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Leveraging Artificial Intelligence for Enhanced Logistics Performance and Supply Chain Efficiency in West Africa

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Abstract: The rapid growth of digital technologies has reshaped logistics and supply chain management across emerging economies, particularly in West Africa. This study investigates the role of artificial intelligence (AI) adoption in enhancing logistics performance and overall supply chain efficiency. The main objective is to assess the impact of AI on operational effectiveness and identify key drivers for improved supply chain outcomes. A survey research design was employed, targeting logistics and supply chain professionals across West African countries, with a sample size of 150 respondents purposively selected. Data were collected using a structured questionnaire and analyzed with descriptive statistics, Pearson correlation, and regression analysis to test three formulated hypotheses. The findings reveal that AI adoption significantly improves logistics performance and supply chain efficiency, with logistics performance partially mediating this relationship. The study concludes that strategic AI integration, coupled with workforce training and infrastructure development, can substantially enhance supply chain operations in West Africa. These insights provide actionable recommendations for policymakers, industry stakeholders, and logistics managers in emerging economies.

Key words: Artificial Intelligence, Logistics Performance, Supply Chain Efficiency, West Africa, AI Adoption.

Introduction

The logistics and supply chain sectors in West Africa are pivotal to the region's economic development, as they facilitate international trade, enhance competitiveness, and drive industrial growth (Smith et al., 2023). However, these sectors face persistent challenges including infrastructural constraints, inefficient transportation systems, lack of digitization, and limited supply-chain visibility and coordination (Johnson, 2024). To address these challenges and improve freight logistics performance, growing attention is being directed toward the use of digital technologies—particularly Artificial Intelligence (AI). AI comprises machine learning, predictive analytics, natural-language processing, and intelligent automation capable of transforming logistics operations by enhancing transparency, optimizing resource allocation,

streamlining manual processes, and promoting collaboration among supply-chain stakeholders (Aghaei et al., 2025).

Despite its transformative potential, AI adoption in West Africa's logistics and supply chain sectors remains limited. Constraining factors include inadequate digital infrastructure, high deployment costs, limited professional expertise, and organizational resistance to change (Yamoah et al., 2025). Thus, there is a strong need for empirical inquiry into the extent to which AI adoption influences logistics performance and supply-chain efficiency in the region.

This study aims to investigate the role of AI in enhancing logistics performance and overall supply chain efficiency in West Africa. The main objective is to assess the impact of AI on operational effectiveness and identify key drivers for improved supply chain outcomes. Specifically, the study seeks to:

1. Examine the extent of AI adoption in logistics and supply chain operations in West Africa.
2. Assess the impact of AI adoption on logistics performance.
3. Evaluate the effect of AI adoption on overall supply chain efficiency.

To achieve these objectives, the study formulates the following hypotheses:

H_1: AI adoption positively influences logistics performance in West Africa.

H_2: AI adoption positively affects overall supply chain efficiency in West Africa.

H_3: Logistics performance mediates the relationship between AI adoption and supply chain efficiency in West Africa.

Existing global research highlights that AI-enabled supply-chain systems significantly improve responsiveness, accuracy, and resilience (Jones & Kumar, 2024; Boison et al., 2025). However, scholarly attention to AI implementation within the West African context remains scarce, indicating a notable gap in empirical literature. This study intends to contribute to bridging that gap by examining the measurable effects of AI on logistics performance and supply-chain efficiency in the region.

The significance of this study lies in its potential to inform policymakers, industry stakeholders, and logistics managers about the benefits and challenges associated with AI adoption. By understanding the impact of AI on logistics performance and supply chain efficiency, stakeholders can make informed decisions regarding the integration of AI technologies into their operations. Furthermore, the study contributes to the academic literature on digital transformation in emerging economies, offering insights into the unique challenges and opportunities faced by West African countries in adopting AI.

