in Nigeria, and recommends that, management of listed oil and gas firms in Nigeria should implement adequate supply chain digitalization programs to connect with sustainable competitiveness through productivity in their businesses.*

Keywords: *Productivity, Supply chain digitalization, Sustainable competitiveness, Listed oil and gas companies*

INTRODUCTION

In contemporary times, countless firms globally are ambitious to deal with ever-increasing competition in view of the fact that it has consequently spiraled into the prime schema for these firms. A spirited comparative stance necessitates that firms have sustainable competitive increase that can be tireless in conjunction with incidence by competitors and transformations in the industry. Sustainable competitiveness materializes as an indispensable dynamic in the perception of goods and services value, which ought to be calculated as fundamentals of competitiveness. As a result of the importance of sustainable competitiveness to the long-standing success of companies, the accessible literature takes in hand its content as well as its

sources, and the diverse categories of strategies such as supply chain digitalization that may help firms realize sustainable competitiveness.

Supply chain digitalization is built up of a number of core competencies required for balancing assorted production skills and join together multiple torrents of technologies. Supply chain digitalization is a result of prearranged set of competencies that sum up to proactive, relational, coordinative use of technology by a given supply chain who wishes to transport specific good and service offerings to realize sustainable competitiveness.

Supply chain digitalization obliges businesses to reflect on the synchronization and the alliance of their supply chain as indispensable in their innovative strategies. Without a doubt, the administration of these upstream and downstream associates and of the entire supply chain prop up value formation for customers (Lavastre, Ageron & Chaze-Magnan, 2016). Additionally, lower computing costs, cheaper storage, and less expensive broadband that has been offered have powered the investment in digital technologies widely (Mussomeli, Gish, & Laaper, 2015). Thus, nowadays, people worldwide prefer to use digital tools and devices to communicate and interact with their relatives, friends, business associates and all. In fact, market forecast presents that a quarter of the world population currently connects to the internet, whereas half of these people are energetically on a social media platform (Bearing Point, 2015).

Studies by Bughin *et al.* (2018) indicates that, many digital technologies such as Big Data, the Internet of Things, Blockchain, Cloud Computing systems, Artificial Intelligence, Man-Machine Learning and many more applications are instrumental to improving the supply chain of any industry. The above mentioned have been classified as digital supply chain (DSC) technologies supporting some companies to obtain a tremendous positive change in performance in more complicated areas. Tahiduzzaman (2017) further explained that DSC in supply chain management (SCM) is a supply chain constructed on an internet-empowered competencies core. A DSC has a unique embedded system and techniques that governs and manages the real-time inventory levels, assists to have first-rate customer interaction with items, plays the role of a location and equipment transport, and supports the planning process as well as implementing an inclusive company performance.

These new technologies affect every industry and organization. Supply chains, in particular, are affected by these changes and their consequences (Foli *et al.*, 2012; Zeiringer *et al.*, 2022). On the one hand, the actors in a supply chain including suppliers, partners, companies, and dealers create, use, and share knowledge and information with others (Buyukozkan & Gocer, 2018). The high internet penetration rate among people in conjunction with the availability of different digital communication tools have also significantly changed the buying behaviour and demand patterns of customers; and this, in turn, has imposed great pressure on supply chain managers.

According to Peppard and Ward (2016), companies powerfully believe that by digitalizing their processes, they can guarantee or realize organizational survival and development through advanced overall performance and competitive advantage. Porter and Heppelmann (2015) declared that digitalization is projected to play a progressively significant role in the management and design of global chain supply mainly to companies dynamically involved in value-adding activities, as well as those involved in production and logistics systems.

Most companies currently are operating in business environments that are characterized by complexity, rapid technological growth, and constant changes (Murray *et al.*, 2015; Durst *et al.*, 2019). Companies could only boost their productivity, lower operational costs, realize high customer satisfaction, and optimal client retention, by integrating modern technology into their businesses (Deloitte, 2015). This will significantly metamorphose into an effective, agile and responsive supply chain where the lead-time can be condensed, and the availability of products can experience an increase for a sustained operation of a supply chain.

It is then clear as crystal that, in this day and age, supply chain digitalization has turned out to be a significant appliance for businesses to uphold realistic partnerships and couple a colossal value connection with other firms. Innovative digital technologies that are up-and-coming every day are on their line of attack to have an effect on practically all business development and activities globally. The goal of supply chain digitalization therefore is to decipher varied resources into competitive product and service offerings.

