Global Supply Chain Disruptions and Manufacturing in Flux: A Bibliometric and Systematic Post-Pandemic Review

Gersom Arie Sepvianto*, Budi Eko Soetjipto, Madziatul Churiyah

Management Department, Economic and Business Faculty, State of Malang University
Corresponding author. Email: gersom.arie.2504138@students.um.ac.id

ABSTRACT
The COVID-19 pandemic has fundamentally transformed global manufacturing supply chains, exposing structural vulnerabilities and shifting the focus from cost efficiency to resilience. This study aims to analyze the evolution of supply chain disruption research and identify strategic responses within the manufacturing sector in the post-pandemic era. A dual-method approach was employed, combining bibliometric analysis of 550 Scopus-indexed articles with a systematic literature review of 54 high-impact studies published between 2020 and 2026, following the PRISMA protocol. The findings reveal a transition from short-term disruption recovery to a state of "structural flux," characterized by persistent geopolitical, environmental, and technological uncertainties. Critical manufacturing sectors exhibit targeted vulnerabilities, while general manufacturing faces systemic disruptions, requiring distinct resilience strategies. Industry 4.0 technologies, particularly additive manufacturing, artificial intelligence, and data-driven systems, play a pivotal role in enabling adaptive and predictive supply chain management. Furthermore, emerging frameworks such as Industry 5.0 and viable supply chain models highlight a shift toward human-centric and structurally robust systems. The study recommends enhancing technological integration, operational agility, and cross-sector collaboration to build proactive resilience against future disruptions.

Keywords: *Supply Chain Disruption, Manufacturing Resilience, Industry 4.0, Industry 5.0, Structural flux.*

1. INTRODUCTION

The global manufacturing ecosystem, long refined via Just-in-Time (JIT) methods and deep globalization, underwent a profound transformation due to the COVID-19 pandemic. Acting as a quintessential "Black Swan" event, it revealed deep-seated flaws in tightly linked supply chains, redirecting emphasis from simple cost-cutting to strength and reliability. In the post-pandemic landscape, manufacturing now navigates ongoing turbulence, termed "structural flux." Disruptions persist well beyond the initial health emergency, encompassing geopolitical frictions, climate-induced interruptions, cybersecurity threats, and erratic demand patterns. The semiconductor crisis illustrates how regional disturbances can trigger extended, widespread repercussions (Frieske & Stieler, 2022), as do evolving conditions in key manufacturing centers like China, which undermine long-held supply chain premises (Fan et al., 2023).

In this context, technological flexibility is paramount. The progression to Industry 5.0, bolstered by Artificial Intelligence (AI) and the Internet of Things (IoT), signals a shift to more nimble and sturdy frameworks (Ahmed et al., 2023). At the same time, organizations are increasingly required to account for geopolitical uncertainty, moving beyond reactive responses toward more anticipatory and system-oriented resilience strategies (Bednarski et al., 2025). Since 2020, scholarly attention to supply chain disruption has expanded rapidly, reflecting the scale and complexity of ongoing structural changes. However, important gaps remain. Existing research offers a limited conceptualization of geopolitical volatility as a continuous, non-linear risk (Bi et al., 2024), while the integration of autonomous technologies with human decision-making processes in crisis contexts is still insufficiently understood. Moreover, the trade-off between resilience and environmental sustainability—particularly the implications of redundancy and buffering—remains underexplored (Bucovețchi et al., 2026).

In response, this study adopts a combined bibliometric and systematic review approach to examine the evolution of supply chain disruption research in manufacturing between 2020 and 2026. It aims to clarify the emergence of "manufacturing flux," assess the transition from cost-oriented to resilience-driven supply chain models, and identify the technological and strategic configurations required to support proactive resilience in an increasingly uncertain global landscape.

