

INFORMATION TECHNOLOGY INFRASTRUCTURE AND SUPPLY CHAIN PERFORMANCE OF UPSTREAM OIL AND GAS COMPANIES IN NIGERIA

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Abstract

This study investigated the correlation between information technology infrastructure and supply chain performance of upstream oil and gas companies in Nigeria. Supply chain performance was decomposed into service quality, operational efficiency and delivery speed. The study adopted a cross sectional research design. The study population comprised 24 upstream oil and gas companies operating in Nigeria. The study took a census. 3 copies of questionnaire were administered to the operations manager, ICT Director and technical director of each of the 24 companies, making a total of 72 respondents. The reliability of the instrument was determined via Cronbach Alpha test. All the items scored above 0.70. Pearson Product Moment Correlation was used to test the correlation between information technology infrastructure and measures of supply chain performance, with the help of Statistical Package for Social Sciences (SPSS) version 25.0. The study revealed that information technology infrastructure had a significant correlation with supply chain performance. The study therefore concluded that information technology infrastructure significantly correlates with supply chain performance of upstream oil and gas companies in Nigeria; and recommends that managers of upstream oil and gas companies in Nigeria should utilize information technology for faster transactions that enhance supply chain performance.

Keywords: Delivery speed, information technology infrastructure, operational efficiency, service quality, supply chain performance

Introduction

The world has progressed to a digital era where transactions are made through the internet and information technology infrastructure. Information infrastructure has gone beyond the collection of interconnected devices to assume the center stage in today's business transactions (Nwodo, 2025). Information infrastructure is the resource that enable businesses gather, analyze, organize, and disseminate information essential to their profitability (Mukangu, 2016). The rise of Intranets and Extranets is the latest indication of the importance of information technology infrastructure to business performance.

Supply chains like every other business use information technology to enhance their performance (Tshiyole & Jokonya, 2016). Within the oil and gas sector, information infrastructure enable oil and gas firms collect, manage, and disseminate information more quickly and this provides them with the ease of going through physical transportation. The implementation of information infrastructure helps supply chains to boost performance (Rahmanseresht et al., 2016).

Also, information technology infrastructure enable supply chains achieve real-time data sharing and communication, improve operational efficiency, transparency, and responsiveness across the entire supply chain. Nwodo (2025) states that information technology infrastructure facilitates cost reduction through better inventory management; enhances customer satisfaction by providing better service quality, and offers greater logistics visibility, leading to more informed decision-making and a competitive advantage.

In spite of the strategic importance of information technology infrastructure in boosting performance, upstream oil and gas companies in Nigeria complain of issues bordering on poor supply chain outcomes (Eluozo, 2018). Problems of this kind exists for several reasons, one of which may be due to lack of adequate empirical studies to systematize how information technology infrastructure boost supply chain performance among upstream oil and gas companies in Nigeria. In view of this gap, this study sought to determine the correlation between information

technology infrastructure and supply chain performance of upstream oil and gas companies in Nigeria.

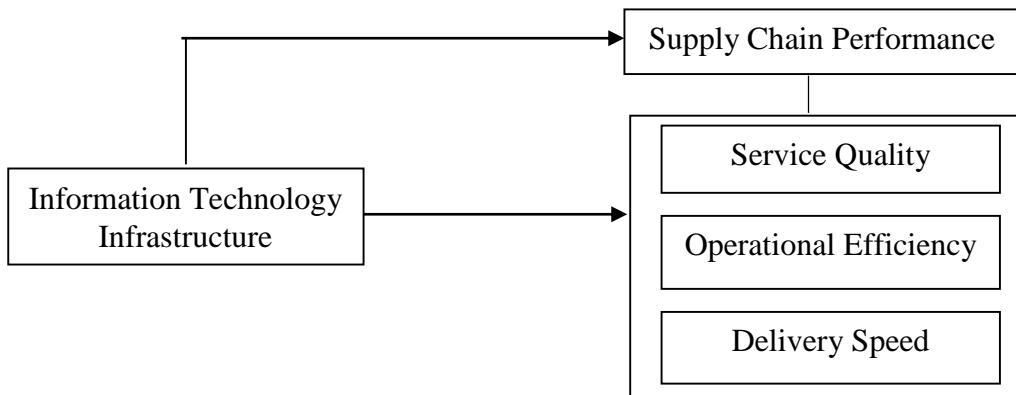


Fig. 1: Conceptual framework of relationship between information technology infrastructure and supply chain performance of upstream oil and gas companies in Nigeria.

