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Supply Chain Resilience and Risk Management Strategies in the Post-Pandemic Era

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Abstract*:* *The COVID-19 pandemic exposed deep and systemic vulnerabilities in global supply chains, disrupting the movement of goods, raw materials, and finished products across virtually every industry. This paper investigates supply chain resilience and risk management strategies adopted by organizations in the post-pandemic era, with particular emphasis on how companies are rethinking their operational frameworks to cope with uncertainty. Drawing on an extensive review of peer-reviewed literature, industry reports, and real-world case studies, the study examines the conceptual foundations of supply chain resilience, the multi-dimensional nature of pandemic-induced disruptions, and the strategic responses organizations have embraced. Key themes include digital transformation, supplier diversification, near-shoring and reshoring, inventory buffering, and collaboration frameworks. The paper further explores the role of emerging technologies such as artificial intelligence, blockchain, and the Internet of Things in building adaptive and robust supply networks. Additionally, the study discusses the human dimension of resilience, including workforce flexibility, leadership agility, and organizational learning. The findings suggest that building resilience is not a one-time response but an ongoing strategic investment. Organizations that integrate resilience thinking into their core operational strategy are better positioned to absorb shocks, adapt to volatile environments, and ultimately thrive in an era of persistent global uncertainty. This paper contributes to both theoretical understanding and practical guidance for managers, policymakers, and supply chain professionals navigating the post-pandemic landscape*

Keywords - Supply chain resilience, risk management, post-pandemic, digital transformation, supplier diversification, business continuity, emerging technologies

1. Introduction

When the World Health Organization declared COVID-19 a global pandemic in March 2020, supply chains around the world faced a reckoning unlike anything experienced in modern economic history. Within weeks, factories shut down, shipping routes were disrupted, and the shelves of supermarkets in developed nations stood empty. For supply chain practitioners, this was not simply a logistical challenge — it was a fundamental stress test that revealed how decades of lean optimization had, in many ways, traded resilience for efficiency.

Prior to the pandemic, the dominant paradigm in supply chain management had been the relentless pursuit of cost minimization through lean inventories, single-source procurement, and extended global supplier networks. This approach, championed by efficiency-focused management philosophies, had delivered impressive results during periods of relative stability. However, when the pandemic struck with its full force — simultaneously disrupting supply and demand across continents — the fragility of these systems became alarmingly apparent (Ivanov, 2020).

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The disruptions were not merely operational. They cascaded into strategic, economic, and humanitarian consequences. Semiconductor shortages paralyzed the automotive industry. Personal protective equipment (PPE) could not reach healthcare workers when they needed it most. Food supply chains, despite producing enough food globally, could not distribute it effectively due to transportation bottlenecks (Hobbs, 2020). These events collectively underscored that supply chain resilience was not a luxury or a secondary concern — it was a strategic imperative.

In the years following the initial pandemic shock, organizations across industries have been engaged in deep reflection and active restructuring of their supply chain philosophies. The question is no longer simply "how do we cut costs?" but rather "how do we build systems that can absorb disruption, recover quickly, and adapt to an uncertain future?" This shift in mindset represents a fundamental evolution in how supply chains are conceived, designed, and managed.

This paper seeks to examine these evolving strategies through a comprehensive lens. The research is structured around several key questions: What are the theoretical foundations of supply chain resilience? How did the pandemic expose existing vulnerabilities? What strategic frameworks and operational practices have organizations adopted in response? What role do emerging technologies play in enabling resilience? And how do human and organizational factors contribute to or hinder the development of resilient supply chains?

By synthesizing existing scholarship and integrating insights from real-world organizational responses, this paper aims to provide a holistic and deeply humanized account of supply chain resilience in the post-pandemic world. The goal is not simply to document what happened, but to understand why it happened and what it means for the future of global commerce and organizational strategy (Christopher & Peck, 2004).

2. Conceptual Foundations of Supply Chain Resilience

2.1 Defining Supply Chain Resilience

Supply chain resilience (SCRES) is a multidimensional concept that has been defined and approached from multiple disciplinary perspectives. At its core, resilience refers to the ability of a supply chain system to anticipate, adapt to, and recover from disruptions, returning to its original state or adapting to a new, more desirable state (Ponomarov & Holcomb, 2009). This definition draws from ecological resilience theory, which conceptualizes resilience as the capacity of a system to absorb disturbance while retaining its essential structure and functions.

