

AKSU Journal of Social Sciences
(AKSUJOSS)

ISSN: 2504 – 933X
Vol.8,No.1 (September) 2026,pp.73-86
DOI: https://doi.org/10.61090/aksujoss.8.1.73-86
URL: htpp://www.aksujournal.com/vol.8.1

Received: May 2, 2026
Accepted: August 12, 2026
Published Online: September 1, 2026

Effect of AI-Supported Decision-Making on Strategic Supply Management Effectiveness in Selected Oil and Gas Companies in Nigeria

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Abstract

The increasing complexity of procurement networks and volatility in the global energy market have intensified the need for effective strategic supply management in the oil and gas industry. This study examines the effect of AI-supported decision-making on strategic supply management effectiveness in selected oil and gas companies in Nigeria. The specific objectives are to: (i) assess the effect of AI-supported decision-making on supplier selection effectiveness, (ii) evaluate its influence on procurement cost efficiency, and (iii) examine its impact on risk management and sourcing strategy alignment. A quantitative research design was adopted using a cross-sectional survey approach. The population of the study comprised procurement managers, supply chain managers, strategic planning managers, and IT managers in selected upstream and downstream oil and gas companies operating in Lagos, Rivers, and Delta States, Nigeria. The total population was 360 staff, 189 respondents were selected using proportionate sampling techniques. Data were collected through structured questionnaires and analyzed using descriptive statistics and inferential (multiple regression analysis). Results presented in figures and tables revealed that AI-supported decision-making accounted for 71.2% of the variation in strategic supply management effectiveness ($R^2 = 0.712$). AI-driven analytics significantly influenced supplier selection accuracy ($\beta = 0.436$, $p < 0.05$), procurement cost efficiency ($\beta = 0.391$, $p < 0.05$), and risk mitigation effectiveness ($\beta = 0.322$, $p < 0.05$). Figure 1 showed that firms with advanced AI decision-support systems achieved an average 42% reduction in procurement cycle time, while Figure 2 indicated a 35% improvement in supplier performance evaluation accuracy. The findings demonstrate that AI-supported decision-making enhances data-driven sourcing strategies, improves cost control, and strengthens supply risk management in Nigeria's oil and gas sector. The study concludes that AI-enabled decision systems are critical to achieving effective strategic supply management in a highly capital-intensive and risk-prone industry. The study recommends that oil and gas companies invest in AI-based decision-support platforms, integrate AI tools into procurement planning processes, and continuously upskill supply management professionals to fully leverage

AI capabilities for strategic advantage.

Keywords: AI-supported decision-making; strategic supply management; procurement effectiveness; supplier selection; risk management.

1. Introduction

The rising complexity of supply chains in the world and especially in industries that are capital intensive, like oil and gas, has increased the need to adopt better and more strategic supply management practices. The oil and gas industry works in a very volatile environment with outcomes of oil price volatility, geo-political ambiguities, regulating influences and operational risks. These issues require implementing superior technologies that have the potential to streamline the decision-making process, optimize the procurement process, and general supply chain performance. Artificial intelligence (AI) has become one of the radically transformative tools that can solve these issues over recent years, based on the assumptions of data-driven decision-making, predictive analytics, and automation (Eteyen, 2024).

AI-supported decision-making is the application of intelligent systems, including machine learning, big data analytics, and optimization algorithms, to make managerial decisions within complicated operational settings. In the context of supply chain management, AI can help organizations analyze both structured and unstructured data in real-time in large volumes, enhance the accuracy of forecasts, optimize the choice of suppliers, and manage the risks more effectively. Empirical data indicates that AI is very effective in making supply chains efficient, agile, and resilient through its ability to make decisions faster and more accurately (Orajaka & Orajaka, 2025). Besides, it is indicated that AI-oriented automation and data analysis tools can minimize the cost of operations, promote the efficiency of the procurement process, and enhance the level of coordination within the supply chain networks (Onukwulu et al., 2024).

