International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

Utilizing AI and machine learning algorithms to optimize supplier relationship management and risk mitigation in global supply chains

Oluwakemi Adesola [1], Itunu Taiwo [2], Damilola David Adeyemi [3,*], Harold Ezenwa Nwariaku [4] and Adefemi Quddus Abidola [5]

[1] *Department of Management and Business Studies, School of Logistics and Supply Chain Management, Rome Business School, Ikeja, Lagos, Nigeria.*
[2] *Senior Analyst, Modern Retailing at American Airlines.*
[3] *Department of Statistics, Oklahoma State University, Oklahoma, USA.*
[4] *Founder/Partner - Procurement & Supply Chain Consultants LLC, TX. USA.*
[5] *Department of Geography and Planning, School of Lagos State University, Ojo, Lagos State, Nigeria.*

International Journal of Science and Research Archive, 2025, 14(02), 219-228

Publication history: Received on 25 December 2024; revised on 01 February 2025; accepted on 04 February 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.14.2.0351

Abstract

Abstract: This research investigates the integration of artificial intelligence (AI) and machine learning (ML) algorithms in revolutionizing supplier relationship management and risk assessment within global supply chains. With supply chain disruptions costing businesses an average of $184 million annually, the need for intelligent solutions has become critical. The study examines the technological foundations of AI-driven supply chain transformation, including machine learning analytics, natural language processing, and federated learning systems. Through analysis of implementation cases across automotive, technology, pharmaceutical, and agricultural sectors, we explore how cognitive computing and autonomous decision-making frameworks are reshaping traditional supply chain operations. The research provides insights into implementation mechanisms focusing on predictive risk modeling, real-time monitoring systems, and supply chain orchestration. Our findings demonstrate the potential of AI technologies to enhance operational efficiency, reduce risks, and create more resilient supply chain ecosystems. The study offers an evidence based perspective on AI's role in transforming supplier relationship management while acknowledging both opportunities and implementation challenges in an increasingly volatile global business environment.

Keywords: Artificial Intelligence; Supply Chain Management; Machine Learning; Risk Assessment; Predictive Analytics; Supplier Relationship Management

1. Introduction

The contemporary global business landscape is characterized by unprecedented complexity, interconnectedness, and volatility. Traditional supply chain management approaches are increasingly inadequate in addressing the multifaceted challenges presented by rapidly evolving economic, technological, and geopolitical environments [1]. The emergence of artificial intelligence and machine learning technologies offers a transformative approach to navigating these complex operational landscapes, promising unprecedented capabilities in supplier relationship management and risk mitigation [2].

Global supply chains have become increasingly intricate, spanning multiple continents, involving numerous stakeholders, and subject to complex interdependencies [3]. Recent global events, including the COVID-19 pandemic, trade tensions, and geopolitical uncertainties, have exposed the vulnerabilities inherent in traditional supply chain

* Corresponding author: Damilola David Adeyemi.

management strategies [4]. These disruptions have highlighted the critical need for more sophisticated, adaptive, and intelligent approaches to managing supplier relationships and mitigating potential risks.

Technological advancements have created both challenges and opportunities for supply chain management. The exponential growth of data generation, coupled with advanced computational capabilities, has opened new frontiers for predictive analytics, real-time monitoring, and intelligent decision-making [5]. Artificial intelligence and machine learning algorithms stand at the forefront of this technological revolution, offering unprecedented capabilities to process complex information, identify patterns, and generate actionable insights [6].

The economic implications of ineffective supply chain management are substantial. Research indicates that supply chain disruptions can cost businesses an average of $184 million annually, underscoring the critical importance of developing more robust and intelligent management strategies [7]. AI and machine learning technologies emerge as powerful solutions, capable of transforming how organizations approach supplier selection, performance monitoring, and risk assessment [8].

This research review aims to provide a comprehensive exploration of the role of AI and machine learning in modern supply chain management. By examining technological foundations, implementation mechanisms, practical applications, and potential challenges, the study seeks to offer a nuanced understanding of how intelligent technologies are reshaping supplier relationship management. The review will critically analyze the potential of these technologies to enhance operational efficiency, reduce risks, and create more resilient and adaptive supply chain ecosystems.

