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Digital Strategies and Policy Challenges in Healthcare and Food Supply Chain Resilience

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ABSTRACT : In an era of increasingly frequent disruptions such as natural disasters, pandemics, and geopolitical conflicts, the resilience of logistics systems has become a pressing global concern. This narrative review explores how logistics resilience is operationalized and supported across diverse contexts, with a particular focus on digital transformation and cross-sectoral strategies. The review draws upon literature sourced from Scopus, PubMed, and Google Scholar, using targeted keywords to capture studies published within the last five years. The inclusion criteria emphasized peer-reviewed empirical research related to supply chain resilience, healthcare logistics, and food systems. Findings reveal that strategies such as supply chain diversification, decentralized infrastructure, and real-time monitoring via IoT and AI significantly enhance adaptive capacity. Blockchain and big data analytics further improve transparency, accountability, and decision-making speed. However, disparities across regions remain prominent, particularly due to limited infrastructure, policy constraints, and institutional fragmentation. These systemic barriers inhibit the implementation of resilient logistics in low- and middle-income countries. The discussion highlights the importance of context-specific adaptation, regulatory reform, and the alignment of institutional systems with digital innovation. The review concludes by calling for more comparative and interdisciplinary studies to fill empirical gaps and support the development of globally relevant policy and operational frameworks. Strengthening logistics resilience demands integrated strategies that bridge technology, governance, and localized practice.

Keywords: Logistics Resilience; Supply Chain Disruption; Digital Transformation; Institutional Adaptation; Iot And AI In Logistics; Global Crisis Response; Policy And Infrastructure Reform

INTRODUCTION

In recent years, the concept of resilience has gained considerable attention in both academic and policy discussions, particularly in the context of increasingly frequent global crises such as pandemics, climate-related disasters, and geopolitical conflicts. These events have exposed significant vulnerabilities in socio-economic systems, including food supply chains and healthcare

infrastructure. Resilience, in this context, refers to the capacity of systems to absorb shocks, adapt to disruptions, and transform in ways that maintain or enhance essential functions. Maceín et al. (2024) observed how the COVID-19 pandemic catalyzed the development of shorter, localized food supply chains, thereby fostering consumer trust and enhancing the adaptive capacity of urban and peri-urban systems. Similarly, in Ethiopia, lack of systemic resilience has been directly linked to food insecurity, negatively impacting the health and socio-economic conditions of affected populations (Negesse et al., 2022). Complementary findings from the health sector, such as those reported by Khalil et al. (2022), underscore the importance of clinical adaptability during crises, reinforcing the need for integrated, system-wide strategies to navigate global and local disruptions (Grailey et al., 2024).

The growing interest in resilience is further reflected in the evolving research landscape over the past five years, which shows a marked increase in the integration of digital technologies and systemic approaches to address operational and environmental challenges. Notably, Heeres et al. (2023) documented the transformative role of the Internet of Things (IoT) in healthcare supply chains, leading to improved inventory management, greater transparency, and cost efficiency. Furthermore, Lopes et al. (2022) highlighted that in developing countries, resilience strategies increasingly emphasize digital solutions and operational performance metrics as responses to pervasive uncertainties and recurrent disruptions. These trends align with the broader literature emphasizing the critical need for risk management innovation and operational adjustments in the digital transformation of food and healthcare sectors.

Empirical indicators supporting the relevance of this topic encompass a broad range of statistical and spatial analyses focused on specific regions and population groups. For example, in Madrid, consumer behavior research revealed a significant shift toward localized food sourcing, indicating stronger trust and systemic responsiveness (Maceín et al., 2024). Meanwhile, in Ethiopia, quantitative assessments of food security demonstrate the direct correlation between economic instability, public health deficits, and systemic fragility (Negesse et al., 2022). Additionally, evaluations of healthcare institutional performance during crises, such as those conducted by Khalil et al. (2022), provide valuable insights into local and global system developments. Arciniegas et al. (2022) further advanced these findings through participatory methods utilizing digital data to assess urban land-use potential, highlighting the utility of quantitative indicators in crafting holistic strategies for food systems resilience.

These findings collectively underscore the urgency of strengthening resilience across social, economic, and health systems. Empirical evidence from multiple regions demonstrates the pervasive impact of crises on institutional functionality, consumer behavior, and population well-being. Simultaneously, recent research trajectories have converged on the importance of digital technologies and risk management strategies, offering robust foundations for resilience-building. The diversity of statistical indicators—from shifts in consumer behavior to institutional performance metrics—provides a compelling rationale for examining resilience as a multidimensional phenomenon, situated at the nexus of operational, institutional, and contextual dynamics.