2. METHOD

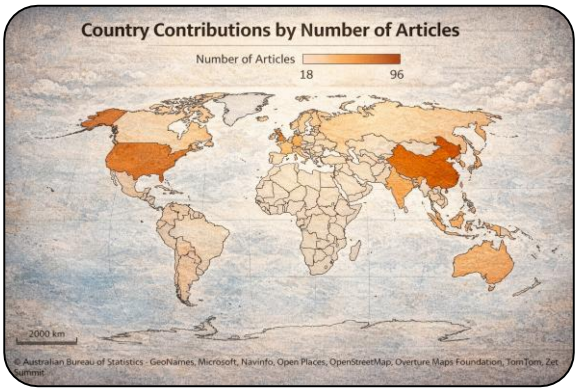
This study adopts a dual-layered "macro-to-micro" design to capture both broad trends and in-depth insights. The bibliometric stage analysis of 550 selected articles to map the intellectual structure and evolution of supply chain disruption research in manufacturing, identifying key themes and contributors. The core analysis is conducted through a systematic literature review (SLR) using the PRISMA 2020 protocol (Page et al., 2022). This process refines the dataset to 54 high-impact studies from 2020–2026, focusing on post-pandemic resilience. The approach enables a focused examination of emerging disruption dynamics and Industry 5.0 developments, linking long-term research trends with current manufacturing challenges.

A bibliometric approach is used to examine the intellectual structure of supply chain disruption research in manufacturing. Data were retrieved from the Scopus database on 13th March 2026 using a structured Boolean keyword *TITLE-ABS-KEY ("Supply Chain" OR "Logistic*" AND "Disruption*" OR "Dysfunction" AND "Manufacture" OR "Manufacturing")* search, limited to English-language, peer-reviewed, open-access articles. After filtering, 550 publications were retained, enabling a longitudinal view of the field. Science mapping with VOSviewer analysis publication trends, geographic distribution, and keyword co-occurrence, allowing the identification of major themes, key contributors, and evolving research patterns, and establishing a foundation for the subsequent systematic review.

Following the bibliometric mapping, a Systematic Literature Review (SLR) was conducted to synthesize key contemporary studies. The process followed the PRISMA framework (Page et al., 2022) to ensure transparency and consistency. From an initial pool of 550 publications, rigorous screening reduced the sample to 54 high-impact articles, focusing on the post-pandemic period (2020–2026). Selection criteria emphasized relevant subject areas, including engineering, management, and computer science, and applied the keyword "global supply chain disruption*" to capture systemic volatility. This refinement supports an in-depth qualitative analysis of "manufacturing flux," Industry 5.0 transitions, and emerging resilience strategies.

3. RESULTS AND DISCUSSIONS

A longitudinal analysis of publications from 2006 to 2026 reveals a clear shift in research on global supply chain disruptions. The number of published articles from 2006 to 2026 shows a clear upward trend over time. Between 2006 and 2015, publication output remained very low, generally below 5 articles per year. Growth began gradually around 2016–2019, reaching approximately 15–20 articles. A significant surge appears from 2020 onward, with around 35 articles in 2020 and a sharp increase to about 75 in 2022. The peak occurs in 2025, exceeding 100 articles, before dropping notably to around 25 in 2026. Overall, 2020 marks the key turning point, followed by rapid expansion through 2025. The geographical distribution of research is led by several major contributors. China emerges as the most prolific, followed by the United Kingdom, India, and the United States. China's dominance reflects its central position in global manufacturing and its focus on managing post-pandemic supply chain restructuring. European countries such as Germany, Italy, and France also contribute significantly, indicating a broad international research effort. Collaboration patterns, illustrated in **Figure 1**, reveal strong interconnections, particularly between China and the United Kingdom. The United States and India also demonstrate extensive cross-theme linkages, reinforcing the global and collaborative nature of this research field.