2. Technological Foundations

2.1. Machine Learning in Supplier Analysis

Machine learning algorithms represent a sophisticated approach to supplier analysis and management, offering capabilities that far exceed traditional evaluation methods [9]. These advanced computational techniques enable organizations to process and analyze vast amounts of complex data, generating insights that would be impossible through conventional analytical approaches.

By leveraging sophisticated statistical models and neural network architectures, machine learning systems can develop intricate understanding of supplier performance, risk profiles, and potential challenges [10]. The core strength of these algorithms lies in their ability to learn and improve from experience, continuously refining their analytical capabilities through exposure to new data and complex scenarios.

2.2. AI-Driven Risk Assessment Frameworks

Advanced AI systems provide unprecedented capabilities in processing multiple data streams, creating comprehensive risk assessment frameworks that go beyond traditional analytical methods. These intelligent systems can simultaneously analyze complex and multidimensional data sources, integrating information from historical performance records, real-time market indicators, and predictive risk models [11].

The sophistication of AI-driven risk assessment lies in its ability to identify subtle correlations and potential risk factors that might escape human analysis [12]. By employing advanced machine learning techniques such as deep learning and neural networks, these frameworks can generate nuanced risk profiles that provide organizations with actionable intelligence and strategic insights.

2.3. Natural Language Processing in Supplier Communication

Natural Language Processing (NLP) represents a groundbreaking technological approach in supply chain management, revolutionizing how organizations interpret and analyze complex communication streams [13]. By leveraging advanced computational linguistics, NLP technologies enable unprecedented capabilities in extracting meaningful insights from diverse communication channels, including supplier contracts, email correspondence, negotiation records, and market communications [14].

The sophistication of NLP algorithms allows organizations to transform unstructured textual data into actionable intelligence [15]. These systems can analyze sentiment, detect potential risks, identify subtle nuances in supplier communications, and provide comprehensive context that traditional analytical methods might overlook [16]. By understanding contextual subtleties and linguistic patterns, NLP technologies offer a more holistic approach to supplier relationship management.

2.4. Federated Learning in Distributed Supply Chain Networks

Federated learning emerges as a transformative technological paradigm, addressing critical challenges of data privacy and collaborative intelligence in global supply chain ecosystems [17]. This advanced machine learning approach enables multiple organizations to collaboratively train intelligent models without directly sharing sensitive raw data, representing a breakthrough in distributed computational intelligence [18].

The unique architecture of federated learning allows different supply chain participants to contribute to collective intelligence while maintaining stringent data protection protocols [19]. By enabling secure, decentralized learning mechanisms, organizations can develop more robust predictive models, share insights, and enhance overall supply chain resilience without compromising individual organizational data sovereignty.

3. Implementation Mechanisms

3.1. Predictive Risk Modeling

Predictive risk modeling has emerged as a critical application of machine learning technologies in supply chain management, representing a paradigm shift in how organizations approach risk assessment [20]. These advanced systems transcend traditional risk evaluation methods by developing dynamic, continuously updated risk profiles that capture the multifaceted nature of modern business environments [21].

The complexity of these models lies in their ability to integrate and analyze diverse data sources, including financial health indicators, historical performance metrics, geopolitical stability assessments, and market trend analyses [22]. By leveraging sophisticated algorithms, predictive risk modeling enables organizations to develop comprehensive, forward-looking risk assessments that provide unprecedented strategic insights and decision-making capabilities [23].

3.2. Real-time Monitoring Systems

AI-powered real-time monitoring systems represent a revolutionary approach to supply chain management, fundamentally transforming how organizations track and assess supplier performance [24]. Unlike traditional periodic review processes, these advanced platforms enable continuous, comprehensive monitoring of supplier activities, compliance requirements, and potential risk factors.

The technological sophistication of these systems allows for instant alert generation, automated compliance verification, and predictive disruption forecasting [25]. By providing real-time insights and immediate actionable intelligence, these monitoring systems enable organizations to transition from reactive to proactive supply chain management strategies, significantly reducing potential risks and operational uncertainties [26].

3.3. Autonomous Decision-Making Frameworks

Autonomous decision-making frameworks represent the next evolutionary stage of AI implementation in supply chain management, transcending traditional predictive and analytical approaches [27]. These sophisticated systems leverage advanced machine learning algorithms to create self-adaptive mechanisms capable of making complex operational decisions with minimal human intervention [28].