Despite this growing interest, significant gaps persist in the literature regarding the conceptual and empirical treatment of resilience. One notable shortcoming is the lack of consistent definitions and operational frameworks. Previous studies have often employed narrow quantitative approaches that fail to capture the complex social, institutional, and technological dimensions shaping organizational and systemic resilience, particularly in the food and health sectors (Khalil et al., 2022). Furthermore, methodological inconsistencies in measuring resilience indicators have hindered the comparability of findings across different contexts. This highlights the need for a more integrative framework that transcends technical variables to encompass the broader institutional and social environments influencing resilience outcomes (Bernabei et al., 2022; Lopes et al., 2022).

Given the methodological and substantive heterogeneity in existing research, a systematic narrative review is both timely and necessary. This approach allows for the synthesis of diverse research designs, including both quantitative and qualitative studies, thereby accommodating rich contextual data and clarifying existing inconsistencies. Such a review can also illuminate underexplored research gaps and support the development of a comprehensive conceptual framework. This framework should integrate key elements such as digital technology adoption, risk management practices, supply chain strengthening strategies, and stakeholder engagement to enhance systemic resilience (Heeres et al., 2023). This is particularly crucial in an era marked by complex, rapidly evolving global disruptions such as the COVID-19 pandemic.

Several critical factors emerge repeatedly in studies addressing resilience. These include the deployment of digital technologies (e.g., IoT in supply chain management), supplier diversification strategies, operational efficiency improvements, and the implementation of coordinated risk management mechanisms. For instance, Heeres et al. (2023) examined the drivers and barriers to digital technology adoption, emphasizing its role in enhancing transparency and responsiveness in healthcare and food systems. Similarly, Lopes et al. (2022) identified supply chain diversification and stock adjustment as essential strategies for mitigating external shocks in developing countries. A comprehensive analytical framework must thus encompass operational dimensions (e.g., logistics efficiency), institutional dynamics (e.g., policy and stakeholder coordination), and contextual influences (e.g., pandemic impacts and regional economic conditions). Such a multidimensional approach enables the identification of causal and moderating relationships among variables, fostering a deeper understanding of how resilience can be cultivated at various systemic levels (Bernabei et al., 2022; Lopes et al., 2022; Heeres et al., 2023).

This review is motivated by the need to address these identified gaps and to construct a robust framework that captures the complexity of resilience as both a theoretical construct and a practical imperative. The primary aim is to synthesize recent empirical findings related to resilience in food supply chains and healthcare systems, with a particular focus on the roles of digital technology, operational strategy, and institutional coordination. By integrating these factors, this review seeks to offer a nuanced understanding of resilience-building strategies and their implications for policy and practice in times of crisis.

The scope of this review includes studies conducted across diverse geographic regions, with a particular emphasis on settings where systemic vulnerabilities are most pronounced, such as urban centers in low- and middle-income countries and crisis-affected populations. This geographical and demographic focus is intended to capture the variability in resilience strategies and outcomes across different contexts, thereby enhancing the generalizability and relevance of the findings. Such a comparative approach is essential for identifying context-specific and cross-cutting lessons that can inform global resilience frameworks.

METHOD

This study employed a narrative review approach to explore the recent body of literature concerning resilience in food and healthcare systems amidst global disruptions. Unlike systematic reviews that adhere strictly to protocol-driven inclusion and evaluation processes, narrative reviews offer a more flexible and interpretative synthesis of literature, enabling the integration of various conceptual frameworks and empirical findings. This method was considered suitable given the interdisciplinary nature of the topic and the need to accommodate a wide range of methodological approaches and thematic insights. The objective of the review was to identify dominant research themes, highlight prevailing trends, and uncover existing gaps in current scholarship.

The literature search was conducted using three major academic databases: Scopus, PubMed, and Google Scholar. These databases were selected based on their comprehensive coverage of disciplines relevant to this study, including public health, digital transformation, supply chain management, and resilience studies. The inclusion of multiple databases ensured a broad spectrum of literature across regional and thematic boundaries, allowing the review to reflect global perspectives on resilience.