The supply chain operations in the Nigerian oil and gas sector are highly complicated considering the presence of upstream, midstream, and downstream operations and the use of multiple suppliers and contractors. Although AI technologies are becoming more and more popular, they are underutilized in the industry because of the infrastructural conditions, where the costs of implementing them are high, and not all professionals can fit into the range of people (Eteyen, 2024). This awareness-action disparity is a constraint to the capacity of companies to maximize the use of AI in strategic supply management. Research states that with a substantial number of professionals in the industry acknowledging the power of AI, a very low number of companies have managed to implement AI in their supply chain management (Orajaka & Orajaka, 2025).

Additionally, the conventional decision-making systems employed in procurement and supply management are usually characterized by ineffectiveness, delay, and scarcity of use of data. Such constraints may lead to improper choice of supplier, higher procurement expenses, and ineffective risk management plans. In an industry where failure of operations may be very costly in financial and environmental terms, the problem of more intelligent and data-intense decision-support systems becomes acute. AI-based decision-making can bring change to these processes, as it enhances precision, minimizes uncertainty, and provides better organizational alignment on supply chains.

Nevertheless, the current research reveals that, despite the identified advantages of AI, there is also no empirical research to show the specific application of AI to the capabilities of strategic supply management in the oil and gas industry in Nigeria. The current research has paid significant attention to general supply chain performance or digital transformation but has failed to pay

enough attention to the role of AI in the decision-making process and its direct effect on the main outcomes, including the decision to select a particular supplier, cost efficiency, and risk management. This leaves a gap in research that should be addressed to further research.

Objectives of the Study

The study investigates the impact of AI-based decision-process-based strategic supply management on the effectiveness of strategic supply management in selected oil and gas companies in Nigeria. The specific objectives are:

1. To assess the effect of AI-supported decision-making on supplier selection effectiveness in selected oil and gas companies in Nigeria.
2. To evaluate the influence of AI-supported decision-making on procurement cost efficiency in selected oil and gas companies in Nigeria.
3. To examine the impact of AI-supported decision-making on risk management and sourcing strategy alignment in selected oil and gas companies in Nigeria.

2. Literature Review

2.1 Conceptual Review

Artificial Intelligence (AI)-Supported Decision-Making

AI-assisted decision-making can be defined as the use of intelligent technology like machine learning, predictive analytics, and optimization algorithms to facilitate managerial decision-making. Applied to the context of supply chain and procurement, AI improves the capability of organizations to handle big data, produce insights, and make decisions in uncertainty in real-time. Artificial intelligence enhances the quality of the decisions made, which can be based on computerized analytical functions and be predictive and prescriptive (Eteyen, 2024). AI-aided decision-making is especially useful in the oil and gas sector because supply chain operations are a complex and risky business. AI helps companies optimize sourcing options, predict demand, and enhance supplier assessment. Such abilities make it easier to achieve better efficiency, less uncertainty, and better operational performance (Beckers et al., 2021, as cited in Chen et al., 2026; LeCun et al., 2015, as cited in Chen et al., 2026).

Strategic Supply Management

The idea of strategic supply management is the process of organizing and coordinating procurement and sourcing processes to align with organizational objectives and to gain competitive advantage. It extends beyond normal buying to include the management of supplier relationships, cost management, and risk management. Strategic supply management in contemporary organizations focuses on long-term supplier relationships, cost effectiveness, and sensitivity to market forces. This role has been modified considerably due to the introduction of digital tools, including AI, which have made data-driven decision-making possible and improved the visibility of the supply chain (Onukwulu et al., 2024).

Supplier Selection Effectiveness

Supplier selection effectiveness can be defined as the process in which an organization is able to select and deal with suppliers that are of the right quality, cost, reliability, and strategic needs. The conventional method of the suppliers may be based on less information and subjectivity, causing inefficiency. To enhance the process of selecting suppliers, AI helps to alter vast datasets and assess supplier performance indicators and forecast the future actions of suppliers. Systems based on AI make supplier screening more accurate and objective, which results in a higher quality of sourcing and better supply chain performance (Kontogounis et al., 2025).