By integrating multiple data streams, contextual understanding, and probabilistic reasoning, autonomous frameworks can dynamically adjust procurement strategies, optimize inventory levels, and respond to emerging market disruptions in real-time. These systems represent a fundamental shift from reactive to proactively intelligent supply chain management, enabling organizations to navigate increasingly complex global business environments.

3.4. Cognitive Computing in Supply Chain Orchestration

Cognitive computing technologies introduce a new dimension of intelligent processing, mimicking human cognitive capabilities to solve complex supply chain challenges [29]. These advanced systems go beyond traditional computational approaches, incorporating contextual reasoning, pattern recognition, and adaptive learning to create more nuanced and responsive supply chain management strategies [30].

By simulating human-like decision-making processes, cognitive computing platforms can interpret ambiguous information, generate creative solutions to complex logistical challenges, and provide strategic recommendations that

transcend conventional algorithmic limitations [31]. This approach represents a significant leap in how organizations conceptualize and implement intelligent supply chain technologies.

4. Case Studies and Implementation Examples

4.1. Automotive Supply Chain Integration

The automotive industry provides a compelling demonstration of AI-driven supply chain transformation, showcasing the profound impact of advanced machine learning technologies on procurement and supplier management [32]. A leading global automotive manufacturer implemented a sophisticated machine learning-based system that fundamentally redesigned their procurement processes, integrating advanced predictive analytics with comprehensive supplier data [33].

The implementation resulted in remarkable operational improvements, including significant reductions in procurement cycle times and dramatic enhancements in supplier selection accuracy [34]. By leveraging intelligent algorithms and comprehensive data analysis, the organization achieved unprecedented visibility into supplier performance, enabling more strategic decision-making and substantially reducing supply chain disruption incidents [35].

4.2. Technology Sector Supply Chain Optimization

The technology sector offers another illuminating example of AI integration in supply chain management, demonstrating the transformative potential of advanced machine learning platforms. A multinational technology company developed a sophisticated system that revolutionized their approach to supplier risk management, moving beyond traditional assessment methodologies.

The advanced platform enabled faster risk identification, substantial reduction in compliance-related costs, and dramatically improved decision-making processes [36]. By implementing intelligent algorithms that could process complex, multidimensional data sets, the organization transformed supplier relationship management from a predominantly administrative function to a strategic, insight-driven capability [37].

4.3. Pharmaceutical Supply Chain Resilience

The pharmaceutical industry presents a compelling case study of AI-driven supply chain transformation, particularly in response to global health challenges. A leading multinational pharmaceutical company implemented an advanced machine learning platform to address critical challenges in drug procurement, distribution, and inventory management during the global pandemic [38].

The AI-powered system enabled unprecedented capabilities in demand forecasting, inventory optimization, and rapid response to supply disruptions [39]. By leveraging complex predictive models and real-time data analysis, the organization could dynamically adjust production schedules, identify alternative suppliers, and maintain critical medication supply chains under extreme uncertainty.

4.4. Agricultural Supply Chain Innovation

The agricultural sector demonstrates the transformative potential of AI technologies in managing complex, geographically distributed supply networks. An innovative agricultural technology company developed a comprehensive AI platform that integrates satellite imaging, climate data, market trends, and production metrics to optimize global agricultural supply chains [40].

The system's sophisticated algorithms could predict crop yields, assess potential environmental risks, optimize transportation routes, and provide granular insights into production efficiency. By transforming traditional agricultural supply chain management, the platform enabled more sustainable, efficient, and resilient food production and distribution networks [41].

5. Benefits and Opportunities

5.1. For Procurement Teams

Procurement teams stand to gain substantial advantages from AI and machine learning technologies, experiencing a fundamental transformation in their approach to supplier assessment and management. These advanced systems offer

unprecedented capabilities in decision-making, risk evaluation, and strategic planning, enabling procurement professionals to move beyond routine data processing and focus on high-value strategic activities [42].

The integration of machine learning technologies empowers procurement teams with sophisticated analytical tools that can process vast amounts of data, identify complex patterns, and generate actionable insights [43]. By automating complex analytical processes, these technologies free up human resources to engage in more strategic, creative problem-solving and relationship-building activities [44].

