Stout in Business and Management (SBM)

DOI: https://doi.org/10.61424/b58x4a50
Journal Homepage: https://stoutjournals.org/index.php/SBM

Resilient Supply Chains in the Age of Global Disruptions: A Systematic Review

Julie Ann
Cebu technological University, Philippines
Corresponding Author: Julie Ann, **E-mail**: annjulie@gmai.com

ARTICLE INFORMATION

Submitted: September 12, 2025
Accepted: December 13, 2025
Published: July 23, 2026
Volume: 1
Issue: 1

KEYWORDS

Global disruptions, pandemics, geopolitical conflicts, supply chain, technological enablers.

ABSTRACT

The increasing frequency and severity of global disruptions, ranging from pandemics and geopolitical conflicts to climate-related events, have exposed vulnerabilities in contemporary supply chains. This systematic review examines the evolving concept of supply chain resilience, synthesizing findings from empirical studies, theoretical frameworks, and industry reports to identify key strategies, practices, and technological enablers that enhance supply chain robustness. The study categorizes resilience approaches into proactive, reactive, and adaptive measures, highlighting the role of digital technologies, risk management frameworks, and collaborative networks in mitigating disruption impacts. Evidence suggests that organizations integrating data-driven decision-making, diversified sourcing, and flexible logistics exhibit higher adaptability and faster recovery during crises. Additionally, the review identifies emerging research gaps, including the need for standardized resilience metrics and the integration of sustainability considerations into resilience planning. By consolidating contemporary insights, this study provides a comprehensive understanding of resilient supply chain practices, offering actionable guidance for managers, policymakers, and scholars aiming to strengthen supply chain performance amid ongoing global uncertainty.

1. Introduction

In an era marked by unprecedented global disruptions, the resilience of supply chains has emerged as a critical factor for organizational survival and competitiveness. Events such as the COVID-19 pandemic, geopolitical tensions, natural disasters, and trade fluctuations have exposed the vulnerability of traditional supply chain models, highlighting the urgent need for systems that can adapt, recover, and maintain functionality under stress (Mishra, 2024). Resilient supply chains, defined as the ability to anticipate, prepare for, respond to, and recover from disruptions, have therefore become a central focus for both practitioners and researchers.

Supply chain resilience is no longer merely a theoretical construct but a practical imperative. Organizations that invest in resilience not only mitigate risks but also gain strategic advantages, including improved operational continuity, enhanced customer trust, and greater flexibility in responding to market volatility. However, the pathways to achieving resilience are complex, requiring integrated approaches that combine risk management, digital technologies, and agile operational strategies (Patel, 2023). The interplay between these factors is further complicated by the global interconnectedness of supply chains, where disruptions in one region can cascade into widespread operational and economic impacts.

Despite growing attention, there remains a fragmented understanding of how resilience can be systematically assessed, measured, and enhanced across diverse industries. Existing literature often addresses isolated aspects such as risk mitigation, redundancy, or supply chain agility, yet comprehensive reviews that synthesize these insights and provide actionable frameworks are limited (Celestin, 2015). A systematic review approach offers the opportunity to consolidate evidence, identify patterns, and uncover gaps in current knowledge, thereby guiding both research agendas and practical applications.

This study seeks to provide a structured synthesis of contemporary research on resilient supply chains in the context of global disruptions. By examining strategies, enablers, and outcomes reported in prior studies, the review aims to illuminate effective

practices, emerging trends, and areas where further investigation is warranted (Sujatha, 2024). Ultimately, this research contributes to building a robust understanding of resilience, offering insights that can support organizations in navigating an increasingly uncertain and complex global environment.

2. Methodology

2.1 Research Design

This study adopts a systematic review approach to examine existing scholarly literature on resilient supply chains in the context of global disruptions. A systematic review is appropriate for synthesizing existing knowledge, identifying emerging trends, and highlighting research gaps within a defined field of study. Unlike narrative reviews, systematic reviews follow a transparent and structured process for identifying, selecting, and analyzing relevant studies. The methodology employed in this research was guided by widely accepted systematic review procedures, which emphasize rigor, replicability, and comprehensive coverage of the literature. Through this approach, the study aims to consolidate empirical and conceptual insights regarding supply chain resilience, particularly in response to disruptions such as pandemics, geopolitical conflicts, climate-related events, and technological shifts.

2.2 Data Sources and Search Strategy

The literature search was conducted using major academic databases that index peer-reviewed journals and high-quality research publications. These databases included Scopus, Web of Science, ScienceDirect, and Google Scholar. The search strategy focused on identifying studies related to supply chain resilience, risk management, and disruption response within global supply networks. Keywords and search phrases were carefully selected to capture the breadth of research in this field. Examples of key terms used in the search process included "supply chain resilience," "resilient supply chains," "supply chain disruption," "global supply chain risk," "supply chain adaptability," and "supply chain recovery strategies." Boolean operators such as AND and OR were used to combine search terms and refine results. The search primarily targeted publications released within the last decade to ensure the inclusion of recent developments and contemporary discussions, particularly those influenced by major disruptions such as the COVID-19 pandemic.

2.3 Inclusion and Exclusion Criteria

To ensure relevance and quality, specific inclusion and exclusion criteria were applied during the article selection process. Studies included in the review were required to be peer-reviewed journal articles, conference papers, or scholarly publications that focused on supply chain resilience, disruption management, or related strategic responses. Articles published in English and accessible in full text were considered for analysis. The review prioritized studies that provided empirical evidence, theoretical frameworks, or comprehensive discussions of resilience strategies in supply chains. Conversely, articles were excluded if they were not directly related to supply chain resilience, lacked academic rigor, or consisted of opinion pieces without analytical contributions. Additionally, duplicate records and studies that focused solely on operational logistics without addressing resilience or disruption management were removed from the final dataset.