Christopher and Peck (2004) were among the first to formally articulate supply chain resilience in the management literature, defining it as "the ability of a supply chain to return to its original state or move to a new, more desirable state after being disturbed." Their conceptualization identified four key properties: flexibility, velocity, visibility, and collaboration. These properties, they argued, collectively determine whether a supply chain can withstand and recover from unexpected shocks.

More recent scholarship has expanded and refined this understanding. Ivanov and Dolgui (2021) distinguish between robustness (the ability to resist disruption) and resilience (the ability to recover from it), arguing that the two concepts, while related, require different strategic investments. A robust supply chain minimizes the probability and impact of disruptions, while a resilient supply chain ensures rapid recovery even when disruptions do occur.

The post-pandemic discourse has further introduced the concept of adaptive resilience — the ability not just to bounce back but to bounce forward, emerging from disruption with enhanced capabilities and a stronger strategic position. This notion aligns with the broader concept of organizational learning, suggesting that resilient organizations treat disruptions as opportunities for transformation rather than merely crises to survive (Ambulkar et al., 2015).

2.2 Risk Management in Supply Chains

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Supply chain risk management (SCRM) is the process of identifying, assessing, and mitigating risks that could disrupt the flow of goods, information, and finances across the supply chain. Tang (2006) provides an influential taxonomy of supply chain risks, distinguishing between operational risks (routine uncertainties in supply and demand) and disruption risks (rare but high-impact events such as natural disasters, pandemics, and geopolitical crises).

The pandemic dramatically shifted the focus of risk management from operational to disruption risks. Organizations discovered that their risk registers, which had been carefully calibrated to handle demand fluctuations and supplier quality issues, were woefully inadequate in the face of a systemic global shock. This realization has prompted a renewed interest in what scholars call "black swan" events — low-probability, high-impact occurrences that fall outside the range of normal expectations (Taleb, 2007).

Modern frameworks for supply chain risk management emphasize a dynamic and proactive approach. Rather than responding to risks as they materialize, organizations are encouraged to develop risk sensing capabilities — the ability to detect weak signals of emerging threats early enough to take preventive action. This requires not only sophisticated data analytics but also a culture of openness to uncomfortable information and a willingness to challenge assumptions (Wieland & Wallenburg, 2013).

3. Pandemic-Induced Disruptions: Nature, Scope, and Lessons

3.1 The Anatomy of a Global Supply Chain Shock

The COVID-19 pandemic was unique in its capacity to simultaneously disrupt both supply and demand across virtually all industries and geographies. Unlike previous disruptions — such as the 2011 Tōhoku earthquake or Hurricane Katrina — which were geographically concentrated and had clear recovery timescales, the pandemic unfolded in waves, affected different regions at different times, and generated profound uncertainty about its duration and ultimate impact.

On the supply side, factory shutdowns in China — the world's manufacturing hub — created immediate shortages of components and finished goods. As the virus spread westward, production facilities in Europe and North America also closed, compounding these shortages. Logistics networks were severely disrupted as shipping containers accumulated in wrong locations, air freight capacity plummeted with the grounding of passenger aircraft (which carries a significant share of airfreight), and port congestion reached unprecedented levels (Sheffi, 2020).

On the demand side, the pandemic generated extreme and contradictory shifts. Demand for medical equipment, household goods, and home office equipment surged dramatically, while demand for hospitality, automotive, and luxury goods collapsed. These simultaneous demand shocks in opposite directions overwhelmed even the most sophisticated demand forecasting models, leaving organizations either with severe stockouts or massive excess inventory.

3.2 Sector-Specific Vulnerabilities

Different industries experienced the pandemic's supply chain impact in distinct ways, reflecting their unique structural characteristics. The pharmaceutical industry found itself facing critical shortages of active pharmaceutical ingredients (APIs), approximately 80% of which are manufactured in China and India. The concentration of this critical production in a small number of geographies, which had been economically rational, proved catastrophically risky when those regions were simultaneously disrupted (Gereffi, 2020).

