Enhancing Supply-Chain Resilience: A Framework for Risk Mitigation through China+1 Strategy and Geographical Diversification

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Global supply chains are increasingly exposed to risks arising from geopolitical tensions, trade dependencies, and unforeseen disruptions such as pandemics. The heavy reliance on single manufacturing hubs, particularly in China, has revealed critical vulnerabilities in production networks. This study introduces a resilience framework to mitigate these risks by integrating advanced predictive technologies with strategic diversification. By leveraging Long Short-Term Memory (LSTM) neural networks, the framework models and predicts potential disruptions, providing insights into risk patterns and evaluating mitigation strategies. These strategies include multi-sourcing, regional diversification, and nearshoring, focusing on transitioning production to alternative hubs such as India, Vietnam, and Mexico. This approach enhances visibility, adaptability, and overall supply-chain resilience, reducing the systemic risks associated with over-reliance on a single geography.

The framework demonstrates significant improvements in operational efficiency, optimised lead times, and sustainability outcomes while enabling organisations to manage risks and strengthen supplier reliability proactively. By addressing black swan events and systemic vulnerabilities, the framework provides actionable insights for businesses to design adaptive and sustainable supply networks. Combining theoretical insights with real-world applications, this research offers practical solutions to the challenges of modern supply chains. It contributes to a broader understanding of global risk management and provides valuable guidance for policymakers and industry practitioners aiming to build resilient production systems in an ever-evolving landscape.

Keywords: Supply-chain resilience, Risk mitigation, LSTM, Strategic diversification