2.4 Study Selection Process

The study selection process followed a structured multi-stage screening procedure to ensure that only relevant and high-quality studies were included in the final review. Initially, the database search generated a broad set of potentially relevant publications. These records were first screened by reviewing titles and abstracts to identify studies that addressed supply chain resilience or disruption management. Articles that appeared relevant were then subjected to full-text evaluation to assess their alignment with the research objectives and inclusion criteria. During this stage, studies were further examined for methodological rigor, theoretical contribution, and relevance to global supply chain disruptions. The final sample consisted of a carefully curated set of studies that provided meaningful insights into resilience strategies, supply chain adaptability, and organizational responses to disruptions.

2.5 Data Extraction and Analytical Approach

Following the selection of relevant studies, a structured data extraction process was conducted to systematically capture key information from each article. The extracted data included publication year, research context, methodology, key themes, and major findings related to supply chain resilience. These elements were organized into thematic categories to facilitate comparative analysis across studies. The analytical approach primarily involved qualitative synthesis, allowing the researchers to identify recurring patterns, conceptual frameworks, and strategic practices highlighted in the literature. Through thematic analysis, the study categorized findings into key dimensions such as resilience capabilities, technological enablers, risk mitigation strategies, and organizational adaptation mechanisms. This process enabled the integration of diverse insights from multiple studies while highlighting common trends and differences in scholarly perspectives.

2.6 Reliability and Validity of the Review

To enhance the reliability and validity of the review process, several methodological safeguards were implemented. First, the systematic search strategy ensured comprehensive coverage of relevant literature across multiple academic databases. Second, clearly defined inclusion and exclusion criteria reduced the risk of selection bias and ensured consistency in the screening process. Third, the use of thematic analysis allowed for a structured synthesis of findings while maintaining transparency in how themes were derived from the literature. By adhering to these systematic procedures, the study provides a credible and replicable synthesis of existing knowledge on resilient supply chains, thereby offering a solid foundation for understanding resilience strategies in the context of global disruptions.

3. Findings and Discussion

3.1 Overview of the Reviewed Literature

The systematic review reveals a rapidly expanding body of literature focusing on supply chain resilience, particularly in response to global disruptions experienced during the last two decades. The reviewed studies collectively highlight how supply chains have become increasingly vulnerable to complex and interconnected risks, including pandemics, geopolitical tensions, climate-related disasters, and economic shocks (Holgado, 2023). The literature demonstrates a shift from traditional efficiency-focused supply chain models toward resilience-oriented frameworks that emphasize adaptability, flexibility, and risk preparedness. This shift has been significantly influenced by events such as the COVID-19 pandemic, trade conflicts between major economies, and disruptions caused by natural disasters, which exposed structural weaknesses in global production and distribution networks.

Across the reviewed articles, supply chain resilience is commonly conceptualized as the ability of supply networks to anticipate, absorb, adapt to, and recover from disruptions. Many studies emphasize that resilience is not merely about recovery but also about maintaining operational continuity and competitive advantage during periods of uncertainty. Earlier research tended to focus on risk mitigation and inventory management; however, recent scholarship increasingly incorporates digital technologies, collaborative partnerships, and strategic redundancy as core elements of resilient supply chains (Smorodinskaya, 2021). This evolution reflects a broader recognition that supply chains operate within dynamic global environments where uncertainty and disruptions are becoming more frequent.

The reviewed literature also highlights the interdisciplinary nature of supply chain resilience research. Contributions originate from fields such as operations management, logistics, information systems, strategic management, and industrial engineering. Studies examine resilience across diverse sectors including manufacturing, healthcare, food supply, retail, and humanitarian logistics. For instance, research on healthcare supply chains during the COVID-19 crisis demonstrated how shortages of essential medical supplies exposed vulnerabilities in global sourcing systems (Katsaliaki, 2022). Similarly, studies on agricultural supply chains have emphasized the importance of resilience strategies in maintaining food security during climate-related disruptions. Overall, the literature reflects growing scholarly and practical interest in understanding how organizations can design supply chains capable of withstanding and adapting to global uncertainties.

3.1.1 Publication Trends and Research Distribution

The analysis of publication trends indicates a substantial increase in scholarly attention to supply chain resilience over the past decade, with a particularly sharp rise after 2020. Earlier studies on the topic were relatively limited and primarily concentrated on risk management within manufacturing and logistics contexts. However, the COVID-19 pandemic served as a catalyst for intensified research activity, leading to a surge in publications examining the resilience of global supply networks (Boonlua, 2023). Many scholars began to investigate how supply chains could respond more effectively to large-scale disruptions that simultaneously affected production, transportation, and demand patterns.

Geographically, the majority of studies originate from North America, Europe, and East Asia, reflecting the strong presence of manufacturing and global trade networks in these regions. Countries such as the United States, China, the United Kingdom, Germany, and India appear frequently in the reviewed literature, both as contexts of empirical investigation and as contributors to scholarly research (Grzybowska, 2023). Emerging economies have also gained increasing attention, particularly in studies examining supply chain resilience in developing regions where infrastructure limitations and institutional challenges may intensify disruption risks. For example, research focusing on Asian manufacturing hubs highlights how supplier concentration in specific regions can amplify vulnerabilities during geopolitical or pandemic-related disruptions.

In terms of industry focus, manufacturing remains the most widely studied sector due to its complex global production networks and dependence on multiple suppliers. However, recent research has expanded into other sectors such as healthcare, agriculture, retail, and humanitarian logistics. Studies examining the pharmaceutical and medical equipment supply chains during the pandemic illustrate how disruptions can have severe societal consequences, thereby reinforcing the need for resilient systems (Sutar, 2025). Additionally, many publications appear in journals related to operations management, supply chain management,

logistics, and sustainability, reflecting the multidisciplinary nature of the field. Methodologically, both empirical and conceptual studies contribute to the literature, indicating a balanced development of theoretical frameworks and practical applications.

