

THE MODERATING ROLE OF COMPETITIVE PRESSURE ON THE RELATIONSHIP BETWEEN E-PROCUREMENT AND SUPPLY CHAIN SUSTAINABILITY OF THE OIL AND GAS INDUSTRY IN RIVERS STATE

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ABSTRACT

The oil and gas industry in Rivers State, Nigeria, faces significant challenges in maintaining sustainable supply chains. With increasing global attention on environmental responsibility, financial efficiency, and social equity, the sustainability of supply chains has become a critical concern. The purpose of the study was to investigate the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. Anchored on the Stakeholder theory, it adopted a quantitative and explanatory research design with a positivism research paradigm and conducted a correlational investigation without any form of manipulation in a non-contrived setting to ascertain the degree of relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. The target population of this study was twenty-five (25) oil and gas firms in Rivers State according to the Nigeria Directory & Search Engine Finelib.com (2023). Due to the small size of the population, the census method was adopted. To guarantee comprehensive representation of the companies, five (5) respondents were drawn from each of them for the survey, as representatives of the firms based on their managerial roles, they include; supply chain managers, procurement managers, product managers, operations managers and brand managers. Hence, the respondents constituted one hundred and twenty-five (125) employees of the firms. However, only one hundred and three (103) copies of the questionnaire were found useful for the study. A well-structured, self-administered survey questionnaire was adopted, validated and a reliability test conducted before it was used for primary data collection. The data were analyzed using both descriptive and inferential statistics; Pearson Product Moment Correlation and Partial Correlation were employed to establish the degree of relationship between the variables with the aid of Statistical Package of Social Sciences Software (SPSS) version 22. The research results revealed that E-procurement has a significant, strong, positive relationship with environmental responsibility, financial responsibility and social responsibility in the oil and gas industry in Rivers State. The study concluded that e-procurement relates positively and significantly with supply chain sustainability in the oil and gas industry in Rivers State. And competitive pressure has a positive and significant impact on the relationship between both variables. The study therefore, recommends that the oil and gas industry in Rivers State should continuously improve on their e-procurement strategies to facilitate the achievement of supply chain sustainability objectives. As well as to combat competitive pressure through strategic e-supplier collaboration and circular strategy of waste reduction in the oil and gas industry in Rivers State.

INTRODUCTION

The rise of the internet during the 1990s and heightened global competition have presented a challenge to supply chain management experts, scholars, and businesses. They are now compelled to explore various strategies to cut procurement costs and minimize lead times as much as they can (Mahdillou & Akbary, 2014). This quest has led to the development of technologies and organizational solutions worldwide, particularly granting organizations the possibility to manage sourcing procedures online. As a result of the surge in Internet activities, many firms have shifted from conducting paper-based procurement transactions to e-procurement transactions. E-procurement is a major part of supply chain management activities traditionally supported by information technology to enhance operational efficiency and sustain supply chains. E-procurement

management techniques enable firms in the oil and gas industry to diffuse their operational procurement processes and unify strategic procurement processes to achieve higher supply chain transparency and profitability (Aberdeen, 2001; Eyholzer & Hunziker, 2000; Andersen 2001). More so, competitive pressure in the industry often drives companies to seek cost efficiencies throughout their operations by utilizing e-sourcing, e-tendering and e-payment to manage the numerous procurement processes with a view to advancing transparency, reduce waste, eliminate human errors, and streamline business processes. Competitive pressure is the external effect that necessitates organizations to continuously adapt and advance in order to sustain their competitive advantage in the market, amidst challenges posed by industry rivals (Grant, 2019).

In recent times, oil and gas experts have raised concerns about indigenous firms' preparedness to ensure a more sustainable supply chain in the sector (Jeremiah, 2022). Soot; a thick black smoke that billows up into the sky on a daily basis is a common sight in Rivers State, it gets into the respiratory system causing or exasperating asthma, bronchitis, pneumonia, heart disease, birth defects and even cancer (Thisday, 2023). These growing environmental, social, and economic issues have increased the pressure of stakeholders in the oil and gas industry in Rivers State to adopt a sustainable perspective in their operations (William & Benson, 2010). Attah, (2022) postulates that though, Nigeria needs more energy as a result of rapid population growth, it needs it cheaper, cleaner and in abundant supply. Over the years, there have been issues like gas flaring and lack of reservoir maintenance strategies, inadequate attention to safety and environmental health guidelines, infrastructural deficits, oil spillages due to vandalization of pipelines (Oyebode, 2021). More fundamental, (Kandiyoti, 2012), aptly noted pipelines have remained potential targets for socioeconomic sabotage and sources of environmental degradation, the resulting pollution of the environment has caused significant problems for the ecosystem and local communities (Umar, Abdul Khanan, Ogbonnaya, Shiru, & Babad, 2022). Additionally, climate change presents one of the most serious environmental challenges faced by humanity today and the achievement of sustainability is a major issue for organizations worldwide. Enterprises need to both maintain and improve their market position and fulfill their environmental and social responsibilities (Halkos & Evangelinos 2002). Therefore, the use of internet technologies for sourcing, tendering and payment is needed as part of a larger business management initiative to achieve improved transparency, access all spend data, improve collaboration, decision-making through centralized data management, reduce waste, inefficiencies, maverick spend, and human error (Murphy, 2022).