The automotive industry encountered perhaps the most dramatic example of supply chain interdependency. When semiconductor manufacturers shifted capacity to consumer electronics at the start of the pandemic (in response to surging demand for laptops and smartphones), and automakers subsequently cancelled their chip orders expecting continued low demand, they found themselves unable to secure sufficient semiconductor supply when vehicle demand rebounded. The resulting production shutdowns cost the global

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automotive industry an estimated $210 billion in lost revenue in 2021 alone (McKinsey & Company, 2021).

The food and agriculture sector faced different but equally complex challenges. While overall food production remained relatively stable, the pandemic exposed extreme vulnerabilities in food processing and distribution networks. Meat processing plants, which operate with dense workforces in cold environments — conditions particularly conducive to viral transmission — became outbreak hotspots, forcing widespread closures. The resulting supply disruptions contributed to significant price volatility and raised fundamental questions about the concentration of food processing capacity (Hobbs, 2020).

3.3 Structural Weaknesses Revealed

Beyond sector-specific vulnerabilities, the pandemic revealed several cross-cutting structural weaknesses in global supply chains. The first and most significant was the lack of visibility beyond the first tier of suppliers. Most organizations had robust relationships with their direct suppliers, but limited knowledge of the sub-suppliers and sub-sub-suppliers that ultimately provided the raw materials and components their direct suppliers used. When disruptions cascaded through these deeper tiers, organizations were caught completely off guard (Choi et al., 2001).

The second major weakness was excessive concentration — both geographic (with critical manufacturing concentrated in China and a few other low-cost countries) and supplier-specific (with many companies relying on single sources for critical inputs). This concentration had been driven by the logic of economies of scale and cost optimization, but it meant that disruptions in any one location or with any one supplier could cascade through entire supply networks.

Third, the pandemic exposed the fragility of just-in-time (JIT) manufacturing philosophies. JIT systems, designed to minimize inventory and maximize efficiency, have virtually no buffer to absorb demand or supply shocks. When both occurred simultaneously, many JIT-dependent organizations found themselves completely unable to maintain production continuity (Sodhi et al., 2012).

4. Strategic Responses and Resilience-Building Frameworks

4.1 Diversification and Multi-Sourcing

Perhaps the most immediate and widely adopted response to pandemic-induced supply chain disruptions has been supplier diversification. Organizations across industries have moved rapidly away from single-source procurement strategies toward multi-sourcing arrangements that spread supply risk across multiple providers and geographies. This strategic shift represents a deliberate trade-off between efficiency and resilience — accepting somewhat higher procurement costs in exchange for greater supply continuity.

Research by Simchi-Levi et al. (2020) demonstrates that multi-sourcing significantly reduces the expected cost of disruptions, even accounting for the higher steady-state costs of maintaining multiple supplier relationships. Their analysis suggests that for critical components, the "resilience premium" paid through multi-sourcing is typically well justified by the reduction in disruption risk, particularly when the likelihood of low-probability, high-impact events is properly incorporated into the cost calculus.

Geographic diversification has emerged as a complementary strategy, with many organizations restructuring their supplier networks to ensure that no single country or region accounts for more than a defined percentage of their total supply of any critical input. This approach, sometimes described as a "China plus one" strategy (maintaining Chinese manufacturing while developing alternative supply sources), has been particularly prevalent in electronics, pharmaceuticals, and industrial manufacturing (Gereffi, 2020).

4.2 Reshoring and Near-Shoring

A closely related strategic response has been reshoring — the return of manufacturing to domestic locations — and near-shoring — the relocation of production to geographically proximate countries. Driven by concerns

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about supply chain security, geopolitical risk, and the reputational implications of foreign production, many organizations and governments have made significant investments in domestic manufacturing capacity.

The motivations for reshoring extend beyond pure risk management. Shorter supply chains reduce lead times, enabling faster responses to demand changes and reducing the need for safety stock. They also facilitate greater collaboration between manufacturers and their customers, enabling more flexible and customized production. Additionally, concerns about intellectual property protection and quality control have led some organizations to favor domestic production for high-value or technically complex products (Fratocchi et al., 2014).

However, reshoring is not without its challenges. Labor costs in developed economies remain significantly higher than in traditional manufacturing hubs, and the workforce skills and industrial ecosystems needed to support domestic manufacturing may need to be rebuilt after decades of offshoring. The experience of semiconductor manufacturing is illustrative: even with massive government subsidies, building new fabrication plants in the United States and Europe will take years and face significant workforce and supply chain ecosystem challenges (Helper & Soltas, 2021).