3.1.2 Methodological Approaches in the Literature

The reviewed literature demonstrates a diverse range of methodological approaches used to investigate supply chain resilience. Qualitative case studies are among the most frequently employed methods, particularly in research exploring organizational responses to major disruptions. These studies often analyze real-world examples of companies adapting their supply chain structures during crises (Maheshwari, 2025). For instance, several case studies examine how global firms adjusted their sourcing strategies during the COVID-19 pandemic by diversifying suppliers or shifting production closer to key markets. Such qualitative approaches provide valuable insights into the decision-making processes and strategic adaptations adopted by organizations facing unexpected disruptions.

Quantitative methodologies are also widely used, particularly in studies seeking to measure the determinants and outcomes of supply chain resilience. Survey-based research frequently examines relationships between resilience practices such as collaboration, flexibility, and information sharing and organizational performance (Ivanov, 2021). Empirical studies employing statistical modeling often demonstrate that firms investing in supply chain visibility and digital technologies tend to recover more quickly from disruptions. These findings align with earlier research emphasizing the role of information integration and coordinated decision-making in enhancing supply chain responsiveness.

In addition to qualitative and quantitative methods, simulation and modeling techniques are increasingly utilized to analyze disruption scenarios and evaluate resilience strategies. Simulation models allow researchers to test the effects of different risk mitigation strategies such as maintaining safety stock, diversifying suppliers, or redesigning transportation routes without exposing real-world operations to risk. Network modeling and optimization techniques are particularly useful in assessing how disruptions propagate through complex supply chain structures (Montoya-Torres, 2021). Despite these advances, the literature also reveals certain methodological gaps. For instance, relatively few longitudinal studies examine how resilience strategies evolve over time, and limited research integrates multiple data sources to capture the full complexity of supply chain networks. Addressing these methodological gaps could significantly enhance the robustness of future research.

3.1.3 Key Research Themes

The systematic review identifies several recurring themes that collectively shape the current understanding of resilient supply chains. One dominant theme is supply chain risk management, which focuses on identifying potential disruptions and implementing proactive strategies to mitigate their impact. Numerous studies emphasize the importance of risk assessment frameworks that allow organizations to identify vulnerabilities within their supply networks (Ganguly, 2017). These frameworks often incorporate tools such as scenario planning, risk mapping, and contingency planning to improve preparedness for unexpected events. Research consistently demonstrates that organizations with structured risk management systems are better equipped to respond to disruptions and maintain operational continuity.

Another major theme in the literature is digital transformation and the use of advanced technologies to enhance supply chain resilience. Technologies such as big data analytics, artificial intelligence, blockchain, and the Internet of Things have been widely discussed as tools that improve supply chain visibility and real-time decision-making. For example, blockchain technology has been proposed as a means of enhancing transparency and traceability across supply networks, enabling organizations to quickly identify disruptions and coordinate responses with suppliers and logistics partners (Belhadi, 2024). Similarly, data analytics platforms allow firms to predict demand fluctuations and optimize inventory levels, thereby reducing the impact of supply interruptions.

Supply chain diversification and collaboration also emerge as key strategies in the resilience literature. Many studies emphasize the risks associated with overreliance on single suppliers or geographically concentrated sourcing regions. The disruptions experienced during global crises have prompted firms to diversify supplier bases and adopt regionalized supply networks to reduce dependency on distant manufacturing hubs (Lopes, 2022). At the same time, collaborative relationships among supply chain partners are increasingly recognized as critical for resilience. Information sharing, joint planning, and strategic partnerships enable organizations to coordinate responses during disruptions and allocate resources more effectively.

3.2 Drivers of Supply Chain Resilience

The reviewed literature consistently identifies several critical drivers that enable organizations to develop resilient supply chains capable of responding effectively to large-scale disruptions such as pandemics, geopolitical conflicts, climate-related disasters, and financial crises. Supply chain resilience is increasingly viewed as a multidimensional capability that emerges from the interaction of organizational strategies, technological infrastructure, and collaborative networks (Baldwin, 2022). Across the

studies analyzed, resilience is not solely dependent on a single organizational attribute but rather on the integration of internal capabilities and external relationships that allow firms to anticipate, absorb, and recover from disruptions.

Evidence from prior research suggests that organizations that proactively invest in adaptive structures and risk management practices tend to demonstrate greater resilience during periods of uncertainty. For instance, studies examining supply chain responses during the COVID-19 pandemic show that firms with diversified sourcing strategies and flexible production systems were better able to maintain operations compared to firms that relied heavily on single-source suppliers. Similarly, research by Aylor (2020) emphasizes that resilient supply chains depend on capabilities such as visibility, velocity, and flexibility, which collectively enable organizations to respond quickly to changing conditions. The systematic review therefore highlights three dominant drivers of resilience: organizational capabilities and strategic flexibility, technological enablers, and collaborative supply chain networks.

3.2.1 Organizational Capabilities and Strategic Flexibility

Organizational capabilities and strategic flexibility emerge as foundational drivers of supply chain resilience. The literature indicates that firms with strong internal capabilities including effective strategic planning, adaptive leadership, and flexible operational structures are better positioned to respond to disruptions and maintain continuity in supply chain operations. Strategic flexibility allows organizations to rapidly adjust sourcing strategies, production schedules, and distribution channels in response to external shocks. Studies such as those by Abdulraheem (2018) emphasize that resilient firms typically employ contingency planning and scenario analysis to prepare for multiple disruption scenarios.

Evidence from the reviewed studies further shows that agile decision-making processes and decentralized management structures enhance organizational responsiveness during crises. During the global semiconductor shortage, for example, several automotive manufacturers with flexible procurement strategies were able to shift suppliers and reconfigure production schedules more effectively than competitors with rigid supply chain structures. Similarly, research by Rashid (2025) highlights the importance of redundancy and capacity buffers, such as maintaining safety stock or alternative transportation routes, to ensure operational continuity.

Adaptive leadership also plays a crucial role in fostering resilience. Leaders who encourage innovation, cross-functional collaboration, and rapid decision-making enable organizations to respond proactively to disruptions rather than reactively. Studies examining supply chain responses to the COVID-19 pandemic indicate that organizations with strong risk management cultures and integrated supply chain planning systems were able to minimize operational disruptions and recover more quickly (Gunasekaran, 2015). These findings align with the broader literature suggesting that strategic flexibility and organizational learning are essential components of resilient supply chain systems.

