Resilience and Responsiveness in the Logistics Industry during Disruptive Events: A Case Study on the Impact of the Coronavirus Pandemic

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Abstract

Understanding operational resilience during disruptive events is critical in the dynamic global logistics field. This qualitative study explores the challenges faced by a logistics company during the COVID-19 pandemic based on surveys and interviews with twelve logistics management experts. A thematic analysis was used to identify recurring themes regarding logistics disruptions and response strategies. The data revealed internal disruptions such as delays in pickup or delivery, inaccurate delivery information, and communication challenges with drivers. External disruptions include supply-demand imbalances, freight rate volatility, port congestion, and unexpected supplier shutdowns. Strategies to enhance logistics resilience are discussed, emphasizing strategic decision-making, robust leadership, digitalization for improved communication and supply chain visibility, and agility in adapting to change. These findings provide a thorough understanding of logistics disruptions and offer practical recommendations for professionals to navigate challenges and strengthen their logistics operations.

Keywords: Logistics operations, disruptive events, coronavirus pandemic, risk management, contingency planning, digitization, case study

Introduction

Logistics, an essential driver of international trade, involves the intricate movement and storage of products from their point of origin to the end consumers (Baker et al., 2023). However, the complexity of these operations makes them vulnerable to a myriad of disturbances, emphasizing the critical need for resilience and the ability to foresee, navigate, recover, and adapt to such interruptions (Ivanov & Dolgui, 2020). The COVID-19 pandemic, a monumental disruption, profoundly affected the global logistics sector. It notably strained supply chains and had a pronounced effect on significant manufacturing centers, especially China (Garrido et al., 2020; Ali et al., 2021).

This study explores how a logistics company navigates multidimensional disruptions triggered by the pandemic. It examines the risk management paradigms adopted to build resilience during turbulence. The overall aim is to provide an in-depth qualitative account of the challenges encountered and the adaptive strategies deployed concurrently from the perspective of logistics professionals. The following sections present a review of the literature on risk management and resilience in logistics, followed by the conceptual framework, methodological details, results, discussion, and implications of the findings.

Review of the Literature

The coronavirus pandemic has underscored the need for resilience and responsiveness in supply chain logistics, especially during disruptive and uncertain events. Recent studies

have provided valuable insights into risk management and contingency planning from localized and widespread crisis perspectives (Choi, 2020; Ivanov, 2022b). Ivanov et al.'s model integrating agility, resilience, and sustainability offers a promising holistic framework for navigating major disruptions, such as the pandemic (Ivanov, 2022a, 2022b; Ivanov & Dolgui, 2020). This holistic framework is critical for supply chain strategies. However, gaps exist in the granularity of analysis in assessing risks and developing robust contingency plans (de Matta, 2017; Sheth, 2020), highlighting the need for further research to develop more detailed risk assessment and contingency planning frameworks.

Communicating openly and maintaining transparency with stakeholders has also been emphasized as a vital principle during turbulent periods (Onica et al., 2022; Parajuli et al., 2017). Adopting a wider open communication approach could significantly improve supply chain resilience. Nagao et al. (2021) highlighted robustness through supplier diversification as a prudent strategic imperative to withstand disruptions (Nagao et al., 2021). Diversification has emerged as a key tactic in the literature. The pandemic has underscored contingency planning's indispensability, especially in dense urban centers (Gazzeh et al., 2022). The emphasis on contingency planning is unsurprising but illustrates the supply chain vulnerabilities have been exposed. Innovative logistics strategies during crises could transform supply chain logistics into an essential mechanism amid turbulence (Choi, 2020). Adaptability and innovation appear to be recurrent themes in many of these studies.

The digital transformation of the postpandemic supply chain has received significant attention (Chauhan et al., 2023), and structured digital approaches have been proposed to mitigate disruptions (Queiroz et al., 2022). Supplier diversification and transparency have emerged as prominent themes (Kiers et al., 2022; Wijewickrama et al., 2022). Agile and adaptable recovery paradigms tailored for manufacturing supply chains have also been devised (Paul & Chowdhury, 2020, 2021). Postpandemic resilience has necessitated a shift from cost-focused to resilience-oriented supply chain frameworks (Kiers et al., 2022; Lopes et al., 2022). This shift is inevitable and overdue.

Tailored flexible systems represent methods likely to be utilized in the future, and it is vital to address technological, regulatory, and market challenges to ensure the agility and flexibility of supply chains (Klein et al., 2022; Nagao et al., 2021). This underscores the need for a holistic perspective that encompasses all aspects of the supply chain environment.

Overall, the literature has focused more on localized disruptions (A. Garrido et al., 2020; Butt, 2021) and technological innovation (Fathollahi-Fard et al., 2022; Klaus & Manthiou, 2020). There appears to be a gap in research on risk-management paradigms adept at navigating large-scale disruptions in post-pandemic contexts (Fathollahi-Fard et al., 2022; Gazzeh et al., 2022; Ivanov, 2022a, 2022b; Sun & Zhang, 2022; Szuster & Lotko, 2022).