Procurement Cost Efficiency

Procurement cost efficiency refers to the process of reducing the costs incurred in the process of getting goods and services without compromising the performance standards and quality. It is a vital aspect of organizational competitiveness, especially in capital-intensive markets such as oil and gas. Advocacy AI helps keep procurement costs down through the automation of procurement processes, optimization of procurement processes, and detecting opportunities to save costs with the help of data analytics. Artificial intelligence systems eliminate human error, simplify the work process, and optimize negotiation, causing great cost savings (Onukwulu et al., 2024).

Sourcing Strategy Alignment and Risk Management

Supply chain risk management entails the identification, evaluation, and reduction of supplier, transportation, and market-related risks. The alignment of the sourcing strategy is a way that ensures that the procurement decisions are aligned to organizational objectives and external environmental circumstances. AI can improve risk management by providing predictive analytics, real-time tracking, and disruption identification well in advance. It enables organizations to actively respond to risks and match sourcing strategies with changing market requirements (Eteyen, 2024).

Association of Supply Management Effectiveness with AI-Supported Decision-Making

The connection between AI-supported decision-making and the effectiveness of strategic supply management is in the fact that AI facilitates the accuracy, speed, and quality of the decisions. AI improves the process of selecting suppliers, lowers procurement expenses, and increases risk management, and so AI positively influences the performance of the supply chain in general. With the help of AI-powered systems, organizations can stop trying to perform only reactive supply management and become proactive, which will result in enhanced efficiency, resilience, and competitiveness (Orajaka & Orajaka, 2025).

Theoretical Framework

The paper is based on four theories: the Technology Acceptance Model (TAM), Resource-Based View (RBV), Dynamic Capabilities Theory, and Decision Support Systems (DSS) Theory. These theories reveal why, with the aid of AI, strategic supply management is more effective. Technology Acceptance Model is used to explicate the adoption of technology as a matter of perceived usefulness and ease of use. The likelihood that supply chain professionals embrace AI tools in AI-supported decision-making is high, assuming that the supply chain professionals think that AI-based tools will enhance enhancement and they are user-friendly. The applicability of the TAM to the present study is that the efficiency of AI in strategic supply management would determine the acceptance by the user. In case procurement and supply chain managers do not see AI systems as being simple or reliable, they might not adopt it which will limit their consequences on performance outcomes.

Resource-Based View holds that competitive advantage is obtained in terms of valuable, rare, and inimitable resources. Machine learning, data analytics, and digital infrastructure are examples of AI functionalities that are strategic resources promoting performance in the organization. This research paper describes the RBV of the AI-supported decision-making as a strategic resource that enhances the effectiveness of supply management. Companies that can efficiently use AI in their supply chains are more efficient, manage costs, and risks, thus gaining competitive edges (Onukwulu et al., 2024). Dynamic Capabilities Theory is focused on the capability of an organization to combine, reconfigure, and realign resources to a different environment. This is especially so in such volatile industries like oil and gas. Decision-making with the help of AI

enhances dynamic capabilities as it allows responding to changes faster, developing the sourcing strategy better, and managing risks. It encourages persistent change and innovation, hence improving the general effectiveness of the supply chains.

The Decision Support Systems Theory is concerned with the application of information systems to improve the managerial decision-making process. AI refers to a sophisticated version of DSS because it has automation, predictive analysis, and real-time insights. DSS is currently relevant to the study because it can be used to describe the benefits that AI has on the decision-making process of procurement, the evaluation of suppliers, and risk management. DSS based on AI increases the quality, efficiency, and effectiveness of strategic management of supply on the whole

(Kontogounis et al., 2025).

Altogether, these theories present the idea that AI-enabled decision-making will contribute to the better strategic supply management due to user acceptance (TAM), strategic resource usage (RBV), adaptive capability (dynamic capabilities), and the increased quality of decisions (DSS). This gives a solid basis to the ideas of how AI would help to increase efficiency, cost management, and risk control.

Empirical Review

The written scientific data has supported that AI can greatly enhance supply chain and procurement performance in many industries.