Reasoning from the above discussions, it is astonishing to observe that Buyukozkan and Goçer (2018) declared that, there exists an insufficiency of research on the industrial actual case applications regarding supply chain digitalization. They equally noted that companies from diverse trade backgrounds have precise policies, approaches and practices for supply chain digitalization. Some studies also confirm that, digitalization is disposed to resolve the technique of supply chain operation (Shamout *et al.*, 2022; Ali *et al.*, 2021; Alzoubi *et al.*, 2022; Alzoubi *et al.*, 2021; Joghee *et al.*, 2021; AlShurideh *et al.*, 2019; Rachinger *et al.*, 2018). Hence, future research is desirable to develop bases of supply chain digitalization for each industry to boost the critical trends for future supply chain digitalization.

Therefore, it is essential to have a suitable parameter and basis to support in implementing supply chain digitalization. In essence, only very few studies have examined the relationship between implementation of supply chain digitalization toward the performance of supply chain and overall business organizational performance (Pourmorshed & Durst, 2022; Marco *et al.*, 2019; Lee *et al.*, 2018), but these studies are established in western literature. Studies in the developing world in this regard (e.g. Ikegwuru, 2022; Ikegwuru & Nwokah, 2022) focused on the oil and gas companies. Since the development of technologies is repetitively increasing, it is essential to have a study explicitly on supply chain digitalization implementation in any industrial sector, especially the listed oil and gas sector of Nigeria. Therefore, this study investigates the effect of the supply chain digitalization on sustainable competitiveness of listed oil and gas sector of Nigeria.

RELATED LITERATURE REVIEW AND HYPOTHESIS

The Resource Based View Theory of the Firm

The theoretical footing of this study is founded on Resource-Based View (RBV) which postulates that organizational performance outcomes are dependent on its resources and capabilities. This theory emanates from the strategic management field and suggests that the sources of competition for organizations are their resources and capabilities (Barney, 1991). A resource is whatsoever that is owned or acquired by an organization and as long as these resources are valuable in their own right, they will have the aptitude to contrive value-creating tactics that cannot eagerly be replicated by rivals (Grant, 1996; Teece *et al.*, 1997; Barney, 1991).

The resource base theory stipulates that the root for the competitive advantage of a firm lies chiefly in the tendering of a bundle of valuable tangible or intangible resources at the firm's disposal (Wernerfelt, 1984; Rumelt, 1984; Penrose, 1959). By backing up the strength of this theory, Vandermerwe (1996) and Barney (1991) contend that the possession of strategic resources empowers an organization to gain a golden opportunity to develop competitive advantages over its competitors. Such resources are strategically divided into tangible (resources that can have a physical presence) and intangible (resources that are not physically present).

From the foregoing, resource-based theory of the firm holds that the possession of resources that is valuable, hard to reproduce, rare, and cannot be substituted helps an organization to position noticeably out in a competitive environment. It then, suggests that firms should look inward to find the sources of marketing success through the use of their internal resources (Hart & Dowell, 2010). Firms that have access to the best mix of resources and competencies will be able to maintain a long-term advantage in the marketplace (Barney, 2012; Bowersox *et al.*, 2003; Barney, 1991).

If firms focus on their knowledge in supply chain digitalization initiatives such as digital operations and digital customer experience as internal resources than their competitors, the resultant effect of course is sustainable competitiveness. Based on this theory, this study is interested in investigating the effect of supply chain digitalization on sustainable competitiveness, and by adopting and extending the resource-based view theory of the firm, contributes to extant literature associating supply chain digitalization with sustainable competitiveness.

The Concept of Supply Chain Digitalization

Supply chain digitalization as defined by Xue, Zhang, Ling and Zhao (2013) is inter-organizational systems (IOSs) that firms carry out to digitize the processes of transaction and collaboration with their supply chain partners (upstream suppliers and downstream customers). Bhargava *et al.* (2013) informs that supply chain digitalization is a grouping of systems that back communications and dealing procedures amongst global distribution organizations and the partners' activities in supply chains. This statement has also been reinforced by Cecere (2016). Supply chain digitalization enables businesses attend to her aspirations of delivering and supplying the right products at the right time. This process can be powered by means of digital technologies that connect to customer responsiveness. This is owing to the facility of smart products such as smart phones, tablet computer, handheld devices which are capable of translating any electronic message essential by existing systems and consent to electronic data communication amongst firm and supply chain members.