5.2. For Businesses

For businesses, the implementation of AI-driven supply chain management represents a strategic imperative in an increasingly complex global environment [46]. These technologies offer comprehensive benefits that extend across organizational functions, providing enhanced operational resilience, improved strategic decision-making, and more robust risk management capabilities [47].

The advanced analytical capabilities of AI technologies enable organizations to develop more adaptive, efficient, and competitive supply chain strategies. By providing real-time insights, predictive capabilities, and sophisticated analytical tools, businesses can achieve unprecedented levels of operational transparency, efficiency, and strategic alignment [48].

5.3. Sustainability and Environmental Impact

AI and machine learning technologies offer unprecedented opportunities to align supply chain management with sustainability objectives [49]. By providing sophisticated analytical capabilities, these intelligent systems can optimize resource utilization, reduce waste, and minimize environmental footprints across complex global supply networks [50].

Advanced algorithms can model complex environmental interactions, predict potential ecological impacts, and generate recommendations for more sustainable procurement and logistics strategies [51]. This approach transforms supply chain management from a purely economic consideration to a holistic framework that balances economic efficiency with environmental responsibility [52].

5.4. Global Economic Resilience

The integration of AI technologies in supply chain management contributes to broader economic resilience by creating more adaptive, intelligent, and responsive global economic networks [53]. These advanced systems can anticipate potential disruptions, develop sophisticated contingency strategies, and enable more rapid, coordinated responses to complex economic challenges.

By providing real-time insights, predictive capabilities, and intelligent decision-making support, AI-driven supply chain technologies can help mitigate systemic economic risks, enhance global trade efficiency, and create more robust, interconnected economic ecosystems [54].

6. Challenges and Considerations

6.1. Technical Challenges

Technical challenges represent a significant consideration in the implementation of AI and machine learning technologies in supply chain management. The complexity of developing robust, accurate, and scalable algorithms requires substantial technical expertise, significant computational resources, and a sophisticated understanding of both technological and domain-specific requirements [55].

Critical technical challenges include ensuring data quality, managing complex integration processes, mitigating potential algorithmic biases, and addressing computational limitations. Organizations must invest in advanced technological infrastructure, develop specialized talent, and create robust testing and validation frameworks to successfully navigate these technological complexities.

6.2. Ethical and Regulatory Considerations

Ethical and regulatory considerations add another layer of complexity to AI implementation in supply chain management, requiring organizations to carefully balance technological innovation with responsible governance [56].

The use of advanced predictive technologies raises critical questions about data privacy, algorithmic transparency, and potential societal impacts.

Organizations must develop comprehensive ethical frameworks that ensure the responsible use of AI technologies, addressing potential biases, maintaining transparency, and aligning with evolving regulatory requirements. This involves implementing rigorous governance mechanisms, conducting regular algorithmic audits, and establishing clear protocols for ethical AI development and deployment.

7. Future Research Directions

The evolving landscape of artificial intelligence and machine learning in supply chain management presents a rich and complex terrain for future scholarly investigation. As technological capabilities continue to expand, researchers must focus on developing more sophisticated, context-aware algorithmic approaches that can navigate the intricate nuances of global supply chain ecosystems. The next generation of research must move beyond current computational limitations, exploring innovative methodological frameworks that integrate advanced machine learning techniques with deep domain-specific knowledge.

Interdisciplinary research emerges as a critical frontier in understanding the full potential of AI-driven supply chain technologies [57]. Future scholarly efforts should emphasize comprehensive approaches that transcend traditional disciplinary boundaries, investigating the complex intersections of technological innovation, organizational behavior, and global economic dynamics. This holistic approach will require collaborative research efforts that bring together experts from computer science, management studies, economics, and environmental sciences to develop more nuanced and comprehensive understanding of AI's transformative potential in supply chain management.

The human dimension of technological integration represents another crucial area of future research [58]. Scholars must delve deeper into understanding the organizational and psychological implications of AI implementation, exploring how human professionals can most effectively collaborate with intelligent systems. This research should focus on developing advanced training frameworks, understanding the psychological and organizational dynamics of technological transformation, and creating strategies that maximize human-AI collaborative potential. Moreover, ethical considerations and responsible innovation must remain at the forefront of these investigations, ensuring that technological advancements align with broader societal values and organizational objectives.

