

ELECTRONIC DATA INTERCHANGE AND COMPETITIVENESS OF OIL AND GAS COMPANIES IN RIVERS STATE

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Abstract

This study investigated the influence of electronic data interchange (EDI) on competitiveness of oil and gas companies in Rivers State. The study proxied competitiveness with cost reduction, innovativeness and flexibility. The study whose population consisted 28 oil and gas companies, adopted a survey research design. The study took a census due to the small size of the study. The general manager, marketing manager, procurement manager, logistics manager and business development manager of each of the 29 oil and gas firms were purposively selected to provide data for the study. Measures of central tendencies and measures of dispersions were used in at the primary level of analyses; while the P(r) was used to test the correlation between EDI and proxies of competitiveness. The results showed that EDI has positive significant connection with cost reduction, innovativeness and flexibility, hence competitiveness of oil and gas companies in Rivers State. The study concludes that EDI informs competitiveness of oil and gas companies in Rivers State; and recommends that management of oil and gas companies in Port Harcourt should implement EDI systems as panacea to improved competitiveness.

Keywords: Competitiveness, cost reduction, electronic data interchange, flexibility, innovativeness

Introduction

Rapid development of digital technologies (big data, cloud computing, artificial intelligence, Internet of Things, blockchain, and 5G) coupled with the interconnectivity of the global economy and high level of uncertainty in the external environment, risks and opportunities are exerting immeasurable impact on competitive performance of supply chains. During the COVID-19 pandemic, the digital economy flourished with online shopping, remote work, online education, telemedicine and other digitalized activities. Companies that embraced digital transformation in these areas gained a competitive advantage, while those that failed to adapt to the digital shift faced a passive position in the market competition.

Given the influence of digital technology development and the uncertain external environment on supply chain performance, developing resilient and sustainable supply chains by leveraging digital technologies has become a top priority for organizations. There is an urgent need for research and practical implementation of digital transformation in supply chains to enhance their competitive performance at the organizational level (Sun et al., 2022).

Competitiveness of firms often materialize as indispensable dynamic in the perception of goods and services value, which ought to be calculated as fundamentals of competitiveness. Extant

literature suggests that supply chain digitalization can help firms to become more competitive, and firms are increasingly towing this line of argument; and have experimented with digital tools like Electronic Data Interchange (EDI) - a technology that facilitates the automated exchange of business documents between organizations, enabling them to streamline communication, reduce costs, and improve operational efficiency.

The adoption of EDI has become critical in industries where seamless and efficient data transfer is essential for maintaining a competitive edge (Chau & Jim, 2002). By automating the exchange of transactional data such as purchase orders, invoices, and shipping notices, EDI reduces manual errors and accelerates business processes, thus enhancing the overall competitiveness of firms ((Zhu & Kraemer, 2002; Mukhopadhyay et al., 1995).

The integration of EDI systems has been shown to reduce information asymmetry, improve data accuracy, and lower transaction costs, which are critical to sustained competitiveness in a global market (Rai et al., 2006). EDI also foster closer relationships with key stakeholders, allowing firms to build stronger partnerships with suppliers and customers (Nwulu & Nwokah, 2018); which leads to enhanced flexibility and adaptability.

Overall, EDI pivotal to competitiveness by improving operational capabilities and enabling firms to better navigate the complexities of modern business environments (Chwelos et al., 2014). Despite these advantages, most managers of oil and gas firms in Rivers State are yet to fully embrace EDI as a technological solution. With a view to providing more insights to spur managers of oil and gas firms in Rivers State to embrace EDI therefore, this study examine the influence of EDI on competitiveness.

