AI-DRIVEN SUPPLIER RISK MANAGEMENT IN GOODS IMPORT EXPORT TOWARDS AUV ENGINEERING WORKS

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Abstract

Global import–export operations have become increasingly complex due to interactions with suppliers across diverse geographical, economic, and political environments. These complexities expose organizations to various risks such as supplier failure, logistics disruptions, quality deviations, geopolitical uncertainty, and market volatility. Traditional supplier-risk management approaches rely largely on historical data, manual evaluation, and periodic assessments, which limit proactive decision-making. This study examines the role of Artificial Intelligence (AI) in strengthening supplier-risk management in the import–export operations of **AUV Engineering Works**, an engineering goods manufacturing firm. AI technologies such as predictive analytics, machine learning, anomaly detection, and real-time monitoring enable continuous supplier performance evaluation, early risk identification, and improved decision accuracy. These capabilities allow firms to move from reactive risk handling to proactive and preventive risk mitigation.

The study uses both primary and secondary data. Primary data were collected through structured questionnaires, while secondary data were sourced from validated literature. Statistical tools including Simple Percentage Analysis, ANOVA, Chi-Square, and Multiple Regression were employed for data analysis. The findings reveal increasing adoption of AI-based systems, though challenges persist in terms of implementation cost, data integration, and skilled workforce availability.The study concludes that AI-driven supplier-risk management enhances transparency, operational efficiency, and competitive advantage, enabling resilient and sustainable global supply chains.

Keywords: Artificial Intelligence, Supplier Risk Management, Import-Export, Predictive Analytics, Supply Chain Resilience, Machine Learning, AUV Engineering Works

Introduction about the Study

In the era of rapid globalization and technological transformation, businesses across the world operate within a highly interconnected and competitive environment. Global trade has emerged as the backbone of economic growth, with modern supply chains extending across multiple geographical boundaries and involving diverse stakeholders. Traditionally, supplier risk management has relied on conventional assessment models that focus on historical data, periodic performance reviews, and qualitative judgment. While these models are effective in relatively stable environments, they are largely reactive rather than proactive in nature. They fail to capture the dynamic and complex risks associated with global supply chains and lack the ability to process real-time data from multiple sources. As a result, decision-makers are often unable to anticipate disruptions before they occur, leading to operational inefficiencies, delays, and increased costs.

Moreover, with the growing digitization of supply chains, organizations generate massive volumes of structured and unstructured data from global markets, logistics systems, regulatory platforms, and digital communication channels. Traditional risk management systems are inadequate to analyse such large and complex datasets efficiently, thereby limiting their effectiveness in modern international trade operations. Against this backdrop, the present study titled **"AI-Driven Supplier Risk Management in Engineering Goods Import–Export"** aims to examine the transformative role of Artificial Intelligence (AI) technologies in strengthening supply-chain resilience, efficiency, and transparency. The study explores how AI tools such as machine learning and predictive analytics can be strategically utilized to assess supplier reliability, anticipate potential risks, and enhance decision-making in international trade. Furthermore, the research seeks to propose a conceptual and practical framework for implementing AI-driven supplier-risk management systems in real-world engineering goods import–export operations.

Objectives of the Study

1. To examine the extent of adoption of Artificial Intelligence in supplier risk management.
2. To analyse the impact of AI-enabled practices on supply chain resilience and adaptability.
3. To study the perception of transparency in supplier networks among different respondent groups.
4. To evaluate the influence of real-time monitoring, supplier diversification, and AI implementation on supply chain adaptability.
5. To suggest suitable strategies for effective implementation of AI-driven supplier risk management systems.

REVIEW OF LITRETURE

1. **Zhao, Y., & Lee, C. (2024)– "Leveraging artificial intelligence for supplier selection under uncertainty."** Zhao and Lee (2024) reviewed AI methods for supplier selection under uncertain market and

logistics conditions. The paper explored fuzzy logic, Bayesian inference, and hybrid ML models for decision support.

2. **Abdulla A. (2023)– "A hybrid MCDM interpretable AI framework for supplier selection."** Abdulla (2023) reviewed hybrid approaches that combine multi-criteria decision making (MCDM) with interpretable AI to balance ordinal expert judgments and data-driven risk scores for supplier selection.

3. **Kassa, A. (2023)– "Artificial intelligence techniques for enhancing supply chain resilience."** Kassa (2023) reviewed AI techniques used to build resilience in modern supply chains. The paper emphasized how AI assists in disruption prediction, recovery planning, and real-time visibility.