There have been many interesting researches concerning social and environmental issues in supply chain management in the recent years, but none exist on e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. The focus of most studies up to date, however, has been on Performance Management of Supply Chain Sustainability in Small and Medium-Sized Enterprises Dey, Yang, Malesios, Debashree & Konstantinos (2019), E-Sourcing in Procurement: Theory and Behavior in Reverse Auctions with Noncompetitive Contracts (Engelbrecht-Wiggans & Katok, 2006), Supply chain sustainability performance measurement of small and medium sized enterprises using structural equation modeling (Malesios, Dey & Abdelaziz, 2020). Studies relating to the adoption and application of e-procurement systems, especially in developing countries, such as those found in Sub-Saharan Africa, appears severely neglected in procurement literature. According to (Touboullic & Walker 2015; Meixell & Luoma, 2015), more research is needed in the future specially to examine the importance of measuring sustainability of supply chains. Hassini, Surti & Searcy (2012) indicate that there is a need for more research on developing an appropriate framework for sustainability performance measurements in supply chain. In the same way, the need to carry out theoretical and empirical research about the way forward to fulfill the sustainable supply chains has been stated (Eskandarpour, Dejax, Miemczyk & Peton, 2015). It is on this basis that this study intends to examine the relationship between e-procurement

and supply chain sustainability of the oil and gas industry in Rivers State. Illustrated below is the conceptual framework showing the variables underpinning the study.

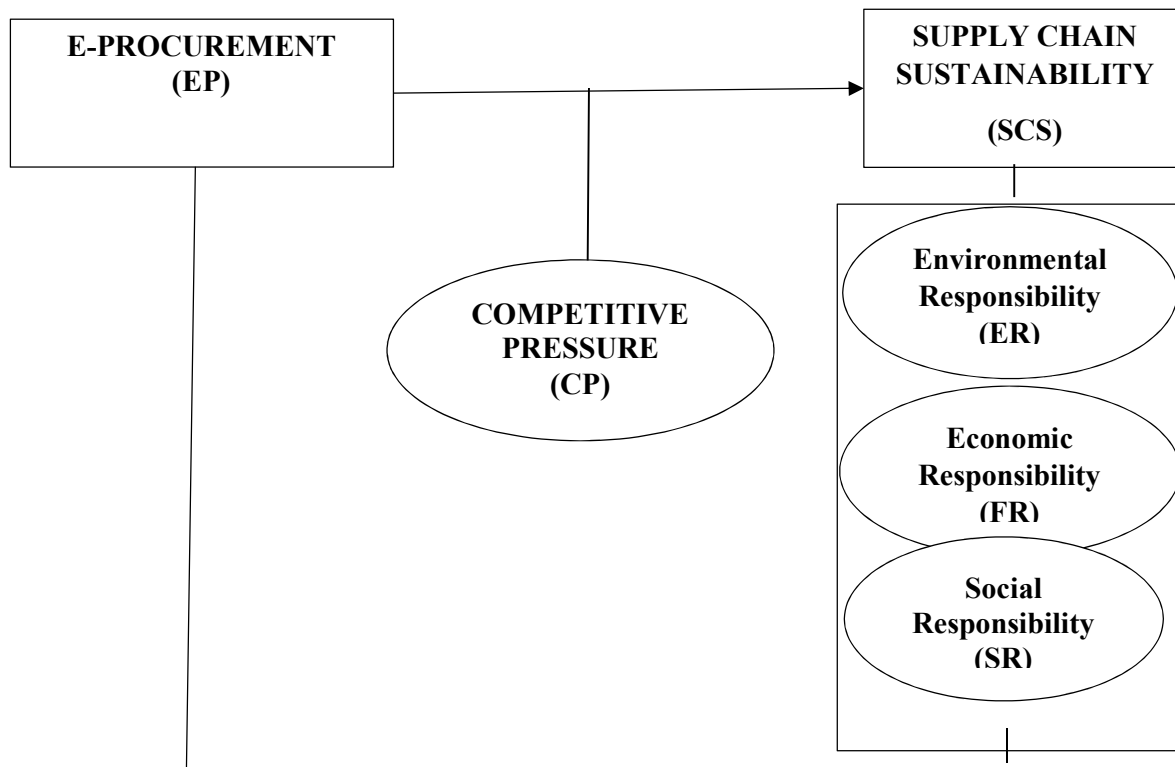


Figure 1: Conceptual Framework of The Moderating Role of Competitive Pressure on The Relationship Between E-Procurement and Supply Chain Sustainability of The Oil and Gas Industry in Rivers State

Sources Researchers' Conceptualization, (2024) as adapted from (Dey, Yang, Malesios, Debashree & Konstantinos, 2019).