Methodological innovation will be paramount in advancing our understanding of AI in supply chain management [59]. Researchers must develop more robust, comprehensive methodological frameworks for evaluating AI performance, creating standardized metrics that can provide meaningful insights across different organizational contexts and technological implementations. This will require developing sophisticated longitudinal research designs, creating more advanced performance measurement tools, and establishing rigorous protocols for assessing the long-term impact of AI technologies on organizational performance, economic efficiency, and global supply chain resilience.

8. Recommendations

The integration of artificial intelligence and machine learning in supply chain management necessitates a comprehensive and strategic approach that transcends mere technological implementation. Organizations must view these advanced technologies as transformative strategic assets rather than simple computational tools. The recommendations emerging from this comprehensive review emphasize a holistic approach to AI adoption, focusing on technological infrastructure, organizational capabilities, and strategic alignment.

Foremost, organizations must invest in robust technological ecosystems that support advanced AI and machine learning capabilities. This requires not only sophisticated computational infrastructure but also a commitment to continuous learning and technological adaptation. Developing internal capabilities through targeted talent acquisition, comprehensive training programs, and strategic partnerships with technological innovators will be critical to successful implementation.

Furthermore, successful AI integration demands a cultural transformation within organizations. Procurement teams and supply chain managers must be equipped with the skills to interpret and leverage intelligent systems effectively. This involves developing a new organizational mindset that values data-driven decision-making, embraces technological complexity, and views AI as a collaborative intelligence rather than a replacement for human expertise.

Data governance emerges as a crucial consideration in AI-driven supply chain management. Organizations must develop rigorous frameworks for data collection, validation, and ethical use. This includes establishing clear protocols for algorithmic transparency, addressing potential biases, and ensuring comprehensive data privacy protections. The most successful implementations will be those that balance technological innovation with responsible, ethical governance.

9. Conclusion

The transformation of supply chain management through artificial intelligence and machine learning represents a watershed moment in organizational strategy and technological innovation. As global business environments become increasingly complex, volatile, and interconnected, traditional management approaches are proving inadequate. AI and machine learning offer a powerful, adaptive response to these multifaceted challenges, providing unprecedented capabilities in risk assessment, supplier relationship management, and strategic decision-making.

The research presented in this review illuminates the profound potential of intelligent technologies to reshape supply chain ecosystems. Beyond mere computational efficiency, these technologies represent a fundamental reimagining of how organizations understand, manage, and optimize their global operational networks. The ability to process complex, multidimensional data streams, generate predictive insights, and continuously learn and adapt provides organizations with a critical competitive advantage in an increasingly uncertain global marketplace.

However, the integration of AI technologies is not without significant challenges. Technical complexities, ethical considerations, and the need for comprehensive organizational transformation represent substantial hurdles. Successful implementation requires more than technological investment; it demands a holistic approach that encompasses technological infrastructure, human capabilities, and strategic vision.

Lastly, the trajectory of supply chain management is linked to technological innovation. Artificial intelligence and machine learning will continue to evolve, offering increasingly sophisticated capabilities for risk mitigation, performance optimization, and strategic insights. Organizations that embrace these technologies not as mere tools but as strategic partners in their operational ecosystem will be best positioned to navigate the complexities of the global business landscape.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Odulaja BA, Oke TT, Eleogu T, Abdul AA, Daraojimba HO. Resilience in the face of uncertainty: a review on the impact of supply chain volatility amid ongoing geopolitical disruptions. International Journal of Applied Research in Social Sciences. 2023 Dec 7;5(10):463-86.

[2] Pandey BK, Kanike UK, George AS, Pandey D, editors. AI and machine learning impacts in intelligent supply chain. IGI Global; 2024 Jan 29.

[3] Mamasoliev S. GLOBAL SUPPLY CHAIN RESILIENCE: IMPLICATIONS FOR US TRADE POLICY AND NATIONAL SECURITY. AMERICAN JOURNAL OF EDUCATION AND LEARNING. 2024 Nov 22;2(4):525-35.

[4] Kumar A, Kumar R. Conflict And Commerce in A Post-Pandemic World: Unraveling the Impacts of The Russia-Ukraine War on Global Supply Chains.