Present Study

The literature has focused extensively on localized supply chain disruptions and technological innovations. However, there is a gap in the research on risk management paradigms to navigate widespread crises in post-pandemic contexts. This study addresses this gap by examining how a logistics company manages multidimensional disruptions triggered by the COVID-19 pandemic. The granular single-case analysis is expected to provide invaluable qualitative evidence revealing the nuanced internal and external disruptions faced, along with the tailored resilience strategies deployed concurrently. Notably, while the findings of a single case analysis are limited in generalizability, they offer rare empirical insights into pragmatic risk management practices during a major disruption event (Kumar & Sharma, 2021; Shen & Sun, 2023).

The primary objective of this qualitative study is to examine the operational challenges faced by a logistics company in California, United States, due to the COVID-19 pandemic. Furthermore, this study identifies the most significant disruptions in the logistics sector and assesses possible countermeasures to counteract such disruptions. This study focused on the following research questions:

RQ1: How does a global disruption event, such as a pandemic, challenge logistics operations' ability to reassess standardized risk management plans?

RQ2: What strategies or contingency plans can help organizations better prepare for current and future logistics disruptions on both short- and long-term bases?

RQ3: What factors or risk management strategies prompt business leaders to adapt by altering their products or services during a pandemic?

Conceptual Framework

This study adopted a conceptual framework to examine the impact of disruptive events, such as COVID-19, on logistics resilience. The multidimensional framework encompasses four key domains: risk assessment, information management, operational procedures, and strategic policies. Risk assessment involves the evaluation of vulnerabilities across ports, transportation, inventory, technology, and other parameters (Figure 1). Information management focuses on enabling seamless data exchange through digitization. Operational procedures entail streamlining supply chain processes to enhance responsiveness. Strategic Policy provides leadership to champion a resilience-oriented vision and culture across the organization. The complementary elements of the framework consist of proactive contingency planning, dynamic resource allocation, developing crisis leadership capability, digital adoption, and implementing best practices.

Figure 1
Conceptual Framework

Note: The multidimensional framework for risk assessment in logistics and supply chain management is illustrated. This framework comprises four principal domains: risk assessment, information management, operational procedures, and strategic policies.
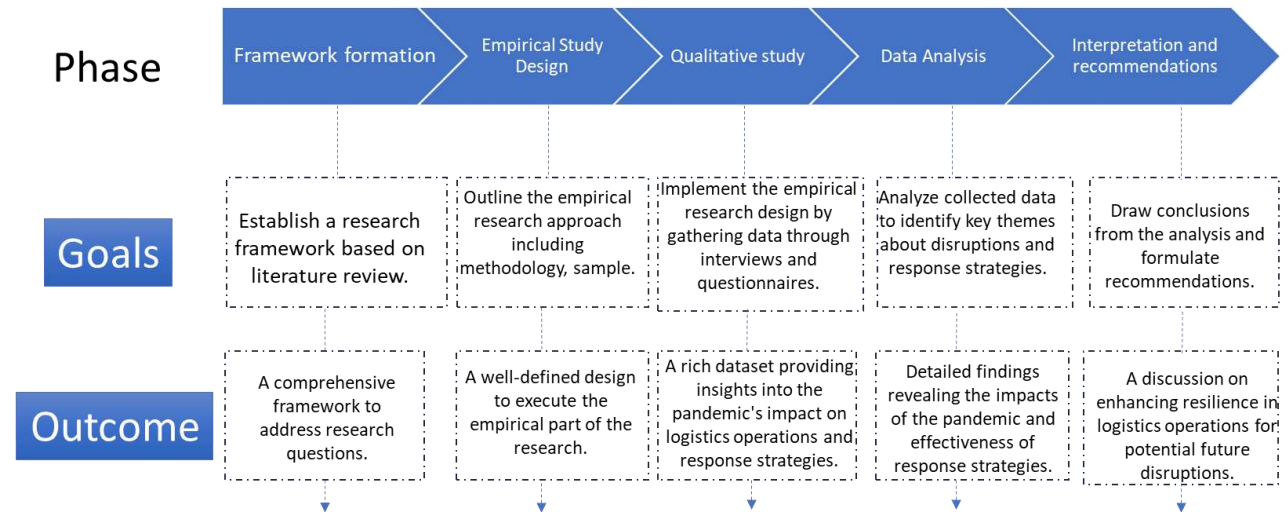
Methods and Materials

A qualitative methodology involving semi-structured interviews and surveys was used. A mid-startup logistics organization in California, United States, served as the primary unit of analysis. Using objective sampling in a cyclical process, participants were selected based on specific characteristics to ensure a diverse and representative sample (Etikan, 2016). Qualitative methods allow for an in-depth exploration of participants' perspectives and experiences, which suits the goal of understanding logistics disruptions and responses during an unprecedented event, such as the COVID-19

pandemic (Paul & Chowdhury, 2020). Expert sampling further enriched the study by targeting people with deep logistics expertise to gain insight into challenges, successes, failures, and emerging trends (Wieland, 2021). The selection criteria encompassed years of experience, management level, and direct involvement in the phenomenon under investigation. The study began by developing a conceptual framework followed by an empirical study design (Figure 2).