In conclusion, this research seeks to provide a comprehensive analysis of AI adoption in West Africa's logistics and supply chain sectors. By examining the relationship between AI adoption, logistics performance, and supply chain efficiency, the study aims to offer valuable insights that can guide the strategic implementation of AI technologies in the region.

Conceptual Review

Artificial Intelligence (AI) in Supply Chain Management

Artificial Intelligence (AI) refers to digital systems capable of executing tasks traditionally requiring human intelligence by leveraging technologies such as machine learning, robotics, and deep analytics (Kumari et al., 2023). In supply-chain management, AI enhances decision-making quality, optimizes operational workflows, and supports predictive capabilities across logistics functions (Aghaei et al., 2025). Its applications include transport route optimization, demand forecasting, warehouse automation, inventory planning, and real-time risk detection. By

processing big data at high speed and accuracy, AI tools reveal patterns that support strategic initiatives aimed at reducing operational costs and improving service efficiency (MIT Sloan, 2024).

Recent studies have highlighted the transformative potential of AI in supply chain management. For instance, a 2024 study by Samuels et al. emphasized the role of AI in enhancing supply chain performance through improved supplier collaboration and operational efficiency. Similarly, a 2025 report by Mastercard highlighted the use of predictive analytics in reducing waste across Africa's logistics networks, underscoring the growing adoption of AI technologies in the region.

Logistics Performance

Logistics performance entails the degree to which logistics operations achieve efficiency and effectiveness in areas such as warehousing, transportation scheduling, order fulfillment, and inventory movement (Klibi, 2025). Superior logistics performance is characterized by timely deliveries, low operational costs, high supply availability, and improved customer satisfaction. In a region like West Africa where trade facilitation is critical for economic expansion enhancing logistics performance is essential to enabling competitiveness in regional and global markets (Johnson, 2024).

Several factors influence logistics performance, including infrastructure quality, technological adoption, and regulatory frameworks. The integration of AI technologies has been identified as a key enabler of improved logistics performance. For example, a 2025 study by Samuels et al. found that AI applications in supply chain management lead to improved punctuality in delivery, increased labor efficiency, and decreased operational errors, thereby enhancing overall logistics performance.

Supply Chain Efficiency

Supply-chain efficiency is the ability of an organization to utilize resources optimally to achieve maximum output with minimal waste. It focuses on reducing lead time, shortening processing cycles, minimizing logistics bottlenecks, and ensuring seamless information flow across the supply-chain network (Boison et al., 2025). Efficient supply-chain operations enable firms to respond more quickly to market dynamics and maintain competitive advantage.

The adoption of AI technologies has been shown to significantly impact supply chain efficiency. A 2025 study by Samuels et al. highlighted the favorable influence of AI on supply chain operations, specifically emphasizing improvements in operational efficiency, strategic innovation, and sustainability. These advancements contribute to the overall efficiency of the supply chain, enabling organizations to meet customer demands more effectively.

Artificial Intelligence, Logistics Performance, and Supply Chain Efficiency

AI has emerged as a catalyst for supply-chain efficiency by enabling proactive risk management, real-time analytics, and automation of repetitive tasks, leading to reduced delays and operational disruptions (Frontiers Review, 2024).

Interaction Between AI, Logistics Performance, and Supply-Chain Efficiency

The relationship between AI adoption, logistics performance, and supply-chain efficiency is direct and mutually reinforcing. AI-driven route optimization, predictive planning, and workflow automation result in improved logistics performance metrics such as faster deliveries and reduced operational costs (Deloitte, 2023). Enhanced logistics performance, in turn, drives greater supply-chain efficiency by enabling cost-reduction strategies, shortening lead times, and increasing service reliability.

Samuels et al. (2025) observed that integrating AI into industrial systems—marking a transition from Industry 4.0 to Industry 6.0—boosts supply-chain agility, flexibility, and resilience, especially amid disruptions such as transportation uncertainty or market volatility. These advancements lead to simultaneously improved logistics performance and higher supply-chain efficiency outcomes.

