Journal of Frontiers in Multidisciplinary Research

A model for AI Integration in Supply Chain Optimization: Case of the United States and Nigeria

Babatunde Bamidele Oyeyemi [1*], Akinbani Toluwanimi [2], Mosopeoluwa Awodola [3]
[1] Federal Polytechnic Offa, Nigeria
[2] Ekiti State University, Nigeria
[3] Ajayi Crowther University, Nigeria

* Corresponding Author: **Babatunde Bamidele Oyeyemi**

Article Info

E-ISSN: 3050-9726
P-ISSN: 3050-9718
Volume: 04
Issue: 01
January-June 2023
Received: 01-01-2023
Accepted: 03-02-2023
Published: 04-03-2023
Page No: 228-239

Abstract
The integration of Artificial Intelligence (AI) in supply chain management has emerged as a transformative strategy to enhance efficiency, resilience, and adaptability in complex global logistics networks. This proposes a comprehensive model for AI integration in supply chain optimization, drawing comparative insights from the United States and Nigeria two economies with contrasting technological infrastructures, regulatory frameworks, and economic dynamics. The model emphasizes a multi-tiered approach incorporating predictive analytics, real-time decision-making, and intelligent automation. In the U.S., AI adoption is characterized by advanced infrastructure, data availability, and investment in digital transformation, enabling real-time inventory management, demand forecasting, and autonomous logistics. Conversely, Nigeria presents a context of infrastructural challenges and data limitations, yet exhibits increasing potential for AI-driven solutions through mobile technology, cloud computing, and emerging policy support. The proposed model comprises four core pillars: (1) AI-readiness assessment focusing on digital infrastructure and data maturity; (2) phased AI adoption strategy tailored to sector-specific needs; (3) stakeholder collaboration for technological transfer and capacity building; and (4) policy alignment to foster ethical AI use and cross-border interoperability. Through comparative analysis, the model identifies key enablers and barriers within each country, highlighting opportunities for technology leapfrogging in Nigeria and continuous innovation in the U.S. This argues that while the scale and mode of AI integration may differ, the strategic alignment of technology, talent, and governance is essential for effective supply chain optimization in both regions. This research contributes to the discourse on inclusive AI deployment by illustrating how adaptable frameworks can bridge technological disparities and drive supply chain resilience. Ultimately, it underscores the importance of localized strategies within a global model, fostering both economic growth and digital equity. The findings serve as a guide for policymakers, industry leaders, and technology developers seeking to harmonize AI integration across diverse socio-economic contexts.

DOI: https://doi.org/10.54660/.IJFMR.2023.4.1.228-239

Keywords: Model, AI integration, Supply chain, Optimization, United States, Nigeria

1. Introduction

Enhancing the effectiveness, responsiveness, and general performance of the entire supply chain network which includes production, logistics, distribution, inventory control, and procurement is the goal of supply chain optimization, a strategic process. In order to improve service quality, reduce expenses, streamline operations, and match supply chain activities with overarching corporate objectives, analytical tools and methodologies are applied (Ezeamii *et al*., 2023; Francis Onotole, *et al*.,

2022). Optimizing supply chains is essential for businesses to stay flexible, lucrative, and customer-focused in the cutthroat, globalized world of today.

The field of supply chain management has seen a substantial transformation with the advent of artificial intelligence (AI). AI is the creation of computer systems that can learn, reason, make decisions, and recognize patterns—tasks that normally require human intelligence (Olanipekun, 2020). Within the supply chain environment, AI enables advanced capabilities such as demand forecasting, real-time inventory tracking, autonomous delivery systems, supplier risk assessment, and predictive maintenance. AI-powered solutions improve end-to-end coordination and enable proactive responses to disturbances by increasing visibility and control throughout the supply chain (Ayo-Farai *et al*., 2023; Ezeamii *et al*., 2023). As organizations increasingly turn to digital transformation to drive growth, AI serves as a critical enabler of smart, data-driven, and resilient supply chains.

Even though AI technologies are widely used, different nations have quite different approaches to their adoption and supply chain integration. The US is an example of a developed country with strong digital infrastructure, significant investments in AI research, and an established legislative framework that encourages innovation. Utilizing automation, machine learning, and big data to optimize operations and preserve competitive advantage, American companies have led the way in the application of AI in supply chains (Ogunyankinnu, *et al*., 2022, Kolade, *et al*., 2022).

Nigeria, on the other hand, is an emerging country with significant infrastructure problems, such as poorer technological penetration, inconsistent power supplies, and limited internet access. But because of its young population, expanding tech sector, and growing government interest in digital transformation, Nigeria also offers special potential (Ilori & Olanipekun, 2020). Insights into how AI integration tactics might be modified to accommodate varying technological and economic realities are provided by contrasting the United States and Nigeria. This promotes inclusive and context-sensitive innovation (Aderibigbe, *et al*., 2023; Ogbuagu, *et al*., 2023).

The goal of this review is to provide a thorough and flexible methodology for incorporating AI into supply chain optimization that works in both developed and developing nations. The model will cover the fundamental elements needed for successful AI adoption, such as governance frameworks, phased implementation plans, infrastructure preparedness, and stakeholder participation.

The review also aims to evaluate the AI integration pathways in Nigeria and the United States, highlighting important facilitators, obstacles, and lessons discovered. This comparative study advances our knowledge of how artificial intelligence (AI) can be used to improve supply chain performance in many contexts, fostering both technological innovation and just economic growth (Ajibola & Olanipekun, 2019, Olanipekun & Ayotola, 2019).

2. Methodology

This study employed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology to systematically identify, evaluate, and synthesize relevant literature for developing a model of AI integration in supply chain optimization, focusing on the United States and Nigeria. The review process was designed to ensure transparency, reproducibility, and comprehensiveness in the selection of sources.

The initial step involved a systematic search of academic databases, including Scopus, Web of Science, IEEE Xplore, PubMed, ScienceDirect, and Google Scholar. Search terms included combinations of keywords such as "Artificial Intelligence," "AI in supply chains," "supply chain optimization," "United States," "Nigeria," "developed economies," and "emerging economies." Boolean operators were used to refine and combine search terms for more accurate results.

Inclusion criteria focused on peer-reviewed articles, conference papers, white papers, and relevant policy documents published between 2013 and 2023. Only sources written in English and addressing AI applications in supply chain contexts were considered. Studies were included if they provided empirical, theoretical, or conceptual insights into AI-driven supply chain practices, particularly within the geographical contexts of the United States and Nigeria.

Exclusion criteria eliminated duplicate entries, non-English sources, and studies unrelated to AI or supply chain optimization. Articles focusing solely on other countries without reference to generalizable models or comparative frameworks were also excluded.

A total of 437 articles were initially identified. After removing 112 duplicates and applying the inclusion/exclusion criteria during the title and abstract screening, 142 articles remained for full-text review. Following this stage, 57 studies were selected for detailed qualitative synthesis and analysis.

The selected literature informed the development of the proposed AI integration model by identifying common frameworks, implementation strategies, infrastructural dependencies, policy recommendations, and case-specific challenges and enablers. This methodological approach ensures that the proposed model is grounded in evidence-based research and is adaptable to both advanced and emerging economies.

2.1 Conceptual Framework

The convergence of technological capabilities and theoretical underpinnings that direct successful implementation is the conceptual framework for incorporating artificial intelligence (AI) into supply chain optimization as shown in figure 1 (Kolade, *et al*., 2021). This section goes into detail on the fundamental AI technologies that are pertinent to supply chains, the particular SCM functions that are touched by these technologies, and the theoretical models that guide the structure and flexibility of the suggested AI integration model.

Artificial intellect is a broad category of technologies that mimic human intellect in order to automate decision-making, perform difficult jobs, and adjust to data patterns. A number of AI technologies are revolutionary in the field of supply chain management.