Source: Adopted from Sharma et al. (2022).

Literature Review

Theoretical Framework

Resource-based view (RBV) is a managerial framework used to determine strategic resources a firm can exploit to achieve competitive advantage (Barney, 1991). The main thrust of RBV is the relationship between customer value, competitive advantage and superior performance (Delke, 2015). The firm can provide value to customers in many ways, through superior production systems, lower cost structures and emphasize customer service through flexible and dynamic technological systems (Delke, 2015).

RBV posits that key resources such as; intangible assets (relationships and systems) and capabilities (skills and knowledge) are characteristics which enable the firm implement strategies to meet with the needs of customers, thereby enhancing the firm's ability to secure a sustained competitive advantage. The relevance of RBV to information technology is critical aspect of supply chain and so, its effective use can serve as a source that organizations can leverage on to achieve competitive advantage (Alemu, 2016). The significance of the RBV to the current study is that, effectively technology and managing important information within upstream oil and gas companies serve as a bedrock of supply chain performance.

Concept of Information Technology Infrastructure

Information technology infrastructure can be anything from a simple combination of hardware, software, and particular connectivity medium, which together allow multiple computing devices to communicate with each other. An information technology infrastructure is a collection of computers and other hardware components interconnected by communication channels that allow sharing of resources and information.

According to Nwodo (2025), information technology infrastructure is the integrated system of physical hardware (like routers, switches, cables, and servers) and virtual/logical components (such as software applications, protocols, and security measures) that together, support information connectivity, data communication, and resource sharing within or across the internet. Information infrastructure enable organizations to easily share information and hardware, allowing them to take advantage of communication mediums such as electronic mail, newsgroups, and video conferencing. It also allows them to work more securely, efficiently, and productively (Rahmanseresht et al., 2016).

Supply Chain Performance

Performance refers to how well an organization achieves its market-oriented goals as well as its financial goals (Hitt & Dacin, 2010). Supply chain performance refers to the measurement and evaluation of how effectively a supply chain operates in achieving its objectives and meeting customer expectations. It encompasses various key performance indicators (KPIs) such as cost, quality, delivery time, flexibility, and responsiveness.

Supply chain performance is "the measurement and evaluation of the effectiveness and efficiency of the supply chain in achieving its objectives, meeting customer requirements, and delivering value to stakeholders" (Chopra & Meindl, 2015). This study adopts service quality, operational efficiency and delivery speed as measures of supply chain performance.

Service quality

Service quality is a measure of how well the level of service provided is in line with customer expectations (Tjiptono & Chandra, 2012). It is customers' assessment of the overall excellence of services they receive (Ateke & Amangala, 2021; Ghotbabadi et al., 2015). It is customers' comprehensive evaluation of a service and the extent to which it meets their expectations and provides satisfaction (Al-Jazzazi & Sultan, 2017). Service quality is one of the most prominent ways commercial enterprises that aspire to achieve increased profits through customer acquisition and retention of current ones attain their aim (Ateke & Amangala, 2021).

Service quality is essential to attracting, keeping, and expanding customers (Ghotbabadi et al., 2015), as well as motivating and eliciting purchase or purchase intention (Ateke & Amangala, 2021). Service quality got its earliest conceptualizations based on the peculiar properties of services and cognitive psychology-based studies (Polyakova & Mirza, 2015); with the comparison of actual service performance to set standards serving as the basis of the conceptualization (Parasuraman et al., 1988, as cited in Ateke & Amangala, 2021), such that service quality is judged in relation to how well service delivery meet customers' expectations or company's promises (Grönroos, 1984).

Operational efficiency

The primary focus of "efficiency" is optimal use of resources to achieve the best possible outcomes (Ateke et al., 2025). In business operations, efficiency represent favourable outcome of assessment between inputs employed and outputs obtained; as may be demonstrated by a firms' ability to generate maximum outputs with minimal resources. Thus, operational efficiency focuses on maintaining high level of productivity and providing consistent quality of service while incurring less cost, minimizing resource consumption and reducing wastes (Nwulu et al., 2022).

Scholars argue that efficiency means optimal resource utilization and cost and waste reduction in business operations (Egbe & Aturu-Aghedo, 2023); the input-output ratio that defines a firm's best possible outcome or the extent to which a firm optimally utilize resources and avoids redundancy in operations (Nwulu et al., 2022, as cited in Ateke et al., 2025).