The Concept of Sustainable Competitiveness

Competitiveness is the extent to which a firm can perform superiorly against its competitors (Wu *et al.*, 2008). Newbert (2008) defined competitive advantage as „„the implementation of a strategy not currently

being implemented by other firms that facilitates the reduction of costs, the exploitation of market opportunities, and/or the neutralization of competitive threats” (p. 749). Firms can turn their strategies competitive based on their distinctive resources. These distinctive resources enable firms to survive longer and further develop competitiveness without pressures from external environmental challenges. The priorities to achieve competitiveness can be defined as a consistent set of performance characteristics that can contribute to enhance a firm’s competitiveness (Castro, Santos & Silva 2008).

Competitiveness thus, stands for the matchless prospective that positions a company far away from its competitors, in that way endowing them with a superior position in the marketplace. Sustainable competitiveness materializes as an indispensable dynamic in the discernment of goods and services value, which ought to be premeditated as ground rules of competitive advantage in an enduring manner. Understanding the sources of sustained competitiveness therefore, has turned out to be a foremost field of study in strategic management (Flint & Van Fleet, 2005; King, 2007). In line with Vilanova (2005), this study adopts productivity and innovativeness as the measures of sustainable competitiveness

Productivity

Productivity metrics refer, essentially, to measures of inputs and outputs of a single, or combination of inputs, in order to grant comparisons over time, between plants or in relation to some model (Usubamatov *et al.*, 2010). is measured by the comparison of inputs and outputs of resources (Callen, Morel & Fader, 2010). Productivity is the result of interactions of organizational management systems with external environment factor and, fundamentally, this concept aims to accelerate actions in the sense of improving performance in multiple dimensions (Bornia, 2002). Accordingly, this study defines productivity as a measure of how well sub-systems of listed oil and gas firms work by embracing total systems thinking to indicate the extent of actual accomplishment in relation to the attainable level in a given external environment. In fact, productivity is an element that significantly impacts competitiveness at the company level, being considered one of the measures of competitiveness performance.

Empirical Review

Ikegwuru (2022) investigated digital supply chain technologies enactment and sustainable competitiveness of oil and gas companies in Rivers State by means of a causal study on a population comprised of two hundred and ninety-five (295) oil and gas companies in Rivers State and through the Taro Yamane’s formula a sample size of one hundred and seventy (170) oil and gas firms were attained. Assessing key respondents in terms of the Chief Executive Officers (CEOs) or branch managers of the companies investigated. 510 copies of structured questionnaire were distributed and, 334 copies were returned, yielding a response rate of 75.1 percent. The multiple regression analysis was employed for data analysis. The results revealed that the components of digital supply chain technology (Big data analytics, Cloud computing systems and Mobile applications) studied had a strong, positive and significant influence on

sustainable competitiveness. The study therefore, concludes that, digital supply chain technology proficiency significantly influences sustainable competitiveness of oil and gas companies in Rivers State, and recommends that, to empower a new way of working with digital supply chain technology, management of oil and gas companies should acclimatize their organizational structures and job designs to tender the finest out of their employees and DSCT to improve on sustainable competitiveness. in their supply chain industry.

Ikegwuru and Nwokah (2022) examined the influence of digital supply chain implementation on supply chain collaboration in oil and gas companies in Rivers State using a population of 295 oil and gas companies in Rivers State, and deriving a sample size of 169 oil and gas companies through the Krejcie and Morgan's formula. The study adopted the simple random sampling technique to draw two (2) management staff from each of the 169 companies studied, to attain 338 management staff as respondents. 338 copies of structured questionnaire were distributed to the respondents, of which 246 (88%) of the questionnaire were appropriately filled and afterward used for analysis. The simple regression method was used to test the hypotheses at 0.05 level of significance and it was discovered that, digital supply chain implementation moderately, positively and significantly influences supply chain collaboration. The study therefore, concludes that digital supply chain implementation significantly influences supply chain collaboration of oil and gas companies in Rivers State, and recommends that, the management of oil and gas companies should examine the value creation capacity in their existing supply chain by a thorough review process that will detect digital supply chain advantages on presently perceived ways to boost supply chain collaboration and best practices in their industry. Further, the oil and gas companies should consider adopting DSC in their occupational practices to remain reliable in the competitive market by providing good supply chain collaboration and best business practices simultaneously.