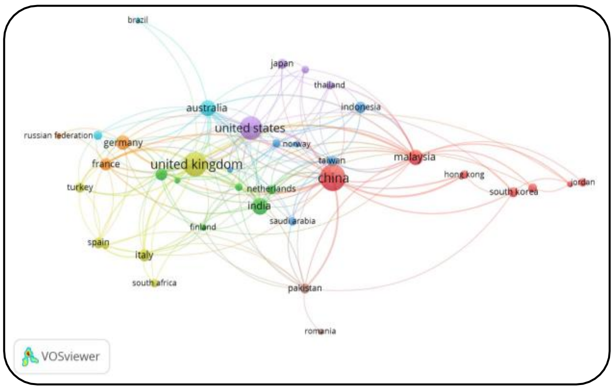


Figure 1. Country Contributions by Number of Articles Published and Co-occurrence of Countries

These global linkages suggest that "manufacturing flux" is widely understood as a shared international challenge, that requires coordinated strategic responses. The network also reflects the emergence of new research hubs in Southeast Asia and the Middle East, indicating that resilience has become a global priority rather than a regional issue. Manufacturing economies primarily drive research output. China leads in publication volume, reflecting its focus on maintaining industrial stability and advancing risk-mitigating technologies. The United Kingdom and the United States follow as key centers, particularly in addressing geopolitical and digital resilience. Germany contributes strongly to smart manufacturing and Industry 4.0/5.0, while India advances adaptive models for emerging economies. Together, these countries form the core of the "Great Supply Chain Reset," as detailed in **Table 1**.

Table 1. Top Five Countries' Contribution with Specific Thematic Research Focus

Country	Thematic Research Focus	Key Contributors
China	AI-driven resilience, risk prediction, supply chain recovery, digital technologies (AI, blockchain), disruption modeling	(Fan et al., 2023) ; (Lin et al., 2021) (Pan et al., 2025) ; (Khan et al., 2022) ; (Zhang et al., 2026) ; (Li & Yuan, 2024) ; (Zhong, 2025) ; (Gao et al., 2024)
United Kingdom	Supply chain resilience frameworks, geopolitical disruption, leadership & innovation, additive manufacturing, collaboration models	(Ali et al., 2024) ; (Salmi et al., 2020) ; (Arjunan et al., 2021) ; (Nikookar et al., 2025) ; (Bednarski et al., 2025) ; (Kolade et al., 2022) ; (Okorie et al., 2020)
USA	Risk management, smart manufacturing, cyber supply chains, infrastructure resilience, logistics optimization	(Manley et al., 2022) ; (Gladkikh et al., 2025) ; (Bi et al., 2024) ; (Kali et al., 2025) ; (Terry et al., 2020) ; (Kovács & Falagara Sigala, 2021) ; (Nguyen et al., 2020)
Germany	Smart manufacturing, Industry 4.0/5.0, resilience systems	(Frieske & Stieler, 2022) ; (Spieske & Birkel, 2021) -
India	Flexible supply chains, emerging economies	(Sakhardande & Prabhu Gaonkar, 2021)

The keyword co-occurrence analysis in **Figure 3** shows that post-pandemic manufacturing has become increasingly interconnected and multidimensional. Four main thematic clusters emerge. The technological cluster highlights tools such as artificial intelligence, IoT, and simulation as key enablers of adaptive responses. The organizational cluster emphasizes capabilities such as resilience, leadership, and strategic flexibility. The macro-environmental cluster captures external pressures, including demand fluctuations, trade disruptions, and geopolitical factors. Finally, the performance cluster links these dynamics to outcomes such as cost efficiency and productivity. Together, these clusters illustrate that supply chain resilience is shaped by the interaction between technology, organizational readiness, external conditions, and performance outcomes.

