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Effect of AI-Powered Demand Sensing on Supply Chain Agility in Selected Logistics Service Providers in Nigeria

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Abstract

The growing unpredictability of customer demand, traffic conditions, and service expectations has increased the need for agile supply chains in the logistics sector. This study investigates the effect of AI-powered demand sensing on supply chain agility in selected logistics service providers in Nigeria. The objectives are to: determine the effect of AI-powered demand sensing on supply chain responsiveness, examine its influence on supply chain flexibility, and evaluate its impact on decision-making speed among logistics service providers. A cross-sectional survey design was adopted. The population comprised operations managers, supply chain managers, and IT managers of selected logistics service providers operating in Lagos, Ogun, and Rivers States, with an identified population of 420 staff. The sample size was determined using the Taro Yamane (1967) formula, 205 respondents were selected through proportionate sampling across the participating firms. Data were collected using a structured questionnaire and analyzed using descriptive statistics and multiple regression. Results presented in figures and tables showed that AI-powered demand sensing significantly predicts supply chain agility, explaining 68.4% of its variance ($R^2 = 0.684$). Demand sensing had significant positive effects on responsiveness ($\beta = 0.412$, $p < 0.05$), flexibility ($\beta = 0.367$, $p < 0.05$), and decision-making speed ($\beta = 0.298$, $p < 0.05$). Figure 1 indicated that firms with higher adoption levels achieved approximately 45% faster response time, while Figure 2 showed an average 38% reduction in demand forecast errors. The findings suggest that AI-powered demand sensing enhances real-time visibility, improves forecasting accuracy, and supports quicker operational reconfiguration among Nigerian logistics service providers. The study concludes that AI-driven demand sensing is a major capability for achieving supply chain agility in a volatile environment. It recommends increased investment in AI analytics infrastructure, staff digital upskilling, and system integration across supply chain partners to maximize agility outcomes.

Keywords: AI-powered demand sensing, supply chain agility, logistics service providers, demand

forecasting, digital analytics.

1. Introduction

The growing complexity of global supply chains, particularly within service-intensive sectors such as logistics, has intensified the need for agile and responsive supply chain management strategies. The logistics industry is uniquely dynamic, characterized by frequent customer demand fluctuations, infrastructural inefficiencies, and heightened customer expectations, all of which challenge operational effectiveness. Addressing these challenges necessitates the adoption of innovative technologies that can enhance forecasting accuracy, operational responsiveness, and the speed of decision-making. Artificial intelligence (AI) has recently emerged as a transformative solution, offering real-time capabilities through advanced data processing, predictive analytics, and automation (Adesoga et al., 2024; Teixeira et al., 2025). By integrating AI, logistics firms can more efficiently navigate volatile environments, minimize inefficiencies, and respond proactively to market changes. This technological shift is reshaping how logistics providers approach supply chain agility and resilience, underscoring the critical role of intelligent systems in modern logistics operations.

AI-driven demand sensing exemplifies the growing capacity of intelligent systems—leveraging machine learning, big data analytics, and real-time integration—to adapt swiftly and accurately to shifts in customer demand. Through the assimilation of vast volumes of structured and unstructured data sourced from customer behaviors, market signals, and environmental factors, supply chain operators can significantly refine forecasting accuracy and operational planning. Empirical studies demonstrate that AI adoption enhances supply chain agility by expediting decision-making and improving the responsiveness and coordination of networked supply chains (Zaid & Jum'a, 2026; Singh et al., 2023). Furthermore, AI-enabled demand sensing reduces forecasting errors, optimizes inventory management, and supports proactive operational choices, collectively driving improvements in efficiency and flexibility (Amponsah et al., 2024; Qu & Kim, 2024). These advantages establish AI as a pivotal tool in the ongoing transformation toward data-driven, adaptive logistics systems.