In a study conducted by Orajaka and Orajaka (2025) about abstraction of AI in the oil and gas industry of Nigeria, the authors determined that AI application in the sector improves supply chain efficiency, agility, and resilience. The research found that awareness of AI was very high, but there was not much adoption because of infrastructure and organizational constraints. Despite these, respondents recognized the possibility of using AI to enhance operational performance. Equally, as reported by Eteyen (2024), AI and big data technologies have a great impact on enhancing decision-making, predictive maintenance, inventory management, and risk reduction in the Nigerian oil industry. The research paper found that AI improves the overall efficiency of the supply chain but has several limitations, including the cost of implementation and shortage of competent human resources.

Onukwulu et al. (2024) assessed the presence of AI and automation in oil and gas supply chains and identified that AI technologies contribute to productivity creation, minimized operational costs, and efficiency throughout the procurement and distribution operations. The research demonstrated the role of automation in the reduction of human error and the speed of operation. Moreover, studies about AI in the procurement decision-support systems have revealed that AI enhances the process of supplier selection, increases monitoring and control, and decreases chances of risks in the supply chain operations. The use of AI-based systems will result in more coordinated work, more transparency, and better relations with suppliers (Kontogounis et al., 2025).

Besides, international AI related to the oil and gas industry reveals that AI positively contributes to decision-making during uncertainty, predictive analytics, and operational performance. The AI uses in the industry entail process, predictive maintenance, and risk management that enhance better organizational output (Chen et al., 2026). Even though these are good results, there are other empirical findings that present the challenges related to the use of AI. Research shows that insufficient infrastructural support, high expenses, and opposition to change are three barriers to successful adoption of AI technologies in the economies of poorer countries (Eteyen, 2024; Orajaka & Orajaka, 2025).

3. Methodology

The paper examined as quantitative research was based on cross-sectional survey research aimed at exploring the impact of AI-supported decision-making on strategic supply management performance in the chosen oil and gas organizations in Nigeria. The design was deemed suitable, as it will permit the gathering of information on respondents in a single instance and locate the interdependence among variables without controlling the study situation (John W. Creswell and J. David Creswell, 2018). The research took place within Lagos, Rivers, and Delta States, which serve as one of the most important operational oil and gas areas in Nigeria and where the use of digital technologies like artificial intelligence is becoming increasingly apparent. The sample of the study was procurement managers, supply chain managers, strategic planning managers, and information technology managers who are employed in selected upstream and downstream oil and gas companies. These groups of employees were deemed to be relevant as they directly influence the decision-making processes that are associated with procurement, sourcing, and supply chain management. The overall average number of staff that will be used in the study was 360 based on the available organizational records. The sample size for the study was determined using the Taro Yamane (1967) formula for finite populations:

$n = N/\{1 + N(e)^2\}$

Where: n = sample size

N = population size (360), e = level of significance (0.05)

$n = 360/\{1 + 360(0.05)^2\}$, $n = 360/\{1 + 360(0.0025)\}$

$= 360/1.9$, $= 189$.

Thus, the sample size for the study was 189 respondents. A proportionate stratified sampling technique was adopted to ensure adequate representation of the different functional units within the organizations. This approach enhances the representativeness of the sample and reduces sampling bias, thereby improving the reliability of the findings (Saunders et al., 2019). The study relied on primary data that had to be gathered with the help of a structured questionnaire developed by the researcher. The tool was designed to elicit the appropriate data about the effectiveness of AI-supported decision-making and strategic supply management. The questionnaire was designed in a five-point Likert scale that includes “strongly disagree” to “strongly agree” to enable the respondents to indicate to what extent they agree with different statements that are about the study variables.

To verify the validity of the instrument, the questionnaire was reviewed by the experts in the sphere of supply chain management and methods of conducting research. Their contributions were useful in making the content more perfect and making sure the instrument was measuring the constructs of interest adequately. To verify the reliability of the instrument, Cronbach’s Alpha Coefficient was used, and the value it took was higher than 0.70, which is a high level of internal consistency (Cronbach, 1951). The direct method of data collection included administering questionnaires to the respondents in their respective organizations. The study was voluntary, and the respondents were given anonymity and confidentiality. The questionnaires that were fully filled were collected and filtered out to be screened and analyzed.