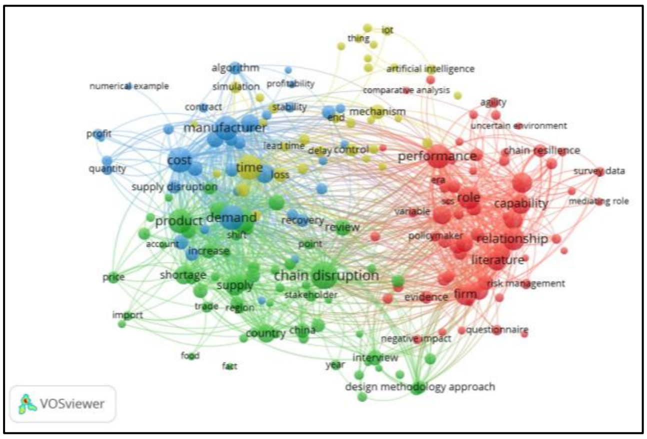


Figure 3. Bibliometric Analysis: Co-occurrence of Keywords

The bibliometric clustering highlights the interconnected nature of post-pandemic manufacturing systems, where disruptions arise from macro-level forces but require firm-level strategic responses. The strong link between global dynamics and organizational capabilities suggests that resilience depends not only on external conditions but also on how firms adapt through leadership and collaboration. At the same time, the interaction between technological agility and performance reflects a shift toward data-driven operations, where outcomes increasingly rely on real-time analytics and AI capabilities. The convergence of organizational and technological dimensions further indicates a growing human–technology synergy, with digital tools supporting managerial decision-making. Overall, resilience emerges as a multi-layered construct shaped by the interplay of external pressures, internal capabilities, technology, and performance.

The evolution of research on manufacturing supply chain disruptions reveals a clear three-phase progression. The initial phase (2020–2021) was largely reactive, focusing on crisis response and short-term continuity measures during the COVID-19 shock. In the transition phase (2021–2023), attention shifted toward understanding resilience, emphasizing diversification, risk management, and adaptive capabilities. In the most recent phase (2024–2026), the discourse reflects a state of "structural flux," where disruptions are persistent and systemic. Research increasingly highlights the role of advanced technologies, Industry 5.0, and geopolitical dynamics. Overall, the field has moved from reactive efficiency models toward proactive, resilience-oriented frameworks.

Disruptions in critical manufacturing sectors, such as automotive and semiconductors, are typically driven by targeted component shortages within highly interconnected, multi-tier supply chains. These structures are particularly sensitive to upstream bottlenecks, where demand volatility and long lead times can trigger bullwhip effects, intensifying mismatches between supply and demand. The widespread use of Just-in-Time (JIT) systems further amplifies this vulnerability by removing inventory buffers, allowing minor delays to escalate into production stoppages (Frieske & Stieler, 2022). Dependence on scarce inputs and concentrated suppliers can also result in "surgical disruptions," where even low-value components halt entire production systems (Manley et al., 2022).

In contrast, general manufacturing faces broader, system-wide disruptions driven by simultaneous supply and demand shocks, often described as a "scissor effect" (Xu et al., 2020). These disruptions stem from both internal and external factors, including labor shortages, logistics constraints, and regulatory pressures (Okorie et al., 2020). As a result, resilience strategies diverge: critical sectors prioritize structural redundancy and diversification (Shin & Shin, 2021), while general manufacturing emphasizes flexibility, digital integration, and rapid adaptation (Spieske & Birkel, 2021).

The analysis highlights three key Industry 4.0 technologies that play a central role in mitigating supply chain disruptions: additive manufacturing, AI with big data analytics, and the integration of IoT with blockchain. These technologies operate across physical, analytical, and informational dimensions, collectively enhancing supply chain resilience. Additive manufacturing enables decentralized, on-demand production, reducing reliance on global logistics and allowing firms to maintain operations during disruptions through localized "cyber supply chains (Gladkikh et al., 2025). In parallel, AI and big data function as predictive tools, supporting scenario analysis, risk anticipation, and adaptive decision-making, thereby improving responsiveness under uncertainty (Pan et al., 2025). Meanwhile, IoT and blockchain strengthen transparency and coordination by enabling real-time monitoring and secure data sharing across supply networks. This enhances traceability and reduces information asymmetry, particularly in complex and compliance-sensitive environments (Alzoubi et al., 2025).