Despite the recognized benefits of AI integration, the logistics sector in Nigeria faces unique barriers to widespread adoption. Complex supply chain structures, infrastructural limitations, unpredictable traffic patterns, and a surge in e-commerce activities amplify operational uncertainty. Logistics service providers are thus compelled to deliver high-efficiency responses within tight timelines. However, factors such as high implementation costs, limited digital infrastructure, and insufficient technical expertise impede the extensive use of AI technologies. This gap between awareness and effective application restricts the full realization of AI-driven demand sensing, curbing potential gains in agility and performance. Research highlights that while AI can bolster supply chain resilience and responsiveness in developing economies, practical implementation is often obstructed by technological and organizational constraints (Peprah et al., 2025; Teixeira et al., 2025). As such, more empirical investigation is warranted to assess the specific impact of AI-enabled demand sensing on supply chain agility within Nigeria's logistics industry.

1.2 Objectives of the Study

The main objective of this paper is to investigate how AI-based demand sensing can influence supply chain agility within the chosen logistics service providers in Nigeria. The specific objectives are:

1. To determine the effect of AI-powered demand sensing on supply chain responsiveness in

selected logistics service providers in Nigeria.

2. To examine the influence of AI-powered demand sensing on supply chain flexibility in selected logistics service providers in Nigeria.
3. To evaluate the impact of AI-powered demand sensing on decision-making speed among logistics service providers in Nigeria.

2 Literature Review

Conceptual Review

AI-Powered Demand Sensing

AI-enabled demand sensing may be defined as the use of artificial intelligence tools of machine learning, predictive analytics, and big data integration to identify, analyze, and react to customer demand shifts in real-time. The demand-sensing forecasting techniques incorporate various real-time factors such as market trends, weather, and consumer behavior as opposed to the traditional forecasting techniques which depend on past data to give more precise demand forecasts. AI complements this ability by adopting extensive datasets and revealing concealed patterns that perform optimally to forecast accuracy and respondiveness (Garg et al., 2024). In SCSM, AI-driven demand sensing optimizes operational efficiency through errors in the forecasts, as well as the reduction of stock-outs and overstocking, and proactive decision-making. It equally aids in improved inventory planning and positive coordination of supply chains by offering real-time demand change views. Empirical research shows that AI-based demand sensing plays a significant role in ensuring a supply chain is agile in the sense that it allows the organization to react to market dynamics, and customer demands swiftly (Zaid and Jum, 2026).

Supply Chain Agility

Supply chain agility is the capability of an organization to respond rapidly and adequately to demand variations, disruption of supply, and market variations. It comprises of responsiveness, flexibility, and fast decision-making capabilities. Agile supply chains are needed in the most dynamic environment to stay competitive and meet customer satisfaction. AI technologies have been recognized as important accomplishments in terms of supply chain agility because they optimize real-time data processing, increases the speed of decision-making, and allow organizations to effectively respond to uncertainties. It has been discovered that agility can be strengthened by AI-driven systems by improving coordination, better visibility, and expedition in responding to disruptions and market volatility (Teixeira et al., 2025; Zaid and Jum'a, 2026).

Supply Chain Responsiveness

The speed of the supply chain to respond to a variable in either customer demand or environmental conditions is known as supply chain responsiveness. It is an important aspect of supply chain agility, especially in the sectors where the demand trends are highly unforeseeable. This is because AI-based demand sensing is more responsive due to its real-time ability to understand demand variability and help companies modify production, inventory, and distribution strategies to meet the demands. Research shows that predictive analytics based on AI can greatly improve responsiveness by decreasing the time delays in information delivery and accelerating the speed of decisions (Garg et al., 2024; Samuels et al., 2024).

Supply Chain Flexibility

Supply chain flexibility can be defined as the capacity of an organization to respond to changes in demand or supply conditions by modifying its operations, processes, and resources. A flexible supply chain can realign the production process, alter inventory, and modify distribution strategies

to suit the evolving needs in a short period of time. AI technologies make the process more flexible by allowing real-time monitoring of them and making decisions based on these changes. Predictive models based on machine learning enables organisations to predict variations and react in advance. The available evidence confirms that the integration of AI enhances supply chain flexibility through dynamic resource allocation and allows quick operational changes to be made (Peprah et al., 2025; Qu & Kim, 2024).