THEORETICAL FOUNDATION

STAKEHOLDER THEORY

The stakeholder theory was first articulated in 1984 by Edward R. Freeman's paper titled *Strategic Management: A Stakeholder Approach*. According to Freeman (1984), managers should develop their strategies in alignment with the interests of all stakeholders, including employees, customers, suppliers, financiers, communities, and others. Mitchell, Agle & Wood, (1997) indicate that the stakeholder theory is focused on the various sets of people who can affect or are affected by the activities of an organization. Jensen, (2001) observed that stakeholder theory proposes that firms should be operated for the advantage of all those who have a stake in the enterprise, including employees, customers, suppliers, and the community. For Evan & Freeman, (1993), stakeholder theory suggests that the interests of all stakeholders are of fundamental value, and managers must offer identical consideration to the genuine interests of all stakeholders. Lending credence to Evan & Freeman, (1993), Harrison & Wicks, (2013) defined stakeholder theory as managing and creating value for different parties with interests in the firm's operations, harmonizing various needs and concerns. Stakeholder theory places of interest the interconnectedness of stakeholders' interests, suggesting that satisfying stakeholders leads to long-term business success. Donaldson, & Preston,

(1995), posit that the stakeholder theory is a philosophy of organizational management and morality that addresses principles and values in managing organizations, predominantly concerning the interests of all stakeholders. Therefore, the basic idea is that organizations should be accountable not just to their shareholders but to all parties affected by their actions.

In recent years, stakeholder theory has garnered renewed attention, especially in light of global issues like climate change, social inequality, and corporate governance scandals (Freeman, Harrison, & Wicks 2020). Additionally, the COVID-19 pandemic underscored the implication of stakeholder engagement and corporate responsibility, as companies faced unparalleled challenges and aimed to assist their employees, customers, and communities. In e-procurement management, this theory emphasizes the significance of fostering robust relationships with suppliers and other stakeholders to attain shared advantages. Concerning sustainability, stakeholder theory emphasizes engaging with stakeholders to understand their sustainability expectations and integrating their feedback into procurement practices. Regarding sustainability, stakeholder theory highlights the importance of involving stakeholders to comprehend their sustainability expectations and incorporating their input into procurement procedures.

LITERATURE REVIEW

E-PROCUREMENT

The term “e-procurement” entails the usage of Internet-based information and communication technologies (ICTs) to carry out specific or the entire procurement process including sourcing, negotiation, ordering, receipt, and post-purchase review (Gunasekaran & Ngai, 2008). According to Davila, Gupta, & Palmer, (2003), e-procurement is the business-to-business or business-to-consumer or business-to-government purchase of goods and services through the Internet as well as other information and networking platforms. The concept of e-procurement is defined as the application of electronic tools and platforms to reorganize and boost the procurement process, including supplier selection, ordering, and payment processes (Croom & Johnston, 2003). Kumar and Kumar, (2021) E-procurement encompasses the use of electronic tools and technologies to streamline and automate the procurement process, from requisition to payment, in order to enhance efficiency, transparency, and cost-effectiveness. E-procurement management encompasses the application of online platforms and digital tools to automate and restructure procurement processes, enabling organizations to efficiently source goods and services, negotiate contracts, and manage supplier relationships (Gupta & Sharma, 2022). Rai & Patwa, (2020) observed that e-procurement is the strategic utilization of internet-based technologies to enable the sourcing, purchasing, and supervision of goods and services, optimizing processes and nurturing collaboration among stakeholders. Kapoor & Tandon, (2023) suggest that e-procurement is the combination of electronic systems and processes into the procurement lifecycle with the aim of achieving efficiency, reduce cost, and foster transparency. In consonance with Singh and Sinha, (2023), we are inclined to define e-procurement as the digitalization and optimization of acquisition processes via the use of electronic platforms to achieve firms’ goals and objectives. Gunasekaran and Ngai, (2008) posit that e-procurement is a multidimensional concept comprising of e-sourcing, e-auctioning and e-payment as dimensions.

The term sourcing is a process of evaluating, selecting, and managing suppliers to acquire the desired goods and services from them (Arbuzova, 2021). Sourcing involves conducting a careful analysis of the firm’s needs, wants, history of the supplier/market, negotiating with suppliers and drawing up contracts (Annalakshmi, 2022). Thus, e-sourcing refers to the use of Internet-enabled applications and decision support tools that facilitate competitive and collaborative interactions among buyers and suppliers through the use of online negotiations, reverse (decreasing bid) auctions, and other related tools (Engelbrecht-Wiggans & Katok, 2006). Chukwuemeka & Poi, (2023) defined e-sourcing as the sourcing process enabled with the appropriate web-enabled, collaborative