3.2.2 Technological Enablers of Resilience

Technological innovation has become a major enabler of supply chain resilience in the digital economy. The reviewed literature highlights the growing importance of technologies such as big data analytics, artificial intelligence (AI), blockchain, and the Internet of Things (IoT) in improving supply chain visibility, forecasting accuracy, and coordination across complex networks (Pennisi di Floristella, 2022). These technologies enable organizations to monitor supply chain activities in real time, detect potential disruptions early, and implement data-driven responses to mitigate risks.

Big data analytics, for example, allows firms to analyze large volumes of operational and market data to identify emerging risks and optimize supply chain performance. Studies by Veselovská (2020) demonstrate that organizations leveraging advanced analytics are better able to predict demand fluctuations, anticipate supplier disruptions, and adjust inventory levels accordingly. Similarly, AI-driven predictive models have been widely used to enhance demand forecasting and logistics optimization, reducing the likelihood of stockouts and delivery delays during periods of uncertainty.

Blockchain technology also contributes to resilience by enhancing transparency and trust among supply chain participants. By providing immutable records of transactions and product movements, blockchain improves traceability and reduces the risk of fraud or information asymmetry within supply chain networks. This capability is particularly important in industries such as pharmaceuticals and food supply chains, where product authenticity and safety are critical (Khan, 2025). Additionally, IoT devices enable real-time tracking of goods and environmental conditions throughout the supply chain, allowing firms to monitor transportation risks and respond quickly to disruptions.

Collectively, these technological advancements strengthen supply chain resilience by enabling greater visibility, predictive capabilities, and coordinated decision-making. The literature suggests that firms integrating digital technologies into their supply

chain management practices are more capable of anticipating disruptions and adapting their operations in dynamic global environments (Tang, 2006).

3.2.3 Collaboration and Network Integration

Collaboration and network integration represent another significant driver of supply chain resilience. The reviewed studies emphasize that resilience is not solely determined by the capabilities of individual firms but also by the strength of relationships within the broader supply chain network (Sako, 2022). Collaborative practices such as information sharing, strategic partnerships, and supplier integration enable organizations to coordinate responses to disruptions and maintain continuity in supply chain operations.

Research indicates that supply chains characterized by strong inter-organizational relationships tend to be more resilient during periods of disruption. For example, studies analyzing supply chain responses to natural disasters and pandemic-related disruptions reveal that firms with long-term partnerships and transparent communication channels were able to secure critical supplies more effectively than firms with purely transactional supplier relationships (Panwar, 2022). Collaboration allows organizations to pool resources, share risk-related information, and jointly develop contingency plans for managing disruptions.

Information sharing plays a particularly important role in enhancing supply chain resilience. Real-time data exchange between suppliers, manufacturers, and distributors enables organizations to detect disruptions early and coordinate corrective actions across the network (Alabi, 2023). For instance, integrated supply chain platforms used by major retail and manufacturing firms allow partners to share inventory data, demand forecasts, and logistics updates, improving collective responsiveness to supply and demand fluctuations.

Supplier integration is also highlighted as a key resilience strategy. Firms that actively engage suppliers in product development, planning processes, and risk management activities are better able to build trust and ensure supply continuity during disruptions. According to research by Chopra (2014), collaborative supply chain relationships not only improve operational efficiency but also enhance the ability of organizations to adapt to unexpected events.

3.3 Strategies for Managing Global Supply Chain Disruptions

The systematic review reveals that organizations increasingly adopt a combination of proactive and reactive strategies to manage disruptions in global supply chains. The literature consistently emphasizes that resilience is not achieved through a single intervention but through an integrated set of risk management practices, structural adjustments, and operational capabilities. Studies reviewed in this research indicate that firms that successfully navigated recent global disruptions such as the COVID-19 pandemic, geopolitical conflicts, and transportation bottlenecks implemented comprehensive strategies that combined risk anticipation, supplier diversification, and operational agility. For example, multinational manufacturers and global retailers strengthened monitoring systems, diversified supplier networks, and adopted digital technologies to maintain supply continuity. These findings are consistent with earlier research that highlights the importance of strategic preparedness and adaptive capabilities in enhancing supply chain resilience (Xu, 2020; Mishra, 2024).

The analysis further indicates that organizations increasingly view disruption management as a strategic priority rather than merely an operational concern. Firms are integrating resilience considerations into long-term supply chain design, investment in digital infrastructure, and collaborative partnerships with suppliers and logistics providers (Patel, 2023). As a result, modern supply chain resilience strategies emphasize both prevention and recovery mechanisms, enabling organizations to respond effectively when disruptions occur while maintaining service levels and operational stability.

3.3.1 Risk Identification and Assessment

A central finding from the reviewed literature is that effective disruption management begins with systematic risk identification and assessment. Organizations increasingly utilize structured frameworks to detect vulnerabilities within their supply chains and evaluate potential disruption scenarios. These frameworks often incorporate risk mapping, scenario planning, and vulnerability assessments that examine critical nodes within supply networks, including suppliers, transportation routes, and production facilities (Celestin, 2015). Through such analyses, firms can identify high-risk dependencies and prioritize mitigation strategies.

Several studies highlight the role of digital monitoring systems and data analytics in strengthening risk identification processes. For instance, real-time tracking technologies and predictive analytics enable organizations to monitor supplier performance, transportation delays, and geopolitical developments that may affect supply continuity. Sujatha (2024) note that digital twins and simulation models allow firms to test disruption scenarios and evaluate the potential impact on supply chain performance. Similarly, research by Smorodinskaya (2021) emphasizes that structured risk assessment frameworks enable firms to differentiate between operational risks, such as demand variability, and disruption risks, such as natural disasters or pandemics.