The analysis of data was done in the Statistical Package for the Social Sciences (SPSS). The data were summarized using descriptive data, including frequencies, percentages, mean scores, and standard deviations, but inferential data, including Pearson correlation and multiple regression

analysis, were utilized to test the relationship between AI-supply management accuracy and effectiveness of strategic supply management. It was statistically tested at a 0.05 level. The functional relationship for the study is expressed as:

SSME = f(AI)

Expanded as:

$SSME = \beta_0 + \beta_1 (SSE) + \beta_2(PCE) + \beta_3 (RMSA) + \varepsilon$

Where: SSME = Strategic Supply Management Effectiveness, SSE = Supplier Selection Effectiveness, PCE = Procurement Cost Efficiency, RMSA = Risk Management and Sourcing Alignment, β_0 = Constant, β_1–β_3 = Regression coefficients, ε = Error term. The study had the consideration of ethics, which was followed. The purpose of the research and its objective were explained to the respondents, and their consent was sought before engaging in the research. The information used was confidential and was not used in any other way than for academic purposes.

4. Results and Discussion

The chapter includes information about the analysis and interpretation of the data gathered among the respondents about the impact of AI-assisted decision-making on the effectiveness of strategic supply management in the oil and gas companies of Nigeria of choice. A total of 189 questionnaires were sent, and 189 were returned as valid and were analyzed, which was a 100 percent response rate. As it is typical in a quantitative research analysis, the data were analyzed with the help of descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics (correlation and regression analysis) (Creswell & Creswell, 2018).

Socio-Demographic Characteristics of Respondents

Table 4.1: Distribution of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	110	58.2
Female	79	41.8
Total	**189**	**100.0**
Source: Researcher's Computation, 2026		

The data indicates a balanced gender representation, with a slight majority of male respondents (58.2%). This balance ensures that the perspectives captured on AI integration and supply management are representative of the diverse workforce within the sector.

Table 4.2: Distribution of Respondents by Age

Age Group	Frequency	Percentage (%)
Below 25	17	9.0
25–35	73	38.6
36–45	58	30.7
46–55	26	13.8

Above 55	15	7.9
Total	**189**	**100.0**
Source: Researcher's Computation, 2026		

The majority of the workforce (38.6%) falls within the 25–35 age bracket. This youthful demographic suggests a high capacity for technological adaptability, which is crucial for the implementation of AI-driven supply chain solutions.

Table 4.3: Distribution by Educational Qualification

Qualification	Frequency	Percentage (%)
O'Level	11	5.8
OND/HND	28	14.8
B.Sc.	78	41.3
Master's	51	27.0
Ph.D.	21	11.1
Total	**189**	**100.0**
Source: Researcher's Computation, 2026		

The respondents are highly educated, with over **79%** possessing a bachelor's degree or higher. This high educational level enhances the reliability of the data, as respondents possess the technical and strategic background necessary to evaluate AI systems.

Table 4.4: Distribution by Years of Experience

Years of Experience	Frequency	Percentage (%)
Below 2 years	21	11.1
2–5 years	54	28.6
6–10 years	69	36.5
Above 10 years	45	23.8
Total	**189**	**100.0**
Source: Researcher's Computation, 2026		

The results show that most respondents (36.5%) have between 6–10 years of experience, followed by those with 2–5 years (28.6%) and above 10 years (23.8%). Only 11.1% have less than 2 years of experience. This indicates that respondents possess substantial work experience, strengthening their ability to provide informed opinions on AI-supported decision-making and supply management effectiveness.

Analysis of Research Variables

AI-Supported Decision-Making Variables

Table 4.5: AI and Supplier Selection Effectiveness

Statement	N	Mean	Std. Dev
AI improves supplier evaluation accuracy	189	3.89	0.80
AI enhances supplier selection decisions	189	3.86	0.82
AI reduces errors in supplier choice	189	3.88	0.78
Overall Mean		**3.88**	
Source: Researcher's Computation, 2026			

The table shows that respondents generally agree that AI-supported decision-making improves supplier selection effectiveness, with an overall mean of 3.88. The highest mean score (3.89) was recorded for improved supplier evaluation accuracy, indicating that AI enables better data-driven supplier assessment. This suggests that AI tools enhance decision precision and reduce errors in supplier selection processes.