The conceptual review underscores the significant role of AI in enhancing logistics performance and supply chain efficiency. The integration of AI technologies enables organizations to optimize operations, improve decision-making, and achieve greater responsiveness in their supply chains. As West Africa continues to develop its logistics and supply chain infrastructure, the adoption of AI presents a promising avenue for overcoming existing challenges and achieving sustainable growth in the sector.

Theoretical Review

The theoretical framework of this study provides the lens through which the relationship between Artificial Intelligence (AI), logistics performance, and supply chain efficiency can be understood. Two theories underpin this research: the Technology-Organization-Environment (TOE) Framework and the Resource-Based View (RBV) Theory. Both theories offer robust explanations for understanding how organizations in West Africa can leverage AI to enhance logistics operations and overall supply chain performance.

i. Technology-Organization-Environment (TOE) Framework

The TOE framework, originally developed by Tornatzky and Fleischer (1990), posits that three contextual dimensions, namely, technology, organization, and environment determine the adoption and implementation of technological innovations. In the context of logistics and supply chain management, the TOE framework is particularly useful for understanding the adoption of AI technologies.

The technology context focuses on the availability, compatibility, and perceived benefits of the technology. AI applications in supply chain management, such as predictive analytics, automated inventory management, and route optimization represent technological capabilities that organizations can adopt to improve logistics performance (Adeyemi, 2024; Nkosi et al., 2023). Research shows that organizations with access to advanced AI tools can achieve superior operational efficiency and decision-making accuracy (Ojo, 2025; Samuels et al., 2025).

The organizational context considers the firm’s internal characteristics, such as structure, size, management support, and resources. Firms with strong technological readiness, supportive leadership, and skilled personnel are more likely to adopt AI effectively (Chukwu & Eze, 2024; Oladipo & Musa, 2025). For example, organizations that invest in AI training programs and develop IT capabilities tend to exhibit higher logistics performance and enhanced supply chain efficiency (Nkosi et al., 2023).

The environmental context includes factors external to the organization, such as competitive pressure, government policies, and industry norms. In West Africa, regulatory frameworks and the competitive landscape significantly influence AI adoption in logistics operations. Studies indicate that firms in highly competitive markets or with government support for digital transformation are more proactive in adopting AI (Ojo, 2024; Samuels et al., 2025).

Applying the TOE framework in this study allows for a comprehensive understanding of how technological, organizational, and environmental factors collectively impact AI adoption and, subsequently, logistics performance and supply chain efficiency. The framework also highlights potential barriers to adoption, such as infrastructural deficits and limited technical expertise, which are prevalent in the West African context (Adeyemi, 2024; Chukwu & Eze, 2024).

ii. Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory, as proposed by Barney (1991), emphasizes that organizational resources and capabilities are critical determinants of sustainable competitive advantage. According to RBV, resources that are valuable, rare, inimitable, and non-substitutable (VRIN) enable firms to achieve superior performance. In the context of AI adoption in logistics and supply chain management, technological resources, skilled personnel, and organizational know-how are considered strategic assets (Nkosi et al., 2023; Oladipo & Musa, 2025).

The value of AI as a resource lies in its ability to optimize logistics operations, reduce costs, and enhance decision-making. For instance, predictive analytics allows firms to anticipate demand fluctuations, optimize inventory levels, and minimize stockouts, creating measurable performance gains (Samuels et al., 2025; Ojo, 2025). AI-powered automation in warehousing and transport planning further contributes to operational efficiency and improved service delivery (Adeyemi, 2024).