Figure 2
Phases of the Study

Phase	Framework formation	Empirical Study Design	Qualitative study	Data Analysis	Interpretation and recommendations
Goals	Establish a research framework based on literature review.	Outline the empirical research approach including methodology, sample.	Implement the empirical research design by gathering data through interviews and questionnaires.	Analyze collected data to identify key themes about disruptions and response strategies.	Draw conclusions from the analysis and formulate recommendations.
Outcome	A comprehensive framework to address research questions.	A well-defined design to execute the empirical part of the research.	A rich dataset providing insights into the pandemic's impact on logistics operations and response strategies.	Detailed findings revealing the impacts of the pandemic and effectiveness of response strategies.	A discussion on enhancing resilience in logistics operations for potential future disruptions.

Note: The figure presents different phases involved in the study. These stages include the design and planning of the study, the collection and analysis of data, and finally, the interpretation and reporting of the findings.

Participants and Data Saturation

The sampling cycle culminated in the selection of twelve participants for the virtual interviews (see Appendix A1). Adhering to the qualitative research guidelines proposed by Francis et al. (2010), a sample size of seven to 12 interviews was deemed sufficient for comprehensive data understanding (Francis et al., 2010). At the 10th interview, data saturation was evident, with recurring themes and no new insights emerging. The inclusion criteria and detailed profiles of the participants are presented in Table 2.

Table 1
Inclusion Criteria and Description

Criteria	Description
Professional experience	Participants must have a minimum of ten years of experience in managing logistics operations. This criterion ensures the depth of practical knowledge and understanding in the field.
Position in the firm	Participants should be in a senior executive role within their company. This ensures that they have a comprehensive overview and decision-making power in logistics operations.
Involvement	It is essential for participants to have direct involvement in overseeing one or more of their organization's logistics operations. This involvement guarantees first-hand experience and knowledge relevant to the study.

Note. These criteria are designed to ensure that participants have sufficient professional experience and hold a significant position within their organization.

Table 2
Participants' Profile

Participants	Job Title	Experience (Years)	Interview Duration (Min)
P1	Senior Accounts Receivable Manager	5	29
P2	Senior Yard Manager	6	26
P3	Dispatch Manager	5	29
P4	Director of Operations	8	31
P5	Senior Operations Manager	5.5	32
P6	Vice President of Operations	9.5	26
P7	Senior Corporate Accounting Manager	6	23
P8	Senior Pricing Analyst	7	24
P9	Customer Success Supervisor	4.5	19
P10	Product Marketing Manager	5.5	32
P11	Director, Transportation Engineering Systems	10	24
P12	Chief Product Officer	12	25

Note. This table presents a detailed profile of the participants involved in the study. It includes their job titles, years of experience in their respective fields, and the duration of their interviews.

Participant Selection and Interview Process

Twelve experienced professionals who held authoritative roles within the selected logistics firm were chosen as interviewees. The semi-structured interview format consisted of open-ended questions to prompt discussion and to cover key topics related to the research questions. This interview structure enabled the participants to share insights based on their experiences.

Expert interviews and surveys were conducted remotely from 2023, January through February, under coronavirus guidelines. Once participants consented to participate, they received a virtual meeting link, an informed consent form, and the interview protocol. All interviews were recorded with strict adherence to anonymity guidelines. The interview structure encompassed participant and organizational information, logistics disruptions, remedial action plans, logistics resilience, risk management, and contingency operations.

Structured Survey

In addition to the interviews, a structured survey consisting of closed-ended questions was distributed to additional logistics professionals. The survey gathered quantifiable data to complement qualitative interview findings. The goal was to collect more than 10 valid responses, targeting an 80% response rate for robust analysis.

Reflexive Thematic Analysis

Reflexive thematic analysis (TA) was used to systematically identify, organize, and offer insights into patterns of meaning (themes) across the qualitative dataset. This method provides a flexible yet robust framework for coding and deriving themes from the interviews and survey data. The analyses were performed manually by the researcher. Rigor was ensured by following the reflexive TA process outlined by Braun and Clarke (2021)

1. Familiarization: The data were read repeatedly to achieve immersion and to obtain a sense of breadth and depth. Detailed notes were obtained from the first impressions.

2. Coding: Initial codes were generated by systematically identifying and labeling the meaningful features of the data across the entire dataset. Coding was performed manually by highlighting and annotating the transcripts.

3. Search for themes: Codes were analyzed and collated into candidate themes and subthemes based on patterned meanings. The themes were reviewed for coherence, consistency, and distinctiveness.