4. **Lin, J., & Wu, D. (2023)– "AI and blockchain integration for transparent supplier management."** Lin and Wu (2023) presented a review analyzing the integration of AI with blockchain to enhance transparency in supplier networks. The paper explained how AI-driven analytics can detect anomalies, while blockchain ensures immutable data tracking across the supply chain.

5. **Wang, H., & Chen, L. (2023)– "Artificial intelligence applications in global procurement risk management."** Wang and Chen (2023) conducted a systematic review focusing on AI applications for managing procurement risks in global supply chains.

RESEARCH METHODOLOGY

The study adopts both primary and secondary data sources. Primary data were collected using a structured questionnaire comprising close-ended questions to ensure consistency and facilitate quantitative analysis. Secondary data were obtained from reputed journals, reports, and online databases.

The sample consisted of professionals working in procurement, logistics, and supply chain functions. Statistical tools such as Simple Percentage Analysis, ANOVA, Chi-Square Test, and Multiple Regression Analysis were used to analyse the data and test the hypotheses.

Hypotheses of the Study

ANOVA Hypothesis

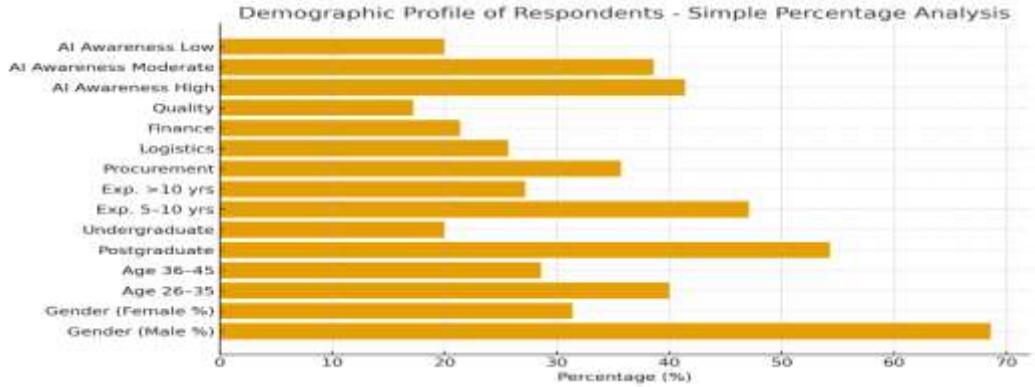
- H_{01}: There is no significant difference in the perceived transparency of supplier networks among different respondent groups.
- H_{11}: There is a significant difference in the perceived transparency of supplier networks among different respondent groups.

Regression Hypothesis

- H_{02}: AI-enabled practices have no significant effect on supply chain adaptability.
- H_{12}: AI-enabled practices have a significant effect on supply chain adaptability.

ANALYSIS

DEMOGRAPHICS



INTERPRETATION

The demographic profile indicates that a majority of respondents are male (68.6%), belong to the 26–35 age group, and possess postgraduate qualifications. Most respondents have 5–10 years of work experience and are employed in procurement and logistics departments. This reflects a technologically aware and professionally competent respondent base.

ANOVA

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.816	3	4.272	4.507	0.005
Within Groups	103.308	109	0.948		
Total	116.124	112			

INTERPRETATION

The ANOVA results show an F-value of 4.507 with a significance level of 0.005, which is less than 0.05. Hence, the null hypothesis (H_{01}) is rejected and the alternative hypothesis (H_{11}) is accepted. This indicates a statistically significant difference in perceptions of supplier network transparency among respondent groups.

REGRESSION

Independent Variable	Unstandardized Coefficient (B)	t-value	Significance ($p < 0.05$)
Constant	2.692	6.401	—
How frequently do you assess the resilience of your supply chain?	0.264	2.966	0.004
Do you use real-time monitoring tools in your supply chain operations?	0.262	3.195	0.002
How diversified are your supplier and logistics networks?	0.218	3.303	0.001
What stage are you in regarding AI implementation for supply chain risk management?	0.229	2.516	0.013

INTERPRETATION

The regression analysis reveals that all independent variables—frequency of resilience assessment, use of real-time monitoring tools, diversification of suppliers, and stage of AI implementation—have positive coefficients with p-values less than 0.05. Therefore, the null hypothesis (H_{02}) is rejected. AI-enabled practices significantly improve supply chain adaptability and responsiveness.