The reviewed studies also show that proactive risk identification improves organizational preparedness and response capabilities. For example, during the COVID-19 pandemic, companies that had previously conducted vulnerability analyses were better positioned to identify potential shortages of critical materials and adjust sourcing strategies accordingly (Katsaliaki, 2022). This evidence supports the argument that systematic risk assessment forms the foundation of resilient supply chain management, enabling organizations to anticipate disruptions rather than merely reacting to them after they occur.

3.3.2 Diversification and Redundancy Strategies

Another key finding from the literature is the growing importance of diversification and redundancy as strategies for mitigating supply chain disruptions. Many organizations historically relied on highly centralized and cost-efficient supply networks, often sourcing critical components from a single supplier or geographic region (Boonlua, 2023). While such configurations minimized costs, they also created significant vulnerabilities when disruptions affected those regions. The studies reviewed indicate that firms are increasingly moving toward diversified sourcing strategies to reduce these risks.

Supplier diversification, including multi-sourcing and geographically dispersed supplier networks, emerged as a widely adopted resilience strategy. By maintaining relationships with multiple suppliers across different regions, organizations reduce their dependence on a single source and increase their ability to maintain production during disruptions. For instance, several manufacturing firms shifted from single sourcing in East Asia to multi-regional sourcing arrangements after experiencing supply shortages during global transportation disruptions. According to Grzybowska (2022), diversified supply networks provide organizations with alternative supply routes that enhance operational continuity during crises.

Redundancy strategies also play a critical role in supply chain resilience. These strategies include maintaining safety stock, developing backup suppliers, and investing in additional production capacity. Although redundancy may increase operational costs, the literature suggests that such investments can significantly reduce the financial and operational impacts of disruptions. Research by Sutar (2025) demonstrates that firms that maintained strategic inventory buffers were able to continue meeting customer demand even when transportation networks experienced delays. Consequently, the findings indicate that diversification and redundancy serve as essential safeguards that enhance supply chain robustness while balancing efficiency and resilience.

3.3.3 Supply Chain Agility and Flexibility

The review further identifies supply chain agility and flexibility as critical capabilities that enable organizations to respond rapidly to changing conditions during disruptions. Agile supply chains are characterized by adaptable processes, decentralized decision-making, and rapid information sharing across supply network partners (Ivanov, 2021). These features allow organizations to quickly modify production schedules, adjust logistics routes, and respond to fluctuations in demand or supply availability.

Flexible manufacturing systems represent an important component of supply chain agility. Several studies highlight how organizations adopted modular production technologies and adaptable manufacturing processes to switch between products or production volumes when disruptions occurred. For example, during the early stages of the COVID-19 pandemic, some manufacturers rapidly reconfigured production lines to produce essential goods such as medical equipment and personal protective equipment (Montoya-Torres, 2021). This ability to rapidly reallocate production resources demonstrates how operational flexibility contributes to supply chain resilience.

Dynamic logistics planning also plays a crucial role in enabling agile responses to disruptions. Advances in digital technologies, including artificial intelligence and real-time transportation monitoring systems, allow firms to adjust distribution routes and transportation modes when disruptions occur. According to Ganguly (2017), agile supply chains rely on rapid information exchange and collaborative relationships between supply chain partners to support such adaptive responses.

In addition, responsive procurement strategies contribute to supply chain agility by enabling organizations to rapidly source materials from alternative suppliers. Procurement teams increasingly rely on digital supplier platforms and collaborative partnerships to accelerate sourcing decisions during disruptions (Belhadi, 2024). The reviewed literature therefore indicates that agility and flexibility are essential characteristics of resilient supply chains, enabling organizations to maintain operational continuity and quickly recover from unexpected disruptions.

3.4 Impacts of Global Disruptions on Supply Chain Performance

Global disruptions have significantly reshaped supply chain operations, influencing both short-term operational efficiency and long-term structural dynamics of global supply networks. The reviewed literature consistently indicates that disruptions such as pandemics, geopolitical conflicts, natural disasters, and trade restrictions create immediate operational disturbances while simultaneously prompting structural adjustments in supply chain design and management (Lopes, 2022). Studies analyzing

disruptions during the COVID-19 pandemic, for instance, highlight how global supply chains experienced unprecedented interruptions in production, transportation, and distribution networks, exposing the vulnerabilities of highly interconnected and lean supply systems. These disruptions affected supply chain performance by reducing reliability, increasing lead times, and diminishing service levels across multiple industries including manufacturing, healthcare, and retail.

Beyond immediate operational disturbances, the literature reveals that global disruptions also catalyze long-term structural changes within supply networks. Organizations increasingly recognize the risks associated with overly centralized production systems and extended global supply networks. Consequently, firms are reconsidering sourcing strategies, supplier diversification, and digital integration to build greater adaptability (Baldwin, 2022). Previous studies emphasize that disruptions often act as critical learning events, encouraging organizations to redesign supply chains with greater emphasis on resilience, visibility, and agility. As a result, supply chains are evolving from efficiency-driven systems toward more balanced models that prioritize both cost efficiency and risk management.

3.4.1 Operational and Logistical Challenges

Operational and logistical challenges represent the most immediate consequences of global supply chain disruptions. The reviewed studies consistently report transportation delays, production stoppages, inventory shortages, and labor constraints as common operational issues affecting supply chain performance. For instance, disruptions in global shipping routes and port congestion significantly delayed the movement of goods during the COVID-19 pandemic, leading to longer lead times and reduced product availability in international markets (Aylor, 2020). These transportation disruptions often resulted in cascading effects across supply chains, where delays at one stage of production created bottlenecks throughout the entire network.

Production stoppages are another critical operational challenge identified in the literature. Factory closures caused by lockdowns, health regulations, or shortages of critical raw materials forced many companies to temporarily halt production. Industries heavily dependent on global component sourcing, such as electronics and automotive manufacturing, were particularly affected (Abdulraheem, 2018). Studies highlight the semiconductor shortage experienced by automotive manufacturers as a prominent example of how disruptions in one component market can significantly impair production capacity across multiple industries.