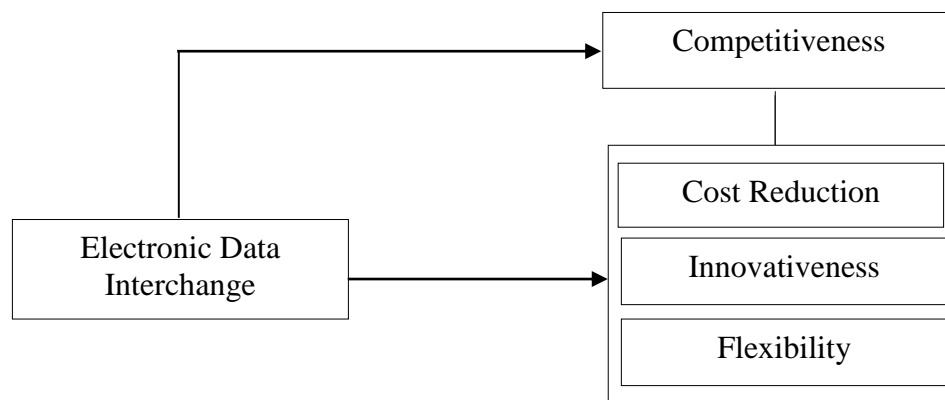


Fig.1 Conceptual framework for relationship between electronic data interchange and competitiveness

Theoretical Foundation

The theoretical footing of this study is Resource-Based View (RBV) which postulates that organizational performance is dependent on resources and capabilities possessed by a firm (Barney, 1991). RBV from a strategic management view suggests that the sources of competitive for an organizations are its resources and capabilities (Barney, 1991). A resource is anything owned or acquired by a firm; and which can confer benefits (Hall, 1993; Yang, et al., 2009).

As long as an organization has resources that are valuable in their own right, they will have the ability to implement value-creating tactics that cannot readily be replicated by rivals (Grant,

1996; Treece et al., 1997; Barney, 1991). Firms that have access to the best mix of knowledge-based resources and competencies maintain long-term advantage in the market (Barney, 2012; Bowersox et al., 2003; Barney, 1991).

RBV stresses that the basis for competitive advantage lies primarily in the application of a bundle of valuable tangible or intangible resources at the firm's disposal (Wernerfelt, 1984; Rumelt, 1984; Penrose, 1959). Tangible resources are those that physical presence, including a firm's technology, property, assets, plant, and equipment, as well as cash; while intangible resources do not have physical presence. They comprise, the knowledge and skills of employees, a firm's reputation, and a firm's culture, capabilities and organizational processes. Vandermerwe (1996) and Barney (1991) contend that the possession of strategic resources enables an organization to gain an opportunity to develop competitive advantage over rivals.

Electronic Data Interchange

EDI is a set of specifications for exchanging standard business documents such as purchase orders, invoices and bills of lading over computer networks (Kanda & Deshmukh, 2006). It is a method that world class organizations have successfully used to improve communication (Watts & Treleven, 2018; Picot & Niggle, 2019). The use of EDI is growing rapidly, and is expected to be a dominant form of communication between companies in several markets. EDI technology impacts inter and intra firm management and business practices that influence economic value creation and competitive advantage (Vlosky et al., 2020). EDI plays a key roles in competitive success of firms (Subramani, 2018).

Research has shown that EDI help firms establish cooperative relationships and share vital information (Grover et al., 2016, Son et al., 2015), adds value to channel relationships by increasing efficiency of transactions, facilitating related systems (manufacturing and marketing) and improving coordination and communication systems (O'Callaghan et al., 2013). Adoption of EDI impact all corporate functions and is associated with performance (Cook et al., 2016). According to Arnold et al. (2017), the use of EDI enable exchange of transaction information such as purchase order, invoice and materials requirement planning information; and helps to eliminate time wastage, reduces paper work which most times lead to clerical errors and facilitates easy communication.

EDI enable partners in a supply chain to act upon the same data, at same time with minimum resources (Christopher, 2016). It therefore, strengthens collaboration and enhance communications that facilitate joint operations and coordination (Ross, 2016). EDI has numerous advantages like faster information flow, quick payments, receive standardized data, easy tracing of orders, visibility of information to all members and easy updating of received data (Archinder, 2016).