Lee *et al.* (2022) studied the effect of digital supply chain on the supply chain and organization performance and as well assesses the mediating effect of supply chain performance in the relationship between digital supply chain and the organizational performance in the Malaysia manufacturing industry using a quantitative research design. Data was composed by means of an emailed online survey questionnaire to 1160 manufacturing companies listed in the Federation of Malaysian Manufacturers (FMM) directory, and using stratified sampling technique attained 56 (5.43%) valuable responses for data analysis. Data was analyzed with the Partial Least Square Structural Equation Modeling (PLS-SEM), and all hypotheses were supported. The study concludes that manufacturing companies in Malaysia can contemplate adopting digital supply chain in the business procedure to stay dependable in the competitive market by making accessible good supply chain performance and most outstanding organizational performance in entirety.

Pourmorshed and Durst (2022) looked into the situation of lack of studies in small and medium-sized enterprises (SMEs) and explores the practicality of the digitalization integration framework (DIF) proposed by Buyukozkan and Goçer (2018) for the development of DSC in SMEs. More exactly, based on a case study design concerning Swedish SMEs operating in the similar supply chain, this paper provides insight into the DSC process of these Swedish SMEs adopting the DIF. The outcome of the study aided the proposal of an updated framework comprising of five main components in the digitalization process, specifically: digital strategy, digital organization and culture, digital operations, digital products and services, and digital customer experience. Additionally, each component comprises of numerous stages, termed sub-

components, which could be pondered by SMEs when developing DSC to upsurge the success of this thought-provoking activity.

Marco *et al.* (2019) investigated the relationship between investments in digital technologies and firm performances as well as investigating the precise technologies more disposed to be associated with greater performance and eventually the growing effect of technologies on performance. Reinforced on typical data accumulated in 2017 on a sample of 1,149 Italian firms, the results reveal a positive impact on adopters' performance and the function of robotics and laser cutting in this relationship.

From the review of literature, the following conceptual frame work was designed:

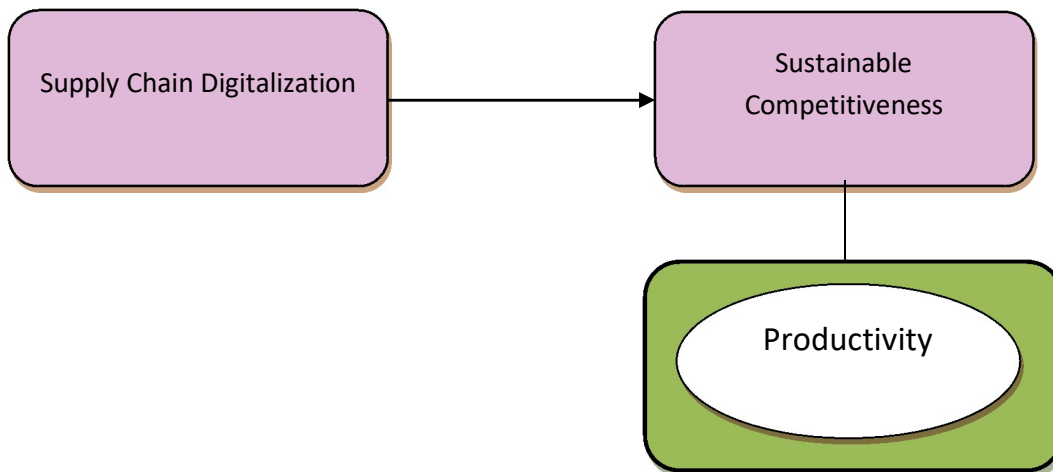


Figure1: Conceptual Framework of Supply Chain Digitalization and Sustainable Competitiveness.

Source: Designed by the Researchers. (2023).

From the conceptual framework, the following hypothesis was raised:

H₀₁: Supply chain digitalization does not significantly influence sustainable competitiveness of listed oil and gas companies in Nigeria

METHODOLOGY

This study applied the quantitative research method and relied on the philosophy of positivism, and used a survey with a deductive approach in an empirical research concerning supply chain digitalization and competitiveness of listed oil and gas firms in Nigeria. The population of the study comprises eleven (11) oil and gas companies which are quoted on the Nigerian Stock Exchange. The sample size is also 11 listed oil and gas companies, since it is less than 30. The simple random sampling technique was adopted for the study, and the number of participants was three hundred and thirty (330) management staff, on a sample frame of thirty (30) respondents per firm. The primary data collected for the study consists of information gotten from original materials such as questionnaire. The simple regression technique was used for the data analysis with the support of SPSS software to test the stated hypothesis.