The effectiveness of Industry 4.0 technologies lies in their combined application. Additive manufacturing enhances production flexibility, AI and big data support predictive decision-making, and IoT with blockchain improves visibility and trust. Together, they enable a shift from fragmented, reactive systems toward more integrated and resilient supply chain structures. Recent literature also reflects a broader transition toward human-centric models under Industry 5.0. The Human–Cyber–Physical System (HCPS) framework emphasizes the role of human–AI collaboration in managing uncertainty, enabling more adaptive and "crisis-aware" responses (Bucovețchi et al., 2026). Similarly, the Cyber Supply Chain model leverages distributed additive manufacturing to bypass logistical constraints through localized production (Gladkikh et al., 2025). Theoretical extensions, such as Organizational Information Processing Theory, further explain how AI enhances firms' ability to manage uncertainty (Pan et al., 2025), while the Viable Supply Chain framework prioritizes long-term structural stability over short-term efficiency (Rahman et al., 2024). Despite these advances, several gaps remain. Geopolitical disruptions are still underrepresented as persistent, nonlinear risks (Bednarski et al., 2025). The coordination between human decision-makers and autonomous systems also requires deeper exploration (Bi et al., 2024). In addition, the trade-off between resilience and sustainability remains unresolved, and cross-sector comparative studies are still limited (Zhong, 2025).

4. CONCLUSION

The findings indicate that global manufacturing has entered a phase of persistent "structural flux," where disruptions are systemic rather than episodic. Academic discourse has shifted from short-term response toward long-term resilience, with increasing recognition of geopolitical and macro-environmental risks. Industry 4.0 technologies now function as key enablers of adaptive and decentralized operations, while emerging frameworks such as HCPS, Cyber Supply Chains, and Viable Supply Chains emphasize human-centric and robust system design. However, the focus on large-scale contexts may overlook SME constraints, and existing research remains fragmented across sectors. Future work should address SME adaptability, sustainability–resilience trade-offs, and human–AI collaboration, alongside broader cross-sector validation of resilience strategies.

REFERENCES

Ahmed, T., Karmaker, C. L., Nasir, S. B., Moktadir, M. A., & Paul, S. K. (2023). Modeling the artificial intelligence-based imperatives of industry 5.0 towards resilient supply chains: A post-COVID-19 pandemic perspective. *Computers and Industrial Engineering*, *177*(January), 109055. https://doi.org/10.1016/j.cie.2023.109055

Ali, I., Charles, V., Modibbo, U. M., Gherman, T., & Gupta, S. (2024). Navigating COVID-19: unraveling supply chain disruptions through best-worst method and fuzzy TOPSIS. *Benchmarking*, *31*(5), 1548–1589. https://doi.org/10.1108/BIJ-11-2022-0708

Alzoubi, H. M., Tan, C. L., Khatib, M. El, Alshurideh, M. T., Shwedeh, F., Yanamandra, R., & Lee, K. L. (2025). Smart Government Initiatives: Transforming Global Supply Chains through Digital Change. *International Review of Management and Marketing* , *15*(3), 209–217. https://doi.org/10.32479/irmm.18962

Arjunan, A., Zahid, S., Baroutaji, A., & Robinson, J. (2021). 3D printed auxetic nasopharyngeal swabs for COVID-19 sample collection. *Journal of the Mechanical Behavior of Biomedical Materials*, *114*(October 2020), 104175. https://doi.org/10.1016/j.jmbbm.2020.104175

Bednarski, L., Roscoe, S., Blome, C., & Schleper, M. C. (2025). Geopolitical disruptions in global supply chains: a state-of-the-art literature review. *Production Planning and Control*, *36*(4), 536–562. https://doi.org/10.1080/09537287.2023.2286283

Bi, M., Estrada-Garcia, J. A., Tilbury, D. M., Shen, S., & Barton, K. (2024). Heterogeneous Risk Management Using a Multi-Agent Framework for Supply Chain Disruption Response. *IEEE Robotics and Automation Letters*, *9*(6), 5126–5133. https://doi.org/10.1109/LRA.2024.3388838