4.3 Strategic Inventory Management

The pandemic has prompted a fundamental reconsideration of inventory philosophy. For decades, the trend in supply chain management was toward ever-leaner inventories, driven by the conviction that capital tied up in stock was wasteful. The pandemic has forced a painful reappraisal of this conviction, with many organizations discovering that the cost of stockouts — in terms of lost revenue, customer dissatisfaction, and reputational damage — far exceeded the carrying costs of safety stock they had been so assiduously eliminating.

The result has been a widespread adoption of what might be termed "strategic buffering" — the maintenance of elevated safety stock for critical and high-risk items, while retaining lean approaches for low-risk, easily substitutable materials. This differentiated approach to inventory management requires sophisticated risk assessment at the SKU level, taking into account factors such as supply concentration, lead time variability, substitutability, and the strategic importance of each item to business continuity (Henke, 2021).

4.4 Visibility and Transparency

A critical enabler of supply chain resilience is end-to-end visibility — the ability to see, in real time or near-real time, what is happening at all tiers of the supply chain. The pandemic demonstrated catastrophically that organizations without this visibility were flying blind, unable to anticipate disruptions before they had already cascaded into their immediate operations.

Building supply chain visibility requires significant investment in both technology and relationships. On the technology side, organizations are deploying supply chain management platforms, IoT sensors, and data analytics tools that provide continuous monitoring of inventory levels, transportation status, and supplier operations. On the relationship side, they are developing deeper, more collaborative partnerships with key suppliers, sharing demand forecasts and operational data in ways that would have been inconceivable under the adversarial, transactional procurement models that prevailed in many industries (Ivanov & Dolgui, 2021).

5. Digital Transformation and Emerging Technologies

5.1 Artificial Intelligence and Predictive Analytics

Artificial intelligence (AI) and machine learning (ML) are transforming the risk management capabilities of supply chains in fundamental ways. Traditional risk management relied heavily on human judgment and historical data, making it poorly suited to detecting novel threats or anticipating non-linear dynamics. AI systems, by contrast, can analyze vast quantities of structured and unstructured data — including news feeds,

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social media, weather data, and financial indicators — to generate early warnings of potential supply chain disruptions.

Companies like Resilinc and riskmethods have developed AI-powered supply chain risk monitoring platforms that continuously scan global information sources for signals of supplier distress, geopolitical instability, and natural disasters, alerting procurement teams to potential disruptions before they materialize. During the pandemic, organizations using these platforms were able to identify at-risk suppliers weeks before disruptions became public knowledge, giving them critical time to develop contingency plans (Dolgui et al., 2020).

Beyond risk monitoring, AI is enabling significant advances in demand forecasting. Traditional forecasting models struggled to handle the extreme demand shifts caused by the pandemic, but AI-powered demand sensing tools — which incorporate real-time point-of-sale data, social media trends, and external economic indicators — were able to adapt much more quickly to changing conditions. This reduced the bullwhip effect (the amplification of demand volatility as signals move up the supply chain) and enabled more appropriate inventory positioning.

5.2 Blockchain for Supply Chain Transparency

Blockchain technology offers compelling possibilities for supply chain transparency and traceability. By creating an immutable, shared ledger of transactions and movements across the supply chain, blockchain can provide all participants with a common, verified view of where products and components are, where they came from, and what has happened to them at each stage of their journey.

This capability has important implications for resilience. When disruptions occur, blockchain-enabled supply chains can rapidly identify exactly which batches of products are affected, enabling targeted responses rather than broad, precautionary actions. In the pharmaceutical industry, for example, blockchain-based track-and-trace systems can quickly identify the provenance of suspected counterfeit or contaminated products, enabling rapid recalls without disrupting the supply of unaffected products (Saberi et al., 2019).

The adoption of blockchain in supply chains faces significant challenges, however. The technology requires buy-in from all participants in the supply network, including suppliers who may be reluctant to share operational data with competitors or customers. Interoperability between different blockchain platforms remains a challenge, and the technology is still relatively costly to implement and operate at scale (Lumineau et al., 2021).