Operational efficiency occurs when the right combination of people, process, and technology come together to enhance the productivity and value of any business operation, while driving down the cost of routine operations to a desired level (Kabelele & Musabila, 2020). According to Reenu et al. (2021), operational efficiency results from business' activities that promote optimal use of resources. A firm's ability to survive and flourish over the long-run depends on the efficiency of its operations (Bestman & Chinyere, 2021, as cited in Ateke et al., 2025).

Delivery speed

Basically, delivery speed represent how fast it takes a firm to deliver customers' orders. It is a calculation of the amount of time required fulfil an order in relation to the total number of orders received (Clearpath Team, 2017). Delivery speed is a value-added service that denotes the period between the placement of an order and actual delivery of the order (Wisner et al., 2014). It can also be referred to as the speed with which a package is delivered by a courier service or the speed with which a service is provided to a customer (Ziółkowski et al., 2022).

Delivery speed is considered the “game-changer” in today's fast-paced world, especially as e-commerce continue to develop and, customers' expectation of prompt delivery orders crystalize. Rise in consumers' online purchases has made delivery speed a crucial factor in buying decisions and customer loyalty. Most online shoppers choose retailers based on delivery speed alone, security and safety concerns (Ateke & Ogbuji, 2017); and are quick to switch to vendors that offer faster delivery. Thus, businesses are acknowledging and investing in technologies that facilitate route optimization and real-time tracking to streamline their delivery processes. These innovations not only reduce delivery times but also improve customer satisfaction and loyalty.

Information Technology Infrastructure and Supply Chain Performance

The connection between information technology infrastructure and supply chain performance has attracted research interest in the past few years. This is in recognition of the role information and communication technology is playing in modern business operations. Ateke and Ogbuji (2017) opine that businesses take advantage of advances in technology to effect the creation and delivery of value that does not only give consumers a broad range of alternatives, but also gives them their desired satisfaction.

Advances in information and communication technology (ICT) have pushed the frontiers of business practice to newer levels, with ICT enabled platforms offering potentials for enhanced commercial activities at lower costs for firms and consumers alike (Ateke & Ogbuji, 2017). Central to the use of technology in business however, is information technology infrastructure, and the extent to which firms install these infrastructures determine their presence and performance in the market.

Empirical studies on the interplay between information technology infrastructure and supply chain performance include that of Ananga et al. (2024) which examined the role of technology infrastructure on business performance of commercial banks in Kenya. The study revealed that hardware/Software, information and database influence business performance of Commercial Banks in Kenya.

Shih-Ming and Chiu-Yun (2024) on their part examined the impact of foundational information technology (IT) capabilities on supply chain efficiency and operational performance. The study found that information technology capabilities significantly enhance supply chain efficiency, which in turn has a direct positive impact on operational performance.

Also, Nada et al. (2024) investigated the impact of IT infrastructure on innovation performance as a critical issue in the Iraqi private Universities. The results of the study indicated a positive and statistically significant association between IT infrastructure and innovation performance. Likewise, Oluochi and Mengich (2023) assessed the impact of IT adoption on employee performance among the workforce in Kisumu County Government. The study revealed that technology adoption enhanced employee performance.

Consequent upon the foregoing, the present study formulate the following hypotheses:

H₀₁: There is no significant correlation between information technology infrastructure and service quality of upstream oil and gas companies in Nigeria.

H₀₂: There is no significant correlation between information technology infrastructure and operational efficiency of upstream oil and gas companies in Nigeria.

H₀₃: There is no significant correlation between information technology infrastructure and delivery speed of upstream oil and gas companies in Nigeria.

Methodology

This study adopted across-sectional research design with a correlational type of investigation. The study population comprised 24 upstream oil and gas companies operating in Nigeria as enlisted in the finelib.com Nigerian Directory and Search Engine. The study took a census. 3 copies of questionnaire to the operations manager, ICT director and technical director of the 24 companies. This means that a total of 72 respondents provided data for the study. The reliability of the instrument was determined by the use of Cronbach Alpha test, with all items scoring above 0.70. Pearson Product Moment Correlation was used to test the hypotheses with the aid of the Statistical Packages for Social Science, version 25.0.

Table 1: Reliability Coefficients of Variable Measures

S/N	Dimension/Measure	No. of Item	Cronbach Alpha
1	Information Technology Infrastructure	4	0.96
2	Service Quality	4	0.92
3	Operational Efficiency	4	0.86
4	Delivery Speed	4	0.84

Source: Survey Data, 2025

As shown in Table1, the results of the Cronbach's alpha analysis revealed that all the variables in the study produced high Cronbach's Alpha coefficients indicating that, there is inter-item consistency among the variables in the study. This means that, if this study is conducted again in similar condition, the results would be similar to the results of our study.