4. Defining and naming themes: Themes were defined and refined to determine the essence of each theme captured. Clear names were assigned.

5. Reporting: The themes were summarized in the results section using vivid

examples from the data. Frequency counts were used for additional quantification.

Coded data extracts were analyzed to identify overarching themes. The candidate themes were reviewed for coherence and distinctiveness. Subthemes were identified within broader themes to showcase nuances and depths. The themes were then defined, named, and finalized based on their significance and relevance to the research questions. These strategies enhanced the trustworthiness of the analysis. Frequency counts quantified the occurrence of themes and subthemes. The iterative TA process allowed robust themes to emerge inductively from the qualitative data. To validate the findings further, colleague collaboration and member checking were conducted. The iterative analysis elicited robust inductive themes rooted in the experiences articulated in raw qualitative data. This rigorous process allowed the systematic identification and in-depth exploration of patterns of meaning in logistics resilience strategies during a major disruption event. Four principles are followed to establish trustworthiness: credibility, dependability, conformability, and transferability (Ryan et al., 2022).

Results

Table 2 offers a comprehensive overview of the participants' profiles, detailing their job titles, years of experience, and duration of their interviews. The participants spanned a range of roles within the logistics organization, from senior accounts receivable managers to chief product officers. Their experience in the field varied, with tenures ranging from 4.5 to 12 years. On average, each interview lasted approximately 25 min, accumulating 320 min (5.3 h) of audio. The extensive audio content was transcribed into 66 pages of text, meticulously reviewed, and corrected for accuracy.

Thematic Analysis

Three themes emerged from the data analysis: internal logistics disruptions, external logistics disruptions, and recommended contingency response strategies. These themes were based on the frequency table (see Appendix A2), which recorded the number of times the participants mentioned a specific code.

Internal Logistics Disruptions

Delays in pickup or delivery were mentioned by 66.7% of participants (see Appendix A3). Delayed or inaccurate delivery information is highlighted at the 50% level. Communication challenges between the organization and drivers were noted by 50% of the participants. Inadequate information sharing within the company was a concern for 58.3% of participants.

External Logistics Disruptions

Imbalanced supply and demand were mentioned by 100% of participants (see Appendix A4). The volatility of freight rates was a concern at 33.3%, while conjunction at ports and delayed shipments was noted at 75%. Unexpected or unplanned supplier shutdowns were highlighted by 50% of participants, and increasing regulatory burdens were mentioned by all participants.

Recommended Contingency Response Strategies

Participants proposed strategies to counteract the effects of pandemic-induced challenges. Resource planning throughout logistics operations was mentioned by 58.3% of participants. Amplifying digital communication within the supply chain network was highlighted by 41.7%. Long-term strategic planning was advocated by 66.7% of the participants. Decisive leadership and strategic decision-making were underscored by 66.7%, while organizational adaptability and resilience were recommended by 50% of the participants. Establishing a rapid response mandate was emphasized by 41.7% of the participants.

Discussion/Implications

This qualitative study examined how a logistics company navigated the multifaceted disruptions triggered by the COVID-19 pandemic. Rigorous thematic analysis of the direct participant accounts uncovered two central themes: internal and external disruptions. Internally, delays, inaccurate data, communication gaps, and information constraints affect operational coordination and service delivery. Disruptions such as demand-supply volatility, freight fluctuations, port congestion, supplier breakdowns, and regulatory changes emanate from the business ecosystem. A key finding is the interdependence between these

disruption dimensions, with external forces seriously exacerbating internal challenges. This interplay highlights the complex and interconnected nature of logistics disruption.

To counteract these disruptions, five key response strategies were proposed: resource optimization, digital integration, visionary planning, leadership development, and organizational adaptability. Optimizing resources by enhancing fleet management and warehousing can improve resilience during shortages induced by external disruptions (Ivanov, 2022a). Digital integration creates transparency, enables coordination with suppliers, provides customer access and heightens responsiveness (Chauhan et al., 2023). Forward-thinking strategies that harmonize current capabilities and future goals are vital for preparedness and continued relevance in shifting landscapes (Baker et al., 2023). Decisive leadership and adaptability facilitate rapid sensemaking and maneuverability when unexpected situations arise (Nagao et al., 2021). Ultimately, these strategies coalesce to engender organizational resilience, defined as the capacity to foresee potential disruptions, withstand their impacts, recover normal functioning, and adapt to new realities (Lopes et al., 2022).

The study's central research question (RQ1) examined the significant disruptions faced by a logistics firm in California during the coronavirus pandemic. The thematic analysis revealed many challenges, as shown in Figure 3. Internally, delays in pickup and delivery, data inaccuracies, communication gaps, and limited information exchange posed challenges. Imbalanced supply demand, freight volatility, port congestion, supplier breakdowns, and regulatory shifts disrupt operations. Subsequent questions (RQ2 and RQ3) explored the potential response strategies. Five key tactics have emerged: optimizing resources, digital integration, visionary planning, leadership development, and organizational adaptability. These strategies offer actionable insights for logistics entities that are struggling with pandemic disruptions. They also reinforce the existing research on effective contingency planning under turbulence (Wieland, 2021). Blending current capabilities with future outlooks, training adaptable leaders, leveraging technology, and enhancing flexibility enables logistics organizations to withstand, recover, and thrive despite disruptions.