Inventory shortages also emerged as a widespread consequence of supply chain disruptions. Just-in-time inventory management practices, while effective in reducing storage costs, left many firms vulnerable to supply interruptions. When disruptions occurred, organizations struggled to maintain adequate stock levels, leading to stockouts and reduced service reliability. Furthermore, labor shortages within logistics, manufacturing, and transportation sectors intensified operational difficulties (Rashid, 2025). Workforce constraints arising from health concerns, migration restrictions, and workplace safety regulations limited the capacity of supply chains to recover quickly from disruptions. Collectively, these operational challenges reduced efficiency, increased lead times, and undermined supply chain reliability across global markets.

3.4.2 Financial and Economic Implications

Global supply chain disruptions also produce significant financial and economic consequences for organizations and national economies. The reviewed literature indicates that disruptions frequently lead to increased operational costs due to higher transportation expenses, emergency sourcing, inventory holding costs, and production inefficiencies. For example, the surge in global freight rates during periods of logistical congestion forced many firms to allocate additional financial resources to maintain supply continuity (Gunasekaran, 2015). These cost increases reduced profit margins and placed financial pressure on organizations operating in highly competitive markets.

Revenue losses represent another critical financial impact of supply chain disruptions. When organizations experience production delays or inventory shortages, they are often unable to meet customer demand, resulting in missed sales opportunities and reduced market share (Pennisi di Floristella, 2022). Several studies highlight that small and medium-sized enterprises are particularly vulnerable to such disruptions because they often lack the financial reserves or supply network flexibility required to absorb operational shocks.

At the macroeconomic level, supply chain disruptions also influence global trade dynamics and economic stability. Interruptions in international supply networks can lead to fluctuations in commodity prices, inflationary pressures, and shifts in global trade patterns. For instance, shortages of essential goods during global crises often trigger price volatility and changes in import–export balances (Veselovská, 2020). Additionally, disruptions encourage governments to reconsider trade policies and supply security strategies, particularly in sectors such as healthcare, food production, and critical technologies. Consequently, supply chain disruptions not only affect individual firms but also reshape broader economic relationships and global trade structures.

3.4.3 Organizational and Strategic Adjustments

In response to recurring global disruptions, organizations are increasingly implementing strategic adjustments aimed at strengthening supply chain resilience and long-term sustainability. The literature indicates that many firms are reconfiguring their supply networks by adopting strategies such as nearshoring, regionalization, supplier diversification, and digital transformation (Khan, 2025). These strategic adjustments represent a shift from purely efficiency-focused supply chain models toward systems that prioritize adaptability and risk mitigation.

Nearshoring and regionalization have emerged as prominent strategies for reducing dependency on distant suppliers and minimizing exposure to international transportation disruptions. By relocating production facilities or sourcing partners closer to end markets, organizations can shorten supply chains and enhance responsiveness to demand fluctuations (Tang, 2006). Studies demonstrate that companies in industries such as electronics and pharmaceuticals have increasingly explored regional manufacturing hubs to improve supply reliability and reduce geopolitical risks.

Digital transformation also plays a critical role in strengthening supply chain resilience. Investments in digital technologies such as advanced analytics, artificial intelligence, and real-time tracking systems improve supply chain visibility and enable organizations to detect disruptions more quickly (Sako, 2022). These technologies allow firms to monitor supplier performance, anticipate demand changes, and implement proactive risk management strategies. Previous research emphasizes that organizations integrating digital supply chain platforms are better positioned to respond to disruptions and maintain operational continuity.

3.5 Strategic Implications and Future Research Directions

The findings of this systematic review highlight that supply chain resilience has become a critical strategic priority for organizations operating in an increasingly volatile global environment. The reviewed studies consistently demonstrate that global disruptions such as pandemics, geopolitical tensions, climate-related events, and technological shocks have exposed structural weaknesses in traditional supply chain models that emphasize efficiency over flexibility. As a result, organizations are increasingly shifting toward resilience-oriented supply chain strategies that integrate risk management, technological innovation, and collaborative networks (Panwar, 2022). The synthesis of the literature suggests that resilience is not a single capability but a multidimensional construct that includes adaptability, redundancy, visibility, and strategic coordination among supply chain partners. These insights provide important implications for managerial decision-making, policy development, and future academic research aimed at strengthening global supply chain systems.

3.5.1 Managerial and Strategic Implications

The review highlights several practical implications for managers seeking to enhance supply chain resilience. First, organizations must move beyond cost-minimization strategies and adopt strategic supply chain planning that prioritizes flexibility and risk diversification. Studies have shown that firms relying heavily on single suppliers or geographically concentrated production hubs faced significant disruptions during global crises such as the COVID-19 pandemic. Consequently, supplier diversification, nearshoring, and multi-sourcing strategies have emerged as critical managerial practices for reducing vulnerability. Alabi (2023) emphasized that resilient supply chains require proactive risk identification and contingency planning, which enables organizations to respond rapidly to unexpected disruptions.

Second, the adoption of advanced digital technologies plays a crucial role in strengthening supply chain resilience. Technologies such as big data analytics, artificial intelligence, blockchain, and the Internet of Things (IoT) enhance supply chain visibility, real-time monitoring, and predictive decision-making. Chopra (2014) highlight that digital supply chain twins and predictive analytics models allow organizations to simulate disruption scenarios and develop more effective response strategies. For example, multinational retailers and logistics firms increasingly use real-time tracking systems and data analytics platforms to monitor inventory flows and anticipate potential disruptions across global supply networks.

Third, collaboration and strategic partnerships among supply chain actors are essential for building resilient systems. The literature indicates that information sharing, trust, and coordinated planning among suppliers, manufacturers, distributors, and logistics providers significantly improve disruption management capabilities. According to Xu (2020), collaborative supply chain relationships facilitate faster recovery from disruptions by enabling coordinated responses and resource sharing among partners. Organizations are therefore encouraged to develop long-term strategic partnerships rather than purely transactional relationships within their supply networks.