One of the most well-known subcategories of artificial intelligence in supply chains is machine learning (ML). Without explicit programming, it uses algorithms that learn from past and current data to forecast results and make defensible choices (Eyeghre *et al*., 2023; Olanipekun, Ilori & Ibitoye, 2020). Demand forecasting, supplier assessment, and logistics anomaly detection are three areas where machine learning excels.

Fig 1: Supply Chain Functions Impacted by AI

AI systems that decipher visual information from the real environment are referred to as computer vision (CV) systems. CV is used in supply chains for ship tracking, product identification, quality control, and warehouse automation. It increases total manufacturing and logistics productivity, decreases worker dependency, and improves operational accuracy.

Automation in material handling, packing, and storage is made possible by robotics, especially when combined with AI algorithms. Particularly in high-volume settings, autonomous mobile robots (AMRs) and robotic arms help to make operations quicker, safer, and more reliable (Belot, 2020).

Artificial intelligence (AI) systems can comprehend, interpret, and react to human language thanks to natural language processing, or NLP. NLP makes supply chains more responsive and efficient by facilitating contract analysis, supplier communication, and customer service automation (Schöpper and Kersten, 2021; Aslam and Calghan, 2023). AI technologies improve the efficiency, accuracy, and responsiveness of several supply chain functional domains.

One crucial area where AI greatly enhances performance is forecasting. To provide more precise demand estimates, machine learning algorithms examine vast datasets, such as customer behavior, weather patterns, and market trends. This decreases stockouts and lowers the expense of keeping inventory on hand. AI solutions in inventory management allow for dynamic storage optimization, automatic stock replenishment, and real-time tracking (Sanusi, 2023). These features enhance order fulfillment, cut down on waste, and match inventory levels to real demand.

Logistics operations benefit from AI through route optimization, autonomous vehicle deployment, and predictive maintenance. AI solutions analyze traffic patterns, fuel consumption, and delivery schedules to optimize transportation networks and minimize costs (Dikshit *et al*., 2023; Bharadiya, 2023).

In procurement, AI assists in supplier selection, contract management, and spend analytics. It enhances visibility into supplier performance, detects risks in supply chains, and identifies cost-saving opportunities through intelligent sourcing strategies.

AI's capacity to identify possible supply chain interruptions improves risk management. AI systems evaluate risk exposure and facilitate proactive contingency planning in response to geopolitical events and cyberthreats, guaranteeing supply chain operations' resilience and continuity (West, Kraut & Ei Chew, 2019). Three distinct theoretical underpinnings—systems theory, digital transformation frameworks, and innovation diffusion theory—are used to build an efficient and flexible AI integration model for supply chain optimization.

According to systems theory, the supply chain is an intricately linked system in which every part affects the overall performance. Strategic use of AI technology can optimize subsystems (such logistics or procurement) while making sure that modifications are consistent with the objectives of the entire system. This comprehensive approach guarantees coordination and synergy among various supply chain nodes (Alonge, *et al*., 2023; Oyewola, *et al*., 2022).

Frameworks for digital transformation offer a road map for incorporating cutting-edge technologies into corporate procedures. Stakeholder engagement, infrastructure readiness, capability creation, and change management are all highlighted in these frameworks. Organizations in the US and Nigeria can successfully deploy AI by navigating the structural and cultural changes required by using such a framework (Ramdoo, *et al*., 2021).

Everett Rogers created the innovation diffusion theory, which describes how innovative technologies proliferate in a social structure. When evaluating the possibility of AI adoption in various situations, key concepts like relative advantage, compatibility, complexity, trialability, and observability are helpful (Ananyi & nwosu, 2023; Olisah, 2023). AI may spread quickly in affluent nations like the US because of institutional support and technological capability, but in developing nations like Nigeria, adaption plans must take knowledge transfer and infrastructure limitations into account. The conceptual framework supports an organized and flexible approach to AI integration in supply chain optimization by combining theoretical insights with technological capabilities (Asa & Zosu, 2023; Nwagwu, *et al*., 2023). A context-sensitive model that takes into account the different requirements and capabilities of developed and emerging economies can be created thanks to this integrated viewpoint.

2.2 Country Contexts

To create a flexible model for AI integration in supply chain optimization, it is essential to comprehend the different national contexts of Nigeria and the United States (Aderibigbe *et al*., 2023; Arshad, 2023). Although the technological infrastructure, digital maturity, legal frameworks, and economic development of these two nations differ, they each provide special chances and difficulties for the integration of AI in supply chains.

In terms of digital innovation and technology infrastructure, the US leads the world. Its extensive usage of cloud computing, sophisticated data centers, high broadband penetration, and strong logistics infrastructure offer a strong basis for integrating AI into supply chain operations. The U.S. economy's level of digital maturity enables businesses to use AI in a wide range of supply chain tasks with a high level of sophistication and scalability (Akang, *et al*., 2019; Oriekhoe, *et al*., 2023).

In the US, supply chain AI applications are very common. Walmart uses data powered by AI to improve warehouse

operations and supplier relationships. While autonomous cars and drones are being tried for last-mile delivery, both startups and large corporations use AI-powered robotics for order picking and packing at fulfillment centers (Attah *et al*., 2023; Talla, 2022). Supply chain systems are becoming more resilient and agile through the use of digital twins, AI-based procurement tools, and predictive analytics.

AI and digital transformation are largely supported by the regulatory environment in the United States. Frameworks for AI risk management have been created by organizations like the National Institute of Standards and Technology (NIST), and innovation ecosystems are supported by federal and state financing through grants, tax breaks, and public-private partnerships. Venture capital activity, especially in innovation hotspots like Silicon Valley and Boston, further supports the investment climate (Esan, *et al*., 2023; Onukwulu, Agho & Eyo-Udo, 2023). These factors make it possible to quickly test and implement AI solutions across a range of industries, such as manufacturing, retail, and healthcare.

Nigeria, on the other hand, has serious infrastructure problems and supply chain inefficiencies. The efficient flow of goods and services is hampered by problems such inadequate road networks, unstable electrical supplies, a lack of storage facilities, and port congestion (Sahu *et al*., 2022). Particularly for small and medium-sized businesses, these inefficiencies raise logistical expenses and lower overall competitiveness. Frequent disruptions and stockouts are also a result of disjointed supply chain structures and poor visibility across operations (Ezenwa, 2019; Otokiti, *et al*., 2022).

Nigeria has a lot of promise for digital innovation despite these obstacles, especially given its expanding mobile connectivity. With 3G and 4G networks driving rising internet penetration, the nation boasts one of Africa's largest mobile phone user bases. Digital payments, supply chain tracking, and micro-logistics are already using mobile-based solutions. Platforms such as Kobo360 and TradeDepot, for instance, are utilizing digital technologies to establish real-time connections between distributors, retailers, and suppliers, providing early indicators of a supply chain change facilitated by digital technology (Ananyi & Nwosu, 2023; Ochinanwata, 2019).

Digital transformation is becoming more and more supported by government policy. The goal of initiatives like the Nigerian Innovation Fund and the National Digital Economy Policy and Strategy (2020–2030) is to promote a knowledge-based economy. The policy direction is favorable to promoting AI-driven solutions in manufacturing, logistics, and agriculture, even though there are still implementation gaps (Ebuka, Emmanuel & Idigo, 2023; Onukwulu, Agho & Eyo-Udo, 2023). Additionally, the private sector is acting as a catalyst. AI and data analytics are being used by startups in the finance, agritech, and logistics sectors to improve supply chains and solve market inefficiencies.

However, poor data infrastructure, low AI knowledge, and restricted access to finance limit the scope and pace of AI integration in Nigeria. Building capacity, forming strategic alliances, and customizing AI solutions for the local environment are all necessary to close this gap. While Nigeria is a developing context where AI may address enduring inefficiencies and open up new economic routes, the United States offers a developed, resource-rich setting where AI can be implemented at scale. These disparate realities highlight the necessity for a flexible, context-sensitive model for AI integration in supply chain optimization and offer a convincing basis for comparison analysis (Khalifa, Abd Elghany & Abd Elghany, 2021; Onyeaka, *et al*., 2023).