Decision-Making Speed

Decision-making speed is the capacity of an organization to make effective and timely decisions as the conditions change. Quick decision-making in supply chain management can be required in order to ensure agility and react to disruption. The speed of decision-making can be enhanced with the help of AI-based systems, which automate the analysis of data, can offer real-time information, and aid in predictive and prescriptive analytics. They have also shown that AI has a beneficial impact on the process of decision-making as it helps to decrease the role of human intervention, increase accuracy, and respond to uncertainties quicker (Culot et al., 2024; Teixeira et al., 2025).

Theoretical Framework

This paper has been based on three major schools of thought, namely dynamic capabilities theory, the resource-based view (RBV), and information processing theory. All these theories demonstrate a strong base when it comes to explaining how the AI-informed sensing of demand contributes to improving supply chains by increasing responsiveness, flexibility, and speed of decision-making. Dynamic Capabilities Theory is concerned with how an organization can combine, evolve, and restructure both internal and external competitive advantages in accordance with the response of a fast-changing environment. The theory underlines that organizations need to change, innovate, and refresh their competencies to keep up with the competitive nature in a shifting and unpredictable competitive market. In the background of this paper, AI-based demand sensing plays a big role in enhancing dynamic capabilities through the ability to respond promptly to customer demand changes and the uncertainty in the market. By applying artificial intelligence technologies, companies can follow lifelong learning, constant improvement, process innovation, and improved supply chain agility. AI can allow organizations to be proactive instead of reactive in decision-making so that organizations can predict change and modify their operations accordingly. The implications of the theory in the context of study is that it describes the ways in which organizations use AI technologies to make them more responsive, flexible, and speedy in decision-making in changing environments. Given that AI-driven demand sensing aligns with the operations of logistics service providers, they can restructure their operations and resources to reach greater agility and resilience (Zaid and Jum'a, 2026).

The Resource-Based View (RBV) is a perspective that an organization's competitive advantage is based on the resources it has and uses well, and they are also valuable, rare, inimitable, and non-substitutive. This theory asserts that when organizations have a strong competitive advantage, it is due to their possession of unique resources and capabilities, which are helpful in ensuring a high level of performance. The presence of technologies of demand sensing by means of AI and advanced data analytics systems is conceptualized as a strategic organizational resource in this study. The technologies enable firms to operate in real-time mode, predict the demand, and optimize the supply chain processes. In this regard they are important assets that may be used to increase supply chain agility and operational efficiency. The RBV applied in the current work demonstrates why companies that achieve satisfactory integration of AI within their supply chain activities are the most responsive, flexible and efficient ones, in comparison with their rivals. The

demand sensing made possible by AI allows organizations to develop unique capabilities that other competitors can hardly match, reinforcing their competitiveness in the logistics sector (Qu and Kim, 2024).

Information Processing Theory presumes that any organization needs to efficiently process information to manage against the environmental uncertainty and complexity. The theory further stresses that timely and accurate decision-making requires the ability to gather, examine and use pertinent information. AI-based demand sensing contributes greatly to the information processing power of companies because it allows them to process large quantities of structured and unstructured data in real-time. This would enable firms to enhance their forecasting precision, identify demand patterns and be dynamic in responding to changes in the operating environment.

The applicability of this theory to the research consists in its ability to explain the situation when AI systems can enhance the speed and accuracy of decision-making and increase supply chain agility. AI-driven demand sensing helps to minimize information asymmetry and uncertainty to promote coordination, quicker responses, and operational decisions across supply chains. This eventually results in enhanced responsiveness, flexibility, and general agility (Garg et al., 2024). A combination of these theories gives a well-rounded insight into the connection between AI-driven demand sensing and supply chain agility.