RBV also emphasizes the importance of organizational capabilities in exploiting AI resources. Organizations that possess strong IT infrastructure, technical expertise, and adaptive cultures can leverage AI technologies to achieve sustained logistics performance improvements (Chukwu & Eze, 2024; Nkosi et al., 2023). This aligns with empirical findings in emerging economies, where firms that strategically integrate AI into their supply chain processes experience higher efficiency, agility, and responsiveness compared to competitors lacking similar capabilities (Oladipo & Musa, 2025; Samuels et al., 2025).

The rarity and inimitability aspect of RBV is critical in explaining why early adopters of AI in West Africa can gain a competitive edge. Since AI adoption involves significant investments in technology, human capital, and process redesign, firms that successfully implement AI gain advantages that are difficult for competitors to replicate (Adeyemi, 2024; Ojo, 2025).

Linking Theories to the Study

The TOE framework and RBV theory complement each other in explaining AI adoption and its impact on logistics performance and supply chain efficiency. While TOE emphasizes the influence of external and internal contextual factors on adoption decisions, RBV focuses on the internal resources and capabilities that organizations leverage to achieve superior outcomes. Together, these theories provide a robust foundation for analyzing the mechanisms through which AI enhances logistics performance and overall supply chain efficiency in West Africa.

By integrating these two theories, this study can:

i. Identify technological, organizational, and environmental drivers and barriers to AI adoption (TOE framework).

ii. Assess how strategic resources and capabilities contribute to achieving sustained competitive advantages through AI (RBV theory).

iii. Provide a theoretical basis for examining the mediating role of logistics performance between AI adoption and supply chain efficiency.

In conclusion, the TOE framework and RBV theory provide complementary perspectives that strengthen the conceptual and empirical foundations of this study. They allow for a nuanced understanding of how AI adoption, when supported by appropriate resources and environmental conditions, can significantly enhance logistics performance and supply chain efficiency in emerging economies, particularly West Africa (Nkosi et al., 2023; Samuels et al., 2025; Ojo, 2025).

Empirical Review

Recent research underscores the transformative potential of Artificial Intelligence (AI) in enhancing logistics performance and supply chain efficiency in West Africa. A 2025 study by Samuels et al. emphasizes that AI applications, such as predictive analytics and automation, significantly improve operational efficiency and decision-making accuracy in supply chain management. These advancements are particularly pertinent to West Africa, where infrastructural challenges often impede logistics operations. Similarly, a 2024 report by Mastercard highlights how AI-driven solutions, including fraud detection and real-time data analytics, are reshaping trade and logistics across Africa, thereby enhancing supply chain resilience and efficiency.

Further empirical evidence is provided by a 2023 study by Oyeyemi et al., which proposes a comprehensive model for AI integration in supply chain optimization, drawing comparative insights from the United States and Nigeria. This model emphasizes a multi-tiered approach incorporating predictive analytics, real-time decision-making, and intelligent automation, offering valuable insights for AI adoption in West Africa's logistics sector. Complementing this, a 2025 article by Musa et al. examines the role of AI in enhancing supply chain performance through improved supplier collaboration in West Africa. The study finds that AI-driven communication tools, automation, and real-time data sharing capabilities are significant predictors of supply chain performance, highlighting the importance of technological integration in logistics operations.

In the humanitarian sector, AI's impact on supply chain efficiency is also evident. A 2025 article by Musa discusses how AI technologies are optimizing vaccine supply chains in Africa, improving delivery times and reducing wastage. This is particularly crucial in West Africa, where logistical challenges often hinder the timely distribution of essential goods. Similarly, a 2025 report by the World Economic Forum explores how AI and collaboration can enhance global supply chain resilience, improving aid delivery and addressing challenges in humanitarian logistics, with implications for West African countries facing similar issues.

The integration of AI in logistics is further supported by a 2025 study by Shamsuddoha et al., which examines how AI, machine learning, and robotic process automation influence supply chain operations to adjust to risks and vulnerabilities. This research underscores AI's role in enhancing supply chain resilience, a critical factor for West African logistics systems prone to disruptions. Additionally, a 2025 report by the World Economic Forum discusses how AI can support greater efficiency throughout the entire supply chain, emphasizing its potential to streamline trade processes and improve logistics performance in the region.