technology to facilitate the full life-cycle of the procurement process for both buyers and suppliers. The goal of e-sourcing is to locate and engage suppliers to meet business needs with the aid of the internet and other digital technologies. On the other hand, electronic auctioning (E-auctioning) is the technique of conducting auctions electronically. This process involves several sellers and buyers engaging in a competitive bidding environment enabled by digital platforms (Kambil & van Heck, 2002). Turban, King, Lee, Liang & Turban, (2015) defined e-auctioning as an online process where both buyers and sellers participate in real-time bidding through a digital interface. E-auctioning is a form of e-procurement process carried out online and through information and networking systems. It is a web-based system that allows potential suppliers to compete online, in real-time, pricing for goods and services. Whereas, e-payment in the context of e-procurement refers to the electronic processing and settlement of financial transactions for goods and services obtained through an electronic procurement system. This comprises of the use of electronic funds transfer (EFT), credit/debit cards, and online banking to enable imbursements (European Central Bank. 2010). Turban, *et al.* (2015) observed that e-payment entails all digital payment approaches used to fulfill financial responsibilities arising from electronic procurement activities. In the realm of e-procurement, e-payment refers to the collection of electronic payment solutions that enable firms to pay for products obtained digitally.

SUPPLY CHAIN SUSTAINABILITY

Supply chain sustainability is the process of managing supply chain activities with consideration for achieving environmental, financial and social objectives (Farahani & Davarzani, 2009; Peters, 2010). Supply chain sustainability denotes the management of environmental, social, and financial impacts throughout the life cycle of goods and services in the supply chain. According to Touboullic, Chicksand & Walker, (2014), supply chain sustainability is the strategic, transparent combination and achievement of an organization's social, environmental, and financial goals in the systemic coordination of key interorganizational business processes for improving the long-term performance of the individual company and its supply chains. In consonance with Touboullic *et al.* (2014), Sánchez-Flores *et al.* (2020) indicate that supply chain sustainability is the formation of harmonized supply chains through the voluntary combination of financial, environmental, and social issues with significant inter-organizational commercial systems to efficiently and effectively manage supply chain flows and fulfill stakeholders' requirements. Winter, (2021) suggests that sustainability in supply chains necessitates three (3) responsibilities: social, environmental, and financial. Citing (Seuring & Müller, 2008), Chukwuemeka & Poi, (2023) opine that supply chain sustainability entails organizations' efforts to regulate the environmental and human influence on their products' expedition through the supply chain, from the sourcing of raw materials, to manufacturing, storage, and delivery. In agreement with Kim, Jeong & Jung, (2014), we are inclined to define supply chain sustainability as a supply chain that is accountable to its shareholders, stakeholders and environments through innovative strategic, tactics and management technologies. This is integrating sustainable development and operating under the three dimensions of sustainability environmental responsibility, social responsibility and economic responsibility (Dey, Yang, Malesios, Debashree & Konstantinos, 2019).

ENVIRONMENTAL RESPONSIBILITY

The environment is a key element of the sustainable development schema; climate change, global warming, and the rising cost of energy are fundamental themes of interest (Szegedi, Gabriel & Papp, 2017). Environmental responsibility has evolved due to fears and damages from carbon emissions, release of pollutants, dumping, and environmental waste, considering the entire life cycle of the product. Environmental responsibility currently focuses on the capacity of ecosystems to continue providing goods and services (Bakshi, 2019). According to Simon, (2022), environmental responsibility is the ability of the supply chain to prevent and alleviate the environmental damages that may be caused by their commercial activities. Therefore, the environmental dimension of

sustainable development contains environmentally-friendly production processes and actions for reducing the quantity of waste (Min & Kim, 2012). Crucial elements of the environmental dimension of sustainable development include organizational activities such as the selection of partners in the supply chain based on ecological guidelines, and the commitment of employees to environmental protection programs (Cantor, Morrow & Montabon, 2012). Stobierski, (2022) suggests that when a supply chain is economically responsible, decisions are made by considering their overall effects on society and businesses at the same time while making profit. Hence, economic responsibility can improve business operations while engaging in sustainable practices. We are inclined to define environmental responsibility as the capacity of the supply chain to protect the ecosystems while providing goods and services to meet customers' requirements.

SOCIAL RESPONSIBILITY

Social responsibility refers to a concept whereby firms integrate corporate social concerns in their business operations and interactions with all investors and participants. Blewitt, (2014) suggests that social responsibility considers several relationships between human rights and development, including the impact of a firm's activities on individuals and global poverty, dubious business operations, and the consumer's choice within the moral contexts. According to the United Way NCA, (2023), firms that adopt social responsibility initiatives are committed not only to shareholders but also stakeholders. For example: employees, clients, suppliers, and their host communities, engaging in practices that are beneficial to local communities, like supporting educational programs, skills acquisition, poverty alleviation etc. Boyd & Lombardo, (2023) indicate that the term social responsibility is used to describe organizations and individuals who adopt strategies and programs that are beneficial to society. These strategies and programs include charity work (donating time, money, and resources), volunteer work, supporting key issues (political, environmental, social), and simply acting with integrity and honesty. Antonio, (2016) suggest that social responsibility establishes a generic consumer entitlement to safe and quality products and this is reflected in numerous explanations with phrases such as: "integrating social concerns in firms' operations," "contributing to the betterment of society," "respect people, communities and the environment," and "treating all stakeholders in a socially responsible way."