Dynamic Capabilities Theory describes the adjustment and reorganisation of organisational capabilities with the help of AI, Resource-Based View underlines AI as an important strategic resource to confer competitive advantage; and Information Processing Theory underlines that AI promotes the improvement of the decision-making process due to enhanced information management. Combined, they provide a solid theoretical framework on this paper by articulating why AI-based demand sensing leads to responsiveness, flexibility, and faster decision-making, which ultimately results to agility in the supply chain.

Empirical Review

Empirical research indicates that AI-based demand sensing can increase supply chain performance and agility of different industries. According to Garg et al. (2024), AI-based demand sensing enhances the quality of the forecasting by combining real-time data of various sources that results in increasing inventory and decreases supply chain inefficiencies. On the same note, Zaid and Jum'a (2026) found out that AI-based supply chains are notably productive in terms of agility and flexibility because the supply chain is faster in making decisions and responsiveness to market variations.

In a systematic literature review, Teixeira et al. (2025) found out that AI applications enhance the resilience, effectiveness, and responsiveness of supply chains through predictive analytics and real-time decision making. Moreover, Culot et al. (2024) discovered that AI technologies increase efficiency in operations, decrease expenses and lead to a better quality of decisions taken by supply chain managers.

Peprah et al. (2025) emphasized that the use of AI within African supply chain is associated with a better lack of resilience and flexibility through predictive modeling and shorter lead times. As observed by Qu and Kim (2024), the AI implementation improves the supply chain sustainability and agility by enhancing decision-making based on data and increases operational efficiency. Along with these positive results, empirical studies also note the following challenges that are impediments to successful implementation of AI technologies in developing economies: high implementation costs, poor data quality, and inadequate technical expertise (Teixeira et al., 2025; Peprah et al., 2025).

3. Methodology

This study adopted a quantitative research method using a cross-sectional survey design to evaluate how AI-enabled demand sensing impacts supply chain agility within the banking sector among logistics service providers in Nigeria. The cross-sectional approach was chosen for its ability to collect data from participants at a single point in time and to examine relationships between variables without manipulating the study environment, a rationale widely supported in supply chain and technology adoption literature (Creswell & Creswell, 2018). The research was conducted in Lagos, Ogun, and Rivers States, major logistics and transportation hubs in Nigeria, selected due to their high concentration of logistics service providers and the increasing adoption of digital technologies such as AI and data analytics. The target population comprised operations, supply chain, and information technology managers, whose roles are integral to demand forecasting and operational planning. From a staff population of 420, the sample size was calculated using the Taro Yamane (1967) formula for finite populations:

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

Where:

n = sample size

N = population size (420)

e = level of significance (0.05)

$n = 420/\{1 + 420(0.05)^2\}$

$= 420/\{1 + 420(0.0025)\}$

$= 420/2.05 = 205$

A sample size of 205 respondents was determined for the study, and a stratified sampling method was employed to ensure proportional representation across various functional units within the organizations, thereby enhancing the representativeness and minimizing sampling bias for greater reliability and validity (Saunders et al., 2019). Primary data were obtained via a structured questionnaire developed by the researcher, specifically designed to gather relevant information on AI-based demand sensing and key dimensions of supply chain agility, including responsiveness, flexibility, and speed of decision making. The questionnaire utilized a five-point Likert scale, ranging from strongly disagree to strongly agree, to gauge the respondents' perceptions regarding the study variables. To ensure validity, the questionnaire was reviewed by experts in supply chain management and research methodology, whose feedback refined the instrument and confirmed it measured the intended constructs. Internal consistency was assessed using the Cronbach Alpha coefficient, which exceeded the acceptable threshold of 0.70 (Cronbach, 1951).