Findings and Suggestions

The study reveals that the adoption of Artificial Intelligence in supplier risk management is steadily increasing among organizations involved in engineering goods import–export operations. Most firms have moved beyond traditional, manual risk assessment methods and are either in the pilot phase or have fully implemented AI-enabled tools for monitoring supplier performance and supply chain risks. The demographic profile indicates that respondents are largely young, qualified, and experienced professionals from procurement and logistics functions, suggesting adequate awareness and readiness for digital transformation. The ANOVA results confirm that there is a significant difference in the perception of transparency across supplier networks among different respondent groups, indicating that exposure to AI systems and organizational roles influence how transparency is perceived. Further, the regression analysis establishes that AI-enabled practices such as frequent resilience assessment, real-time monitoring, diversification of supplier and logistics networks, and the stage of AI implementation have a

significant and positive impact on supply chain adaptability. Despite these advantages, the study identifies data integration challenges as the most critical barrier to effective AI adoption, followed by high implementation costs and shortages of skilled personnel.

Suggestions

Based on the findings of the study, organizations are advised to prioritize the development of robust and integrated data management systems that enable seamless information flow across procurement, logistics, and risk management functions. Investment in AI-enabled real-time monitoring tools should be strengthened to enhance early risk detection and improve supplier performance visibility. To further improve transparency and traceability across multi-tier supplier networks, organizations should consider integrating AI analytics with blockchain technology. Firms are also encouraged to adopt a hybrid governance model that combines centralized strategic oversight with decentralized analytical capabilities, allowing greater flexibility and faster decision-making. Additionally, organizations should focus on capacity-building initiatives such as training programs and skill development workshops to bridge the talent gap in AI and data analytics. By addressing these areas, firms can effectively leverage AI-driven supplier risk management to enhance supply chain resilience, operational efficiency, and long-term competitiveness in global trade.

Conclusion

The study concludes that Artificial Intelligence plays a vital role in transforming supplier risk management from a reactive to a proactive approach. AI-driven tools enable organizations to predict disruptions, continuously evaluate supplier performance, and enhance strategic sourcing decisions. Despite challenges related to cost, data integration, and skill availability, the long-term benefits of AI adoption significantly outweigh the limitations. AI-driven supplier risk management is essential for building resilient, transparent, and competitive import–export supply chains in the engineering goods sector.

References

1. **Dr D Mythili, Vishva S & Vishnu Prabhu C (2023),** A Study on Effective Logistics Management on Organizational Performance Evidence from Global Logistics, Rabindra Bharati Journal of Philosophy, 0973 – 0087, Vol. XXXI No.16, PP 94-101

2. **Chowdhury, F., & Islam, M. (2025)**. AI-based supplier segmentation for effective risk mitigation. Journal of Supply Chain Analytics, 12(1), 45–62.

3. **Gidiagba, J. O. (2025).** A systematic review of machine learning applications in sustainable supplier selection (2010–2024). Sustainable Supply Chain Review, 8(2), 101–120.

4. **Li, X., & Zhang, Q. (2025).** Explainable AI for supplier risk management: A review and research framework. International Journal of Operations Research, 15(3), 78–95.

5. **Samuels, A. (2025).** Examining the integration of artificial intelligence in supply chain from Industry 4.0 → 6.0: A systematic review. Industrial Management Review, 20(1), 33–56.

6. **Teixeira, A. R. (2025).** A systematic literature review on artificial intelligence in supply chain management. Journal of Supply Chain Technology, 9(4), 12–40.

7. **Bhattacharya, S., Govindan, K., & Sharma, P. (2024).** Applications of AI in closed loop supply chains: A systematic review and future agenda. International Journal of Production Research, 62(14), 4250–4275.

8. **Cannas, V. G., Ciano, M. P., Saltalamacchia, M., & Secchi, R. (2024).** Artificial intelligence in supply chain and operations management: Multiple case study and literature review. Operations and Supply Chain Journal, 11(3), 112–135.

9. **Mr.Prakash J & Dr.N.Amsaveni,** A study on Work Ability and Work Capacity of Employees with special reference to Sri Karthika Enterprise, IPE Journal of Management, ISSN 2249-9040, Volume 14, Issue 14,201-206

10. **Dr. Jayashree R**. (2025). *The Impact of Training and Development on Employees in Coimbatore's IT Industry*, IPE Journal of Management, ISSN: 2249-9040, Volume 15, No. 13, January–June 2025, Page No: 153–158.