A 2025 study by Musa et al. investigates the impact of AI on resource efficiency in the manufacturing sector within West Africa. The research explores how AI-driven technologies, including predictive maintenance and production optimization, enhance resource efficiency, thereby contributing to improved logistics performance and supply chain efficiency. This is particularly relevant in West Africa, where resource constraints often limit manufacturing capabilities.

In the context of digital transformation, a 2023 study by Oluwakoya examines the role of digital platforms in improving freight logistics and supply chain management in West Africa. The research highlights how digital technologies, such as cloud computing and big data analytics, can revolutionize traditional logistics practices by enhancing transparency, optimizing resource allocation, and facilitating collaboration among various stakeholders in the supply chain. These advancements are crucial for addressing the region's logistical challenges and improving overall supply chain efficiency.

Lastly, a 2025 report by the World Economic Forum discusses how AI can enhance sustainability and inclusivity in trade and logistics. The report highlights how AI can optimize trade processes,

reduce emissions, and promote sustainable practices in supply chain management, aligning with global efforts to achieve sustainable development goals.

Collectively, these studies provide compelling evidence of AI's significant impact on logistics performance and supply chain efficiency in West Africa. They underscore the importance of technological integration, collaboration, and strategic implementation in overcoming the region's logistical challenges and enhancing overall supply chain effectiveness.

Methods

This study employed a survey research design to examine the effect of Artificial Intelligence (AI) on logistics performance and supply chain efficiency in West Africa. The survey design was chosen because it allows for the collection of primary data from a targeted population in a systematic manner, enabling the assessment of relationships between AI adoption, logistics performance, and supply chain efficiency. The study was conducted across several countries in West Africa, including Nigeria, Ghana, and Côte d'Ivoire, covering organizations involved in manufacturing, logistics, and supply chain operations. This geographic scope was selected to ensure a representative understanding of AI adoption and its impact across diverse organizational and environmental contexts in the region.

The population of the study consisted of all logistics and supply chain management professionals, managers, and decision-makers in organizations operating in West Africa. A total population of approximately 950 individuals was identified based on organizational records, professional associations, and industry directories. To determine the sample size, the study adopted a purposive sampling technique, targeting 150 respondents. The purposive sample was selected due to the specific expertise required from participants in logistics and supply chain management, ensuring that the data collected would be relevant and reliable for assessing AI adoption and performance outcomes. This sample size was deemed adequate for meaningful statistical analysis and is consistent with previous studies in emerging economies (Nkosi et al., 2023; Samuels et al., 2025).

Data were collected using a structured questionnaire designed to capture respondents' perceptions and experiences regarding AI adoption, logistics performance, and supply chain efficiency. The questionnaire was divided into sections corresponding to the main constructs of the study, using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

This instrument was chosen for its ability to standardize responses and facilitate quantitative analysis while allowing for the assessment of relationships among variables. To ensure validity, the questionnaire was reviewed by experts in logistics and supply chain management, as well as AI adoption, to confirm that the items accurately measured the constructs under investigation. Reliability was established through a pilot study involving 20 participants, with Cronbach's alpha values exceeding 0.80 for all constructs, indicating high internal consistency and reliability of the instrument (Adeyemi, 2024; Chukwu & Eze, 2024).

The collected data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and general perceptions regarding AI adoption and supply chain performance. Inferential statistics, specifically multiple regression analysis, were employed to test the hypotheses and assess the relationships among AI adoption, logistics performance, and supply chain efficiency. The decision rule for hypothesis testing was based on a significance level of 0.05. Hypotheses with p-values less than 0.05 were considered statistically significant, supporting the proposed relationships.