Figure 3
Summary of Disruption Themes and Response Strategies
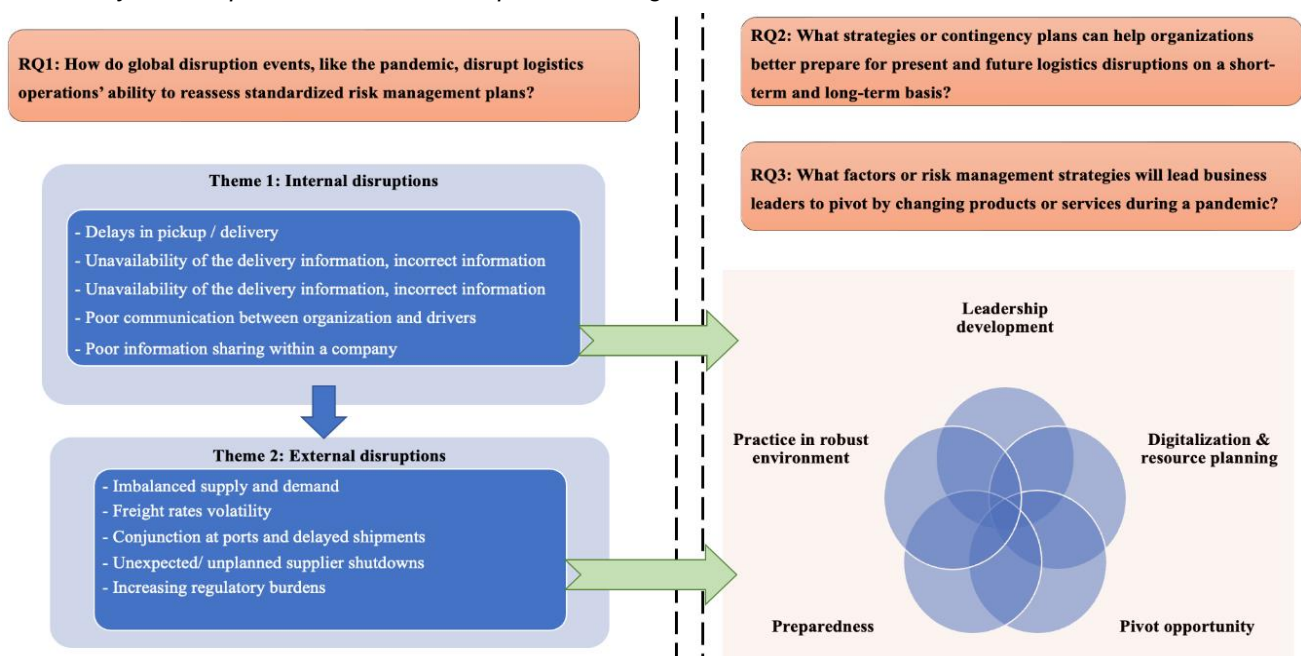
Note: This visual summary categorizes disruptions that can occur within a specified context, outlining the main themes under which these disruptions fall

The study reinforces the core premise of resilience theory, advocating developmental strategies to handle disruptions effectively (Fonseca & Azevedo, 2020; Ivanov, 2022a; Strielkowski et al., 2022; Vainauskienė & Vaitkienė, 2022). Leadership training, technology adoption, optimization, and proactive preparation offer a blueprint for logistics entities to navigate disruptions adeptly (Baker et al., 2023). While a single case study limits generalizability, this study provides invaluable empirical evidence on real-world resilience strategies during global disruptions, which are underinvestigated in the current literature (Kumar & Sharma, 2021; Shen & Sun, 2023). These findings provide several valuable contributions to the literature. A granular examination of a logistics organization's pandemic response provides a framework for categorizing internal and external disruptions. This structure can serve as a foundation for future research to explore specific subthemes in greater depth and to elucidate implications for logistics management. Additionally, the study aimed to expand knowledge on effective crisis response strategies, although further inquiry into resilience factors and best practices is warranted.

Although these findings are significant, it is essential to recognize that this study had certain limitations. While this work offers qualitative insights into disruptions, large-scale quantitative studies complement the understanding of disruption magnitudes and generalizability. The limited availability of related literature also poses challenges for contextualizing findings within current knowledge.

