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E- Procurement Practices and Operational Efficiency of Oil and Gas Equipment Companies in Rivers State

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ABSTRACT:

The study assessed the influence of e-procurement practices on operational efficiency of oil and gas equipment companies in Rivers State. The objectives of the study were specifically, to determine the extent to which e- sourcing and e- ordering relate to operational efficiency. The study adopted an explanatory research design, specifically the correlational investigation. The population of this study consists of thirty-one (31) oil and gas equipment companies in Rivers State. The study took a census. Two (2) respondents were drawn from each of the companies making a total of sixty- two (62) respondents to whom copies of structured questionnaire were administered. The hypotheses were evaluated with a threshold of 0.05, using the simple regression with the aid of statistical packages of social science (SPSS) version 25.0. The study found that practices of e- procurement such as e- sourcing and e- ordering has very strong positive influence on operational efficiency. In view of these findings, we concluded that both e-sourcing and e- ordering influence operational efficiency of oil and gas equipment companies in Rivers State. It is the recommendation of this study that the management of the oil and gas equipment companies should focus on investing more with regards the development and reinforcement of E-sourcing and E- ordering platforms and systems that drive the operations of the organization, thereby promoting its practice and application within the context of the organization.

KEYWORDS:

E- procurement, E- sourcing, E- ordering, Operational efficiency



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Introduction

The oil and gas industry is indisputably one of the largest sectors worldwide, known for its complex supply chain and procurement processes that include substantial documentation, manual data entry, and lengthy approval cycles. Oil and gas companies have incorporated information technology to integrate e-procurement into their supply chain support activities, aiming to achieve strategic business objectives such as improved operational efficiencies, sustainability, and profitability. Ghossein, Islam, and Saliola (2018) argue that the procurement function is essential in organizations because it provides the best possible organizational performance and increases shareholder value. Oil and gas companies acquire equipment that allows them to drill and extract oil and gas. This includes the acquisition of drilling equipment and other apparatus required for oil and gas exploration. Acquiring the appropriate oil and gas production equipment necessitates a substantial allocation of financial resources, and it is imperative to conduct routine maintenance to ensure the equipment remains in optimal condition and avert unforeseen hazards. The equipment consists of a valve actuator, pump, compressor, pipe, bearings, welding supplies, seals, boilers, exchangers, and other associated things. Nevertheless, despite the benefits of e-procurement for businesses, the oil and gas equipment companies in Rivers State have primarily relied on manual management methods. The adoption of e-procurement in enterprises has resulted in a relatively low acceptance rate. Adopting e-procurement solutions can reduce order processing time, save expenses related to order management and supplier payments, minimize transaction errors, and improve the accuracy and quality of received information (Bahaddad, Steve, Luke, & Osama, 2018).

E-procurement is a technique that leverages information technology to streamline the processing of purchase records. The process entails exchanging information with vendors and offering assistance in making purchase decisions (Sanchez-Rodriguez, Martínez-Lorente, & Hemsworth, 2020). Grimani, Gavine, and Moncur (2020) contend that e-procurement is a well-established system that has undergone extensive experimentation over time. This is the result of multiple previous attempts to create automated procurement technologies, such as electronic workflow systems and EDI, for organizational use. E-procurement includes several forms, such as e-tendering, e-marketplace, e-auction/reverse auction, and e-catalogue/purchase, which target certain stages of the procurement process. Alternatively, Basheka, Oluka, & Mugurusi (2012) view it as a holistic approach that integrates and improves various procurement procedures across the entire firm. E-procurement has the potential to reduce material expenses by 5 to 10 percent, increase productivity by 30 to 50 percent, promote innovation, and improve quality. Furthermore, it enables instantaneous document processing with great efficiency and aids in risk mitigation. E-procurement has provided organizations with numerous advantages in terms of improving the procurement process's performance. These benefits encompass decreased manufacturing expenses by enhancing cooperation between buyers and vendors, as well as better customer satisfaction due to a reduction in procurement errors (Vaidya & Campbell, 2016).

Researchers assert that we can use e-procurement techniques to predict operational efficiency. This belief has served as a driving force for previous research endeavours that sought to elucidate the correlation between e-procurement and operational efficiency. Nyongesa and Moronge (2019) investigated the influence of e-procurement on service delivery in Kenyan state-owned institutions. Oteki, Namusonge, Sakwa, and Ngeno (2019) conducted a study to examine the influence of electronic procurement methods on the performance of supply chains. In their study, Maria and Camilo (2021) examined the behaviors and performance of manufacturing businesses with regard to

e-procurement. The primary goal of this study was on examining the link between e-procurement practices and the operational efficiency of oil and gas equipment enterprises in Rivers State. The main objectives were to assess the influence of e-sourcing and e-ordering on operational effectiveness of oil and gas companies in Rivers State.