Concept of Competitiveness

Competitiveness is the extent to which a firm achieve performance superiority over competitors (Wu et al., 2008). Competitiveness is also a consistent set of performance characteristics that contribute to enhance a performance competitiveness (Castro et al., 2008). Firms achieve competitiveness by leveraging strategies that are inspired by their distinctive resources. These distinctive resources enable firms to survive longer and further develop competitiveness without

pressures from external environmental challenges. Firm's capacity to compete in today's business world depends on their ability to develop new strategic directions.

The process of thinking about the new, of considering novel ideas and solutions, plays a crucial role in terms of acquiring a competitive edge. Meeting the expectations of firms, dictated mainly by the search for consistent profits by satisfactorily resolving the inherent business uncertainties, in the final analysis rests on being competitive. Achieving this requires more than expectation, however, it requires firms to develop capabilities to turn expectations into reality (Lemos & Nascimento, 1999).

These capabilities are associated with factors that can be classified into areas or that express abilities, with positive developments in the market, on production and on finance. They relate to the firm's people, methods, planning capacity, organization and control, at levels able to meet the challenges of rival firms, to compete. The ability to compete means staying alive in the market.

Competitiveness is a concept that is difficult to measure directly (Ateke & Nwiele, 2017). Proxies adopted by firms to represent the concept include profitability, productivity, cost minimization, increased market share, sales growth, customer satisfaction (Cameron, 1980, as cited in Ateke & Nwiele, 2017). In this study, cost reduction, innovation and flexibility as used to measure competitiveness.

Cost reduction

Cost reduction involves improving operations and increasing efficiency. Cost reduction has gained significant momentum in recent years, driven by advances in supply chain digitization, changing consumer behaviour, and heightened demand for great customer experience.

Cost reduction is one of the benefits of digital transformation that streamline operations. By integrating digital technologies into business processes, oil and gas companies can automate manual tasks, reduce errors, and optimized workflows. This results in increased efficiency, improved productivity, and reduced costs.

Innovativeness

Innovativeness comprise the process that begins with an idea and continue until a marketable product with the potential to that change the economy of a firm or country is created (Ateke & Harry 2021). It is a process that provide added value and novelty to a firm through new market, procedures, solution or product development (Mcfadzean & Shaw, 2005, as cited in Ateke & Harry 2021). Innovativeness is a fundamental tool for achieving growth and earning competitive edge.

Innovativeness also provide firms with a strategic orientation to overcome problems while striving to achieve sustainable competitive advantage (Hitt et al., 2001; Kuratko et al., 2005). Schumpeter (1934) describe different types of innovation: new products, new methods of production, new sources of supply, exploitation of new markets, and new ways to organize business.

The design and development of new products has become an essential activity for companies wishing to remain competitive in their markets. But innovation alone is not enough. What really

determines competitiveness and survival is the speed with which companies get their products to market, how efficient production is and how well the product meets consumer's needs.

Flexibility

This refers to the ability of an organization to use its available resources to respond to the major changes that take place in its external environment. Economic globalization and increasing competitive pressures for most firms demand innovative strategies to comply with such dynamic and complex environments. In addition, the increasingly digitized technological innovations and the higher demand uncertainty set new challenges for manufacturing firms seeking a competitive advantage (Wei et al., 2017; Huerta-Arribas, 2014).

These situation leads organizations to implement efficient and effective management strategies and practices in order to respond quickly to the changing requirements of the current competitive environment (Broekaert et al., 2016). Consequently, the focus of strategy has shifted from cost, quality and term/service delivery to flexibility. In fact, flexibility is currently one of the main success factors for companies seeking to enjoy a favorable position in the market (Pérez-Pérez et al., 2018; Pérez-Pérez et al., 2016).

Strategic, organizational and manufacturing flexibility allow companies to adapt to changing circumstances in an organized manner, thus increasing their competitiveness. It is considered that companies that are sluggish and inflexible are likely to miss valuable opportunities for profit and growth (Zahra et al., 2008). Strategic flexibility is the capability of an organization to identify significant changes or instability caused by the external environment and act promptly, allocating resources to new courses of action in response to those changes.