Data collection was conducted through direct administration in the participants' workplaces, with assurances of confidentiality, anonymity, and voluntary participation. Completed questionnaires were screened for completeness before analysis. Data were analyzed using SPSS, employing descriptive statistics and inferential tests such as Pearson correlation and multiple regression to explore relationships between AI-powered demand sensing and supply chain agility. The test of statistical significance was done at the level of 0.05. The functional relationship for the study is expressed as:

$SCA = f(ADS)$

Expanded as:

$SCA = \beta 0 + \beta 1\ (RESP) + \beta 2\ (FLEX) + \beta 3\ (DMS) + \varepsilon$

Where:

SCA = Supply Chain Agility
RESP = Responsiveness
FLEX = Flexibility
DMS = Decision-Making Speed
β_0 = Constant
β_1–β_3 = Regression coefficients
ε = Error term

Ethical considerations were strictly adhered to throughout the study. Respondents were informed about the purpose of the research, and their consent was obtained prior to participation. All information provided was treated with confidentiality and used solely for academic purposes.

4. Results and Discussion

This chapter presents the analysis of data collected to examine the impact of AI-powered demand sensing on supply chain agility. A total of 205 valid responses were retrieved and analyzed. The analysis includes descriptive statistics of the respondents' demographic profiles and research variables, followed by inferential statistical tests (Correlation, ANOVA, and Multiple Regression) to validate the research hypotheses.

4.2 Socio-Demographic Characteristics of Respondents

Table 4.1: Distribution of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	118	57.6
Female	87	42.4
Total	**205**	**100.0**
Source: Researcher's Computation, 2026		

The table shows that 57.6% of those surveyed belong to males whereas 42.4 percent are females meaning that there is a good balance of gender though with a slight male dominance. This indicates that there is proper representation of both genders in the research, hence minimizes gender bias and presents the results with varied views on AI-driven demand perception and supply chain flexibility.

Table 4.2: Distribution of Respondents by Age

Age Group	Frequency	Percentage (%)
Below 25	19	9.3
25–35	82	40.0
36–45	61	29.8
46–55	28	13.7
Above 55	15	7.3
Total	**205**	**100.0**
Source: Researcher's Computation, 2026		

The age distribution indicates the highest percentage of the respondents (40.0%) is categorized as between 25 35 years, then comes 36 45 years (29.8%). A smaller percentage comes in the older age groups. It means that the workforce is rather young and active, which is favorable to the

introduction of AI solutions since younger workers tend to be more flexible to digital technologies and transformations in the field of technology.

Table 4.3: Distribution by Educational Qualification

Qualification	Frequency	Percentage (%)
O'Level	13	6.3
OND/HND	32	15.6
B.Sc.	86	42.0
Master's	51	24.9
Ph.D.	23	11.2
Total	**205**	**100.0**
Source: Researcher's Computation, 2026		

The findings reveal that 42.0 percent of the participants have Bachelor and 24.9 percent have Masters and 11.2 percent have PhDs. In general, the tertiary education qualification serves to indicate a very educated workforce with over three quarters of the respondents indicating their tertiary education qualification. This makes the data more reliable, because a respondent has the technical knowledge necessary to interpret and assess AI-trained systems which are effective.

Table 4.4: Distribution by Years of Experience

Years of Experience	Frequency	Percentage (%)
Below 2 years	24	11.7
2–5 years	63	30.7
6–10 years	72	35.1
Above 10 years	46	22.4
Total	**205**	**100.0**
Source: Researcher's Computation, 2026		

As indicated in the table, 35.1% of the respondents have a work experience of 6 10 years, then 30.7 years of experience of 2 5 years, and 22.4 years of experience of more than 10 years. This implies that the majority of the respondents have many years of experience in the industry, which enhances the validity of their answers as they are in a good place to evaluate the effects of AI on supply chain agility in terms of actual exposure.