Theoretical framework

This study is grounded in the concept of social exchange. The social exchange theory examines the dynamics of individual interactions, focusing on the impact of connections on these interactions and their final effect on outcomes and satisfaction. The social exchange theory suggests that both parties involved assume mutual responsibility and interdependence. The theory adequately explains the distinct relationship that forms between the client and supplier, leading to mutually advantageous economic transactions for both parties. In return for the supplier's product innovation, reduced risk of supply shortages, faster delivery times, improved product safety, enhanced product quality, and a competitive price, the buyer offers the supplier financial support, technical assistance, and training (Mandra & Makori, 2017). The core principle of this theory is the fundamental concept that individual groups engage with each other, expecting benefits and striving to avoid fines or punishment (Field & Meile, 2008). The notion of reciprocity is highly valued in social exchange theory. It posits that the actions and behaviors of one person in a transaction will elicit matching actions and behaviors from the other party involved (Field & Meile, 2008).

2. Review of Related Literature and Hypothesis Formulation

2.1 E- Procurement Practices

Sanchez-Rodrigues, Martínez-Lorente, and Hemsworth (2020) defined e-procurement as the use of information technology to facilitate the exchange of information with vendors and streamline the processing of purchase records, thereby aiding in purchasing choices. E-procurement is a component of the wider idea of information technology (IT). It is the process of conducting business transactions between suppliers and purchasers via electronic communication. E-procurement is a component of a mechanized purchasing system. Its purpose is to streamline the process of purchasing items from a business or government organization using the Internet. Buyers can access the system to browse supplier catalogs and make purchases. E-procurement is a procedure that enables authorized users to request a product or service via a web interface. The interface then generates a purchase order for dispatch to a supplier. Conventional procurement techniques often entail conducting requests predominantly through telephone communication, postal mail, or in-person meetings. Procurement, formerly known as purchasing and supply, encompasses both internal and business-to-business services in many firms (Kim, Suresh, & Kocabasoglu-Hillmer, 2015). E-procurement is a specialized tool that aims to enhance the transparency and efficiency of the purchasing process while also assisting firms in achieving cost reductions. Organizations have two main reasons for transitioning to e-procurement: the need to enhance process compliance and the requirement for improved process efficiency. This is due to the numerous advantages that e-procurement offers over traditional procurement methods. Researchers have conducted several empirical studies to explore the benefits and drawbacks of implementing and utilizing e-procurement systems. For example, Toktaş-Palut *et al.* (2014) conducted a comprehensive literature review on this topic. Thus, this study employed e-sourcing and e-ordering as characteristics of e-procurement practices.

a. E- Sourcing

E-sourcing refers to the procedure of locating possible suppliers and gathering information about their products, prices, and sales conditions (Swaminathan *et al.*, 2003, as referenced in Munubi, Kinanga, & Ondiba, 2017). Electronic sourcing refers to the practice of utilizing the internet to make informed judgments and develop strategies for acquiring services or products. Sourcing is the act of using technological methods to find a new supplier who can provide goods or services in a specific category. This is a web-based tool that facilitates collaborative technologies throughout the entire procurement process between the customer and supplier. E-sourcing refers to the utilization of internet technology to identify possible suppliers, with the aim of reducing search costs (Madzimure *et al.*, 2020; Ombat, 2015). E-sourcing is a procedure that encompasses the act of requesting and authorizing purchases, as explained by experts. Both phrases, email and intranet, are used to describe the method of obtaining purchases from specific suppliers using an enterprise resource planning (ERP) system. E-sourcing is a robust procurement management system that offers secure and compliant sourcing solutions for global enterprises. Wu *et al.* (2007) found that the utilization of coordinated e-sourcing apps had both direct and indirect impacts on perceived efficiency improvements. E-sourcing guarantees more transparency, broader geographical coverage, reduced transaction time, and improved pricing.