Bucovețchi, O., Voipan, A. E., Voipan, D., Georgescu, A., & Dobrescu, R. M. (2026). Modeling Organizational Resilience in Human-Cyber-Physical Systems (Industry 5.0) Through Collective Dynamics, Decision Scenarios and Crisis-Aware AI: A Multi-Method Simulation Approach. *Applied Sciences (Switzerland)*, *16*(1), 1–29. https://doi.org/10.3390/app16010292

Fan, D., Lin, Y., Fu, X. (Maggie), Yeung, A. C. L., & Shi, X. (2023). Supply chain disruption recovery in the evolving crisis—Evidence from the early COVID-19 outbreak in China. *Transportation Research Part E: Logistics and Transportation Review*, *176*(June), 103202. https://doi.org/10.1016/j.tre.2023.103202

Frieske, B., & Stieler, S. (2022). The “Semiconductor Crisis” as a Result of the COVID-19 Pandemic and Impacts on the Automotive Industry and Its Supply Chains. *World Electric Vehicle Journal*, *13*(10), 1–14. https://doi.org/10.3390/wevj13100189

Gao, X., Chen, Z., Huang, G., & Hezam, I. M. (2024). Blockchain-Enabled Safeguard Mechanism in SCP-Based Relief Supply Chain Designs in Response to Long-Term Disasters. *IEEE Access*, *12*(June), 133054–133066. https://doi.org/10.1109/ACCESS.2024.3457609

Gladkikh, M., Shan, Y., Ayers, J., Tackett, E., & Mao, H. (2025). Blueprint and case study for the cyber supply chain: Distributed additive manufacturing enables resilience and sustainability. *Manufacturing Letters*, *44*(2025), 1699–1707. https://doi.org/10.1016/j.mfglet.2025.06.189

Kali, R., Gu, J., & Neuyou, E. (2025). Message in a Bottleneck: Supply Chain Disruptions and Manufacturing Output in the United States. *Global Networks*, *25*(4). https://doi.org/10.1111/glob.70032

Khan, S. A. R., Waqas, M., Honggang, X., Ahmad, N., & Yu, Z. (2022). Adoption of innovative strategies to mitigate supply chain disruption: COVID-19 pandemic. *Operations Management Research*, *15*(3–4), 1115–1133. https://doi.org/10.1007/s12063-021-00222-y

Kolade, O., Adegbile, A., & Sarpong, D. (2022). Can university-industry-government collaborations drive a 3-D printing revolution in Africa? A triple helix model of technological leapfrogging in additive manufacturing. *Technology in Society*, *69*(March), 101960. https://doi.org/10.1016/j.techsoc.2022.101960

Kovács, G., & Falagara Sigala, I. (2021). Lessons learned from humanitarian logistics to manage supply chain disruptions. *Journal of Supply Chain Management*, *57*(1), 41–49. https://doi.org/10.1111/jscm.12253

Li, Y., & Yuan, Y. (2024). Supply Chain Disruption Recovery Strategies for Measuring Profitability and Resilience in Supply and Demand Disruption Scenarios. *RAIRO - Operations Research*, *58*(1), 591–612. https://doi.org/10.1051/ro/2023192

Lin, Y., Fan, D., Shi, X., & Fu, M. (2021). The effects of supply chain diversification during the COVID-19 crisis: Evidence from Chinese manufacturers. *Transportation Research Part E: Logistics and Transportation Review*, *155*(April), 102493. https://doi.org/10.1016/j.tre.2021.102493

Manley, R. L., Alonso, E., & Nassar, N. T. (2022). Examining industry vulnerability: A focus on mineral commodities used in the automotive and electronics industries. *Resources Policy*, *78*(August), 102894. https://doi.org/10.1016/j.resourpol.2022.102894

Nguyen, H., Sharkey, T. C., Mitchell, J. E., & Wallace, W. A. (2020). Optimizing the recovery of disrupted single-sourced multi-echelon assembly supply chain networks. *IISE Transactions*, *52*(7), 703–720. https://doi.org/10.1080/24725854.2019.1670372