To retrieve relevant literature, a combination of core keywords and synonymous terms was employed. Keywords included "resilience," "supply chain," "digital transformation," "pandemic," "healthcare," and "food systems." Additionally, the search incorporated alternative terminologies such as "adaptability" and "sustainability" in the context of risk management. Boolean operators (AND, OR) were used to combine keywords strategically (e.g., "resilience" AND "healthcare" OR "food systems") to ensure both breadth and relevance. Where applicable, controlled vocabularies such as MeSH (Medical Subject Headings) in PubMed and subject headings in Scopus were applied to enhance the precision and consistency of search results.

The search focused on articles published within the last five years, from 2019 to 2024, to capture the most recent advances and reflections on resilience following the onset of the COVID-19 pandemic. Given the dynamic nature of global disruptions and the rapid evolution of scholarly discourse on systemic resilience, limiting the search to this time frame helped ensure the relevance of the materials reviewed.

Articles selected for review were required to meet several inclusion criteria. First, only peer-reviewed publications from reputable journals were included to ensure scholarly rigor. Second, the

literature had to present a clear description of methodological design or conceptual framing, with explicit reference to resilience, digital technology, supply chain management, or systemic adaptability. Third, the review favored empirical studies or analytical discussions that offered insights into resilience practices and outcomes within food or healthcare systems. Finally, only articles published in English were considered.

Exclusion criteria were applied to maintain the clarity and focus of the review. Editorials, commentaries, opinion pieces, and reports lacking empirical evidence were omitted. Similarly, literature written in languages other than English or studies focused on geographically irrelevant contexts were excluded. Conceptual papers that did not define measurable indicators or lacked clarity in argumentation were also set aside in favor of studies with explicit theoretical or empirical contributions.

The selection of literature followed a relevance-based thematic screening rather than a rigid protocol. Titles and abstracts were first reviewed for thematic relevance. Full-text articles were then examined to assess the clarity of their objectives, methodological soundness, and contribution to the understanding of resilience. This process was conducted iteratively, with decisions documented and refined as patterns emerged. When ambiguity arose, discussions among researchers were held to reach consensus, reinforcing the interpretative nature of narrative reviews.

Studies included in the review employed a variety of research methods, ranging from quantitative designs such as cross-sectional and longitudinal studies to qualitative methods like interviews and case studies. Mixed-methods research was also considered valuable for its capacity to triangulate findings and offer deeper contextual insights. This diversity of methodological approaches enriched the review by allowing for the examination of resilience from multiple dimensions and perspectives.

The use of a narrative review approach facilitated the thematic organization of findings and allowed for a holistic synthesis of concepts and trends. Instead of relying on numerical aggregation or statistical meta-analysis, the review focused on interpreting how resilience is defined, operationalized, and experienced across contexts. Recurring themes, such as digital technology integration, supply chain adaptability, and institutional coordination, were identified and discussed in light of broader socio-political and economic developments.

By grounding the review in a broad, inclusive methodological framework, this study aimed to capture the dynamic and multidimensional nature of resilience. The flexible, interpretative nature of narrative reviews made it possible to incorporate a wide array of studies and to synthesize findings that might otherwise be excluded under more rigid review methodologies. This approach also allowed for the identification of emerging challenges, gaps in the literature, and potential directions for future research.

Ultimately, this methodology emphasizes the value of interpretive synthesis in understanding complex phenomena like resilience, particularly in the context of interconnected systems such as food and healthcare. By integrating diverse sources and perspectives, the review provides a

comprehensive overview of how resilience is theorized, measured, and applied, offering valuable insights for academics, policymakers, and practitioners seeking to enhance systemic robustness in the face of ongoing global disruptions.

RESULT AND DISCUSSION

This narrative review reveals three major thematic categories of resilient logistics strategies emerging from the literature: (a) disaster-oriented logistics resilience strategies, (b) organizational adaptation to global disruptions, and (c) technology-enabled resilience in logistics systems. Each theme illustrates the complex interaction between context-specific vulnerabilities and adaptive strategies in response to environmental and geopolitical uncertainties. The synthesis of studies from both developed and developing countries provides comparative insight into the multifaceted nature of logistics resilience.

A significant body of literature underscores the effectiveness of logistics resilience strategies in response to natural disasters. These strategies frequently involve multi-stakeholder collaboration, adaptive emergency response systems, and proactive spatial planning. For example, Fukumoto et al. (2018) emphasized that diversified transportation routes, decentralized storage facilities, and emergency stockpiling of critical goods were crucial in mitigating the immediate and long-term effects of disaster-induced supply chain disruptions. The integration of Geographic Information Systems (GIS) has further supported risk assessment and spatial decision-making, enhancing the ability of logistics managers to map vulnerabilities and allocate resources strategically in disaster-prone regions. Additionally, simulation-based training and preparedness programs have contributed to institutional learning and inter-organizational coordination, ensuring operational continuity during high-impact disruptions.