FINANCIAL RESPONSIBILITY

A supply chain's first responsibility is its financial responsibility because it determines its longevity, growth and survival (Suryakant, 2022). According to Grawehr, (2022), economic responsibility refers to the practice of making financial decisions based on a commitment to doing good. For example; investing in alternative energy sources, putting more money into education programs, and funding local charities as a way of bolstering their mission. Stobierski, (2022) suggests that when a supply chain is financially responsible, decisions are made to satisfy stakeholders' requirements while making profit. Hence, financial responsibility can improve business operations while engaging in sustainable practices. Financial responsibility is the practice of a firm backing all of its financial decisions in its commitment to do good in the areas listed above. The end goal is not to simply maximize profits, but make sure the business operations positively impact the environment, people, and society. Transparent Hands, (2018) indicate that financial responsibility is an interconnected field that focuses on striking a balance between business, environmental, and philanthropic practices. Therefore, financial responsibility is the practice of a firm backing all of its monetary decisions in its promise to do good in all its dealings with stakeholders. However, the end goal is not merely profit maximization but to completely influence the environment, people, and society at large.

COMPETITIVE PRESSURE

Competitive pressure means the burden encountered by organisations or individuals as a result of competition. Competitive pressure is defined as the level of aggressive atmosphere in the industries

in which firms operates (Lertwongsatien & Wongpinunwatana, 2003). Porter, (1980) defined competitive pressure as the heaviness employed on a firm by its competitors to do better in costs incurred, quality, novelty etc. For Musselin, (2018), competitive pressure is a form of conflict and rivalry faced by different firms within an industry who target the same set of customers. The pressure from competitors has become institutional, leading to a multi-level forms of opposition that have transformed many organizations into competitors. Competitive pressure consists of market factors that affect the degree of competition measured by the number of firms who offer similar products in an industry (Chong, Eggleton & Leong, 2005; Subroto, 2015). Hill and Jones, (2012) indicate that competitive pressure is the intensity of opposition confronted by organizations within an industry, which encourages them to adopt strategies that enhance their competitive situation. Spicey, (2020) suggests that competitive pressure is a fundamental driver of change in every industry whereby firms competing for business make improvements that puts pressure on their competitors. Due to technological development and the internet, the most successful organizations are no longer engaged in domestic competition; they compete globally (Slaughter & Leslie, 1997; Lazega & Snijders, 2016; Musselin, 2018). To mitigate competitive pressures, organizations must be involved in activities that will encourage high performance and competitive advantage.

EMPIRICAL REVIEW

Several scholars consider e-procurement as an emerging phenomenon that lies at the input end of the supply chain (Presutti 2003). As demonstrated in literature, the relationship between e-procurement and supply chain sustainability is increasingly significant in the modern business environment. Walker and Bramme, (2012) analysed the relationship between sustainable procurement and e-procurement in the public sector. A survey of sustainable procurement and e-procurement adoption was conducted with a sample of over 280 public procurement practitioners from 20 countries and with collective responsibility for expenditure totaling \$45 BN. Using multiple regression, the study developed a model to show that e-procurement and communication with suppliers supports sustainable procurement. Findings reveal that e-procurement and communication with suppliers may help environmental, labour, health and safety aspects of sustainable procurement.

Similarly, Kot, (2018) examined sustainable supply chain management in small and medium enterprises in Poland. The purpose of the study was to present contemporary research in sustainable development relative to managing the supply chain of SMEs, as well as the empirical findings in this area. The research adopted a survey questionnaire, Polish small and medium enterprises were randomly sampled. A total of 383 fully completed questionnaire were used for the final analysis. The Likert's five-level scale was used to assess the SSCM concept in small and medium entities. The results found that all of the sustainability areas were crucial in the supply chain management practices of the studied SMEs.

Also, Dey, *et al*/(2019), studied the performance management of supply chain sustainability practices in French and British small and medium sized enterprises. The study reviewed literature to identify constructs for supply chain sustainability performance measurement of SMEs, developed a questionnaire to derive supply chain characteristics of SMEs, a survey was carried out with the selected SMEs and the data processed with the SEM and DEA models. The study found that efficient SMEs would achieve a higher degree of sustainability by adopting cost intensive practices to enhance economic, environmental and operational performances in the Midlands, UK, whereas operational practices are likely to impact operational, environmental and social performances in Normandy, France.

In the same vein, Jianmin, Muddassar, Kausar and Muhammad. (2022) examined the impact of sustainable supply chain strategy and sustainable competitive advantage while considering the

mediating role of sustainable supply chain practice and moderating role of sustainability inhibitors. The data was collected from the one hundred and eighty (180) employees working in the pharmaceutical companies of Pakistan. The study applied a quantitative approach for testing a theoretical model, using discriminant validity analysis, assessment of measurement model, composite reliability & validity analysis to assess the dimensions and model's reliability and validity. The study results show a positive relationship between sustainable supply chain strategy and sustainable competitive advantage. Sustainable supply chain practice mediates the relationship between sustainable supply chain strategy and sustainable competitive advantage, while sustainability inhibitors strengthen the relationship between sustainable supply chain strategy and sustainable supply chain practice.