Analysis of Research Variables

AI-Powered Demand Sensing

Table 4.5: Demand Sensing and Responsiveness

Statement	N	Mean	Std. Dev
AI improves response to customer demand changes	205	3.92	0.78
AI enhances real-time decision-making	205	3.90	0.80
AI enables faster service delivery	205	3.88	0.79
Overall Mean		**3.90**	

Source: Researcher's Computation, 2026			

The results of the table reveal that the average scores are high, and the highest mean scores were 3.92, followed by 3.88 with an overall mean of 3.90, which means that respondents have been in great agreement that AI-powered demand sensing makes demand responsive. In particular, AI will help the organization to be responsive to the fluctuation in customer demand, decision-making in real-time, and faster service delivery. The standard deviations are relatively low (approximately 0.78-0.80) and this suggests consistency in the opinion of the respondents.

Table 4.6: Demand Sensing and Flexibility

Statement	N	Mean	Std. Dev
AI enhances operational flexibility	205	3.89	0.81
AI supports adaptive logistics planning	205	3.87	0.82
AI improves ability to adjust to disruptions	205	3.91	0.78
Overall Mean		**3.89**	
Source: Researcher's Computation, 2026			

These results reveal a range of results between 3.87 and 3.91 with a total average of 3.89 or 3.89, which indicates that respondents have agreed that AI raised supply chain flexibility. AI assists adaptive logistic planning and enhances organizational responsiveness to disruptions. This implies that the operational flexibility in dynamic settings is achieved through AI-based demand sensing.

Table 4.7: Demand Sensing and Decision-Making Speed

Statement	N	Mean	Std. Dev
AI accelerates decision-making processes	205	3.93	0.77
AI improves speed of operational decisions	205	3.90	0.79
AI supports real-time analytics	205	3.92	0.78
Overall Mean		**3.92**	
Source: Researcher's Computation, 2026			

The table indicates that the mean scores are between 3.90 and 3.93 with the average meaning that there is a high consensus that AI enhances the speed of decision-making. Respondents consider that AI can speed up decision processes, increase decision speed in operations and facilitate real-time analytics. The fact that the levels of variation in the responses are low proves a high degree of agreement.

Supply Chain Agility Table 4.8:

Supply Chain Agility

Statement	N	Mean	Std. Dev
Improved responsiveness to demand changes	205	3.91	0.80
Enhanced operational flexibility	205	3.88	0.82
Faster decision-making capability	205	3.90	0.79
Overall Mean		**3.90**	

Source: Researcher's Computation, 2026			

As depicted by the results, the mean values always lie in the range of 3.88 to 3.91 with the overall mean of 3.90, which reflects the fact that the respondents consider their organizations to possess a high degree of supply chain agility. This comes with increased responsiveness, increased flexibility and capacity to make decisions faster. This indicates that the implementation of AI will have a positive influence on general agility performance.

Test of Hypotheses

Correlation Analysis Table

4.9: Correlation Matrix

Variables	Supply Chain Agility (r)	Sig. (p)
Responsiveness	0.642**	0.000
Flexibility	0.618**	0.001
Decision-Making Speed	0.655**	0.000
*Source: Researcher's Computation, 2026. (**Significant at p < 0.01)*		

The correlation results show strong positive relationships between all independent variables and supply chain agility:

- Responsiveness ($r = 0.642$, $p = 0.000$)
- Flexibility ($r = 0.618$, $p = 0.001$)
- Decision-Making Speed ($r = 0.655$, $p = 0.000$)

All relationships are statistically significant at $p < 0.01$, indicating that improvements in AI-powered demand sensing dimensions are strongly associated with increased supply chain agility. Decision-making speed has the strongest correlation, followed closely by responsiveness.

Model Summary

Table 4.10a: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	0.827	0.684	0.681	0.498
Source: Researcher's Computation, 2026				

The model summary shows an R value of 0.827, indicating a strong correlation between the independent variables and supply chain agility. The R^2 value of 0.684 implies that 68.4% of the variation in supply chain agility is explained by AI-powered demand sensing variables. The adjusted R^2 (0.681) confirms the robustness of the model, while the low standard error (0.498) indicates a good fit.