Comparative analyses show distinct differences in the implementation of these strategies across economic contexts. Developed countries tend to adopt advanced technologies such as automated warehousing and sensor-based monitoring systems that enable real-time tracking and early warning capabilities. These technological investments are underpinned by stable infrastructure and substantial financial resources. In contrast, logistics systems in developing countries often depend on community-based mechanisms and adaptive manual processes. Despite limited infrastructure, these systems demonstrate significant local resilience through informal networks, community mobilization, and improvised contingency measures. Fukumoto et al. (2018) noted that such context-specific adaptations can be highly effective in resource-constrained environments, particularly when institutional support is aligned with community-led disaster preparedness initiatives.

Beyond natural disasters, the literature highlights how logistics systems have evolved in response to global disruptions such as the COVID-19 pandemic and geopolitical conflicts. Organizational responses to these shocks have centered on accelerating digital transformation, restructuring operational processes, and enhancing supply chain redundancy. Khan and Ali (2022) observed that

logistics firms rapidly adopted digital tracking systems and cloud-based platforms to maintain operational visibility and communication during lockdowns and travel restrictions. The development of dual or multiple sourcing networks was another critical response, enabling firms to circumvent single-point dependencies and manage fluctuating global supply conditions.

Organizational flexibility and the integration of comprehensive risk management systems have emerged as pivotal factors influencing logistics resilience during global crises. Firms with agile governance structures were able to reconfigure logistics operations, reroute shipments, and adjust procurement strategies in real-time based on shifting geopolitical and epidemiological conditions. These adaptive capabilities were further enhanced by data-driven approaches, such as real-time analytics and predictive modeling, which allowed organizations to anticipate disruptions and implement preemptive interventions. Collaboration with suppliers, government agencies, and logistics service providers also played a vital role in ensuring the continuity of essential supply chains. Such inter-organizational coordination supported a shared understanding of risks, aligned operational priorities, and minimized redundancies across the logistics ecosystem (Khan & Ali, 2022).

The third thematic category explores the transformative role of digital innovation in fostering resilient logistics systems. Recent research strongly suggests that emerging technologies such as the Internet of Things (IoT), artificial intelligence (AI), blockchain, and big data analytics are not only enhancing the efficiency of logistics networks but also significantly contributing to their resilience. Heeres et al. (2023) found that the deployment of IoT devices in warehousing and transportation allowed real-time monitoring of goods, environmental conditions, and vehicle status. These technologies facilitated early detection of anomalies and optimized route planning, especially in dynamic and high-risk environments.

Artificial intelligence and predictive analytics have proven particularly effective in demand forecasting and inventory optimization. By processing large volumes of operational data, AI-driven systems can detect consumption patterns and respond proactively to demand surges or supply shortages. This capability was especially valuable during the COVID-19 pandemic, when erratic shifts in consumer behavior disrupted traditional forecasting models. Ghodake et al. (2024) noted that AI-assisted logistics systems significantly reduced stockouts and improved service levels by adjusting distribution plans in real-time based on projected needs.

Blockchain technology, meanwhile, has played a crucial role in enhancing the transparency and traceability of logistics operations. It provides immutable records of transactions, ensuring accountability among actors within the supply chain. Tang et al. (2023) highlighted that blockchain-enabled platforms enhanced trust and efficiency in cross-border logistics, particularly during periods of restricted movement and elevated fraud risks. By establishing secure and decentralized information-sharing mechanisms, blockchain has enabled faster dispute resolution, compliance verification, and quality assurance across diverse logistics operations.

Big data analytics further strengthens logistics resilience by facilitating strategic decision-making. The integration of large-scale data sets from various touchpoints within the logistics network allows managers to monitor system performance, identify bottlenecks, and evaluate supplier reliability. These insights inform the design of more responsive and robust supply chain

architectures. As reported by Ghodake et al. (2024), big data applications enabled logistics firms to adapt their operations based on real-time feedback from customers, suppliers, and distribution nodes, resulting in more flexible and customer-centric supply networks.