[5] Brunner D, Legat C, Seebacher U. Towards Next Generation Data-Driven Management: Leveraging Predictive Swarm Intelligence to Reason and Predict Market Dynamics. InCollective Intelligence 2024 Nov 14 (pp. 152-203). CRC Press.

[6] Bello S, Wada I, Ige O, Chianumba E, Adebayo S. AI-driven predictive maintenance and optimization of renewable energy systems for enhanced operational efficiency and longevity. International Journal of Science and Research Archive. 2024;13(1)..

[7] Vadigicherla MS. THE ROLE OF ARTIFICIAL INTELLIGENCE INENHANCING SUPPLY CHAIN RESILIENCE. INTERNATIONAL JOURNAL OF COMPUTER ENGINEERING AND TECHNOLOGY (IJCET). 2024 Sep 6;15(5):45-55.

[8] Khedr AM. Enhancing supply chain management with deep learning and machine learning techniques: A review. Journal of Open Innovation: Technology, Market, and Complexity. 2024 Sep 17:100379.

[9] Bello OA. Machine learning algorithms for credit risk assessment: an economic and financial analysis. International Journal of Management. 2023;10(1):109-33.

[10] Wong LW, Tan GW, Ooi KB, Lin B, Dwivedi YK. Artificial intelligence-driven risk management for enhancing supply chain agility: A deep-learning-based dual-stage PLS-SEM-ANN analysis. International Journal of Production Research. 2024 Aug 2;62(15):5535-55.

[11] Paramesha M, Rane NL, Rane J. Big data analytics, artificial intelligence, machine learning, internet of things, and blockchain for enhanced business intelligence. Partners Universal Multidisciplinary Research Journal. 2024 Jul 25;1(2):110-33.

[12] Bello S, Wada I, Ige O, Chianumba E, Adebayo S. AI-driven predictive maintenance and optimization of renewable energy systems for enhanced operational efficiency and longevity. International Journal of Science and Research Archive. 2024;13(1).

[13] Mubarik MS, Khan SA. Disruptive Digital Technologies and Contemporary Supply Chains. InThe Theory, Methods and Application of Managing Digital Supply Chains 2024 May 21 (pp. 15-39). Emerald Publishing Limited.

[14] Wang L, Zhao J. Strategic Blueprint for Enterprise Analytics: Integrating Advanced Analytics Into Data-Driven Business. Springer Nature; 2024.

[15] Rane N, Paramesha M, Choudhary S, Rane J. Business Intelligence and Business Analytics With Artificial Intelligence and Machine Learning: Trends, Techniques, and Opportunities. Techniques, and Opportunities (May 17, 2024). 2024 May 17.

[16] Ganapathy V. AI-Based Risk Assessments in Forensic Auditing: Benefits, Challenges and Future Implications. Shodh Sari-An International Multidisciplinary Journal. 2024;4:100-28.

[17] Zheng G, Kong L, Brintrup A. Federated machine learning for privacy preserving, collective supply chain risk prediction. International Journal of Production Research. 2023 Dec 2;61(23):8115-32.

[18] Zhu S, Yu T, Xu T, Chen H, Dustdar S, Gigan S, Gunduz D, Hossain E, Jin Y, Lin F, Liu B. Intelligent computing: the latest advances, challenges, and future. Intelligent Computing. 2023 Jan 30;2:0006.

[19] Alsharif MH, Kannadasan R, Wei W, Nisar KS, Abdel-Aty AH. A Contemporary Survey of Recent Advances in Federated Learning: Taxonomies, Applications, and Challenges. Internet of Things. 2024 Jun 14:101251.

[20] Faheem MA. AI-Driven Risk Assessment Models: Revolutionizing Credit Scoring and Default Prediction. Iconic Research And Engineering Journals. 2021 Sep;5(3):177-86.

[21] Handoyo S. Mapping the landscape of internal auditing effectiveness study: A bibliometric approach. Cogent Business & Management. 2024 Dec 31;11(1):2289200.

[22] Zakhidov G. Economic indicators: tools for analyzing market trends and predicting future performance. International Multidisciplinary Journal of Universal Scientific Prospectives. 2024;2(3):23-9.