2.3 Proposed model for AI integration

With the US and Nigeria as examples, the suggested paradigm for integrating artificial intelligence (AI) into supply chain optimization is set up to offer a thorough, flexible, and context-sensitive road map for both developed and emerging economies. Stakeholder engagement and capacity building, policy and ethical governance, a phased deployment strategy, and an assessment of AI readiness make up the model's four interconnected parts. These elements work together to provide a strong and expandable framework for using AI to efficiently and fairly change supply chain processes.

The first component of the model focuses on evaluating the preconditions necessary for successful AI adoption. AI readiness is determined by assessing three key metrics: digital infrastructure, data availability, and workforce capacity.

Digital infrastructure refers to the presence of reliable internet connectivity, data centers, cloud computing platforms, and hardware necessary to support AI deployment (Matthew *et al*., 2021; Li *et al*., 2022). In the U.S., these infrastructures are well established, whereas in Nigeria, infrastructure is unevenly distributed and often concentrated in urban areas.

Data availability pertains to the existence of high-quality, real-time, and structured data across supply chain operations. Effective AI systems require vast datasets for training and continuous learning. However, many Nigerian organizations operate with limited digital records or fragmented databases, posing a challenge to AI functionality (Otuoze, Hunt & Jefferson, 2021; Yusuf & Al-Ansari, 2023).

The availability of qualified experts like data scientists, AI engineers, and logistics analysts is a component of workforce capacity. With the help of prestigious institutions and tech firms, the United States boasts a robust pipeline of AI expertise (Ijeomah, 2020; Onukwulu, Agho & Eyo-Udo, 2023). Nigeria, on the other hand, is just beginning to develop a proficient digital workforce, which calls for focused investment in training and education.

Given the intricacy of integrating AI, the strategy takes a staged approach that enables businesses to progressively increase capacity and scalability. There are three phases to this approach.

Organizations launch pilot programs to evaluate particular AI applications in low-risk settings during the short-term phase. These experiments could involve predictive maintenance in logistics systems, chatbots for customer support, or demand forecasting technologies (Eyeghre *et al*., 2023). Stakeholder alignment, experimentation, and proof-of-concept validation are all made possible at this phase. Scaling effective solutions across various supply chain functions is the main goal of the medium-term phase. An AI-driven inventory optimization model, for instance, that has been evaluated in a single distribution center can be extended regionally or nationwide. To enable widespread adoption, this stage necessitates spending on change management, employee training, and systems integration (Lubag, *et al*., 2023; Olaghere, Inegbedion & Osiobe, 2023).

Full AI maturity, when AI is integrated across the supply

chain as an independent decision-making partner, is the goal of the long-term phase. At this stage, businesses employ AI to continuously track, improve, and modify supply chain operations, resulting in increased customer responsiveness, agility, and resilience. Key stakeholders, including the government, business, academia, and foreign partners, must actively participate in order for AI integration to be successful (Egwim, *et al*., 2023; Ogbuagu, *et al*., 2023).

By establishing enabling laws, providing capital for innovation hubs, and guaranteeing regulatory support for digital transformation, governments play a fundamental role. Implementation and innovation are fueled by industry participants such as supply chain managers, logistics companies, and IT developers. By performing research, educating the workforce, and assessing the efficacy of AI, academia makes a contribution (Ahmed, *et al*., 2023; Qi, *et al*., 2017). Donor agencies and international development organizations can help with infrastructure investment and capacity building, especially in nations like Nigeria.

Collaborative platforms involving these stakeholders can facilitate knowledge exchange, foster innovation ecosystems, and create a shared vision for AI-enabled supply chains.

Finally, policy and ethical governance are critical to ensuring responsible AI integration. Data protection is essential to guard against misuse of personal and corporate information. Countries must enact and enforce laws aligned with global standards such as the General Data Protection Regulation (GDPR).

Algorithmic fairness makes ensuring AI models don't exclude or perpetuate prejudices. Building trust in AI judgments requires transparency in auditing procedures and algorithm design (Althabatah, *et al*., 2023; Negi, 2021). Particularly for global supply chains, cross-border regulation is becoming more and more important. Regulatory framework harmonization promotes cross-jurisdictional compliance, data flow, and system interoperability. The suggested AI integration model provides a comprehensive approach to supply chain optimization in both established and developing environments. Organizations may fully utilize AI to improve supply chain performance, resilience, and inclusivity by evaluating preparedness, adopting in phases, involving stakeholders, and maintaining ethical governance (Danese, Romano & Formentini, 2013; Oteri, *et al*., 2023).

2.4 Comparative Analysis

Supply chain optimization through the use of artificial intelligence (AI) is a revolutionary approach that has many advantages but also unique difficulties as shown in figure 2. Given the disparities in the two nations' technological, economic, and infrastructure environments, a comparison of the adoption of AI in the US and Nigeria identifies both shared facilitators and particular obstacles. Since both countries can gain from the sharing of information and experiences in AI integration, it is essential to comprehend these elements in order to find chances for mutual learning (Richey, *et al*., 2022; Simchi-Levi, Wang & Wei, 2018).

The adoption of AI in supply chains is facilitated by a number of factors, with infrastructure, finance, and regulatory backing acting as the main motivators in both established and emerging markets.

The extensive availability of cutting-edge technology infrastructure in the US offers a major benefit. AI systems can operate at scale because to the country's vast data centers, fast internet networks, and availability of cloud computing platforms. Innovations like autonomous supply chain management systems, machine learning, and predictive analytics are supported by this infrastructure (Qrunfleh & Tarafdar, 2014; Wang, *et al*., 2016). Furthermore, the United States has strong funding sources, such as government grants, private investments, and venture capital, all of which promote AI research and development.

Adoption of AI is also greatly aided by regulatory assistance. To guarantee the responsible development and application of AI technologies, the United States has set up explicit frameworks, such as those offered by the National Institute of Standards and Technology (NIST). These rules encourage creativity while preserving public confidence in AI applications, especially in delicate industries like banking and healthcare (Mwangi, 2019; Zohuri & Moghaddam, 2020).

Although Nigeria's technological infrastructure is not as advanced as that of the United States, there have been significant advancements in internet penetration and mobile connectivity. Digital platforms have emerged in retail, logistics, and agriculture thanks to the quick development of 3G and 4G networks. Furthermore, promoting digital innovation and facilitating the deployment of AI technology are the main objectives of government policies like the National Digital Economy Policy (Vinnyk *et al*., 2021; Gomes *et al*., 2022). However, there are still infrastructure gaps that prevent AI from being widely used in supply chain operations, especially in rural areas. In comparison to the U.S., there are fewer venture capital firms and private equity investors, making funding sources even more scarce.

While several enablers exist, AI adoption faces significant barriers and risks in both the United States and Nigeria, though these obstacles manifest differently in the two contexts.