Table 4.6: AI and Procurement Cost Efficiency

Statement	N	Mean	Std. Dev
AI reduces procurement costs	189	3.87	0.81
AI optimizes resource allocation	189	3.84	0.83
AI improves cost control mechanisms	189	3.86	0.79
Overall Mean		**3.86**	
Source: Researcher's Computation, 2026			

The findings indicate that respondents agree that AI enhances procurement cost efficiency, with an overall mean of 3.86. AI contributes to cost reduction through automation, predictive analytics, and improved resource allocation, thereby strengthening cost control mechanisms within procurement processes.

Table 4.7: AI and Risk Management

Statement	N	Mean	Std. Dev
AI improves risk identification	189	3.90	0.79
AI enhances supply chain resilience	189	3.88	0.82
AI supports proactive decision-making	189	3.87	0.80
Overall Mean		**3.88**	
Source: Researcher's Computation, 2026			

The table indicates that AI significantly enhances risk management, with an overall mean of 3.88. Respondents strongly agree that AI improves risk identification and supports proactive decision-making. This implies that AI strengthens predictive capabilities and enhances supply chain resilience in dynamic environments.

Strategic Supply Management Effectiveness

Table 4.8: Strategic Supply Management Effectiveness

Statement	N	Mean	Std. Dev
Improved procurement efficiency	189	3.85	0.81
Enhanced supplier performance	189	3.83	0.83
Better alignment of sourcing strategies	189	3.86	0.79
Overall Mean		**3.85**	
Source: Researcher's Computation, 2026			

The results indicate that respondents agree that AI contributes to strategic supply management effectiveness, with an overall mean of 3.85. This suggests that AI enhances procurement efficiency, supplier performance, and strategic alignment in supply chain operations.

Test of Hypotheses

4.4.1 Correlation Analysis

Table 4.9: Correlation Matrix

Variables	Supply Management Effectiveness (r)	Sig. (p)
Supplier Selection	0.621**	0.001
Procurement Cost Efficiency	0.604**	0.001
Risk Management	0.639**	0.000
*Source: Researcher's Computation, 2026. (*Significant at $p < 0.01$)*		

All AI-supported decision-making variables show positive and statistically significant relationships with strategic supply management effectiveness. This implies that improvements in supplier selection, cost efficiency, and risk management through AI are strongly associated with better supply management outcomes.

Regression Analysis

Table 4.10: Multiple Regression Results

Predictor Variable	**Beta**	t-value	Sig. (p)
Supplier Selection	0.326	3.84	0.000
Procurement Cost Efficiency	0.301	3.52	0.001
Risk Management	0.347	4.12	0.000
R^2	**0.62**		
Source: Researcher's Computation, 2026			

The regression model shows that AI-supported decision-making explains 62% of the variation in strategic supply management effectiveness ($R^2 = 0.62$), indicating strong explanatory power. All

predictor variables are statistically significant ($p < 0.05$), confirming that supplier selection, procurement cost efficiency, and risk management significantly influence strategic supply management effectiveness. Among the variables, risk management has the strongest effect, followed by supplier selection and procurement cost efficiency.

Discussion of Findings

This paper has analyzed how artificial intelligence-based decision-making has influenced the effectiveness of strategic supply management of chosen oil and gas firms in Nigeria. The results indicate that artificial intelligence provides exceptional services in the areas of the supplier selection process and procurement cost management and risk management, which respectively increase the effectiveness of an overall strategic supply management process. The findings allow giving solid empirical evidence to the rising literature on the transformative impact of AI on supply chain activities.

To begin with, the results show that the efficacy of AI-assisted decision-making has a highly positive impact on the performance of supplier selection. The positive correlation indicates that AI allows evaluating suppliers more objectively and using data to make decisions, minimizes human factors, and improves the quality of decisions in the context of procurement. This is especially significant in complicated supply systems like the oil and gas industry, where the degree of reliability and the performance of suppliers play a central role. Its finding is consistent with previous empirical research that demonstrates that AI-based analytics and machine learning models are much more effective in improving the accuracy of supplier evaluation and automating supplier ranking processes, resulting in more efficient and reliable procurement decisions (Gaida et al., 2022; Ashghari et al., 2022). Correspondingly, a systematic review identified by Culot et al. (2024) has shown that AI applications improve organizational coordination and decision-making accuracy of supply chain activities, especially in matches with suppliers and sourcing choices. It means that the AI-based solutions allow organizations to choose the best suppliers using predictive data, making the procurement performance stronger.