Electronic Data Interchange and Competitiveness

In the view of Nwulu and Nwokah (2018), the ability of a firm to perform well and remain competitive in the Nigerian food and beverages sub-sector is largely dependent on the adoption of viable customer service management practices in the local, foreign markets, and supply chain and logistics servicing companies.

Many studies relate the adoption of EDI technology to different performance outcomes in different sectors, including manufacturing, service, processing, and shipping (Chau et al., 2002). Lacovou et al., 2016) proposed a theoretical model consisting: perceived benefits, organizational readiness and external pressures as determinant of EDI adoption in SMEs. This model has earlier been validated in the study of Chwelos et al. (2014) which showed that intention to adopt EDI is influenced by perceived benefits, external pressure and organizational readiness.

From the review of existing literature, it is evident that a number of overlapping and divergent models have attempted explain EDI adoption decision by examining different factors. Goksoy et al. (2012) posits that contrary to small companies, oil and gas firms have demonstrated reluctance to invest in EDI systems. From the forgoing, the study infers EDI may not have significant influence on competitiveness of oil and gas firms in Rivers State. Thus, the following hypotheses are formulated:

Ho₁: Electronic Data Interchange does not significantly influence cost reduction of oil and gas firms in Rivers State.

H₀₂: Electronic Data Interchange does not significantly influence innovativeness of oil and gas firms in Rivers State.

H₀₃: Electronic Data Interchange does not significantly influence flexibility of oil and gas firms in Rivers State.

Methodology

This study is correlational in nature. The population of the study 29 oil and gas firms in Rivers State, Nigeria. A census was taken due to the small size of population. 5 managers (general, marketing, procurement, logistics and business development) were drawn from each of the 29 oil and gas firms. In all, 145 managers responded to the instrument used to collect primary data. Measures of central tendencies and measures of dispersions were used for the univariate analysis; while Pearson Product Moment correlation was used to test the hypotheses formulated. The Statistical Package for the Social Sciences version 23.0 facilitated the data analyses.

Data Analysis and Results

Table 1: Descriptive Statistics for Electronic Data Interchange

	N	Min.	Max.	Mean	Std. Dev.
To what extent do you think that EDI system plays a key role in achieving competitive success in your company?	135	1.00	5.00	3.2222	1.54372
To what extent is your company creative in its methods of ensuring the use of EDI?	135	1.00	5.00	3.6296	1.54408
To what extent do your company use of an EDI to enable the exchange of transaction information?	135	1.00	5.00	3.5259	1.37042
To what extent does EDI facilitate the coordination of activities and goals within and/or between organizations?	135	1.00	5.00	3.4370	1.51907
To what extent does EDI add value to channel relationships through an increase in the efficiency of transaction processing?	135	1.00	5.00	3.7407	1.42976
Valid N (listwise)	135				

Source: SPSS Output

Table 1 illustrates that there is a high level of affirmation (where $x > 2.50$) as regards the indicators of EDI. The construct examined the context and manifestations of EDI within the target organizations with indicators aimed at examining respondents' perception of supply chain digitization through its indicators. The results affirm to all five indicators of EDI within the organizations as also supported by the low disparity in response ($SD < 2.00$). The implication of these responses is that the respondents are strongly of the opinion that EDI is an observed phenomenon in their organizations and hence are largely on the range of the scale.