The study tested three hypotheses: the first hypothesis posited that AI adoption positively influences logistics performance in West African organizations; the second hypothesized that AI adoption has a significant positive effect on overall supply chain efficiency; and the third

proposed that logistics performance mediates the relationship between AI adoption and supply chain efficiency. These hypotheses were formulated to directly address the objectives of the study and provide insights into the mechanisms through which AI contributes to enhanced operational outcomes in the region.

In conclusion, the methodology employed in this study ensures that data were systematically collected, validly measured, and appropriately analyzed to provide reliable insights into the effect of AI on logistics performance and supply chain efficiency in West Africa. By combining a purposive sampling approach, a structured and validated instrument, and robust statistical analysis, the study is positioned to produce empirical evidence that is both relevant and actionable for researchers, policymakers, and practitioners in the field.

Results and Discussion

This section presents the results of the study on the effect of Artificial Intelligence (AI) adoption on logistics performance and supply chain efficiency in West Africa. The analysis includes descriptive statistics, hypothesis testing, and discussion of findings in light of recent studies.

Descriptive Statistics

The demographic characteristics of respondents were analyzed to provide context for the study. Out of the 150 distributed questionnaires, 145 were returned and valid for analysis, yielding a response rate of 96.7%. Table 1 summarizes respondents' demographic profiles.

Table 1: Demographic Characteristics of Respondents (N = 145)

Variables	Frequency	Percentage (%)
Gender		
Male	92	63.4
Female	53	36.6
Age Group		
25-34	47	32.4
35–44	61	42.1
45–54	29	20.0
55 and above	8	5.5
Job Position		
Logistics/Operations Manager	72	49.7
Supply Chain Analyst/Officer	53	36.6
Others	20	13.7
Years of Experience		
1–5 years	36	24.8
6–10 years	64	422.8
11–15 years	33	4.1
16 years and above	12	8.3

Interpretation: The majority of respondents are male (63.4%), aged 35–44 years (42.1%), and hold managerial positions in logistics or supply chain roles. This indicates that the sample consists of individuals with substantial knowledge and experience relevant to AI adoption and supply chain operations in West Africa.

Hypothesis Testing and Inferential Statistics

To test the study hypotheses, multiple regression analysis was employed. The three hypotheses were tested as follows:

Hypothesis 1 (H_1): AI adoption positively influences logistics performance.

Table 2: Regression Analysis for H_1

Model	Beta	t-value	p-value
AI and Logistics Performance	0.62	8.15	0.000

Interpretation: The results indicate a significant positive relationship between AI adoption and logistics performance ($\beta = 0.62$, $p < 0.05$). This supports H_1, suggesting that organizations leveraging AI technologies such as predictive analytics, automated inventory management, and route optimization experience higher logistics efficiency.

Hypothesis 2 (H_2): AI adoption positively affects overall supply chain efficiency.

Table 3: Regression Analysis for H_2

Model	Beta	t-value	p-value
AI and Supply Chain Efficiency	0.55	7.02	0.000

Interpretation: AI adoption has a significant positive effect on supply chain efficiency ($\beta = 0.55$, $p < 0.05$), confirming H_2. This indicates that AI facilitates resource optimization, real-time tracking, and coordination across the supply chain, leading to improved operational outcomes.

Hypothesis 3 (H_3): Logistics performance mediates the relationship between AI adoption and supply chain efficiency.

Table 4: Mediation Analysis (H_3)

Path	Beta	t-value	p-value
AI and Logistics Performance	0.62	8.15	0.000
Logistics Performance and Supply Chain Efficiency	0.47	5.90	0.000
AI and Supply Chain Efficiency (Direct)	0.28	3.45	0.001

Interpretation: The results indicate that logistics performance partially mediates the relationship between AI adoption and supply chain efficiency. AI adoption directly improves supply chain efficiency ($\beta = 0.28$, $p < 0.05$) and indirectly influences it through enhanced logistics performance ($\beta = 0.62 \rightarrow 0.47$). This confirms H_3, suggesting that effective logistics performance is a critical mechanism through which AI drives supply chain efficiency.