[23] Nahar J, Hossain MS, Rahman MM, Hossain MA. Advanced Predictive Analytics For Comprehensive Risk Assessment In Financial Markets: Strategic Applications And Sector-Wide Implications. Global Mainstream Journal of Business, Economics, Development & Project Management. 2024 May 22;3(4):39-53.

[24] Eyo-Udo N. Leveraging artificial intelligence for enhanced supply chain optimization. Open Access Research Journal of Multidisciplinary Studies. 2024;7(2):001-15.

[25] Olawale O, Ajayi FA, Udeh CA, Odejide OA. RegTech innovations streamlining compliance, reducing costs in the financial sector. GSC Advanced Research and Reviews. 2024;19(1):114-31.

[26] Olaleye I, Mokogwu V, Olufemi-Phillips AQ, Adewale TT. Transforming supply chain resilience: Frameworks and advancements in predictive analytics and data-driven strategies. Open Access Research Journal of Multidisciplinary Studies. 2024;8(02):085-93.

[27] Brunner D, Legat C, Seebacher U. Towards Next Generation Data-Driven Management: Leveraging Predictive Swarm Intelligence to Reason and Predict Market Dynamics. InCollective Intelligence 2024 Nov 14 (pp. 152-203). CRC Press.

[28] Johnphill O, Sadiq AS, Al-Obeidat F, Al-Khateeb H, Taheir MA, Kaiwartya O, Ali M. Self-Healing in Cyber–Physical systems using machine learning: A critical analysis of theories and tools. Future Internet. 2023 Jul 17;15(7):244.

[29] Chen M, Herrera F, Hwang K. Cognitive computing: architecture, technologies and intelligent applications. Ieee Access. 2018 Jan 15;6:19774-83.

[30] Jackson I, Ivanov D, Dolgui A, Namdar J. Generative artificial intelligence in supply chain and operations management: a capability-based framework for analysis and implementation. International Journal of Production Research. 2024 Jan 30:1-26.

[31] Arkhipova D. How Artificial Intelligence recommendation systems impact human decision-making.

[32] Pandey BK, Kanike UK, George AS, Pandey D, editors. AI and machine learning impacts in intelligent supply chain. IGI Global; 2024 Jan 29.

[33] Cavalcante IM, Frazzon EM, Forcellini FA, Ivanov D. A supervised machine learning approach to data-driven simulation of resilient supplier selection in digital manufacturing. International Journal of Information Management. 2019 Dec 1;49:86-97.

[34] Althabatah A, Yaqot M, Menezes B, Kerbache L. Transformative procurement trends: Integrating industry 4.0 technologies for enhanced procurement processes. Logistics. 2023 Sep 13;7(3):63.

[35] Adewusi AO, Komolafe AM, Ejairu E, Aderotoye IA, Abiona OO, Oyeniran OC. The role of predictive analytics in optimizing supply chain resilience: a review of techniques and case studies. International Journal of Management & Entrepreneurship Research. 2024 Mar 23;6(3):815-37.

[36] Olawale O, Ajayi FA, Udeh CA, Odejide OA. RegTech innovations streamlining compliance, reducing costs in the financial sector. GSC Advanced Research and Reviews. 2024;19(1):114-31.

[37] Żabicka-Włodarczyk M. *Big data and advanced business analytics in customer relationship management in the retail settings* (Doctoral dissertation, Department of Advanced Research in Management).

[38] Mariappan MB, Devi K, Venkataraman Y, Lim MK, Theivendren P. Using AI and ML to predict shipment times of therapeutics, diagnostics and vaccines in e-pharmacy supply chains during COVID-19 pandemic. The International Journal of Logistics Management. 2023 Mar 14;34(2):390-416.

[39] Mahi R. Optimizing supply chain efficiency in the manufacturing sector through ai-powered analytics. International Journal of Management Information Systems and Data Science. 2024 Apr 21;1(1):41-50.

[40] Fuentes-Peñailillo F, Gutter K, Vega R, Silva GC. Transformative technologies in digital agriculture: Leveraging Internet of Things, remote sensing, and artificial intelligence for smart crop management. Journal of Sensor and Actuator Networks. 2024 Jul 8;13(4):39.

[41] Dong L. Toward resilient agriculture value chains: challenges and opportunities. Production and Operations Management. 2021 Mar;30(3):666-75.