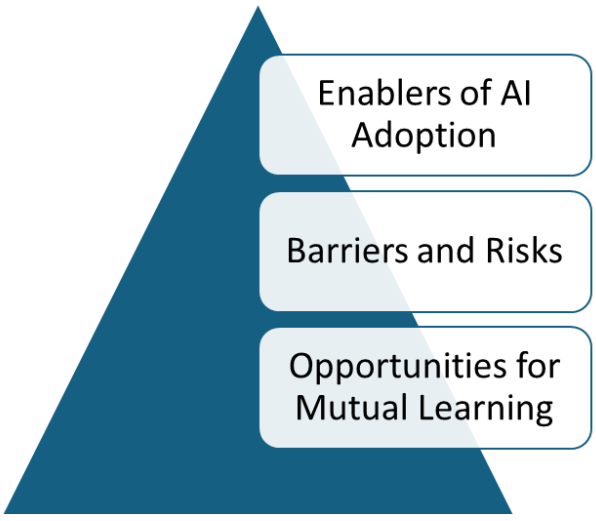

Fig 2: Comparative Analysis

The fundamental issue with AI integration is still cybersecurity. Even while cybersecurity safeguards are rather sophisticated in the United States, the complexity of AI systems makes intrusions more likely, especially in industries like e-commerce and logistics. To safeguard AI systems against hacking, data theft, and system manipulation, businesses need to make significant investments in a strong security architecture. Supply chains in Nigeria are especially susceptible to assaults due to the country's immature

cybersecurity frameworks and lack of resources to fight cybercrime (Hall, T. and Ziemer, 2023; Kayode-Ajala, 2023). The deployment of AI in both countries is made more difficult by concerns about data privacy and intellectual property protection.

Another major obstacle is the cost of putting AI into practice. Even though the price of AI technology is steadily declining in the United States, small and medium-sized businesses (SMEs) still cannot afford the required staff, hardware, and software. Due to a lack of investment in digital infrastructure and limited financial resources, the problem is much more severe in Nigeria. Nigerian organizations can have trouble defending the up-front expenses of implementing AI, particularly if there isn't much of a rapid return on investment. Although talent gaps are a significant obstacle in both nations, they are particularly serious in Nigeria because there aren't enough qualified AI specialists there. The speed and scope of AI implementation are constrained by the lack of AI engineers, data scientists, and other specialized specialists in the United States, despite the country having a sizable talent pool. The skill gap in Nigeria is being widened by the fact that training programs and educational systems have not yet completely adjusted to the demands of the AI-driven economy (Dong, *et al*., 2020; Tien, *et al*., 2019).

Resistance to change is another barrier common to both countries. In the U.S., companies with established supply chain systems may resist AI adoption due to a preference for maintaining traditional, proven methods. Similarly, in Nigeria, there is a cultural reluctance to embrace new technologies, particularly in sectors that are heavily reliant on informal practices and legacy systems. This resistance can slow down the rate of AI integration and undermine its potential benefits (Javaid, *et al*., 2022; Lu, 2019; Zhang & Lu, 2021).

Notwithstanding the difficulties, there are a lot of chances for the US and Nigeria to learn from one another when it comes to using AI to optimize supply chains. Innovation transfer is a significant potential. Nigeria can learn from the United States about best practices for implementing AI, particularly in fields like inventory management, automation, and predictive analytics. Conversely, Nigerian businesses can impart adaptive tactics to U.S. enterprises for overcoming resource limits and infrastructure bottlenecks (Otokiti *et al*., 2022; Ashiru *et al*., 2023). U.S. businesses seeking to improve supply chain accessibility and inclusivity may find value in Nigeria's creative mobile-first strategies.

Scalable models also present significant opportunities for both nations. While the U.S. may focus on scaling AI solutions in well-established supply chains, Nigeria's evolving logistics landscape offers an opportunity to develop scalable, low-cost AI models that can later be adapted to larger, more resource-rich markets. These models could be tested in Nigerian SMEs and then scaled to global supply chains, offering insights into cost-effective AI solutions for emerging markets.

PPPs, or public-private partnerships, offer yet another channel for cooperation and learning from one another. In order to promote AI research and its applications, the U.S. government has been effective in fostering cooperation between public agencies, academic institutions, and commercial tech enterprises. By encouraging collaborations between its government, the commercial sector, and international development organizations, Nigeria can implement comparable tactics to promote the adoption of AI (Oyegbade *et al*., 2022). These partnerships have the potential to close talent gaps, develop a sustainable AI ecosystem, and draw in much-needed capital for infrastructure and capacity expansion. While there are significant differences in AI adoption between the United States and Nigeria, both countries stand to gain from a comparative approach Duan, Edwards & Dwivedi, 2019; Korteling, *et al*., 2021; Tien, 2017. By leveraging each other's strengths, addressing common barriers, and fostering collaboration, the two nations can advance AI integration in supply chain optimization and unlock the full potential of AI technologies in improving efficiency, resilience, and competitiveness (Gebhardt *et al*., 2022).

2.5 Implementation Roadmap

A clear roadmap that considers the particular opportunities, difficulties, and resources present in both developed and emerging economies is necessary for the application of AI in supply chain optimization (Jarrahi, 2018; Terziyan, Gryshko & Golovianko, 2018). The adoption of AI technology should be facilitated by this roadmap in a way that optimizes advantages, removes obstacles, and guarantees ongoing development. The scenarios in Nigeria and the United States present different strategies for adopting AI, with the environment of each nation affecting its approach. Furthermore, in order to evaluate the success of integrating AI and promote ongoing improvements, a strong monitoring and evaluation system is essential.

The application of AI in supply chain optimization in the United States is concentrated on improving operational effectiveness and using predictive analytics to promote more intelligent decision-making. The United States is well-positioned to deploy AI solutions at scale across a variety of industries, including manufacturing, shipping, and retail, thanks to its developed technology infrastructure. The main obstacle facing American businesses is incorporating AI technologies into intricate supply chain systems in a way that lowers costs and increases efficiency without interfering with daily operations.

The potential to improve predictive analytics is one of the main advantages of integrating AI into the US supply chain environment. More precise demand forecasting, inventory control, and route optimization are made possible by AI technologies like machine learning (ML) and deep learning (DL) (Janiesch *et al*., 2021; Heidari *et al*., 2022). Businesses can minimize operational inefficiencies, optimize stock levels, and predict market swings thanks to these skills.

Furthermore, by anticipating possible supply chain interruptions, AI-powered predictive analytics can also be utilized to enhance risk management. Large volumes of historical and current data can be analyzed by machine learning models to find trends and forecast occurrences like delays, equipment malfunctions, or natural disasters. By guaranteeing on-time delivery, American businesses may increase supply chain resilience, reduce risks, and raise customer satisfaction.

For the U.S. scenario, the focus of the implementation roadmap should prioritize scaling AI solutions that enhance efficiency, provide a competitive advantage, and improve decision-making processes. This includes investing in cloud platforms that support AI and advanced data analytics, as well as upskilling the workforce to effectively manage and interpret AI-driven insights.

Due to issues with resource availability, digital adoption, and

inadequate infrastructure, the situation is very different in Nigeria. But there are also special chances to leapfrog using cloud-based and mobile AI tools in this setting. The quick uptake of mobile technology offers a chance to get around traditional infrastructure bottlenecks and jump straight into more advanced, effective supply chain management systems that use artificial intelligence, even though Nigeria's technological infrastructure is still developing (Adenubi *et al*., 2021; Jarrahi, 2018; Terziyan, Gryshko & Golovianko, 2018).

Nigeria's demands are best served by mobile and cloud-based AI platforms since they provide an affordable, scalable, and adaptable way to deal with inefficiencies in inventory management, procurement, and transportation. For instance, Nigerian supply lines frequently encounter logistical difficulties like inadequate road systems and unstable transit systems. Real-time route optimization can be facilitated by AI-powered mobile platforms, which use satellite imagery and data from mobile networks to direct delivery vehicles around congested or subpar roadways. Additionally, without having to make significant investments in on-premises infrastructure, AI-driven inventory management systems can assist small and medium-sized businesses (SMEs) in better tracking products, managing stock levels, and forecasting demand.

This kind of leapfrogging can also present a chance to include e-commerce platforms and mobile payment systems into supply chains powered by artificial intelligence. The integration of AI supply chain management technologies with mobile banking and mobile-based transactions, which are now popular among Nigerian customers, can enhance cash flow, lower fraud, and expedite procurement procedures (Nnene, 2022; Talla, 2022). A favorable policy climate for the adoption of AI is also provided by the Nigerian government's emphasis on developing digital economies and programs like the National Digital Economy Policy.