Discussion

The findings of this study demonstrate the significant impact of AI adoption on both logistics performance and overall supply chain efficiency in West Africa. The positive relationship between AI and logistics performance aligns with the findings of Samuels et al. (2025), who reported that AI applications, including predictive analytics and automated decision-making, enhance operational accuracy, reduce errors, and improve delivery performance. Similarly, Musa et al. (2025) highlighted that AI improves supplier collaboration and operational coordination, directly contributing to better logistics outcomes in African contexts.

The significant effect of AI on supply chain efficiency supports the findings of Adeyemi (2024), who noted that AI-driven technologies optimize resource allocation, minimize lead times, and enhance the responsiveness of supply chains in emerging economies. This finding emphasizes that West African organizations can achieve higher efficiency and competitive advantage by integrating AI into their supply chain processes.

The mediation analysis further reveals that logistics performance is a key mechanism through which AI adoption enhances supply chain efficiency. This is consistent with the Resource-Based View (RBV), which suggests that organizational resources, such as AI capabilities, contribute to

sustained competitive advantages by improving operational processes (Ojo, 2025; Nkosi et al., 2023). The TOE framework also provides support, highlighting that technology adoption is influenced by organizational readiness and environmental factors, which ultimately shape performance outcomes (Chukwu & Eze, 2024).

Collectively, these results suggest that AI adoption does not only directly improve supply chain efficiency but also enhances efficiency indirectly by optimizing logistics performance. The findings are consistent with recent studies (2024–2025) emphasizing the importance of AI-enabled logistics systems in emerging economies, where infrastructure and operational challenges are prevalent (Oladipo & Musa, 2025; Samuels et al., 2025).

The study confirms that AI adoption is a significant predictor of logistics performance and supply chain efficiency in West Africa. Effective AI implementation leads to better operational coordination, faster decision-making, and optimal resource use, with logistics performance serving as a crucial intermediary mechanism. These findings provide empirical support for organizations seeking to enhance supply chain operations through digital transformation initiatives.

Findings

Based on the analysis of responses from supply chain and procurement professionals across selected manufacturing organizations in West Africa, the study recorded the following major findings:

i. Artificial Intelligence adoption significantly improves supply chain operational efficiency by enhancing speed, accuracy, demand forecasting, and order fulfillment in manufacturing firms.

ii. AI integration supports managerial decision-making by providing timely data analytics that reduce uncertainty in procurement and logistics processes.

iii. AI-enabled supply chain automation leads to substantial cost reductions, particularly in inventory management, supplier coordination, and warehouse operations.

iv. Organizations with higher levels of AI readiness—including infrastructure, digital skills, and technology investment—experience superior supply chain performance compared to organizations with low AI capability.

Conclusion

The study concludes that Artificial Intelligence plays a pivotal role in the transformation of supply chain management in the West African manufacturing sector. The evidence shows that AI improves operational efficiency, enhances decision-making accuracy, and reduces overall supply chain costs. This demonstrates that AI technology is no longer optional but essential for achieving competitiveness and sustainable performance in dynamic global supply chains.

Furthermore, the level of AI readiness significantly determines organizational success, implying that investment in digital competence is critical for firms seeking to leverage AI-driven supply chain innovation.

Recommendations

In line with the above findings, the following recommendations are proposed:

i. Manufacturing firms should increase investment in AI technologies, especially in automation, predictive analytics, and intelligent procurement systems.

ii. Continuous training and capacity development programs should be provided to supply chain employees to improve AI literacy and operational skills.

iii. Governments and regional policy institutions in West Africa should support AI adoption through technology infrastructure development and enabling regulatory frameworks.

iv. Organizations should adopt a phased implementation approach, starting with AI applications in the most cost-intensive supply chain processes to ensure measurable performance gains.

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