Likewise, Singh, and Chan, (2022) examined the impact of electronic procurement adoption on green procurement towards sustainable supply chain performance-evidence from Malaysian ISO organizations. This research was supported by the Technology Acceptance Model, the structural model explains 86% of the variance in green procurement. The study found a positive significant relationship between green procurement and the E-procurement technology of the ISO 14001 firms. Hence, adopting e-procurement technology would benefit firms' sustainability.

Lastly, Mareia, (2022) studied the effect of e-procurement on financial performance: Moderating the role of competitive pressure. The purpose of this study was to examine the effect of e-procurement on financial performance. Competitive pressure is proposed as a moderating variable between technological and organizational factors, and e-procurement. The population of the study includes large companies in Jordan. Purposive sampling was deployed to collect the data using a questionnaire. The findings were derived from two hundred and twenty-one (221) responses. Data analysis was conducted using Smart PLS. The findings showed that technological (relative advantage, compatibility, and complexity) and organizational (top management support and organizational readiness) have significant effect on e-procurement which in turn affected firm performance. Competitive pressure did not moderate the effect of technological and organizational factors on e-procurement. Thus, the following hypotheses were proposed:

Ho₁: E-procurement has no significant relationship with environmental responsibility of the oil and gas industry in Rivers State

Ho₂: E-procurement has no significant relationship with financial responsibility of the oil and gas industry in Rivers State

Ho₃: E-procurement has no significant relationship with social responsibility of the oil and gas industry in Rivers State

Ho₄: Competitive pressure does not moderate the relationship between e-procurement management and supply chain sustainability of the oil and gas industry in Rivers State.

METHODOLOGY

This research is guided by the positivism paradigm, also referred to as the scientific view. Based on the supposition that reality can be observed and experimented upon (Cohen, Manion & Marison 2011). Consequentially, this study employed the quantitative and explanatory research design (Yousaf, 2020). The quantitative method emphasizes objective measurements and the statistical, mathematical, or numerical analysis of data collected through, questionnaires, polls and surveys etc. Hence, a correlational investigation was carried out without any form of manipulation in a non-contrived setting to evaluate the degree of relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. The target population of this study was twenty-five (25) oil and gas firms in Rivers State according to the Nigeria Directory & Search Engine Finelib.com (2023). Due to the small size of the population, the census method was adopted. To guarantee comprehensive representation of the companies, five (5) respondents were drawn from

each of them for the survey, as representatives of the firms based on their managerial roles, they include; supply chain managers, procurement managers, product managers, operations managers and brand managers. Hence, the respondents constituted one hundred and twenty-five (125) employees of the firms. However, only one hundred and three (103) copies of the questionnaire were found useful for the study. Self-made copies of questionnaire with a five-point Likert scale which includes extremes of strongly agree, neutral, agree, disagree as well as strongly disagree were used to obtain data. The goodness of data for this study was determined through the validity and reliability of the research instrument. Face and content validity were confirmed by experts in the field of Logistics and Supply Chain Management. Cronbach's alpha coefficient was engaged to test the reliability of the questionnaire. Data were systematized, coded and subjected to the Statistical Package for Social Sciences (SPSS) version 22 to aid analysis. The Pearson's Product Moment Correlation (PPMC) was used to test the hypotheses with respect to the explanatory variable and measures of the study while Partial Correlation was utilized to ascertain the extent of moderation of competitive pressure on the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. The reliability test results are presented in Table 1 as follows:

Table 1 Reliability Analysis

S/N	Variables	Number of Items	Cronbach's Alpha Coefficients
1	E-Procurement	3	0.822
2	Environmental Responsibility	3	0.783
3	Financial Responsibility	3	0.782
4	Social Responsibility	3	0.785
5	Competitive Pressure	3	0.873

Source: SPSS Output form Survey Research (2024)

Cronbach alpha for e-procurement (0.822), environmental responsibility (0.783), financial responsibility (0.782), social responsibility (0.785) and competitive pressure (0.873) respectively which indicates the adequate reliability of the measurement instrument (Cronbach, 1951).

HYPOTHESES TESTING/ BIVARIATE ANALYSIS

In this section, four (4) hypotheses were tested using Pearson Product Moment Correlation and partial Correlation. Pearson Product Moment Correlation determined the relationship between the dimensions and measures of the explanatory variable (e-procurement) and the criterion variable (supply chain sustainability) respectively, while Partial Correlation was used to establish the moderating effect of competitive pressure on the relationship between the explanatory and criterion variables with Dunn's (2001) categorization scheme as shown below:

Table 2: Degree and Direction of Relationship between Variables

Range of r values	Description
± 0.80 to 1.00	Very Strong
± 0.60 to 0.79	Strong
± 0.40 to 0.59	Moderate
± 0.20 to 0.39	Weak
± 0.00 to 0.19	Very Weak

Source: Dun, (2001)

Table 2 shows the categorization scheme adopted for the study, the decision rule was that: we reject null hypothesis and accept alternate hypothesis if probability value <0.01; and accept null hypothesis and rejected alternate hypothesis if probability value >0.01.