In the Nigerian scenario, the implementation roadmap should focus on mobile-first solutions and cloud platforms to maximize the reach and scalability of AI adoption. Key to this approach is ensuring that mobile AI tools are accessible to a wide range of stakeholders, including small businesses, and that they are adaptable to the realities of Nigeria’s infrastructure constraints.

For AI integration to be successful, both the U.S. and Nigerian scenarios require a clear and consistent monitoring and evaluation framework. This framework should include Key Performance Indicators (KPIs) to assess the impact of AI technologies, ensure continuous improvement, and adjust implementation strategies as necessary.

KPIs in the US environment may concentrate on indicators related to operational efficiency, including shorter lead times, higher inventory turnover rates, or lower logistical costs. Furthermore, it would be essential to assess AI's decision-making efficacy using KPIs associated with predictive accuracy, such as advancements in risk prediction or demand forecasting. Since AI-driven advancements in delivery times, product availability, and individualized customer care are essential to preserving a competitive edge, the US may also monitor consumer satisfaction indices.

KPIs in Nigeria should be centered on resolving capacity and infrastructure issues. Despite difficulties with road infrastructure, key signs could include shorter delivery times, more accurate inventory management, or fewer stockouts. Furthermore, assessing the success of the deployment would require tracking increases in the operational efficiency of these businesses and gauging the rate at which SMEs embrace mobile AI platforms (Aderibigbe, *et al*., 2023; Ogbuagu, *et al*., 2023).

The monitoring procedure must to have a continuous improvement approach. AI systems must to be updated and retrained on a regular basis in light of new information, changing market dynamics, and developing technologies. By doing this, both Nigeria and the United States will be able to take full advantage of AI's long-term effects and stay adaptable to shifting supply chain conditions. The implementation roadmap for supply chain optimization using AI in the United States and Nigeria should be customized to meet the unique requirements and circumstances of each nation. Both nations may profit from AI's revolutionary potential by improving efficiency in the United States through predictive analytics and overcoming infrastructural obstacles in Nigeria using mobile and cloud-based AI systems. A strong monitoring and evaluation framework, supported by clear KPIs and a commitment to continuous improvement, will ensure the long-term success and scalability of AI in supply chain operations (Kuchenmüller *et al*., 2022; Kalf *et al*., 2023).

2.6 Policy and strategic recommendations

Governments, business executives, and development organizations must work together to successfully integrate AI into supply chain optimization (Modgil *et al*., 2022; Tsolakis *et al*., 2023). The ecosystem that encourages the adoption of AI technologies is shaped in large part by development organizations, industry leaders, and policymakers. To guarantee AI provides long-term advantages, each group has unique chances and obligations. With an emphasis on the roles of development organizations, business executives, and legislators, the ensuing sections provide policy and strategic proposals meant to facilitate AI integration in supply chains.

Policymakers have a significant role to play in creating an enabling environment for AI integration into supply chains. The adoption of AI technologies hinges on supportive legislation, a conducive regulatory framework, and policies that encourage investment in innovation. In both developed and emerging markets like the U.S. and Nigeria, effective government policies can provide the foundation for the successful integration of AI into supply chain operations.

The creation of supportive legislation that encourages the advancement and uptake of AI technologies is one of the main policy proposals. Legislators ought to enact rules and laws that support the ethical and secure application of AI in supply chains while giving data privacy, algorithmic openness, and AI ethics first priority. In order for businesses to use AI-powered platforms that need access to global data sources, legislation should also promote cross-border data flows (Duan, Edwards & Dwivedi, 2019; Korteling, *et al*., 2021; Tien, 2017). Policies should concentrate on lowering obstacles to technology adoption in developing nations like Nigeria, such as exorbitant digital tool rates, restricted access to money, and insufficient digital infrastructure.

Furthermore, tax breaks for enterprises who spend money on AI R&D can promote innovation and the adoption of AI technologies. These tax breaks may take the form of credits or deductions for businesses that hire AI specialists, invest in AI technology, or create new AI-based goods and services. By encouraging businesses to investigate AI's potential in supply chain optimization, such policies will hasten the

industry's adoption of AI.

Moreover, thorough data policies are necessary for integrating AI. The creation of transparent data governance frameworks that enable data gathering, sharing, and analysis while preserving security and privacy should be a top priority for policymakers (Weller and Bramble, 2023; Duvvur, 2023). AI systems will be able to function more effectively if data-sharing agreements and procedures for cross-border data flows are established, especially in global supply chains. This would entail aiding efforts in Nigeria to increase data quality and availability, as this is frequently a deterrent to the use of AI in emerging countries.

Industry leaders in both developed and emerging markets play a critical role in driving AI adoption and ensuring its successful integration into supply chains. As AI technologies are complex and can disrupt traditional business models, industry leaders must take proactive steps to invest in AI R&D, training, and integration.

Investing in AI research and development is a crucial suggestion for business executives looking to spur innovation and boost supply chain efficiency. To stay on the cutting edge of AI developments and make sure they are prepared to take advantage of new AI solutions, businesses should collaborate with universities, startups, and technology suppliers (Pantanowitz *et al*., 2022; Ramdoo, *et al*., 2021). In addition to encouraging technological innovation, this cooperative strategy will facilitate knowledge exchange and problem-solving throughout the supply chain ecosystem.

Furthermore, personnel upskilling and training are essential to the effective implementation of AI. To give their staff the skills they need to operate and maintain AI systems, industry leaders should give top priority to creating training programs that are specifically focused on AI. This could entail collaborating with academic institutions and technical schools in the US to develop specific programs that teach supply chain management and AI principles. Partnerships with international organizations and technical institutes can assist develop a competent workforce capable of adopting AI technology in Nigeria, where access to AI expertise is more limited.

Another issue that many firms deal with is integrating AI with older systems. Leaders in the industry must implement AI integration in stages, starting with pilot projects and progressively expanding AI solutions throughout the supply chain. Businesses can avoid disturbance and gradually benefit from automation and improved decision-making by integrating AI with their current systems (Ananyi & Nwosu, 2023; Ochinanwata, 2019). Additionally, companies need to make sure that they continue to prioritize cybersecurity because the use of AI may expose supply chains to additional risks associated with data breaches and cyberattacks.

Development agencies play a pivotal role in supporting AI adoption in emerging markets, where resources and infrastructure may be limited. For countries like Nigeria, development agencies can provide critical funding models, technical assistance, and capacity-building initiatives that facilitate AI adoption in supply chains.

Financing AI-based projects and efforts in emerging economies is one of the main responsibilities of development organizations. Businesses in poor nations may be able to access AI technologies and apply solutions that tackle regional supply chain issues with the help of grants, loans, or public-private partnerships (Brandusescu, 2021; Avevor *et al*., 2023). Projects with the potential to generate social and economic advantages, like bettering food distribution, cutting waste, and expanding access to necessities, should be the main emphasis of these funding models.

To guarantee the successful implementation of AI technologies, development organizations should concentrate on offering technical support to companies in emerging markets. This can entail giving access to training and capacity-building initiatives, assisting in the growth of regional innovation ecosystems, and providing advice services on the selection and integration of AI technologies. Development organizations can assist companies in emerging markets in overcoming obstacles to AI adoption, such as a lack of local knowledge, restricted access to technology, and poor infrastructure, by offering practical assistance.

Lastly, to promote AI innovation in supply chains, development organizations can cultivate collaborations between the public and commercial sectors. Building local capacities, sharing resources, and expediting the adoption of AI-based solutions are all made possible through public-private partnerships (Olanipekun, Ilori & Ibitoye, 2020). Development organizations (NGOs), corporations, and governments can work together to establish synergies that will allow AI to revolutionize supply chains in developing nations.