Table 2: Descriptive Statistics for Cost Reduction

	N	Min.	Max.	Mean	Std. Dev.
To what extent do you think that company's product prices are lower compared to your competitors?	135	1.00	5.00	3.5556	1.38039
To what extent do you think that company enjoy economies of scale strategy?	135	1.00	5.00	3.9481	1.41061
To what extent do you think that your product cost is the best when compared with your rivals in the industry?	135	1.00	5.00	3.7852	1.45266
To what extent do your efficient level depend on your cost leadership strategy?	135	1.00	5.00	3.5185	1.32063
To what extent do you think your company is positioned as the cheapest manufacturer in your industry?	135	1.00	5.00	3.8593	1.03781
Valid N (listwise)	135				

Source: SPSS Output

Table 2 illustrates that there is a high level of affirmation (where $x > 2.50$) as regards the indicators of cost reduction which is a measure of competitiveness. The construct examined the context and manifestations of cost reduction within the target organizations with indicators aimed at examining respondents' perception of cost reduction through its indicators. The results affirm to all five indicators of cost reduction within the target organizations as also supported by low disparity in response ($SD < 2.00$). The implication of these responses is that are strongly of the opinion that cost reduction is an observed phenomenon in their organizations and hence are largely on the range of the scale.

Table 3: Descriptive Statistics for Innovativeness

	N	Min.	Max.	Mean	Std. Dev.
To what extent does your company seek out new ways to do things?	135	1.00	5.00	3.5185	1.32063
To what extent is your company creative in its methods of operations?	135	1.00	5.00	3.7185	1.49453
To what extent do your company constantly upgrade its technology level to improve production processes?	135	1.00	5.00	3.8000	1.30898
To what extent is new production process initiated within your firm?	135	1.00	5.00	3.6444	1.32972
To what extent is the innovation process made easier for employees in your company?	135	1.00	5.00	3.6370	1.38547
Valid N (listwise)	135				

Source: SPSS Output

Table 3 illustrates that there is a high level of affirmation (where $x > 2.50$) regards the indicators of innovativeness which is a measure of competitiveness. The construct examined the context and manifestations of innovativeness within the target organizations with indicators aimed at examining respondents' perception of innovativeness through its indicators. The results affirm to all five indicators of innovativeness within the target organizations as also supported by the low disparity in response ($SD < 2.00$). The implication of these responses is that the respondents are strongly of the opinion that innovativeness is an observed phenomenon in their organizations.

Table 4: Descriptive Statistics for Flexibility

	N	Min.	Max.	Mean	Std. Dev.
To what extent do you think that your organization responds to changes that occur in the business environment?	135	1.00	5.00	3.8667	1.45479
To what extent does your organization make pre-emptive move to adapt to the changes in business environment?	135	1.00	5.00	3.8000	1.30898
To what extent does your organization use its available resources to respond to the major changes that take place in its external environment?	135	1.0	5.0	3.644	1.3297
To what extent do your company put in place flexible operational plans that accommodate un expected challenges in business?	135	1.00	5.00	3.2222	1.54372
To what extent do your company's proactive strategies help in improving its level of competitiveness	135	1.00	5.00	3.6296	1.54408
Valid N (listwise)	135				

Source: SPSS Output

Table 4 illustrates that there is a high level of affirmation (where $x > 2.50$) regards the indicators of flexibility which is a measure of competitiveness. The construct examined the context and manifestations of flexibility within the target organizations with indicators aimed at examining respondents' perception of flexibility through its indicators. The results affirm to all five indicators of flexibility within the target organizations as also supported by the low disparity in response ($SD < 2.00$). The implication of these responses is that the respondents strongly agree that flexibility is an observed phenomenon in their organizations and is largely captured on the range of the scale.

Table 5: Correlations for Electronic Data Interchange and Cost Reduction

		Electronic Data Interchange	Cost Reduction
Electronic Data Interchange	Pearson Correlation	1	.771**
	Sig. (2-tailed)		.000
	N	135	135
Cost Reduction	Pearson Correlation	.771**	1
	Sig. (2-tailed)	.000	
	N	135	135

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

Source: SPSS output version 23.0

Table 5 shows the result of correlation analyses on EDI and cost reduction. Similarly displayed in Table 5 is the statistical test of significance (p - value), which makes it possible to generalize our findings to the study population. From the result obtained, the correlation coefficient showed that there is a significant relationship between EDI and cost reduction. The correlation coefficient of 0.771 confirms a strong correlation between the variables; while the probability value of 0.000 shows that the correlation between the variables is statistically significant. Therefore, the null hypothesis is hereby rejected. Thus, there is a significant relationship between EDI and cost reduction of oil and gas companies in Rivers State.