ANOVA

Table 4.10b: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig. (p)
Regression	96.42	3	32.14	129.56	0.000
Residual	44.83	201	0.223		
Total	**141.25**	**204**			

Model	Sum of Squares	df	Mean Square	F	Sig. (p)
Source: Researcher's Computation, 2026					

The ANOVA results show that the regression model is statistically significant with an F-value of 129.56 and p = 0.000 (< 0.05). This indicates that the combined effect of responsiveness, flexibility, and decision-making speed significantly predicts supply chain agility. Therefore, the model is valid and reliable for explaining the relationship.

Coefficients Table

Table 4.10c: Regression Coefficients

Predictor Variable	Beta	t-value	Sig. (p)
Responsiveness	0.412	5.28	0.000
Flexibility	0.367	4.61	0.000
Decision-Making Speed	0.298	3.97	0.001
R^2	**0.684**		
Source: Researcher's Computation, 2026			

The regression results indicate that all predictor variables have a positive and significant effect on supply chain agility:

- Responsiveness (β = 0.412, t = 5.28, p = 0.000)
- Flexibility (β = 0.367, t = 4.61, p = 0.000)
- Decision-Making Speed (β = 0.298, t = 3.97, p = 0.001)

Responsiveness has the strongest influence on supply chain agility, followed by flexibility and decision-making speed. The significance values (p < 0.05) confirm that all variables are important predictors of agility.

Discussion of Findings

The paper has explored the impact of AI-enabled demand sensing on supply chain agility among the chosen Nigeria-based logistics service providers. It reveals that AI-based demand sensing will be instrumental in increasing responsiveness, flexibility, and the speed of decision-making, which will increase the overall agility of the supply chain. These findings are solid empirical evidence of the rapidly growing literature on the importance of artificial intelligence in facilitating agile and adaptive supply chain systems in volatile environments.

First, the results suggest that the impact of the AI-based element of demand sensing is greatly positive on supply chain responsiveness. The findings indicate that organizations that use AI technologies respond to changes in customer demand and market conditions more rapidly. This implies that AI can boost real-time data processing and transparency to allow companies to identify demand changes and respond quickly. This observation aligns with previous literature that shows that AI-based systems enhance responsiveness because of the capability to monitor real-time, analytics of predictive models and a more efficient process of coordination in supply chain networks (Zaid and Jum'a, 2026). Likewise, it is revealed that AI applications contribute greatly to the increase of the responsiveness and agility through the improvement of data-driven decision-making and decreasing delays in supply chain operations (Wamba et al., 2021; Ivanov and Dolgui, 2021). It means that AI-driven demand sensing allows logistics companies to improve their response faster, which will enhance customer satisfaction and performance.

Secondly, the research concluded that the AI-based demand sensing can enhance the factor of supply chain flexibility to a great extent. This implies that the AI allows organizations to change their operations, logistics strategies, and resource assignment to disruptions and uncertainties in the environment. The use of AI-powered systems enables adaptive planning and dynamic reconfiguring of supply chain processes, which enable businesses to have continuity in operations under volatile conditions. This observation goes with the available empirical data that AI increases flexibility of the supply chain, allows organizations to modify their processes, reorganize their operations, and effectively respond to unforeseen disruptions (Zaid & Jum'a, 2026) .. Additionally, empirical research shows that AI technologies will upgrade the traditional fixed supply chains to more flexible and adaptable systems because of enhanced coordination and integration of data (Bag et al., 2023). These results prove that AI-driven demand sensing enhances adaptive capability of logistics companies and contributes to their increased resilience and responsiveness to environmental shifts.