Nikookar, E., Ali, I., Stevenson, M., & Shokouhyar, S. (2025). Necessary Antecedents of Supply Chain Resilience: The Nonnegotiable Influence of Supply Chain Responsiveness and Collaboration. *Journal of Supply Chain Management*, *61*(4), 54–76. https://doi.org/10.1111/jscm.70000

Okorie, O., Subramoniam, R., Charnley, F., Patsavellas, J., Widdifield, D., & Salonitis, K. (2020). Manufacturing in the Time of COVID-19: An Assessment of Barriers and Enablers. *IEEE Engineering Management Review*, *48*(3), 167–175. https://doi.org/10.1109/EMR.2020.3012112

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2022). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews; [A declaração PRISMA 2020: diretriz atualizada para relatar revisões sistemáticas]; [Declaración PRISMA 2020: una guía actualizada para la publicación de revisiones sistemát. *Revista Panamericana de Salud Publica/Pan American Journal of Public Health*, *46*. https://doi.org/10.26633/RPSP.2022.112

Pan, H., Zou, N., Wang, R., Ma, J., & Liu, D. (2025). Artificial Intelligence Usage and Supply Chain Resilience: An Organizational Information Processing Theory Perspective. *Systems*, *13*(9). https://doi.org/10.3390/systems13090724

Rahman, T., Paul, S. K., Agarwal, R., Shukla, N., & Taghikhah, F. (2024). A viable supply chain model for managing panic-buying related challenges: lessons learned from the COVID-19 pandemic. *International Journal of Production Research*, *62*(10), 3415–3434. https://doi.org/10.1080/00207543.2023.2237609

Sakhardande, M. J., & Prabhu Gaonkar, R. S. (2021). Potential based ranking of sectors identified in ‘Make in India’ initiative using fuzzy AHP: the academicians’ and industry professionals’ perspective. *International Journal of System Assurance Engineering and Management*, *12*(2), 337–344. https://doi.org/10.1007/s13198-020-01044-0

Salmi, M., Akmal, J. S., Pei, E., Wolff, J., Jaribion, A., & Khajavi, S. H. (2020). 3D printing in COVID-19: Productivity estimation of the most promising open source solutions in emergency situations. *Applied Sciences (Switzerland)*, *10*(11), 1–15. https://doi.org/10.3390/app10114004

Shin, S. H., & Shin, S. Y. (2021). A study on the reinforcement of supply chains corresponding to global value chain reforms in the automobile parts and component industry. *Journal of International Logistics and Trade*, *19*(3), 163–179. https://doi.org/10.24006/jilt.2021.19.3.163

Spieske, A., & Birkel, H. (2021). Improving supply chain resilience through industry 4.0: A systematic literature review under the impressions of the COVID-19 pandemic. *Computers and Industrial Engineering*, *158*(June), 107452. https://doi.org/10.1016/j.cie.2021.107452

Terry, S., Nagapurkar, P., & Das, S. (2020). Leveraging Flexible Smart Manufacturing to Accelerate Industrial Supply Chain Recovery. *Smart and Sustainable Manufacturing Systems*, *4*(3), 307–313. https://doi.org/10.1520/SSMS20200056

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.

https://doi.org/10.1109/EMR.2020.3018420

Zhang, L., Sun, X., Xu, M., Yang, Y., Zhang, T., & Wen, Z. (2026). Large language model-driven analysis of supply risk dynamics in global electric vehicle supply chain. *Environmental Impact Assessment Review*, *119*(February), 108378. https://doi.org/10.1016/j.eiar.2026.108378

Zhong, X. (2025). Research on Risk Management Strategies Under Global Supply Chain Disruptions: A Case Study of the Electronics Manufacturing Industry. *International Journal of E-Collaboration*, *21*(1), 1–17. https://doi.org/10.4018/IJeC.393074