5.3 Internet of Things and Smart Supply Chains

The Internet of Things (IoT) — the network of connected sensors, devices, and systems that can collect and communicate data from physical environments — is enabling what some analysts describe as the "smart supply chain." IoT sensors embedded in manufacturing equipment, vehicles, containers, and storage facilities can provide real-time data on production output, transportation status, environmental conditions, and inventory levels, creating a level of operational visibility that was previously impossible.

During the pandemic, organizations with IoT-enabled supply chains were better able to manage the complex logistics challenges created by shifting demand patterns, transportation disruptions, and the need for contactless operations. Real-time visibility into warehouse inventory levels enabled more efficient allocation of scarce products. IoT-enabled cold chain monitoring ensured the integrity of temperature-sensitive medical products, including COVID-19 vaccines, as they moved through complex distribution networks (Queiroz et al., 2020).

6. Human and Organizational Dimensions of Supply Chain Resilience

6.1 Leadership Agility and Decision-Making Under Uncertainty

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While technology and structural strategies are essential components of supply chain resilience, the human dimension is equally critical. The pandemic demonstrated that even the most sophisticated supply chain systems ultimately depend on the quality of human judgment and decision-making, particularly under conditions of extreme uncertainty and time pressure.

Leaders who managed the pandemic's supply chain challenges most effectively shared several common characteristics. They were able to rapidly synthesize incomplete information and make decisions without waiting for certainty. They maintained clear communication with employees, suppliers, and customers, even when the information they had to share was uncertain or unpleasant. They were willing to challenge established practices and make unconventional decisions when circumstances demanded it. And they prioritized human welfare alongside operational continuity, recognizing that the trust and loyalty of employees and supply chain partners were themselves strategic assets (Sheffi, 2020).

6.2 Workforce Flexibility and Cross-Training

The pandemic exposed the risks of highly specialized workforces in which individual employees possessed unique skills that could not easily be replicated or distributed. When key employees were incapacitated by illness or unable to work due to lockdowns, organizations with narrow specialization found themselves unable to maintain critical functions.

In response, many organizations have invested significantly in cross-training and workforce flexibility programs. By ensuring that multiple employees can perform each critical function, and that workers can rapidly shift between roles as operational needs change, organizations significantly reduce their vulnerability to workforce disruptions. This investment in human capital redundancy has costs in terms of training time and reduced individual specialization, but organizations that experienced severe workforce disruptions during the pandemic typically regard these costs as well justified (Henke, 2021).

6.3 Organizational Learning and Adaptive Capacity

Perhaps the most important human dimension of supply chain resilience is the capacity for organizational learning — the ability of organizations to systematically draw lessons from experience and translate those lessons into improved capabilities and practices. The pandemic generated an unprecedented wealth of experience with supply chain disruption management, and organizations that have been most effective at capturing and institutionalizing these lessons are better positioned for future challenges.

Effective organizational learning from supply chain disruptions requires structured processes for capturing lessons learned, communicating them across the organization, and embedding them in updated processes, training, and risk management frameworks. It also requires a psychological safety culture in which employees feel comfortable sharing information about failures and near-misses without fear of blame or reprisal. Organizations where fear of failure suppresses information sharing are systematically deprived of the learning inputs they need to improve (Ambulkar et al., 2015).

7. Integrated Resilience Frameworks and Policy Implications

7.1 Towards an Integrated Resilience Framework

The research reviewed in this paper suggests that supply chain resilience cannot be achieved through any single strategy or intervention. Rather, it requires the integration of structural, operational, technological, and human dimensions into a coherent, mutually reinforcing framework. Drawing on the work of Fiksel (2006), Pettit et al. (2010), and others, we propose a framework built around four core capabilities.

The first is anticipation — the ability to identify and assess supply chain risks before they materialize into disruptions. This requires investment in intelligence gathering, scenario planning, and stress testing, as well as the development of a risk-aware organizational culture. The second is prevention — the implementation of structural and operational measures that reduce the probability and potential impact of

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disruptions. This includes supplier diversification, inventory buffering, geographic distribution of production, and robust business continuity planning.