Table 6: Correlations for Electronic Data Interchange and Innovativeness

		Electronic Data Interchange	Innovativeness
Electronic Data Interchange	Pearson Correlation	1	.843**
	Sig. (2-tailed)		.000
	N	135	135
Innovativeness	Pearson Correlation	.843**	1
	Sig. (2-tailed)	.000	
	N	135	135

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

Source: SPSS output version 23.0

Table 6 shows the result of correlation obtained for between EDI and innovativeness. Similarly displayed in Table 6 is the statistical test of significance (p - value), which makes generalization of our findings to the study population possible. From the results, the correlation coefficient showed a very strong relationship between EDI and innovativeness. The correlation coefficient of 0.843 confirms this correlation between the variables; while the probability value of 0.000 suggests that the correlation between EDI and innovativeness is statistically significant. Therefore, the null hypothesis is rejected. Thus, there is a significant relationship between electronic data interchange and innovativeness in oil and gas companies in Rivers State.

Table 7: Correlations for Electronic data Interchange and Flexibility

		Electronic Data Interchange	Flexibility
Electronic Data Interchange	Pearson Correlation	1	.709**
	Sig. (2-tailed)		.000
	N	135	135
Flexibility	Pearson Correlation	.709**	1
	Sig. (2-tailed)	.000	
	N	135	135

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

Source: SPSS output version 23.0

Table 7 shows the result of correlation between EDI and flexibility and the statistical test of significance (p - value) that makes it possible to generalize our findings to the study population. Table 7 shows a correlation coefficient of 0.909 between EDI and flexibility. This suggests that EDI has very strong positive correlation with flexibility. The probability value of 0.000 produced by the test, and which is lower than the critical value of 0.05 shows that the correlation between EDI and flexibility is statistically significant. Therefore, the null hypothesis is rejected. Thus, there is a significant relationship between EDI and flexibility of oil and gas firms in Rivers State.

Discussion of Findings

This study has revealed that EDI has significant influence on competitiveness of oil and gas firms in Rivers State. The findings align with the arguments of Nwulu and Nwokah, (2018) that the ability of a firm to perform well and remain competitive in the Nigerian food and beverages sub- sector is largely dependent on the adoption of viable customer service management practices.

The findings cohere with the view that intention to adopt EDI is influenced by perceived benefits, external pressure and organizational readiness (Chwelos et al., 2014) and that perceived direct benefits, perceived cost, IT knowledge, trading partner's influence and government incentive are significant determinants of EDI adoption (Chau & Jim, 2002).

The findings also support the report that information technology adoption enhance organizational competitiveness by promoting operational efficiency and streamlining communication and data exchange processes (Zhu & Kraemer, 2002). The finding are in tandem with the view that EDI allows firms to respond more rapidly to market demand and reduce delays in the supply chain ().

Similarly, the findings corroborate the finding that integration of EDI systems significantly streamline business processes, improve data accuracy, and facilitate better decision-making (Rai et al., 2006), which enhance intra-firm and inter-firm coordination and leads to competitiveness in fast-paced global economy. Furthermore, the findings are consistent with the position of Mukhopadhyay et al. (1995) that EDI reduces information asymmetry and transaction costs, thereby foster closer relationships with suppliers and customers and help firms to be more agile and responsive to changes in the market, and further strengthen their competitive position.

Conclusion and Recommendations

In view of the results of this study and their alignment with evidence in literature, the study concludes that EDI positively enhances competitiveness of oil and gas firms in Rivers State. This implies that oil and gas firms in Rivers State that adopt EDI systems are likely to improve their competitive edge. This is because EDI has proven to facilitate better coordination, faster transaction processing, reduced errors and lower operational costs. Thus, the study recommends that management of oil and gas companies in Port Harcourt should implement EDI systems as panacea to improved level of competitiveness.

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