Conclusion

With notable gains in productivity, accuracy of predictions, and cost savings, the use of artificial intelligence (AI) into supply chain optimization holds the potential to completely transform supply networks around the globe. Using the US and Nigeria as sample case studies from rich and emerging economies, this has presented a thorough methodology for integrating AI in supply chains. The suggested model is set up to be flexible in a variety of situations, taking into account the particular opportunities and difficulties faced by any nation.

One important takeaway from this is how crucial it is to customize AI integration to the unique technological, infrastructure, and economic circumstances of any nation. The emphasis is on improving scalability, operational efficiency, and predictive analytics in the United States, which has sophisticated digital infrastructure and mature AI. On the other hand, Nigeria may overcome its supply chain inefficiencies and infrastructure limitations by utilizing cloud-based and mobile AI platforms, which provide scalable solutions without necessitating significant expenditures in conventional infrastructure. Additionally, stakeholder engagement, capacity building, and policy governance are essential components for successful AI adoption in both contexts.

The significance of developing a context-sensitive AI integration model cannot be overstated. A one-size-fits-all approach would likely overlook the unique barriers and opportunities within different countries. A context-sensitive model ensures that AI technologies are implemented in ways that maximize their impact, leading to more sustainable and scalable supply chain improvements.

Future studies should examine how AI integration affects supply chains over the long run in both industrialized and emerging nations, paying special attention to concerns like data protection, ethical ramifications, and employment repercussions. Furthermore, studies should focus on how AI may be used to global supply chain issues including sustainability and pandemic and climate change resistance.

Practically speaking, it is imperative to conduct further research on public-private partnerships and the function of international development organizations in promoting the use of AI in developing nations. AI has revolutionary potential, and achieving its full potential in a variety of scenarios will require more study and application.

References

1. Adenubi OT, Temoso O, Abdulaleem I. Has mobile phone technology aided the growth of agricultural productivity in sub-Saharan Africa? South African Journal of Economic and Management Sciences. 2021;24(1):1-9.
2. Aderibigbe AO, Ohenhen PE, Nwaobia NK, Gidiagba JO, Ani EC. Artificial intelligence in developing countries: Bridging the gap between potential and implementation. Computer Science & IT Research Journal. 2023;4(3):185-199.
3. Aderibigbe AO, Ohenhen PE, Nwaobia NK, Gidiagba JO, Ani EC. Artificial intelligence in developing countries: Bridging the gap between potential and implementation. Computer Science & IT Research Journal. 2023;4(3):185-199.
4. Aggarwal P, Aggarwal A. AI-Driven Supply Chain Optimization in ERP Systems Enhancing Demand Forecasting and Inventory Management. International Journal of Management, IT & Engineering. 2023.
5. Ahmed T, Karmaker CL, Nasir SB, Moktadir MA, Paul SK. Modeling the artificial intelligence-based imperatives of industry 5.0 towards resilient supply chains: A post-COVID-19 pandemic perspective. Computers & Industrial Engineering. 2023;177:109055.
6. Ajibola KA, Olanipekun BA. Effect of access to finance on entrepreneurial growth and development in Nigeria among "YOU WIN" beneficiaries in SouthWest, Nigeria. Ife Journal of Entrepreneurship and Business Management. 2019;3(1):134-149.
7. Akang VI, Afolayan MO, Iorpenda MJ, Akang JV. Industrialization of the Nigerian economy: The imperatives of imbibing artificial intelligence and robotics for national growth and development. In: Proceedings of: 2nd International Conference of the IEEE Nigeria. 2019:265.
8. Alonge EO, Eyo-Udo NL, Ubanadu BC, Daraojimba AI, Balogun ED, Ogunsola KO. Real-Time Data Analytics for Enhancing Supply Chain Efficiency. Journal of Supply Chain Management and Analytics. 2023;10(1):49-60.
9. Althabatah A, Yaqot M, Menezes B, Kerbache L. Transformative procurement trends: Integrating industry 4.0 technologies for enhanced procurement processes. Logistics. 2023;7(3):63.
10. Ananyi SO, Nwosu LK. Artificial Intelligence and Economic Aspects of Nigerian Public Universities. 2023.
11. Ananyi SO, Nwosu LK. Utilizing artificial intelligence for enhancing the economic aspects of Nigerian public universities. In: 3rd International Conference on Institutional Leadership and Capacity Building in Africa. 2023:383.
12. Arshad MIKBM. Assessment of the Technological Dimension in the Industrial and Development Policies in Malaysia [Master's thesis]. University of Malaya (Malaysia); 2023.
13. Asa KJ, Zosu SJ. Enhancing procurement and supply chain management for sustainable development through digital transformation. International Journal of African Research Sustainability Studies. 2023.
14. Ashiru F, Nakpodia F, You JJ. Adapting emerging digital communication technologies for resilience: evidence from Nigerian SMEs. Annals of Operations Research. 2023;327(2):795-823.
15. Aslam F, Calghan J. Using NLP to Enhance Supply Chain Management Systems. Journal of Engineering Research and Reports. 2023;25(9):211-219.
16. Attah RU, Ogunsola OY, Garba BMP. Revolutionizing logistics with artificial intelligence: Breakthroughs in automation, analytics, and operational excellence. Iconic Research and Engineering Journals. 2023;6(12):1471-1493.
17. Avevor M, Attionu GT, Osahor D, Azonuche T, Tawo O. Beyond funding: rethinking small business administration strategies and public-private partnerships for minority-owned business resilience (AI, FinTech, and Policy Synergy). 2023.
18. Ayo-Farai O, Obianyo C, Ezeamii V, Jordan K. Spatial Distributions of Environmental Air Pollutants Around Dumpsters at Residential Apartment Buildings. 2023.
19. Belot ST. The state and impact of the Fourth Industrial Revolution on economic development. 2020.
20. Bharadiya JP. Artificial intelligence in transportation systems a critical review. American Journal of Computing and Engineering. 2023;6(1):35-45.
21. Brandusescu A. Artificial intelligence policy and funding in Canada: Public investments, private interests. Private Interests. 2021.
22. Danese P, Romano P, Formentini M. The impact of supply chain integration on responsiveness: The moderating effect of using an international supplier network. Transportation Research Part E: Logistics and Transportation Review. 2013;49(1):125-140.
23. Dikshit S, Atiq A, Shahid M, Dwivedi V, Thusu A. The use of artificial intelligence to optimize the routing of vehicles and reduce traffic congestion in urban areas. EAI Endorsed Transactions on Energy Web. 2023;10:1-13.
24. Dong Y, Hou J, Zhang N, Zhang M. Research on how human intelligence, consciousness, and cognitive computing affect the development of artificial intelligence. Complexity. 2020;2020(1):1680845.
25. Duan Y, Edwards JS, Dwivedi YK. Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda. International Journal of Information Management. 2019;48:63-71.
26. Duvvur V. AI-Driven Data Migration: Intelligent, Secure, and Scalable Approaches for Modernization. International Journal of AI, BigData, Computational and Management Studies. 2023;4(2):21-28.
27. Ebuka AA, Emmanuel D, Idigo P. Artificial Intelligence as a catalyst for the Sustainability of Small and Medium Scale Businesses (SMEs) in Nigeria. Annals of Management and Organization Research. 2023;5(1):1-11.
28. Egwim CN, Alaka H, Demir E, Balogun H, Olu-Ajayi R, Sulaimon I, *et al*. Artificial intelligence in the construction industry: A systematic review of the entire