b. E- Ordering

E-ordering, as defined by Kim and Shunk (2004) and cited in Nurwin (2018), is the streamlined process of generating and authorizing purchase requisitions, placing purchase orders, and receiving ordered goods and services. A software system operating on internet technology facilitates this process, resulting in significant enhancements to the overall supply chain. Organizational workers primarily utilize the supporting software system, an ordering catalog system. Enterprise resource planning (ERP) directly links the ordered commodities and services to the products. It is important to note that ordering direct goods and services is typically based on a predetermined plan. According to Bello, Osmonbekov, and Gilliad (2002), as referenced in Oteki, Namusonge, Sakwa, and Ngeno (2019), electronic data interchange (EDI) electronic ordering is a suitable choice for customers who want to create an automated purchasing system for their purchases. The use of paper, fax, email, and phone-based ordering creates a reliance on manual intervention, which can be inefficient and prone to rekeying errors. This dependency has the potential to degrade the efficiency of the supply chain. Raheem and As-Sabeer (2014) state that an online ordering system is a feature of e-commerce that enables clients to place orders for items or services through a company's website. Typically, a wholesaler can provide this software and integrate it into their online ordering platform. (Sabiiti & Muhumuza, 2013). Order processing is a vital component of order fulfillment and serves as the initial phase of the fulfillment cycle. Order processing, which employs a variety of explicit procedures, is the foundation of all logistics systems, making it a critical element in logistics operations. The order processing begins after the customer receives a purchase requisition. Several channels, including faxes, phone calls, electronic file transfer (EDI), and even human data entry techniques, can receive orders. This procedure guarantees the elimination of human mistakes and optimizes the entire order cycle, resulting in increased efficiency and reduced time consumption.

2.2 Operational Efficiency

Operational efficiency refers primarily to the capacity to perform activities accurately and efficiently (Forsund, 2017). Operational efficiency gauges the effectiveness of an organization's procedures.

Efficiency in an organization's functioning refers to the most effective use of its resources. Evaluating operational performance accurately assesses the effectiveness of flexibility. Operational performance indicators refer to measurements that illustrate cost efficiency, exceptional quality, a wide variety of products, and timely delivery (Al-Jawazneh, 2011). By selecting suppliers, negotiating contracts, and developing connections with suppliers, the product strategy will determine how to obtain materials to fulfill the purchasing strategy (Tarigan, 2020). An organization can attain efficiency in multiple facets of its operations, encompassing service provision, manufacturing procedures, promotional activities, and the management of consumer complaints. Seth *et al.* (2020) found that a firm's efficiency positively impacts its performance. Improvements in operational efficiency generally result in a reduction in working capital expenditure, thereby strengthening a company's financial stability. A competitive strategy encompasses the set of client demands that a firm strives to meet through its product and service offerings (Zhang & Huo, 2012). Every firm aims to implement a distinctive competitive strategy that is in line with its overall strategy. Afterwards, the firm strives to obtain suitable abilities and assets to efficiently carry out its selected strategy. Operational efficiency can be assessed by comparing the operation's outcomes with five fundamental performance indicators: quality, flexibility, speed (delivery), reliability, and cost (Birkie *et al.*, 2017). In conclusion, there are multiple approaches and perspectives available to assess and measure the operational efficiency of an organization.

2.3 Empirical Review

In their study, Nyongesa and Moronge (2019) examined the effects of e-procurement on the provision of services by state companies in Kenya. The study utilized a sample size of 127 participants. The research discovered that the utilization of e-tendering, e-sourcing, e-ordering, and e-invoicing had a notable influence on the effectiveness of service provision in state-owned organizations in Kenya. In their study, Kamaru and Were (2018) investigated the influence of implementing e-procurement on the operational effectiveness of state-owned organizations in the public sector, specifically within the State Department for Infrastructure. The sample size comprised of 142 individuals employed in the procurement divisions of the State Department for Infrastructure. The study concluded that the deployment of e-sourcing has a positive influence on the operational efficiency and effectiveness of state-owned firms operating under the State Department for Infrastructure. Kimutai and Ismael (2016) conducted a study to investigate the influence of strategic e-sourcing strategies on the performance of supply chains in state firms in Kenya. The researchers also wanted to evaluate the additional value created in the value chain as a result of these techniques. The sample was chosen from a pool of 187 state firms. The study demonstrated that cost reduction is crucial for enhancing customer service, maximizing return on investment, and minimizing total cost in enterprises. Nevertheless, it exerts a comparatively insignificant influence on return on investment and the pace of delivery.