RESULTS

This study concerns supply chain digitalization and sustainable competitiveness of listed oil and gas companies in Nigeria. Since the population under study is below thirty (30), the entire population was therefore measured as the sample size. This then suggests that the population of the study is the same as the sample size of the study. Of the 330 copies of questionnaire that were distributed to the respondents, 270 copies were returned, yielding a response rate of 82 percent. Besides, of the 270 copies of the questionnaire returned, the usable copies numbered 202 leading to a response rate of 75%. Hence, these 202 copies were used for the analysis.

Statistical Test of Hypotheses

To test the hypotheses the simple regressions was performed on the dependent and independent variables to determine the degree of influence of the predictor variable on the dependent variable. This is aimed at identifying the extent of the effect of the dimensions of tax incentives on foreign direct investment. The null hypotheses were stated followed by the results of the test presented in tabular form.

Statistical Regression Analysis on the Extent and Direction of the influence of Supply Chain Digitalization on Productivity.

Table 1 Summary of Regression Model for Supply Chain Digitalization on Productivity

Model R	R square	Adjusted Square	R std error of the Estimate	Sig.	
1	.766 ^a	.587	.585	2.104	.000

a. Predictors: (Constant), Supply Chain Digitalization

b. Dependent Variable: Productivity

Source: SPSS Window Output, Version 22.0 (based on 2023 field survey data).

The sum of productivity was regressed with the sum of supply chain digitalization to examine the influence of supply chain digitalization on productivity. The value of R is 0.766. The R (coefficient of correlation) value of 0.766 represents the correlation between supply chain digitalization and productivity. It represents a strong correlation between the two variables. The R² (coefficient of determination) which indicates the explanatory power of the independent variable is 0.587. This means that 59% of the variation in productivity is explained by the independent variable. It shows that supply chain digitalization makes a contribution of 59% to every change in productivity. The R² value as revealed by the result is moderate which means that about 0.41% of the variation in the dependent variable is unexplained by the model, denoting a moderate relationship between the explanatory variable, supply chain digitalization and productivity. Since the P value (sig.) of 000 is less than alpha (0.05), the study concludes that supply chain digitalization influences productivity of listed oil and gas firms in Nigeria.

DISCUSSION OF FINDINGS

This study relied on a quantitative research method in line with the philosophy of positivism. It extends existing theory and its implications for practice. From the analysis, the hypotheses wanted to agree on the end product of supply chain digitalization on measure of sustainable competitiveness (productivity) using the simple regression analysis. The hypotheses was affirmed in the null form, statistically tested and discarded. The alternative hypotheses that supply chain digitalization significantly influenced productivity (R=766**, P=000) was acknowledged. It becomes apparent that supply chain digitalization makes sustainable competitiveness (productivity) well-organized and consequently capable of delivering realistic result.

This study have found similar results with the study by Israelit *et al.* (2018), in which companies who assimilate digital technologies into their supply chain can speedily enrich the service levels. Even though setting up a digitalized and fully integrated supply chain network, businesses can react and respond fast to customer demands with highly effective, efficient, and ultimately improving productivity.

The results of this study equally parallels the findings of Ikegwuru (2022), Ikegwuru and Nwokah (2022) and Rachinger *et al.* (2018), demonstrating that digital technology impacts supply chain performance appreciably. These studies have shown the importance of supply chain digitalization and the value outcomes that emerge when supply chain digitalization is implemented successfully. The findings of this study show how supply chain digitalization can benefit supply chains generally and oil and gas firms specifically. Therefore, supply chain digitalization is important for companies' sustainable competitiveness.

CONCLUSIONS AND RECOMMENDATION

The study was conducted to determine the influence of supply chain digitalization on sustainable competitiveness of listed oil and gas firms in Nigeria. This study established that the independent variable of supply chain digitalization discussed early in this study positively affect the measure of sustainable competitiveness (productivity). H1 was accepted, and this finding is in line with earlier studies. The study therefore concludes that, supply chain digitalization significantly influence sustainable competitiveness of listed oil and gas firms in Nigeria, and recommends that, management of listed oil and gas firms in Nigeria should implement adequate after supply chain digitalization programs to connect with sustainable competitiveness through productivity in their businesses.

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