Test of Hypothesis One: Testing this hypothesis enables the researcher to answer research question one which sought to ascertain the relationship between e-procurement and environmental responsibility in the oil and gas industry in Rivers State.

Table 3: Test of Relationship between E-procurement Statement and Environmental Responsibility Statement

		E-procurement Statement	Environmental Responsibility
E-procurement Statement	Pearson Correlation	1	.871**
	Sig. (2-tailed)		.000
	N	103	103
Environmental Responsibility Statement	Pearson Correlation	.871**	1
	Sig. (2-tailed)	.000	
	N	103	103

** . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output for Test of Hypothesis, (2024).

The SPSS output on Table 3 shows that the strength and direction of the relationship between the variables as designated by the Pearson Correlation Coefficient of 0.871 shows that there is a very strong and positive relationship between e-procurement and environmental responsibility. More so, significance of the relationship is shown by the probability value which is 0.000 less than the threshold of 0.01 signifying that the relationship between e-procurement and environmental responsibility is statistically significant. Hence, there is a very strong, positive and statistically significant relationship between e-sourcing and environmental responsibility ($r = 0.871$, $N = 103$, $p = 0.000 < 0.01$). Based on this result, we rejected the null hypothesis which states that there is no significant relationship between e-procurement and environmental responsibility of oil and gas industry in Rivers State; and accept the alternate hypothesis which states that: There is a significant relationship between e-procurement and environmental responsibility of oil and gas industry in Rivers State.

Test of Hypothesis Two: Testing this hypothesis enables the researcher to answer research question two which sought to ascertain the relationship between e-procurement and financial responsibility of oil and gas industry in Rivers State.

Table 4: Test of Relationship between E-procurement Statement and Financial Responsibility Statement

		E- procurement Statement	Financial Responsibility Statement
E-procurement Statement	Pearson Correlation	1	.761**
	Sig. (2-tailed)		.000
	N	103	103
Financial Responsibility Statement	Pearson Correlation	.761**	1
	Sig. (2-tailed)	.000	
	N	103	103

** . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output for Test of Hypothesis, (2024).

The SPSS output on Table 4 shows that the strength and direction of the relationship between the variables as shown by the Pearson Correlation Coefficient of 0.761. The Correlation Coefficient shows that there is a strong and positive relationship between e-procurement and financial

responsibility. More so, significance of the relationship is shown by the probability value which is 0.000 less than the threshold of 0.01 signifying that the relationship between e-sourcing and economic responsibility is statistically significant. Thus, there is a strong, positive and statistically significant relationship between e-procurement and financial responsibility ($r = 0.761$, $N = 103$, $p = 0.000 < 0.01$). Based on this result, we rejected the null hypothesis which states that there is no significant relationship between e-procurement and financial responsibility of oil and gas firms in Rivers State; and accepted the alternate hypothesis which states that: "There is a significant relationship between e-procurement and financial responsibility of oil and gas industry in Rivers State".

Test of Hypothesis Three: Testing this hypothesis enables the researcher to answer research question three which sought to ascertain the relationship between e-procurement and social sustainability of oil and gas industry in Rivers State.

Table 5: Test of Relationship between E- procurement Statement and Social Responsibility Statement

		E-procurement Statement	Social Responsibility Statement
E-procurement Statement	Pearson Correlation	1	.816**
	Sig. (2-tailed)		.000
	N	103	103
Social Responsibility Statement	Pearson Correlation	.816**	1
	Sig. (2-tailed)	.000	
	N	103	103

** . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS Output for Test of Hypothesis, (2024).

The SPSS output on Table 5 shows that the strength and direction of the relationship between the variables as indicated by the Pearson Correlation Coefficient of 0.816. The Correlation Coefficient shows that there is a very strong and positive relationship between e-procurement and social responsibility. More so, significance of the relationship is shown by the probability value which is 0.000 less than the threshold of 0.01 indicating that the relationship between e-procurement and social responsibility is statistically significant. That is to say, there is a very strong, positive and statistically significant relationship between e-procurement and social responsibility ($r = 0.816$, $N = 103$, $p = 0.000 < 0.01$). In view of this result, we rejected the null hypothesis which states that there is no significant relationship between e-procurement and social responsibility of oil and gas firms in Rivers State; and accepted the alternate hypothesis which states that: "There is a significant relationship between e-procurement and social responsibility of oil and gas industry in Rivers State".

Test of Hypotheses Four: Testing this hypothesis enables the researcher to answer research question four which sought to determine the extent to which competitive pressure moderates the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State.