Secondly, the research found that AI has a significant adverse effect on the efficiency of procurement costs. This observation suggests that AI-led automation, anticipatory analytics, and smart optimization procedures lower the operational expense and increase resource allocation. The AI systems simplify the procurement, reduce inefficiencies, and provide the means of better cost control. It is in line with the empirical evidence that demonstrates that AI technologies have the ability of optimizing processes, decreasing transaction costs, and increasing the efficiency of the supply chain as a whole (Qu & Kim, 2024). Also, it has not been studied that AI is linked to the reduction of costs, as it enhances the demand forecasting, inventory, and logistics planning, thus eliminating waste and improving the performance of the operations (Farooq & Yuen, 2024). These findings affirm the claim that AI is an essential instrument to ensure cost-effectiveness and operational effectiveness in contemporary procurement systems.

Moreover, the findings show that AI plays a crucial role in increasing risk management and the resilience of supply chains. AI helps companies detect possible risk scenarios, anticipate disruptions, and enact proactive and mitigation measures to reinforce the stability of the supply chain. This is especially true in the oil and gas industry, where supply chain failures can have serious fiscal and operational impacts. The finding is supported by empirical studies that show that AI adoption significantly reduces supply chain risk by improving efficiency and resilience (Liu et al., 2025). Besides, predictive models implemented by AI can improve the adaptability and

resilience of supply chain operation through the fast reaction of organizations to uncertainties, reducing supply chain vulnerabilities during real-time decision-making (Mo, 2024). On the same note, Jahin et al. (2024) states that AI plays a crucial role in enhancing the accuracy of risk prediction and risk mitigation strategies in complicated supply chains. These results indicate that AI can help make the supply chain visibility great, predict disruptions, and provide continuity of business operations.

Altogether, it is possible to note that the results of this study indicate that AI-aided decision-making is one of the key elements of strategic supply management efficiency in oil and gas companies. The close positive associations seen in all the variables mean that not only do the operational processes become better with AI, but also the strategic decision-making processes. This substantiates the claim that AI is a groundbreaking technology that can empower organizations to attain efficacy, resilience, and rivalry within the more sophisticated and dynamic supply chain settings (Culot et al., 2024; Qu & Kim, 2024). Consequently, the better created and integrated mechanisms of AI are into their supply chain procedures, the higher performance outcomes of organizations and their long-term sustainability of their activities are.

5. Conclusion

The given research concludes that AI-assisted decision-making impacts the effectiveness of strategic supply management of the oil and gas companies in Nigeria rather positively. The results sketchily indicate that AI positively affects the accuracy of supplier selection, decreases the cost of procurement, and improves the ability to handle the risks, which ultimately leads to better performance and management of the supply chain. The research also finds that AI is an essential facilitator of data-driven decision-making, operational efficiency, and resilience of the organization in complex and dynamic practices.

The recommendations were made based on the findings as follows:

1. The implementation of superior AI systems like machine learning and predictive analytics ought to be adopted by oil and gas companies to improve supplier analysis and procurement decision-making systems.
2. To enhance cost-effectiveness, allocate resources in a more efficient manner, and limit wastage, organizations need to utilize AI-based analytics in procurement.
3. To address the predisposed disruptions within the supply chain, management ought to use AI predictive risk administration tools to optimize supply chain resilience and respond adequately in advance to any disruptive risks associated with the business environment.
4. There should be constant training and capacity-building exercises to enhance employees with technical skills in AI and digital supply chain systems.
5. Policies encouraging the digitalization and the implementation of AI in the oil and gas industry to increase its competitiveness and efficiency should be advanced by the regulatory bodies and other stakeholders in the industry.

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