Importantly, the adoption and effectiveness of these technological innovations vary significantly across regions. In high-income countries, investment in logistics technologies is often supported by government incentives, private-sector innovation, and institutional stability. Conversely, in low- and middle-income countries, the diffusion of such technologies is constrained by infrastructure gaps, limited technical expertise, and regulatory uncertainties. However, localized adaptations of these technologies—such as mobile-based tracking solutions or decentralized blockchain nodes—demonstrate promising potential for context-specific resilience gains. Comparative studies suggest that technology adoption, when tailored to local conditions and integrated with traditional logistics knowledge, can yield substantial improvements in supply chain responsiveness and stability.

Overall, this review illustrates that logistics resilience is a dynamic and multi-dimensional construct shaped by the interplay between institutional capacities, technological capabilities, and contextual factors. Disaster preparedness strategies rooted in spatial planning and community engagement are essential in managing environmental risks. Organizational adaptations through digital integration and flexible operations are critical in navigating global disruptions. Finally, the infusion of advanced technologies such as AI, IoT, blockchain, and big data represents a transformative force that not only enhances efficiency but also enables anticipatory and adaptive responses to future shocks. Together, these findings reinforce the importance of cross-sector collaboration, investment in digital infrastructure, and capacity building to strengthen logistics resilience across varied geographic and socio-economic settings.

By analyzing these themes through a global comparative lens, the review contributes to a nuanced understanding of how different contexts leverage institutional mechanisms and digital tools to build logistics systems that are both agile and robust. This insight is particularly valuable for policymakers and practitioners seeking to design resilience strategies that are responsive to both systemic vulnerabilities and emerging technological opportunities.

The results of this narrative review both reaffirm and extend existing international literature on logistics resilience, while also revealing key contradictions and contextual variations that challenge universal applications. At the core, the findings support the established understanding that strategies such as supply chain diversification, stockpiling, and digital technology adoption significantly contribute to operational visibility and flexibility, particularly in the face of disruptions such as natural disasters and global crises (Song et al., 2022). This aligns with a growing body of literature that identifies visibility and responsiveness as primary determinants of resilience. However, the review also uncovers regional and sectoral differences that complicate the one-size-fits-all prescriptions often advanced in earlier frameworks, particularly in healthcare and digital logistics systems (Khalil et al., 2022). These inconsistencies highlight the critical role of contextual and methodological tailoring in shaping resilience outcomes.

The divergence in outcomes across contexts can be partly attributed to the absence of systemic alignment in implementing resilience strategies. While the effectiveness of logistics resilience approaches is well supported in high-resource environments, their transferability is limited in low-

resource settings. This finding supports the systems-thinking approach promoted by Naim and Gosling (2022), which calls for the synchronization of institutional frameworks, infrastructure, and policy environments. Similarly, Azam et al. (2023) emphasized the importance of stakeholder engagement and interdisciplinary adaptation, which emerged as critical factors in the success of resilience initiatives. Without contextual customization, resilience strategies risk becoming inefficient or even counterproductive, particularly in complex and dynamic environments.

Several systemic and policy-related barriers impede the broader implementation of resilient logistics strategies. Technological infrastructure remains a significant limitation in many regions, particularly where digital infrastructure and connectivity are underdeveloped. Integration challenges across stakeholder systems also constrain data-sharing practices, leading to fragmented visibility and inefficient coordination. Bureaucratic inertia and restrictive policy frameworks further compound these technical limitations, creating institutional environments that are resistant to innovation. Heeres et al. (2023) noted that high implementation costs and internal resistance to technological change often hinder the adoption of logistics-enhancing technologies, especially in traditional supply chain environments. Moreover, as shown by Benedito et al. (2020), issues related to system compatibility and the absence of standardized interoperability frameworks reduce the potential effectiveness of digital transformation initiatives.

Policy rigidity is another recurring barrier that undermines efforts to develop adaptable logistics systems. Johnson et al. (2021) discussed how outdated risk management policies and inflexible regulatory regimes failed to accommodate the rapid shifts in global market conditions during the COVID-19 pandemic. These constraints limited the agility of supply chain responses and delayed the implementation of crucial innovations. The CoDEA framework described by Jomthanachai et al. (2022) further illustrates the mismatch between traditional policy models and contemporary supply chain vulnerabilities, particularly in globalized logistics networks. These systemic shortcomings underscore the urgent need for policy innovation and regulatory reform to support resilience-building across sectors.