The third capability is response — the ability to activate effective countermeasures rapidly when disruptions do occur. This requires pre-positioned contingency plans, clear decision-making authority, and the operational flexibility to redirect resources and adjust processes quickly. The fourth capability is adaptation — the ability to learn from disruptions and use that learning to build stronger, more capable supply chains over time. This is perhaps the most strategically valuable capability, as it ensures that each experience of disruption, however painful, contributes to an enhanced capacity to handle future challenges (Pettit et al., 2010).

7.2 Policy Implications

The pandemic has demonstrated that supply chain resilience is not solely a concern for individual organizations — it is also a matter of national and international policy. Governments around the world have drawn lessons from the pandemic's supply chain disruptions and have begun to intervene more actively in supply chain structures, with a particular focus on strategic and critical industries.

The most prominent example is the global semiconductor sector, where the United States, European Union, Japan, South Korea, and other major economies have committed tens of billions of dollars in subsidies and incentives to attract semiconductor manufacturing to their territories. The U.S. CHIPS and Science Act, signed into law in August 2022, allocated $52.7 billion for domestic semiconductor manufacturing and research, reflecting the recognition that semiconductor supply chain security has become a matter of national strategic interest (Helper & Soltas, 2021).

Beyond sector-specific interventions, policymakers are increasingly focused on building broader supply chain monitoring and risk management capabilities at the national level. This includes investments in supply chain mapping initiatives that identify critical dependencies and vulnerabilities, as well as international cooperation frameworks that facilitate information sharing and coordinated responses to global supply chain emergencies (Gereffi, 2020).

8. Conclusion

The COVID-19 pandemic has fundamentally altered the supply chain management landscape, forcing a reckoning with the limitations of efficiency-focused approaches and driving a profound reconsideration of the balance between optimization and resilience. The disruptions experienced during the pandemic were not simply operational inconveniences — they were systemic shocks that exposed deep structural vulnerabilities in global supply networks and demonstrated, with painful clarity, the strategic importance of resilience.

This paper has explored the conceptual foundations of supply chain resilience, traced the nature and impact of pandemic-induced disruptions, and examined the strategic, technological, and human dimensions of resilience-building efforts in the post-pandemic era. The evidence suggests that leading organizations are making substantial investments in supplier diversification, near-shoring, strategic inventory management, digital transformation, and human capital development, all with the goal of building supply chains that can absorb disruption, recover quickly, and emerge from crises with enhanced capabilities.

Several important themes emerge from this analysis. First, resilience is inherently multi-dimensional — no single strategy or technology is sufficient, and effective resilience requires the integration of structural, operational, technological, and human capabilities. Second, resilience comes at a cost. Organizations must be prepared to accept higher steady-state costs in exchange for the protection that resilience provides, and this trade-off requires sophisticated analysis and strong organizational conviction. Third, resilience is dynamic — it requires continuous investment, learning, and adaptation, rather than a one-time restructuring effort.

Fourth, and perhaps most importantly, resilience is ultimately a human achievement. Supply chains are not abstract systems — they are networks of human relationships, decisions, and commitments. Building truly resilient supply chains requires not just structural and technological investments but also the cultivation of

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trust, collaboration, agility, and learning capabilities at every level of the organization and across the supply network.

The post-pandemic era presents organizations with both the imperative and the opportunity to build supply chains that are genuinely fit for an uncertain world. The organizations that rise to this challenge — that treat resilience not as an insurance policy but as a source of strategic advantage — will be better positioned not just to survive future disruptions but to thrive in the face of them. In a world where disruption has become the new normal, supply chain resilience is not merely a defensive capability; it is a foundation for sustained competitive success.

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References

Ambulkar, S., Blackhurst, J., & Grawe, S. (2015). Firm's resilience to supply chain disruptions: Scale development and empirical examination. Journal of Operations Management, *33–34, 111–122.* https://doi.org/10.1016/j.jom.2014.11.002

Choi, T. Y., Dooley, K. J., & Rungtusanatham, M. (2001). Supply networks and complex adaptive systems: Control versus emergence. Journal of Operations Management, 19(3), 351–366. https://doi.org/10.1016/S0272-6963(00)00068-1

Christopher, M., & Peck, H. (2004). Building the resilient supply chain. International Journal of Logistics Management, *15(2), 1–14*. https://doi.org/10.1108/09574090410700275