Conclusion

This qualitative study identifies key elements for effective crisis management, including adaptability, flexibility, communication, collaboration, leadership, and the use of technology. By concurrently focusing on developing leadership, digitizing processes, streamlining inventory, warehousing, and delivery, logistics companies can respond rapidly to disruptions and minimize adverse impacts. This study also demonstrates how structural weaknesses can cascade into acute crises during unexpected events. Proactive mitigation of these deficiencies, even during stability, is essential for resilience. These findings provide a framework for systematically assessing and addressing vulnerabilities across strategic and operational

dimensions during crises. By prioritizing operational improvements and addressing each phase of strategic and operational processes, logistics organizations can better prepare for and respond to disruptions.

References

Ali, M., Rahman, S. M., & Frederico, G. F. (2021). Capability components of supply chain resilience for readymade garments (RMG) sector in Bangladesh during COVID-19. *Modern Supply Chain Research and Applications, 3*(2), 127-144. https://doi.org/10.1108/MSCRA-06-2020-0015

Baker, D., Briant, S., Hajirasouli, A., Yigitcanlar, T., Paz, A., Bhaskar, A., & Parsons, H. (2023). Urban freight logistics and land use planning education: Trends and gaps through the lens of literature. *Transportation Research Interdisciplinary Perspectives, 17*, 100731. https://doi.org/10.1016/j.trip.2022.100731

Braun, V., & Clarke, V. (2021). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative Research in Sport, Exercise and Health, 13*(2), 201-216. https://doi.org/10.1080/2159676X.2019.1704846

Butt, A. S. (2021). Strategies to mitigate the impact of COVID-19 on supply chain disruptions: a multiple case analysis of buyers and distributors. *The International Journal of Logistics Management.* https://doi.org/10.1108/IJLM-11-2020-0455

Chauhan, S., Singh, R., Gehlot, A., Akram, S. V., Twala, B., & Priyadarshi, N. (2023). Digitalization of supply chain management with industry 4.0 enabling technologies: A sustainable perspective. *Processes, 11*(1), 96. https://doi.org/10.3390/pr11010096

Choi, T. M. (2020). Innovative "Bring-Service-Near-Your-Home" operations under Corona-Virus (COVID-19/SARS-CoV-2) outbreak: Can logistics become the Messiah? *Transportation Research Part E: Logistics and Transportation Review, 140*, 101961. https://doi.org/10.1016/j.tre.2020.101961

de Matta, R. (2017). Contingency planning during the formation of a supply chain. *Annals of Operations Research, 257,* 45–75. https://doi.org/10.1007/s10479-015-2085-0

Etikan, I. (2016). Comparison of convenience sampling and purposive sampling. *American*

Journal of Theoretical and Applied Statistics, *5*(1), 1-4. https://doi.org/10.11648/j.ajtas.20160501.11

Fathollahi-Fard, A. M., Ahmadi, A., & Karimi, B. (2022). Sustainable and Robust Home Healthcare Logistics: A Response to the COVID-19 Pandemic. *Symmetry*, *14*(2), 193. https://doi.org/10.3390/sym14020193

Fonseca, L. M., & Azevedo, A. L. (2020). COVID-19: outcomes for Global Supply Chains. *Management & Marketing*, *15*(s1), 424-438. https://doi.org/10.2478/mmcks-2020-0025

Francis, J. J., Johnston, M., Robertson, C., Glidewell, L., Entwistle, V., Eccles, M. P., & Grimshaw, J. M. (2010). What is an adequate sample size? Operationalizing data saturation for theory-based interview studies. *Psychology & Health, 25*(10), 1229-1245. https://doi.org/10.1080/08870440903194015

Garrido, A., Aguirre, R., Chile, I., AESCS, & Chile, D. L. T. S. (2020). Emergency logistics for disaster management under spatio-temporal demand correlation: The earthquakes case. *Journal of Industrial & Management Optimization, 16*(5), 2369-2387. https://doi.org/10.3934/jimo.2019058

Gazzeh, K., Abubakar, I. R., & Hammad, E. (2022). Impacts of COVID-19 Pandemic on the global flows of people and goods: Implications on the dynamics of urban systems. *Land*, *11*(3), 429. https://doi.org/10.3390/land11030429

Ivanov, D. (2022a). Lean resilience: AURA (Active Usage of Resilience Assets) framework for post-COVID-19 supply chain management. *The International Journal of Logistics Management*, *33*(4), 1196-1217. https://doi.org/10.1108/IJLM-11-2020-0448

Ivanov, D. (2022b). Viable supply chain model: integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic. *Annals of Operations Research*, *319*(1), 1411-1431. https://doi.org/10.1007/s10479-020-03640-6

Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: extending the supply chain resilience angles toward survivability. A position paper motivated by COVID-19 outbreak. *International Journal of Production Research, 58*(10), 2904-2915. https://doi.org/10.1080/00207543.2020.1750727

Kiers, J., Seinhorst, J., Zwanenburg, M., & Stek, K. (2022). Which strategies and corresponding competences are needed to improve supply chain resilience: A COVID-19 based review. *Logistics*, *6*(1), 12. https://doi.org/10.3390/logistics6010012