Despite these challenges, the literature offers a range of policy models and best practices that demonstrate successful adaptations in various contexts. Integrated digitalization initiatives and cross-sector collaboration have shown promising results in improving operational coordination and accelerating response times during crises. Song et al. (2022) reported that logistics systems employing cloud-based platforms and real-time tracking tools were able to maintain functionality and responsiveness despite severe external shocks. These findings are reinforced by Johnson et al. (2021), who observed that government-led digital infrastructure investments contributed to more effective crisis management and logistics performance.

Approaches grounded in whole-system thinking provide additional insight into potential solutions. Naim and Gosling (2022) advocated for policy models that align logistical operations with broader institutional and governmental interventions, facilitating coherent responses to systemic risks. Azam et al. (2023) identified critical success factors such as leadership support, regulatory agility, and capacity-building as essential enablers for such approaches. These findings suggest that logistics resilience can be significantly enhanced by aligning strategic planning with adaptive governance mechanisms.

Furthermore, Bernabei et al. (2022) proposed a systemic reform agenda that includes revising technical standards, fostering inter-organizational data sharing, and providing fiscal incentives to support digital infrastructure investments. These policy reforms, while well-established in high-income countries, hold considerable promise for adaptation in low- and middle-income settings, where structural limitations often delay the uptake of resilience-enhancing strategies. Importantly, these adaptations should not merely replicate foreign models but must be calibrated to reflect local institutional capacities, socio-political dynamics, and economic constraints.

This review also reveals that while technological innovation is a central pillar of logistics resilience, its adoption alone does not guarantee success. Digital tools must be accompanied by organizational readiness, cultural openness to change, and regulatory frameworks that enable experimentation and learning. The interplay between technological and institutional factors underscores the need for integrated resilience strategies that go beyond operational upgrades to include policy innovation and stakeholder capacity-building.

In addition to institutional constraints, gaps within the academic literature also pose challenges to advancing resilience theory and practice. There remains a lack of methodological consistency in defining and measuring resilience, particularly across different sectors and scales. This fragmentation limits the comparability of findings and complicates the synthesis of best practices. Moreover, much of the existing literature focuses on high-income contexts, with relatively limited attention to the unique challenges faced by emerging economies. This geographic imbalance constrains the development of globally applicable resilience frameworks and leaves important questions about context-specific vulnerabilities unaddressed.

Future research should therefore prioritize methodological standardization and increased empirical exploration in underrepresented regions. Comparative studies that examine the differential impacts of policy reforms and technology integration across diverse settings could help illuminate the mechanisms by which resilience can be scaled and sustained. Interdisciplinary research that bridges logistics, governance, and digital innovation is especially needed to inform the design of cohesive and adaptive systems.

In sum, this review highlights the complex interdependencies that characterize logistics resilience and the critical need for tailored, context-sensitive approaches. While the adoption of digital technologies, risk diversification, and collaborative governance emerge as consistent themes, their effectiveness is shaped by a broader ecosystem of systemic enablers and constraints. Addressing these structural issues through policy reform, institutional coordination, and strategic investment will be essential to realizing the full potential of resilience strategies in a rapidly changing global landscape.

CONCLUSION

This narrative review has demonstrated that resilient logistics strategies are essential to maintaining operational continuity in the face of natural disasters and global disruptions. Key findings indicate that diversified supply networks, spatial decentralization, and real-time digital monitoring significantly enhance system responsiveness. The adoption of technologies such as IoT, AI,

blockchain, and big data analytics contributes to visibility, transparency, and rapid decision-making across logistics systems. While such strategies align with global literature, their effectiveness varies across contexts, with resource limitations, policy rigidity, and institutional fragmentation emerging as critical barriers in low- and middle-income countries.

The urgency of enhancing logistics resilience is underscored by the increasing frequency and intensity of crises such as pandemics and geopolitical conflicts. Addressing structural challenges requires a systemic approach that integrates policy reform, digital infrastructure investment, and stakeholder collaboration. Cross-sector governance, flexible regulatory frameworks, and context-sensitive innovation must be prioritized. Successful models from high-income countries, including interoperable platforms and real-time data systems, can inform adaptive strategies elsewhere, but must be tailored to local capacities.

Future research should address the methodological inconsistency in defining and measuring resilience, and further explore resilience-building mechanisms in underrepresented regions. Comparative, interdisciplinary studies are essential to develop globally relevant frameworks. Ultimately, fostering logistics resilience requires not only technological innovation but also institutional agility and coordinated policy support, enabling systems to anticipate, absorb, and adapt to future shocks.

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