construction value chain lifecycle. Energies. 2023;17(1):182.
29. Esan OJ, Uzozie OT, Onaghinor O, Osho GO, Olatunde J. Leading with Lean Six Sigma and RPA in High-Volume Distribution: A Comprehensive Framework for Operational Excellence. 2023.
30. Eyeghre OA, Dike CC, Ezeokafor EN, Oparaji KC, Amadi CS, Chukwuma CC, *et al*. The impact of Annona muricata and metformin on semen quality and hormonal profile in Arsenic trioxide-induced testicular dysfunction in male Wistar rats. Magna Scientia Advanced Research and Reviews. 2023;8(01):001-018.
31. Eyeghre OA, Ezeokafor EN, Dike CC, Oparaji KC, Amadi CS, Chukwuma CC, *et al*. The Impact of Annona Muricata on Semen Quality and Antioxidants Levels in Alcohol-Induced Testicular Dysfunction in Male Wistar Rats. 2023.
32. Ezeamii V, Adhikari A, Caldwell KE, Ayo-Farai O, Obiyano C, Kalu KA. Skin itching, eye irritations, and respiratory symptoms among swimming pool users and nearby residents in relation to stationary airborne chlorine gas exposure levels. In: APHA 2023 Annual Meeting and Expo. APHA; 2023.
33. Ezeamii V, Jordan K, Ayo-Farai O, Obiyano C, Kalu K, Soo JC. Dirunal and seasonal variations of atmospheric chlorine near swimming pools and overall surface microbial activity in surroundings. 2023.
34. Ezenwa AE. Smart logistics diffusion strategies amongst supply chain networks in emerging markets: a case of Nigeria's micro/SMEs 3PLs [Doctoral dissertation]. University of Leeds; 2019.
35. Francis Onotole E, Ogunyankinnu T, Adeoye Y, Osunkanmibi AA, Aipoh G, Egbemhenghe J. The Role of Generative AI in developing new Supply Chain Strategies-Future Trends and Innovations. 2022.
36. Gebhardt M, Kopyto M, Birkel H, Hartmann E. Industry 4.0 technologies as enablers of collaboration in circular supply chains: A systematic literature review. International Journal of Production Research. 2022;60(23):6967-6995.
37. Gomes S, Lopes JM, Ferreira L. The impact of the digital economy on economic growth: The case of OECD countries. RAM. Revista de Administração Mackenzie. 2022;23:eRAMD220029.
38. Hall T, Ziemer U. Cybercrime in Commonwealth West Africa and the regional cyber-criminogenic framework. The Commonwealth Cybercrime Journal. 2023;1(1):5-27.
39. Heidari A, Navimipour NJ, Unal M. Applications of ML/DL in the management of smart cities and societies based on new trends in information technologies: A systematic literature review. Sustainable Cities and Society. 2022;85:104089.
40. Ijeomah S. Challenges of supply chain management in the oil & gas production in Nigeria (Shell Petroleum Development Company of Nigeria) [Doctoral dissertation]. Dublin, National College of Ireland; 2020.
41. Ilori MO, Olanipekun SA. Effects of government policies and extent of its implementations on the foundry industry in Nigeria. IOSR Journal of Business Management. 2020;12(11):52-59.
42. Janiesch C, Zschech P, Heinrich K. Machine learning and deep learning. Electronic Markets. 2021;31(3):685-695.
43. Jarrahi MH. Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. Business Horizons. 2018;61(4):577-586.
44. Javaid M, Haleem A, Singh RP, Suman R. Artificial intelligence applications for industry 4.0: A literature-based study. Journal of Industrial Integration and Management. 2022;7(01):83-111.
45. Kalf HAI, Ibrid AA, Furaijl HB, Salma A, Hasan AA, Shatawi HH, *et al*. Identifying Key Performance Indicators (KPIs) and Measurement Frameworks to Assess and Improve the Performance of Construction Supply Chains. International Journal of Construction Supply Chain Management. 2023;13(1):260-275.
46. Kayode-Ajala O. Applications of Cyber Threat Intelligence (CTI) in financial institutions and challenges in its adoption. Applied Research in Artificial Intelligence and Cloud Computing. 2023;6(8):1-21.
47. Khalifa N, Abd Elghany M, Abd Elghany M. Exploratory research on digitalization transformation practices within supply chain management context in developing countries specifically Egypt in the MENA region. Cogent Business & Management. 2021;8(1):1965459.
48. Khan RS, Sirazy MRM, Das R, Rahman S. An AI and ML-enabled framework for proactive risk mitigation and resilience optimization in global supply chains during national emergencies. Sage Science Review of Applied Machine Learning. 2022;5(2):127-144.
49. Knieps G. The governance of big data and artificial intelligence in network industries. Competition and Regulation in Network Industries. 2023;24(2-3):57-71.
50. Kolade O, Osabuohien E, Aremu A, Olanipekun KA, Osabohien R, Tunji-Olayeni P. Co-creation of entrepreneurship education: challenges and opportunities for university, industry and public sector collaboration in Nigeria. In: The Palgrave Handbook of African Entrepreneurship. 2021:239-265.
51. Kolade O, Rae D, Obembe D, Woldesenbet K, editors. The Palgrave Handbook of African Entrepreneurship. Palgrave Macmillan; 2022.
52. Korteling JH, van de Boer-Visschedijk GC, Blankendaal RA, Boonekamp RC, Eikelboom AR. Human-versus artificial intelligence. Frontiers in Artificial Intelligence. 2021;4:622364.
53. Kuchenmüller T, Chapman E, Takahashi R, Lester L, Reinap M, Ellen M, *et al*. A comprehensive monitoring and evaluation framework for evidence to policy networks. Evaluation and Program Planning. 2022;91:102053.
54. Li X, Li J, Yuan C, Guo S, Wang Z. Digital infrastructure. In: Development Practice of Digital Business Environment in China. Springer Nature Singapore; 2022:39-55.
55. Lu Y. Artificial intelligence: a survey on evolution, models, applications and future trends. Journal of Management Analytics. 2019;6(1):1-29.
56. Lubag M, Bonifacio J, Tan JM, Concepcion R, Mababangloob GR, Galang JG, *et al*. Diversified impacts of enabling a technology-intensified agricultural supply chain on the quality of life in hinterland communities. Sustainability. 2023;15(17):12809.
57. Matthew UO, Kazaure JS, Okafor NU. Contemporary development in E-Learning education, cloud computing technology & internet of things. EAI Endorsed