Klaus, P. P., & Manthiou, A. (2020). Applying the EEE customer mindset in luxury: reevaluating customer experience research and practice during and after corona. *Journal of Service Management*, *31*(6), 1175-1183. https://doi.org/10.1108/JOSM-05-2020-0159

Klein, M., Gutowska, E., & Gutowski, P. (2022). Innovations in the T&L (Transport and Logistics) Sector during the COVID-19 pandemic in Sweden, Germany and Poland. *Sustainability*, *14*(6), 3323. https://doi.org/10.3390/su14063323

Kumar, B., & Sharma, A. (2021). Managing the supply chain during disruptions: Developing a framework for decision-making. *Industrial Marketing Management*, *97*, 159-172. https://doi.org/10.1016/j.indmarman.2021.07.007

Lopes, J. M., Gomes, S., & Mané, L. (2022). Developing knowledge of supply chain resilience in less-developed countries in the pandemic age. *Logistics*, *6*(1), 3. https://doi.org/10.3390/logistics6010003

Nagao, T., Ijuin, H., Yamada, T., Nagasawa, K., & Zhou, L. (2021). COVID-19 disruption strategy for redesigning global supply chain network across TPP countries. *Logistics*, *6*(1), 2. https://doi.org/10.3390/logistics6010002

Onica, T., Fisher, C., & Sisk, L. (2022). After a crisis: Operational restart and contingency planning in manufacturing. *Journal of Supply Chain Management, Logistics and Procurement*, *4*(3), 280-295. https://www.ingentaconnect.com/content/hsp/jscm/2022/00000004/00000003/art00008

Parajuli, A., Kuzgunkaya, O., & Vidyarthi, N. (2017). Responsive contingency planning of capacitated supply networks under disruption risks. *Transportation Research Part E: Logistics and Transportation Review*, *102*, 13-37. https://doi.org/10.1016/j.tre.2017.03.010

Paul, S. K., & Chowdhury, P. (2020). Strategies for managing the impacts of disruptions during COVID-19: An example of toilet paper. *Global Journal of Flexible Systems*

Management, *21*(3), 283-293. https://doi.org/10.1007/s40171-020-00248-4

Paul, S. K., & Chowdhury, P. (2021). A production recovery plan in manufacturing supply chains for a high-demand item during COVID-19. *International Journal of Physical Distribution & Logistics Management*, *51*(2), 104-125. https://doi.org/10.1108/IJPDLM-04-2020-0127

Queiroz, M. M., Ivanov, D., Dolgui, A., & Fosso Wamba, S. (2022). Impacts of epidemic outbreaks on supply chains: mapping a research agenda amid the COVID-19 pandemic through a structured literature review. *Annals of Operations Research*, *319*(1), 1159-1196. https://doi.org/10.1007/s10479-020-03685-7

Ryan, B. J., Telford, V., Brickhouse, M., Campbell, J., Crowe, C., Fink, R., & Brooks, B. W. (2022). Mobilizing and delivering essential meals to children and families affected by school closures during COVID-19 and beyond. *Journal of School Health*, *92*(7), 646-655. https://doi.org/10.1111/josh.13188

Shen, Z. M., & Sun, Y. (2023). Strengthening supply chain resilience during COVID-19: A case study of JD.com. *Journal of Operations Management*, *69*(3), 359-383. https://doi.org/10.1002/joom.1161

Sheth, J. (2020). Business of business is more than business: Managing during the Covid crisis. *Industrial Marketing Management*, *88*, 261-264. https://doi.org/10.1016/j.indmarman.2020.05.028

Strielkowski, W., Firsova, I., Azarova, S., & Shatskaya, I. (2022). Novel insights in the leadership in business and economics: A post-coronavirus update. *Economies*, *10*(2), 48. https://doi.org/10.3390/economies10020048

Sun, Z., & Zhang, Y. (2022). Strategic crisis response of shipping industry in the post COVID-19 era: A case of the top 10 shipping lines. *Journal of Marine Science and Engineering*, *10*(5), 635. https://doi.org/10.3390/jmse10050635

Szuster, M., & Lotko, M. (2022). Disruptions and risk management in supply chains before and during the COVID-19 pandemic. *European Research Studies Journal, 2B*, 225-234. https://doi.org/10.35808/ersj/2956

Vainauskienė, V., & Vaitkienė, R. (2022). Challenges to the learning organization in the context of covid-19 pandemic uncertainty: creativity – based response. *Creativity Studies*, *15*(2), 332-347. https://doi.org/10.3846/cs.2022.15109

Wieland, A. (2021). Dancing the supply chain: Toward transformative supply chain management. *Journal of Supply Chain Management*, *57*(1), 58-73. https://doi.org/10.1111/jscm.12248