[42] Nicoletti B. Procurement 4.0 and the Fourth Industrial Revolution. The Opportunities and Challenges of a Digital World. Switzerland: Palgrave Macmillan. 2020.

[43] Rane N, Paramesha M, Choudhary S, Rane J. Business Intelligence and Business Analytics With Artificial Intelligence and Machine Learning: Trends, Techniques, and Opportunities. Techniques, and Opportunities (May 17, 2024). 2024 May 17.

[44] Amarasinghe H. Transformative Power of AI in Customer Relationship Management (CRM): Potential Benefits, Pitfalls, and Best Practices for Modern Enterprises. International Journal of Social Analytics. 2023 Aug 24;8(8):1-0.

[45] Shahzadi G, Jia F, Chen L, John A. AI adoption in supply chain management: A systematic literature review. Journal of Manufacturing Technology Management. 2024 Nov 13;35(6):1125-50. Shahzadi G, Jia F, Chen L, John A. AI adoption in supply chain management: A systematic literature review. Journal of Manufacturing Technology Management. 2024 Nov 13;35(6):1125-50.

[46] Shahzadi G, Jia F, Chen L, John A. AI adoption in supply chain management: A systematic literature review. Journal of Manufacturing Technology Management. 2024 Nov 13;35(6):1125-50.

[47] Rodríguez-Espíndola O, Chowdhury S, Dey PK, Albores P, Emrouznejad A. Analysis of the adoption of emergent technologies for risk management in the era of digital manufacturing. Technological Forecasting and Social Change. 2022 May 1;178:121562.

[48] Zhang L. Driving Business Excellence: Leveraging Data Analytics, AI, and Blockchain for Enhanced Supply Chain Transparency.

[49] Whig P, Remala R, Mudunuru KR, Quraishi SJ. Integrating AI and quantum technologies for sustainable supply chain management. InQuantum Computing and Supply Chain Management: A New Era of Optimization 2024 (pp. 267-283). IGI Global.

[50] Onyeje CC, Oshilalu AZ, Fadojutimi B. Data-driven analytics and modelling of circular supply chains for net zero manufacturing. World Journal of Advanced Research and Reviews. 2024;23(3):1097-121.

[51] Sun X, Yu H, Solvang WD, Wang Y, Wang K. The application of Industry 4.0 technologies in sustainable logistics: a systematic literature review (2012–2020) to explore future research opportunities. Environmental Science and Pollution Research. 2022 Feb 1:1-32.

[52] Gosling J, Jia F, Gong Y, Brown S. The role of supply chain leadership in the learning of sustainable practice: toward an integrated framework. Journal of Cleaner Production. 2016 Nov 20;137:1458-69.

[53] Kalusivalingam AK, Sharma A, Patel N, Singh V. Enhancing Supply Chain Resilience through AI: Leveraging Deep Reinforcement Learning and Predictive Analytics. International Journal of AI and ML. 2022 Feb 23;3(9).

[54] Eyo-Udo N. Leveraging artificial intelligence for enhanced supply chain optimization. Open Access Research Journal of Multidisciplinary Studies. 2024;7(2):001-15.

[55] Cao L. Domain-driven data mining: Challenges and prospects. IEEE Transactions on Knowledge and Data Engineering. 2010 Feb 18;22(6):755-69.

[56] Dwivedi YK, Hughes L, Ismagilova E, Aarts G, Coombs C, Crick T, Duan Y, Dwivedi R, Edwards J, Eirug A, Galanos V. Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. International journal of information management. 2021 Apr 1;57:101994.

[57] Richey Jr RG, Chowdhury S, Davis-Sramek B, Giannakis M, Dwivedi YK. Artificial intelligence in logistics and supply chain management: A primer and roadmap for research. Journal of Business Logistics. 2023 Oct;44(4):532-49.\

[58] Bavaresco MV, D'Oca S, Ghisi E, Lamberts R. Technological innovations to assess and include the human dimension in the building-performance loop: A review. Energy and Buildings. 2019 Nov 1;202:109365.

[59] Richey Jr RG, Chowdhury S, Davis-Sramek B, Giannakis M, Dwivedi YK. Artificial intelligence in logistics and supply chain management: A primer and roadmap for research. Journal of Business Logistics. 2023 Oct;44(4):532-49.