Ebong and Opara (2022) investigated the relationship between e-ordering and the business performance of mobile telecommunication firms in Rivers and Bayelsa States. The study encompassed a sample of four GSM service providers. The study's findings indicate that e-ordering has a substantial positive impact on business performance outcomes, such as service delivery and operational efficiency, for telecommunication firms in Rivers and Bayelsa States. Oteki, Namusonge, Sakwa, and Ngeno (2019) conducted a study to examine how electronic procurement methods affect the supply chain performance of sugar processing enterprises in Kenya. The target population in Kenya comprised 12 sugar processing enterprises. The results revealed a significant association between the adoption of automated order processing and the efficiency of the supply chain. In a study

conducted by Nurwin (2018), the researcher investigated the influence of controlled electronic order processing procedures on the implementation of preferential regulations in the business operations of the Kenyan government. The study specifically examined 292 state-owned enterprises. The survey unveiled that employees utilize technological means to solicit and remunerate for products and services. Chepkwony and Lagat (2016) conducted a study to evaluate the influence of e-ordering and e-informing on the efficiency of supply chains. The precise demographic comprised 244 procurement officers who were employed by 112 retail firms in Kenya. The study finds that the adoption of e-ordering and e-informing, which are integral parts of e-procurement, results in enhanced supply chain performance. Based on this premise, we formulated two hypotheses for the study.

H₀₁: E- sourcing does not significantly relate with operational efficiency.

H₀₂: E- ordering does not significantly relate with operational efficiency.

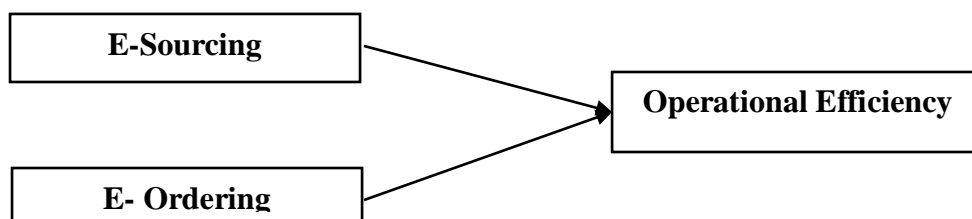


Figure 1. Conceptual Framework

3. Methodology

The study utilized the explanatory research design to evaluate the connection between e-procurement procedures and the operational efficiency of oil and gas equipment firms in Rivers State, Nigeria. The population for this study consists of thirty-seven (31) oil and gas equipment businesses that are currently operating in Rivers State. These companies were gathered from the Port Harcourt Chamber of Commerce and Industry (PHCCI). A census research was conducted by utilizing the full population as the sample size. Three copies of a structured questionnaire were provided to two managers in each of the 31 enterprises comprising the study population. The managers mentioned in this study are the procurement managers and sales managers, as they possess expertise in the topics being covered. Hence, the study included a total of sixty-two (62) managers as respondents. Data collection in this research study mostly relies on the use of a primary source. A Cronbach Alpha reliability test was conducted to determine the dependability of the research equipment. In order to assess the dependability of the study instrument, a threshold of 0.70, as proposed by Nunally (1978), was utilized. In addition, the study employed simple linear regression analysis to assess the two hypotheses, using a significance level of 0.05. The analyses were conducted using the statistical program for social sciences (SPSS) version 25.

Data Analysis and Results

The study recorded an instrument administration and retrieval success rate of 94%, where 58 copies out of the 62 were successfully retrieved, coded and analyzed.

Univariate Data Analysis

Table 1 presents the distribution for the univariate properties of the variables (E-sourcing, E-ordering and operational efficiency).

Table 1: Univariate Data Presentation

	N Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error	Kurtosis Statistic	Std. Error
SRC1	58	3.6552	1.10106	-.737	.314	.008	.618
SRC2	58	3.8276	.97581	-.697	.314	-.376	.618
SRC3	58	3.6552	1.14787	-.792	.314	-.238	.618
E-Sourcing	58	3.7126	.99403	-.586	.314	-.976	.618
ODR1	58	3.5862	1.19992	-.652	.314	-.688	.618
ODR2	58	3.8966	1.20946	-1.274	.314	1.019	.618
ODR3	58	3.6552	1.05218	-.473	.314	-.965	.618
E-Ordering	58	3.7126	1.05861	-1.012	.314	-.347	.618
OPR1	58	3.4483	.90170	-.138	.314	-.755	.618
OPR2	58	4.0000	1.48678	-1.095	.314	-.508	.618
OPR3	58	3.7759	1.38973	-.923	.314	-.565	.618
Operational Efficiency	58	3.7414	1.09588	-1.108	.314	-.618	.618
Valid N (listwise)	58						

Source: Survey Data (2024)

The analysis on the distribution for the variables (table 1) demonstrates evidence of practice and the prevalence of the variables (where $x > 2.00$ for all indicators and summaries for constructs on a 5-point scaling instrument). The findings point to related activities and properties of E-sourcing, E-ordering and operational efficiency as evident and substantially reflected in the behavior of the organizations. This follows the summaries on the variables, all of which are also shown to be substantial and thus, attributes of the organizations of interest. The findings thus identify the target organizations as not only utilizing technology driven processes, but also exhibiting cost effectiveness in their operations.