Transactions on Cloud Systems. 2021;7(20):e3.
58. Modgil S, Singh RK, Hannibal C. Artificial intelligence for supply chain resilience: learning from Covid-19. The International Journal of Logistics Management. 2022;33(4):1246-1268.
59. Mwangi NW. Influence of supply chain optimization on the performance of manufacturing firms in Kenya [Doctoral dissertation]. JKUAT-COHRED; 2019.
60. Negi S. Supply chain efficiency framework to improve business performance in a competitive era. Management Research Review. 2021;44(3):477-508.
61. Nnene U. Mobile Commerce Innovation: a Case for Retailer Adoption and Consumer Acceptance in Nigeria. 2022.
62. Nwagwu U, Niaz M, Chukwu MU, Saddique F. The influence of artificial intelligence to enhancing supply chain performance under the mediating significance of supply chain collaboration in manufacturing and logistics organizations in Pakistan. Traditional Journal of Multidisciplinary Sciences. 2023;1(02):29-40.
63. Ochinanwata NH. Integrated business modelling for developing digital internationalising firms in Nigeria [Doctoral dissertation]. Sheffield Hallam University; 2019.
64. Ogbuagu OO, Mbata AO, Balogun OD, Oladapo O, Ojo OO, Muonde M. Optimizing supply chain logistics for personalized medicine: Strengthening drug discovery, production, and distribution. International Journal of Multidisciplinary Research and Growth Evaluation. 2023;4(1):832-841.
65. Ogbuagu OO, Mbata AO, Balogun OD, Oladapo O, Ojo OO, Muonde M. Quality assurance in pharmaceutical manufacturing: Bridging the gap between regulations, supply chain, and innovations. International Journal of Multidisciplinary Research and Growth Evaluation. 2023;4(1):823-831.
66. Ogunyankinnu T, Onotole EF, Osunkanmibi AA, Adeoye Y, Aipoh G, Egbemhenghe J. Blockchain and AI synergies for effective supply chain management. 2022.
67. Olaghere JA, Inegbedion HE, Osiobe FO. The implications of digitalization in retail service delivery on circular economy in Nigeria: An exploratory case study. Sustainability. 2023;15(17):13192.
68. Olanipekun KA. Assessment of Factors Influencing the Development and Sustainability of Small Scale Foundry Enterprises in Nigeria: A Case Study of Lagos State. Asian Journal of Social Sciences and Management Studies. 2020;7(4):288-294.
69. Olanipekun KA, Ayotola A. Introduction to Marketing. GES 301, Centre for General Studies (CGS), University of Ibadan; 2019.
70. Olanipekun KA, Ilori MO, Ibitoye SA. Effect of Government Policies and Extent of Its Implementation on the Foundry Industry in Nigeria. 2020.
71. Olisah MC. Enhancing the supply chain collaboration model in the Nigerian oil and gas industry: a case study of performance improvement strategies. 2023.
72. Onukwulu EC, Agho MO, Eyo-Udo NL. Developing a framework for AI-driven optimization of supply chains in energy sector. Global Journal of Advanced Research and Reviews. 2023;1(2):82-101.
73. Onukwulu EC, Agho MO, Eyo-Udo NL. Developing a framework for supply chain resilience in renewable energy operations. Global Journal of Research in Science and Technology. 2023;1(2):1-18.
74. Onukwulu EC, Agho MO, Eyo-Udo NL. Sustainable supply chain practices to reduce carbon footprint in oil and gas. Global Journal of Research in Multidisciplinary Studies. 2023;1(2):24-43.
75. Onyeaka H, Tamasiga P, Nwauzoma UM, Miri T, Juliet UC, Nwaiwu O, *et al*. Using artificial intelligence to tackle food waste and enhance the circular economy: Maximising resource efficiency and minimising environmental impact: A review. Sustainability. 2023;15(13):10482.
76. Oriekhoe OI, Ashiwaju BI, Ihemereze KC, Ikwue U, Udeh CA. Review of technological advancement in food supply chain management: comparison between USA and Africa. World Journal of Advanced Research and Reviews. 2023;20(3):1681-1693.
77. Oteri OJ, Onukwulu EC, Igwe AN, Ewim CPM, Ibeh AI, Sobowale A. Cost optimization in logistics product management: strategies for operational efficiency and profitability. International Journal of Business and Management. Forthcoming.
78. Otokiti BO, Igwe AN, Ewim CP, Ibeh AI, Sikhakhane-Nwokediegwu Z. A framework for developing resilient business models for Nigerian SMEs in response to economic disruptions. International Journal of Multidisciplinary Research and Growth Evaluation. 2022;3(1):647-659.
79. Otokiti BO, Igwe AN, Ewim C, Ibeh AI, Sikhakhane-Nwokediegwu Z. A framework for developing resilient business models for Nigerian SMEs in response to economic disruptions. International Journal of Multidisciplinary Research and Growth Evaluation. 2022;3(1):647-659.
80. Otuoze SH, Hunt DV, Jefferson I. Neural network approach to modelling transport system resilience for major cities: case studies of Lagos and Kano (Nigeria). Sustainability. 2021;13(3):1371.
81. Oyegbade IK, Igwe AN, Ofodile OC, Azubuike C. Advancing SME financing through public-private partnerships and low-cost lending: A framework for inclusive growth. Iconic Research and Engineering Journals. 2022;6(2):289-302.
82. Oyewola DO, Dada EG, Omotehinwa TO, Emebo O, Oluwagbemi OO. Application of deep learning techniques and bayesian optimization with tree parzen estimator in the classification of supply chain pricing datasets of health medications. Applied Sciences. 2022;12(19):10166.
83. Pantanowitz L, Bui MM, Chauhan C, ElGabry E, Hassell L, Li Z, *et al*. Rules of engagement: Promoting academic-industry partnership in the era of digital pathology and artificial intelligence. Academic Pathology. 2022;9(1):100026.
84. Pillah TP. Navigating the Public Policy Process: A Comprehensive Guide to Development, Analysis and Management in Nigeria. Journal of Public Administration, Policy and Governance Research. 2023;1(2):39-47.
85. Qi Y, Huo B, Wang Z, Yeung HYJ. The impact of operations and supply chain strategies on integration and performance. International Journal of Production Economics. 2017;185:162-174.
86. Qrunfleh S, Tarafdar M. Supply chain information systems strategy: Impacts on supply chain performance

and firm performance. International Journal of Production Economics. 2014;147:340-350.
87. Ramdoo I, Cosbey A, Geipel J, Toledano P. New Tech, New Deal: Mining Policy Options in the Face of New Technology. 2021.
88. Richey RG, Roath AS, Adams FG, Wieland A. A responsiveness view of logistics and supply chain management. Journal of Business Logistics. 2022;43(1):62-91.
89. Sahu PK, Pani A, Santos G. Freight traffic impacts and logistics inefficiencies in India: Policy interventions and solution concepts for sustainable city logistics. Transportation in Developing Economies. 2022;8(2):31.
90. Sanusi IT. Machine learning education in the K–12 Context. 2023.
91. Schöpper H, Kersten W. Using natural language processing for supply chain mapping: a systematic review of current approaches. In: 5th International Conference on Computational Linguistics and Intelligent Systems (COLINS 2021). 2021;5:71-86.
92. Simchi-Levi D, Wang H, Wei Y. Increasing supply chain robustness through process flexibility and inventory. Production and Operations Management. 2018;27(8):1476-1491.
93. Talla RR. Integrating Blockchain and AI to Enhance Supply Chain Transparency in Energy Sectors. Asia Pacific Journal of Energy and Environment. 2022;9(2):109-118.
94. Terziyan V, Gryshko S, Golovianko M. Patented intelligence: Cloning human decision models for Industry 4.0. Journal of Manufacturing Systems. 2018;48:204-217.
95. Tien JM. Internet of things, real-time decision making, and artificial intelligence. Annals of Data Science. 2017;4:149-178.
96. Tien NH, Anh DBH, Thuc TD. Global Supply Chain and Logistics Management. 2019.
97. Tsolakis N, Schumacher R, Dora M, Kumar M. Artificial intelligence and blockchain implementation in supply chains: a pathway to sustainability and data monetisation? Annals of Operations Research. 2023;327(1):157-210.
98. Vinnyk OM, Zadykhaylo DV, Honcharenko OM, Shapovalova OV, Patsuriia NB. Economic and legal policy of the state in the field of digital economy. International Journal of Criminology and Sociology. 2021;10(1):383-392.
99. Wang G, Gunasekaran A, Ngai EW, Papadopoulos T. Big data analytics in logistics and supply chain management: Certain investigations for research and applications. International Journal of Production Economics. 2016;176:98-110.
100. Weller D, Bramble N. Seizing artificial intelligence's trade promise: the role of international agreements. In: The Elgar Companion to the World Trade Organization. Edward Elgar Publishing; 2023:22-34.
101. West M, Kraut R, Ei Chew H. I'd Blush If I Could: Closing Gender Divides in Digital Skills Through Education. 2019.
102. Yusuf N, Al-Ansari T. Current and future role of natural gas supply chains in the transition to a low-carbon hydrogen economy: A comprehensive review on integrated natural gas supply chain optimisation models. Energies. 2023;16(22):7672.
103. Zhang C, Lu Y. Study on artificial intelligence: The state of the art and future prospects. Journal of Industrial Information Integration. 2021;23:100224.
104. Zohuri B, Moghaddam M. From business intelligence to artificial intelligence. Journal of Material Sciences & Manufacturing Research. 2020;1(1):1-10.