Table 7: Test of Relationship between E-procurement Statement and Supply Chain Sustainability Statement

Control Variables		E-procurement Supply Chain Sustainability Statement Competitive Pressure		
-none ^a	E-procurement	Correlation	1.000	.621
		Significance (2-tailed)	.	.000
		Df	0	103
	Supply Chain Sustainability	Correlation	.621	1.000
		Significance (2-tailed)	.000	.
		Df	103	0
	Competitive Pressure Statement	Correlation	.856	.787
		Significance (2-tailed)	.000	.000
		Df	103	103
Competitive Pressure Statement	E-procurement Management	Correlation	1.000	.741
		Significance (2-tailed)	.	.000
		Df	0	103
	Supply Chain Sustainability	Correlation	.741	1.000
		Significance (2-tailed)	.000	.
		Df	103	0

a. Cells contain zero-order (Pearson) correlations.

Source: SPSS Output for Test of Hypothesis, (2024).

Results of the analysis from the SPSS output on Table 7 showed that the Partial Correlation coefficient between e-procurement and supply chain sustainability was 0.621 before the introduction of competitive pressure. However, the introduction of competitive pressure changed the Partial Correlation Coefficient to 0.741; giving a difference of 0.12. This means competitive pressure influenced the relationship between e-procurement and supply chain sustainability by 12%. Again, result of the analysis is significant (i.e. $p = 0.000 < 0.01$). This means that competitive pressure statistically significantly moderates the relationship between e-procurement and supply chain sustainability. In view of this result, we reject the null hypothesis that states that competitive pressure does not significantly moderate the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State; and therefore, we have accepted that competitive pressure significantly moderates the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. Based on the results of hypotheses four, it has been successfully revealed that competitive pressure significantly moderates the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State.

DISCUSSION OF FINDINGS

Result of the analysis indicates that there is a very strong and positive relationship between e-procurement and environmental, financial and social responsibility. This is based on the Pearson correlation coefficient (r) = 0.871, 0.761 and 0.816 from the test of hypotheses one, two and three respectively. In view of this result, we rejected the null hypotheses which states that there is no significant relationship between e-procurement and environmental, financial and social responsibility of the oil and gas industry in Rivers State; and accepted the alternate hypotheses which states that

there is a significant relationship between e-procurement and environmental, financial and social responsibility of the oil and gas industry in Rivers State. These agree with Oyeboode, (2021) who studied strategies for transforming the oil and gas sector for economic growth and environmental sustainability in Nigeria. The study concluded that the adoption and implementation of electronic strategies will bring a robust solution to nation's oil and gas issues. Also, Faheem & Siddiqu, (2019) found that electronic design and electronic evaluation have positive and significant impact on supply chain performance, implying that compared to electronic sourcing and electronic negotiation, electronic design and electronic evaluation has more effect on supply chain performance. Therefore, the deployment of e-procurement will enhance supply chain sustainability of the oil and gas industry in Rivers State. The findings of this study are in agreement with Pavithra *et al.*, (2018) who found that e-procurement has been successful in reducing transaction time, bringing transparency in price discovery and increasing market revenue, enhancing market competition and sustainable business practices. Hence, e-procurement can bring about supply chain sustainability of the oil and gas industry in Rivers State.

Correspondingly, the investigation of the moderating role of competitive pressure revealed that competitive pressure is an important moderator of the relationship between e-procurement and supply chain sustainability of the oil and gas industry in Rivers State. The introduction of competitive pressure changed the Partial Correlation Coefficient between e-procurement and supply chain sustainability giving a difference of 0.18. In other words, competitive pressure influenced the relationship between e-procurement management and supply chain sustainability by 18%. In view of this result, we reject the null hypothesis that states that competitive pressure does not significantly moderate the relationship between e-procurement management and supply chain sustainability of the oil and gas industry in Rivers State; and therefore, we have accepted that broadband significantly moderates the relationship between e-procurement management and supply chain sustainability of the oil and gas industry in Rivers State.

CONCLUSION AND RECOMMENDATIONS

This study concludes that e-procurement relates positively and significantly with supply chain sustainability of the oil and gas industry in Rivers State. In other words, improving e-procurement strategies will reduce the need for physical transportation, thus cutting down the carbon footprint associated with procurement activities, facilitate better demand forecasting, which can further reduce waste in the supply chain and make positive impact on the environment, society, and their long-term business success. Furthermore, competitive pressure is an important moderator of the relationship between the variables, because when businesses face competition, they often strive to reduce costs, adopt automated procurement processes, enhance transparency, and engage in sustainable practices to enhance their competitiveness. Also, competitive pressure has a significant moderating influence on the relationship between e-procurement management and supply chain sustainability. Consequently, this study recommends that the oil and gas industry in Rivers State should continuously improve on their e-procurement strategies to facilitate the achievement of supply chain sustainability objectives. As well as to combat competitive pressure through strategic e-supplier collaboration and circular strategy of waste reduction in the oil and gas industry in Rivers State.

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