Bivariate Data Analysis

Presented using the tables 2, 3 and 4 are the findings on the regression analysis for the influence of predictors, E-sourcing and E-ordering on the operational efficiency of the organizations.

Table 2: Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	E-Sourcing	.	Stepwise (Criteria: Probability-of-F-to-enter $\leq .050$, Probability-of-F-to-remove $\geq .100$).
2	E-Ordering	.	Stepwise (Criteria: Probability-of-F-to-enter $\leq .050$, Probability-of-F-to-remove $\geq .100$).

a. Dependent Variable: Operational Efficiency

Table 2 identifies all three variables and their roles (predictors and dependent) in the regression model.

Table 3: Model Summary

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.899 ^a	.808	.804		.48494
2	.939 ^b	.882	.878		.38320

a. Predictors: (Constant), E-Sourcing (MRP)

b. Predictors: (Constant), E-Sourcing (MRP), E-Ordering

The table 3 provides clarity on the number of models, based on the number of predictors (E-sourcing and E-ordering), with related R coefficients (E-sourcing $R^2 = 0.808$ and E-ordering $R^2 = 0.882$). From the R and R^2 coefficients, it is shown that both models are significant with the second effect (E-ordering) observed to be stronger in terms of influence.

Table 4: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.063	.248		.254	.800
	E-Sourcing (MRP)	.991	.065	.899	15.332	.000
2	(Constant)	-.025	.197		-.126	.900
	E-Sourcing (MRP)	.348	.120	.316	2.894	.005
	E-Ordering	.666	.113	.643	5.890	.000

a. Dependent Variable: Operational Efficiency

The table 4 illustrates the regression coefficients for the study. The test shows that both E-sourcing (where $P = 0.005$) and E-ordering (where $P = 0.000$) significantly influence outcomes of operational efficiency. The result from the analysis, demonstrate the significance of these variables as antecedents to operational efficiency, indicating that related practices of E-sourcing and E-ordering are imperative for increased outcomes of operational efficiency in the oil and gas equipment companies. Hence, previous stated null hypothetical statements of no significant relationships are therefore rejected, based on the evidence presented.

Discussion of the Findings

The objective of this study was to investigate the correlation between e-procurement procedures and the operational efficiency of oil and gas equipment firms in Rivers State. The findings revealed a coefficient of 0.804** of e- sourcing on operational efficiency indicating a very strong and significant influence of e-sourcing on operational efficiency of oil and gas equipment companies in Rivers state. The results support the empirical stance of Nyongesa and Moronge (2019) that E-tendering, E-sourcing, E-ordering, and E-invoicing have a substantial impact on service delivery. The current study confirms the previous report that e-sourcing had a beneficial impact on the performance of state corporations (Kamaru & Were, 2018). Additionally, it supports the findings that reducing

organization costs is crucial for customer service, return on investment, and total cost. However, lowering organizational costs has a slightly less significant effect on return on investment and speed of delivery (Kimutai & Ismael, 2016).

Also, the analysis revealed a coefficient of 0.878** of e- ordering on operational efficiency indicating a very strong positive and significant influence of e- ordering on operational efficiency. This is supported by the findings of Ebong and Opara's (2022) research, which showed that e-ordering significantly improves business performance outcomes such as service delivery and operational efficiency, aligns with these e- order processing, eliminates repetitive manual tasks and the need for paperwork, resulting in cost reduction, increased productivity, enhanced customer service, and ultimately improved supply chain performance. More so, the findings of Oteki, Namusonge, Sakwa, and Ngeno (2019) conducted research, supports the study's findings, demonstrating a significant correlation between the supply chain's performance and the implementation of electronic order processing.

6. Conclusion and Recommendation

The study finds that e-procurement practices are strongly linked to operational efficiency. The results of the test conducted at a 95% confidence interval indicate that E-sourcing and E-ordering have a significant impact on operational efficiency. This suggests that engaging in E-sourcing and E-ordering activities effectively leads to improved operational efficiency, as well as cost reduction, waste reduction, and on-time delivery in oil and gas equipment companies in Rivers State. The management of oil and gas equipment firms should prioritize the development and strengthening of E-sourcing platforms and systems that drive the organization's operations. Management of oil and gas equipment firms should prioritize efforts to promote and encourage the usage of E-ordering platforms and choices inside the organization.

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