Data Analysis and Findings

Table 2: Correlation between Information Technology Infrastructure and Service Quality

		Information Technology Infrastructure	Service Quality
Information Technology Infrastructure	Pearson Correlation	1	.795**
	Sig. (2-tailed)		.000
	N	68	68
Service Quality	Pearson Correlation	.795**	1
	Sig. (2-tailed)	.000	
	N	68	68

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

Source: SPSS Output

Table 6 reveals a correlation coefficient of 0.795** between information technology infrastructure and service quality, indicating a strong positive correlation between information technology infrastructure and service quality. More so, the probability value (0.000) is less than the critical value (0.05), this shows that there is a statistically significant correlation between information technology infrastructure and service quality. This further implies that information technology infrastructure can be used to achieve service quality among upstream oil and gas companies in Nigeria. Thus, we reject the null hypothesis which denies the existence of significant correlation between information technology infrastructure and service quality of upstream oil and gas companies in Nigeria.

Table 3: Correlation between Information Technology Infrastructure and Operational Efficiency

		Information Technology Infrastructure	Operational Efficiency
Information Technology Infrastructure	Pearson Correlation	1	.608**
	Sig. (2-tailed)		.000
	N	68	68
Operational Efficiency	Pearson Correlation	.608**	1
	Sig. (2-tailed)	.000	
	N	68	68

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

Source: SPSS Output

Table 3 reveals a correlation coefficient of 0.608** between information technology infrastructure and operational efficiency, indicating a strong positive correlation between information technology infrastructure and operational efficiency. More so, the probability value (0.000) is less than the critical value (0.05), this shows that there is a statistically significant correlation between information technology infrastructure and operational efficiency. This implies that information technology infrastructure is instrumental to operational efficiency of upstream oil and gas companies in Nigeria. Hence, we reject the null hypothesis that there is no significant relationship between information technology infrastructure and operational efficiency of upstream oil and gas companies in Nigeria.

Table 4: Correlation between Information Technology Infrastructure and Speed Delivery

		Information Technology Infrastructure	Delivery Speed
Information Technology Infrastructure	Pearson Correlation	1	.459**
	Sig. (2-tailed)		.000
	N	68	68
Delivery Speed	Pearson Correlation	.459**	1
	Sig. (2-tailed)	.000	
	N	68	68

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

Source: SPSS Output

Table 4 reveals a correlation coefficient of 0.459** between information technology infrastructure and delivery speed, indicating a moderate positive correlation between information technology infrastructure and delivery speed. More so, the probability value (0.000) is less than the critical value (0.05); this shows that there is a statistically significant correlation between information technology infrastructure and delivery speed. This implies that information technology infrastructure enhances delivery speed of upstream oil and gas companies in Nigeria. Therefore, we reject the null hypothesis that there is no significant relationship between information technology infrastructure and delivery speed of upstream oil and gas companies in Nigeria.

Discussion of Findings

This study examined the link between information technology infrastructure and supply chain performance of upstream oil and gas companies in Nigeria. The results of the statistical analysis conducted in the study shows that information technology infrastructure has a strong positive correlation with service quality and operational efficiency; and a moderate positive correlation with delivery speed. More so, the probability values (0.000) of all the correlations were less than the critical value (0.05). This implies that a statistically significant correlation exists between information technology infrastructure and measures of supply chain performance.

These findings corroborates the findings of Ananga et al. (2024) that hardware/Software, information and database influence business performance of Commercial Banks in Kenya; and that of Shih-Ming and Chiu-Yun (2024) that information technology capabilities significantly enhance supply chain efficiency, which in turn has a direct positive impact on operational performance.

Also, the current findings support the reports that a positive and statistically significant association exists between information technology infrastructure and innovation performance (Nada et al., 2024); and that technological adoption accounts for notable variance in employee performance (Oluochi & Mengich, 2023).

Conclusion and Recommendations

This study examined the relationship between information technology infrastructure and supply chain performance of upstream oil and gas companies in Nigeria. The findings indicates that information technology infrastructure is pivotal to supply chain performance. The empirical results revealed that information technology infrastructure significantly relates to supply chain performance. Thus, we conclude that information technology infrastructure is a significant correlate of supply chain performance in terms of service quality, operational efficiency and delivery speed. Consequently, we recommends that managers of upstream oil and gas companies in Nigeria that seek improved supply chain performance should develop and utilize information technology infrastructure for easier and faster transactions.

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