Moreover, the findings show that AI-based demand sensing accelerates decision-making to a considerable extent. According to the findings, AI helps organizations to handle large volumes of information in real time, create actionable insights, and make faster decisions regarding operations. This is especially relevant in the logistics industry, where decisions can only be made on time to ensure efficiency and competitiveness in the services. The finding can be backed up with empirical research indicating that AI-based analytics can enhance the speed of decision-making by allowing real-time insights, predictive modeling, and automated decision support systems (Wong et al., 2024)).. Furthermore, AI-enabled solutions increase the accuracy and rapidity of the decision-making process by decreasing the number of human interventions and automating the complicated analysis operations, thus contributing to the overall improvement in supply chain performance (Wamba et al., 2021). This implies that AI-based sensing of demand is one of the central enablers of prompt and knowledgeable decision-taking in the contemporary supply chains.

Additionally, the general results indicate that demand sensing using AI have a high and significant influence on supply chain agility. The model has a high explanatory power ($R^2 = 0.684$), which means that artificial intelligence-based ability to sense demands explain a significant percentage of volatility in agility results. This reaffirms the argument that AI is a building block technology towards realizing agile performance in a supply chain in uncertain and rapidly changing environment. This conclusion can be proved by empirical literature, which shows that AI leads to a more responsive, flexible, and real-time decision-making process (Zaid and Jum'a, 2026; Wamba et al., 2021) in relation to supply chain agility. Also, AI-powered forecasting and demand analytics applications decrease forecast error and enhance operational alignment, which increase the overall logistics operation agility and competitiveness.

In general, the research results of this paper indicate that AI-driven demand sensing is an important contributor to supply chain agility among logistics service providers in Nigeria. The overall positive correlation of the responsiveness, flexibility, and the speed of decision making observed also shows that AI can not only increase the efficiency of the operations but also the strategic ability of the organization to react to the environmental uncertainty. These results affirm that AI is a disruptive technology that could provide organizations with agility, resilience, and competitive advantage in the new supply chain systems. By implication, therefore, logistics companies that successfully embrace AI-based demand sensing systems have higher chances to attain better performance results and remain competitive in a more dynamic market.

5. Conclusion and Recommendations

This research explored how AI-driven demand sensing influences supply chain agility of some of the providers of logistics services in Nigeria. As can be seen by the findings, AI-based demand sensing has a positive and considerable impact on supply chain agility through better responsiveness, flexibility, and speed of decision making. In particular, the research concluded that AI-driven demand sensing is one of the key factors to enhance the responsiveness of a supply chain by allowing organizations to identify and respond promptly to evolving customer demand and operational issues. It is also more flexible to supply chains as it facilitates logistical planning which is adaptive, and helps firms to adapt effectively to disruptions. In addition, AI-driven demand sensing enhances the speed of decisions by processing the real-time data and speedy operational decisions.

The overall finding reveals that AI-driven demand sensing describes a significant percentage of changes in supply chain agility ($R^2 = 0.68\ 4$), thus demonstrating its high powers of prediction. This means the logistics service providers that implement AI-based technologies on demand sensing are in a better position to work effectively in dynamic and unstable contexts. In conclusion, the research confirms that AI-driven demand sensing is an essential condition of agile supply chain performance. It increases the ability of the organization in responding to uncertainty, and in improving the operational efficiency and in remaining competitive in the logistics industry.

From the study findings, the study makes the following recommendation:

1. To make better responses to customer changes in demand, the logistics service providers are advised to invest in AI-powered demand sensing technologies and include predictive analytics, machine learning, and real-time data systems within the scope.
2. Organizations are advised to have AI tools embedded in the logistics and operational planning management systems to enhance flexibility and rapid adjustment to disruption and environmental uncertainties.
3. To use AI-supported systems in decision-making, the management should utilize decision-support systems which are driven by AI to make decisions faster, provide operational responses that are correct and faster.
4. Companies ought to invest in electronic upskilling and unremitting training of the staff to make them more capable of using AI technologies in the supply chain with good performance.
5. Logistics firms ought to improve data infrastructure and encourage data assimilation between supply chain collaborators to optimize the advantages of AI structure based on demand sensing.

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