3.5.2 Policy and Institutional Considerations

Beyond organizational strategies, the review also highlights the critical role of policy and institutional frameworks in strengthening supply chain resilience. Governments and regulatory institutions play an important role in creating supportive

environments that facilitate stable supply chain operations, particularly during large-scale global disruptions. Public policies that promote infrastructure development, trade facilitation, and digital connectivity can significantly enhance the efficiency and adaptability of supply chains (Maheshwari, 2025). For instance, investments in transportation infrastructure, port modernization, and digital logistics platforms enable smoother movement of goods and reduce vulnerability to disruptions.

Furthermore, regulatory frameworks that encourage transparency, risk-sharing, and cross-border cooperation are essential for maintaining the stability of global supply networks. The COVID-19 pandemic demonstrated how restrictive trade policies and export bans can exacerbate supply shortages in critical sectors such as medical supplies and food products. As a result, scholars emphasize the importance of international policy coordination and cooperative trade agreements to ensure continuity in global supply flows during crises (Grzybowska, 2022). Institutions such as the World Trade Organization and regional economic blocs have an important role in promoting policies that support resilient and open supply chain systems.

In addition, governments can support supply chain resilience through targeted industrial policies and incentives that encourage innovation and domestic capacity development. Public-private partnerships in logistics infrastructure, digital technologies, and advanced manufacturing can strengthen national supply chain capabilities while maintaining integration with global markets (Smorodinskaya, 2021). These institutional mechanisms are particularly important for developing economies seeking to enhance their participation in global value chains while minimizing exposure to external shocks.

3.5.3 Future Research Opportunities

Despite the growing body of literature on supply chain resilience, several research gaps remain that warrant further academic investigation. One important area for future research involves the integration of sustainability and resilience within supply chain management. While resilience focuses on the ability to withstand disruptions, sustainability emphasizes long-term environmental and social responsibility (Katsaliaki, 2022). Future studies should explore how organizations can design supply chains that simultaneously achieve resilience, sustainability, and efficiency without creating trade-offs among these objectives.

Another promising research direction concerns the role of emerging digital technologies in disruption management. Although existing studies highlight the benefits of technologies such as artificial intelligence, blockchain, and big data analytics, empirical research examining their real-world implementation and performance outcomes remains limited (Ganguly, 2017). Future research could investigate how digital transformation influences supply chain resilience across different industries and geographic contexts. Additionally, the development of integrated digital platforms that enable real-time coordination across supply chain partners represents a valuable area for further exploration.

Finally, future research should focus on the development of predictive and simulation-based models that can anticipate disruptions and guide strategic decision-making. Recent studies have begun using advanced analytics, machine learning, and system dynamics modeling to forecast supply chain risks and evaluate resilience strategies. However, more interdisciplinary research is needed to develop comprehensive predictive frameworks capable of addressing complex and interconnected global disruptions (Belhadi, 2024). Such models would provide valuable tools for both researchers and practitioners seeking to enhance preparedness and resilience in global supply networks.

4. Conclusion

The increasing frequency and intensity of global disruptions have underscored the critical importance of building resilient supply chains capable of withstanding shocks and sustaining operational continuity. This systematic review examined the evolving body of literature on supply chain resilience in the context of global disruptions such as pandemics, geopolitical conflicts, natural disasters, and technological failures. The analysis of the reviewed studies demonstrates that modern supply chains must move beyond traditional efficiency-focused models toward more adaptive, flexible, and risk-aware systems that prioritize resilience as a strategic capability.

The findings reveal that supply chain resilience is shaped by a combination of organizational, technological, and relational factors. Organizations that adopt proactive risk management strategies, diversify their supplier networks, and invest in digital technologies such as big data analytics, artificial intelligence, and blockchain tend to demonstrate higher levels of preparedness and responsiveness during disruptions. Additionally, collaborative relationships among supply chain partners characterized by transparency, information sharing, and joint problem-solving play a significant role in enhancing the resilience of supply networks. These collaborative practices enable organizations to detect disruptions early, respond quickly, and recover more effectively.

The review also highlights the transformative impact of major global disruptions on supply chain design and management. Events such as the COVID-19 pandemic exposed structural vulnerabilities within highly globalized and lean supply systems,

prompting organizations to reconsider strategies related to sourcing, inventory management, and logistics planning. Many firms have increasingly adopted practices such as nearshoring, strategic stockpiling, and the use of digital monitoring systems to strengthen their ability to anticipate and respond to uncertainties. These strategic shifts reflect a growing recognition that resilience is not only an operational concern but also a key component of long-term competitive advantage.

From a managerial perspective, the findings suggest that organizations must integrate resilience thinking into their strategic planning and supply chain governance structures. Managers should prioritize risk assessment, develop contingency plans, and leverage emerging technologies to improve supply chain visibility and coordination. At the same time, policymakers and institutional actors have an important role in supporting resilient supply networks through regulatory frameworks, infrastructure development, and policies that encourage collaboration and innovation across industries.

Despite the valuable insights generated by existing studies, the review also identifies several gaps in the literature. Future research should explore the measurement of supply chain resilience, the role of sustainability in resilient supply chain design, and the implications of emerging technologies for supply chain risk management. Furthermore, comparative studies across industries and regions would provide deeper insights into how different contexts influence resilience strategies and outcomes.