Wijewickrama, M. K. C. S., Chileshe, N., Rameezdeen, R., & Ochoa, J. J. (2022). Information-centric influence strategies for quality assurance in reverse logistics supply chains: external stakeholders' perspective. *Benchmarking: An International Journal*, *29*(6), 1857-1888. https://doi.org/10.1108/BIJ-05-2021-0276

Table A1

Methodology Employed for Conducting the Semi-structured Individual In-depth Interviews

#	Steps
1	Interviews were conducted over 25-30 minutes, and the entire research process spanned three months, allowing for in-depth exploration of topics.
2	Each interview involved a dyad of one participant and one researcher, ensuring focused and personalized interaction. The sample included 12 experts, providing a broad range of perspectives.
3	Interviews took place during the context analysis and risk management strategies phase of the study, focusing on contingency planning and restructuring in a logistics company.
4	Essential infrastructure for the interviews included an audio recorder, a notebook, a pencil, a separate room for privacy, and a computer for data management.
5	The research tool employed was a scenario-based approach, facilitating detailed discussion and analysis.
6	The primary objective was to gather individual opinions on the current state of the pandemic, providing contemporary and relevant insights.

Note. Semi-structured individual in-depth interview formation

Table A2
Themes Identified in the Study, Classified by the Nature and the Frequency

Code	Theme Classification	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Total
Imbalanced supply and demand	External disruption	1	1	1	1	1	1	1	1	1	1	1	1	12
Conjunction at ports and delayed shipments	External disruption	1	0	1	1	1	0	1	1	0	1	1	1	9
Leadership development	Response strategy	0	1	1	1	0	1	1	0	1	0	1	1	8
Poor communication between organization and drivers	Internal disruption	1	0	1	1	0	1	0	1	0	1	1	1	8
Digitalization and resource planning	Response strategy	1	1	0	1	0	1	1	1	0	1	0	0	7
Poor information sharing within a company	Internal disruption	0	1	1	0	1	1	0	1	0	1	0	1	7
Unexpected/unplanned supplier shutdowns	External disruption	1	0	0	1	1	0	0	1	0	1	0	1	6
Pivot opportunity	Response strategy	1	0	1	0	1	0	0	1	0	1	1	0	6
Delays in pickup/delivery	Internal disruption	1	0	0	0	1	1	0	1	0	1	0	1	6
Unavailability of delivery information, incorrect information	Internal disruption	1	0	0	0	1	1	1	0	0	1	1	0	6
Increasing regulatory burdens	External disruption	0	1	0	1	0	1	1	0	0	0	1	0	5
Preparedness	Response strategy	1	0	0	0	1	0	1	0	0	1	1	0	5
Practice in a robust environment	Response strategy	0	1	1	0	0	1	0	1	1	0	0	0	5
Freight rates volatility	External disruption	1	0	0	0	0	1							

Note. Frequency of each code mentioned by participants.

Table A3
List of Various Internal Logistics Disruptions Identified in the Organization

Internal Logistics Disruptions in the Organization	Participants' Opinions
Damages due to accidents/improper stacking	Not at all
Improper packaging and material details	Not at all
Processing errors (e.g., lost or missing freight)	Not at all
Breakdown of internal/external IT system	Seldom
Poor security of information system	Seldom
Inadequate operational strength (e.g., delivery capacity, poor fleet)	Slightly
Storage issues	Slightly
Poor design of the company's transportation network	Slightly
Breakdown of equipment (e.g., machine failure or truck not working)	Slightly
Information confusion	Slightly
Delays in pickup/delivery	Sometimes
Lack of timely and accurate delivery information (such as delivery location and time) and the provision of incorrect details, such as the receiver's name, address, time, and quotations	Sometimes
Poor communication between the organization and drivers	Sometimes
Poor information sharing within a company	Sometimes

Note. Codes per Participants' Opinions for Internal Logistics Disruptions (Theme One)

Table A4

External Logistics Disruptions as Identified by the Participants.

External Logistics Disruptions	Participants' Opinions
Damages due to customer's fault (e.g., prohibited items)	Never
Customer refusing freight charges	Often
Customer changing the preference	Often
Inaccurate forecast of customer's freight volume	Often
Higher customer expectation (e.g., misunderstanding of transit time)	Often
Unstable fuel prices	Often
Delay due to customers' mistakes (e.g., incorrect paperwork)	Seldom
Complexity process (e.g., international, dangerous goods, special goods)	Seldom
Road conjunction or closures	Seldom
Weather or natural disasters (e.g., flood, bushfire)	Seldom
Industrial actions (e.g., strikes)	Seldom
Uncertainty due to government's law or regulations (e.g., import fee increased)	Seldom
Poor communication between a customer and a company	Sometimes
Driver shortage	Sometimes
Imbalanced supply and demand	Very often
Freight rates volatility	Very often
Conjunction at ports and delayed shipments	Very often
Unexpected/unplanned supplier shutdowns	Very often
Increasing regulatory burdens	Very often

Note. Codes per Participants' Opinions for External Logistics Disruptions (Theme Two)