Dolgui, A., Ivanov, D., & Rozhkov, M. (2020). Does the ripple effect influence the bullwhip effect? An integrated analysis of structural and operational dynamics in the supply chain. International Journal of Production Research, 58(5), *1285–1301*. https://doi.org/10.1080/00207543.2019.1627438

Fiksel, J. (2006). Sustainability and resilience: Toward a systems approach. Sustainability: Science, Practice and Policy, *2(2), 14–21.* https://doi.org/10.1080/15487733.2006.11907980

Fratocchi, L., Di Mauro, C., Barbieri, P., Nassimbeni, G., & Zanoni, A. (2014). When manufacturing moves back: Concepts and questions. Journal of Purchasing and Supply Management, *20(1), 54–59.* https://doi.org/10.1016/j.pursup.2014.01.004

Gereffi, G. (2020). What does the COVID-19 pandemic teach us about global value chains? The case of medical supplies. Journal of International Business Policy, 3(3), 287–301. https://doi.org/10.1057/s42214-020-00062-w

Helper, S., & Soltas, E. (2021). Why the pandemic has disrupted supply chains. The White House. https://www.whitehouse.gov/cea/written-materials/2021/06/17/why-the-pandemic-has-disrupted-supply-chains/

Henke, M. (2021). Supply chain resilience 2021: Procurement perspectives. Hackett Group. https://www.thehackettgroup.com

Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. Canadian Journal of Agricultural Economics, *68(2), 171–176.* https://doi.org/10.1111/cjag.12237

Ivanov, D. (2020). Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. Transportation Research Part E: Logistics and Transportation Review, *136, 101922.* https://doi.org/10.1016/j.tre.2020.101922

Ivanov, D., & Dolgui, A. (2021). OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. International Journal of Production Economics, 232, 107921. https://doi.org/10.1016/j.ijpe.2020.107921

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19, Knowledge Park-II, Institutional Area, Greater Noida (UP), India.

Lumineau, F., Wang, W., & Schilke, O. (2021). Blockchain governance — A new way of organizing collaborations? Organization Science*, 32(2), 500–521.* https://doi.org/10.1287/orsc.2020.1379

McKinsey & Company. (2021). Semiconductors in China: Balancing priorities. McKinsey & Company. https://www.mckinsey.com

Pettit, T. J., Fiksel, J., & Croxton, K. L. (2010). Ensuring supply chain resilience: Development of a conceptual framework. Journal of Business Logistics, *31(1), 1–21*. https://doi.org/10.1002/j.2158-1592.2010.tb00125.x

Ponomarov, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. International Journal of Logistics Management*, 20(1), 124–143.* https://doi.org/10.1108/09574090910954873

Queiroz, M. M., Telles, R., & Bonilla, S. H. (2020). Blockchain and supply chain management integration: A systematic review of the literature. Supply Chain Management: An International Journal, *25(2), 241–254.* https://doi.org/10.1108/SCM-03-2018-0143

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. International Journal of Production Research, *57(7), 2117–2135.* https://doi.org/10.1080/00207543.2018.1533261

Sheffi, Y. (2020). The new (ab)normal: Reshaping business and supply chain strategy beyond COVID-19. MIT CTL Media.

Simchi-Levi, D., Schmidt, W., Wei, Y., Zhang, P. Y., Combs, K., Ge, Y., Gusfield, O., Sanders, J., Sherrod, D., & Tien, J. (2020). Identifying risks and mitigating disruptions in the automotive supply chain. Interfaces, *45(5), 375–390.* https://doi.org/10.1287/inte.2015.0804

Sodhi, M. S., Son, B. G., & Tang, C. S. (2012). Researchers' perspectives on supply chain risk management. Production and Operations Management, *21(1), 1–13.* https://doi.org/10.1111/j.1937-5956.2011.01251.x

Taleb, N. N. (2007). The black swan: The impact of the highly improbable. Random House.

Tang, C. S. (2006). Perspectives in supply chain risk management. International Journal of Production Economics, *103(2), 451–488*. https://doi.org/10.1016/j.ijpe.2005.12.006

Wieland, A., & Wallenburg, C. M. (2013). The influence of relational competencies on supply chain resilience: A relational view. International Journal of Physical Distribution & Logistics Management*, 43(4), 300–320*. https://doi.org/10.1108/IJPDLM-08-2012-0243

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