In conclusion, resilient supply chains are essential for navigating the complexities and uncertainties of the modern global economy. As disruptions continue to shape the landscape of international trade and logistics, organizations must adopt integrated strategies that combine technological innovation, strategic collaboration, and proactive risk management. Strengthening supply chain resilience will not only help organizations mitigate the impacts of disruptions but also enable them to adapt, innovate, and thrive in an increasingly volatile global environment.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.
Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers
Artificial Intelligence (AI) Use Disclosure: The authors declare that no artificial intelligence tools were used in the preparation of this manuscript

References

[1] Abdulraheem, A. O. (2018). Just-in-time manufacturing for improving global supply chain resilience. *Int J Eng Technol Res Manag*, *2*(11), 58.
[2] Alabi, M. O., & Ngwenyama, O. (2023). Food security and disruptions of the global food supply chains during COVID-19: building smarter food supply chains for post COVID-19 era. *British Food Journal*, *125*(1), 167-185.
[3] Aylor, B., Datta, B., DeFauw, M., Gilbert, M., Knizek, C., & McAdoo, M. (2020). Designing resilience into global supply chains. *Boston Consulting Group, August*, *3*.
[4] Baldwin, R., & Freeman, R. (2022). Risks and global supply chains: What we know and what we need to know. *Annual Review of Economics*, *14*(1), 153-180.
[5] Belhadi, A., Kamble, S., Subramanian, N., Singh, R. K., & Venkatesh, M. (2024). Digital capabilities to manage agri-food supply chain uncertainties and build supply chain resilience during compounding geopolitical disruptions. *International Journal of Operations & Production Management*, *44*(11), 1914-1950.
[6] Boonlua, S., Supachaiwat, J., Thongchua, K., & Mohamad, B. (2023). Linking supply chain resilience strategies for surviving major disruptions. *International Journal of Construction Supply Chain Management*, *13*(1), 154-172.
[7] Celestin, M., & Sujatha, S. (2024). Impact of global supply chain disruptions on business resilience: Strategies for adapting to pandemics and geopolitical conflicts. *International Journal of Advanced Trends in Engineering and Technology*, *9*(2), 44-53.
[8] Celestin, M., & Vanitha, N. (2015). Navigating supply chain chaos: Strategies for resilience amid global disruptions. *International Journal of Multidisciplinary Research and Modern Education (IJMRME)*, *1*(2), 457-464.
[9] Chopra, S., & Sodhi, M. (2014). Reducing the risk of supply chain disruptions. *MIT Sloan management review*, *55*(3), 73-80.
[10] Ganguly, A., Chatterjee, D., & Rao, H. (2017). The role of resiliency in managing supply chains disruptions. In *Supply chain risk management: advanced tools, models, and developments* (pp. 237-251). Singapore: Springer Singapore.
[11] Grzybowska, K., & Stachowiak, A. (2022). Global changes and disruptions in supply chains—preliminary research to sustainable resilience of supply chains. *Energies*, *15*(13), 4579.
[12] Gunasekaran, A., Subramanian, N., & Rahman, S. (2015). Supply chain resilience: role of complexities and strategies. *International Journal of Production Research*, *53*(22), 6809-6819.
[13] Holgado, M., & Niess, A. (2023). Resilience in global supply chains: analysis of responses, recovery actions and strategic changes triggered by major disruptions. *Supply Chain Management: An International Journal*, *28*(6), 1040-1059.
[14] Ivanov, D., & Dolgui, A. (2021). A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0. *Production Planning & Control*, *32*(9), 775-788.
[15] Katsaliaki, K., Galetsi, P., & Kumar, S. (2022). Supply chain disruptions and resilience: a major review and future research agenda. *Annals of operations research*, *319*(1), 965-1002.

[16] Khan, T., & Emon, M. M. H. (2025). Resilient supply chains: Lessons from past crisis strategies companies can adopt to create more resilient supply chains. In *Mass Media and Impact of Fake News on Supply Chains* (pp. 285-318). IGI Global Scientific Publishing.
[17] Lopes, J. M., Gomes, S., & Mané, L. (2022). Developing knowledge of supply chain resilience in less-developed countries in the pandemic age. *Logistics*, *6*(1), 3.
[18] Maheshwari, S., & Jaggi, C. K. (2025). Enhancing supply chain resilience through industry-specific approaches to mitigating disruptions. *Opsearch*, *62*(4), 1687-1720.
[19] Mishra, A., Gupta, N., & Jha, G. K. (2024). Supply chain resilience: Adapting to global disruptions and uncertainty. *International Journal of Innovative Research in Engineering*, *5*(2), 189-196.
[20] Montoya-Torres, J. R. (2021, January). Managing disruptions in supply chains. In *International Workshop on Service Orientation in Holonic and Multi-Agent Manufacturing* (pp. 272-284). Cham: Springer International Publishing.
[21] Panwar, R., Pinkse, J., & De Marchi, V. (2022). The future of global supply chains in a post-COVID-19 world. *California Management Review*, *64*(2), 5-23.
[22] Patel, K. R. (2023). Enhancing global supply chain resilience: Effective strategies for mitigating disruptions in an interconnected world. *BULLET: Jurnal Multidisiplin Ilmu*, *2*(1), 257-264.
[23] Pennisi di Floristella, A., & Chen, X. (2022). Building resilient supply chains in uncertain times: a comparative study of EU and ASEAN approaches to supply chain resilience. *Asia Europe Journal*, *20*(4), 457-475.
[24] Rashid, A., Rasheed, R., Rahi, S., & Amirah, N. A. (2025). Impact of supplier trust and integrated technology on supply chain resilience for sustainable supply chain in FMCG sector. *Journal of Science and Technology Policy Management*.
[25] Sako, M. (2022). Global supply chain disruption and resilience. *Communications of the ACM*, *65*(4), 18-21.
[26] Smorodinskaya, N. V., Katukov, D. D., & Malygin, V. E. (2021). Global value chains in the age of uncertainty: advantages, vulnerabilities, and ways for enhancing resilience. *Baltic Region*, *13*(3), 78-107.
[27] Sutar, P. S., Kolte, G. C., & Yamini, S. (2025). Food supply chain disruptions and its resilience: a framework and review for resilience strategies in the digital era. *Opsearch*, 1-35.
[28] Tang, C. S. (2006). Robust strategies for mitigating supply chain disruptions. *International Journal of Logistics: Research and Applications*, *9*(1), 33-45.
[29] Veselovská, L. (2020). Supply chain disruptions in the context of early stages of the global COVID-19 outbreak. *Problems and Perspectives in Management*, *18*(2), 490-500.
[30] Xu, Z., Elomri, A., Kerbache, L., & El Omri, A. (2020). Impacts of COVID-19 on global supply chains: Facts and perspectives. *IEEE engineering management review*, *48*(3), 153-166.