



Supply Chain Resilience and Risk Management Practices In Small and Medium Enterprises

Galadriel Pavlidaki

Department of Computer Science and Engineering, Sundarban College of Technology Studie, Bangladesh
galadriel.pavlidaki@scts-bd.net

Peer Review Information	Abstract
<i>Submission: 19 Jan 2021</i> <i>Revision: 03 Feb 2021</i> <i>Acceptance: 18 March 2021</i> Keywords <i>Supply chain resilience; supply chain risk management, small and medium enterprises, disruption, risk mitigation, business continuity</i>	Small and medium enterprises (SMEs) operate with comparatively limited financial, technological, human and managerial resources, which can increase their exposure to supply interruptions and reduce their ability to absorb shocks. This paper examines supply chain resilience and risk management practices in SMEs through a structured review of academic literature published up to 2021. The study synthesizes evidence on major supply chain risks, risk-management practices, resilience capabilities and organizational outcomes. The methodology combines database-oriented literature identification, eligibility screening, thematic coding and comparative synthesis. The reviewed literature indicates that supplier dependence, demand uncertainty, financial constraints, inadequate information visibility, transportation disruption and limited contingency planning are recurring concerns. Practices such as risk identification and monitoring, supplier diversification, information sharing, collaboration, flexible sourcing, inventory buffers and business-continuity planning are frequently associated with stronger resilience. SME-specific research also emphasizes the importance of organizational capabilities, information systems, collaboration and access to finance. The paper develops a concise conceptual framework linking supply chain risk, risk-management practices, resilience capabilities and SME outcomes. The findings provide a basis for future empirical studies of SMEs in emerging and developed economies.

Introduction

Supply chains are exposed to operational, financial, technological, environmental and market-related uncertainties. For SMEs, these uncertainties can be particularly important because smaller firms often have fewer alternative suppliers, less financial slack, lower bargaining power and more limited access to advanced information systems. Risk management therefore extends beyond identifying individual hazards; it also involves developing capabilities that allow the firm and its supply partners to anticipate, absorb, respond to and recover from disruption.

Supply chain resilience is commonly discussed as the ability of a supply network or enterprise to survive, adapt and continue functioning under turbulent change. Ponomarov and Holcomb (2009) connected resilience with adaptation and recovery, while Pettit, Fiksel and Croxton (2010) conceptualized resilience through the balance between supply chain vulnerabilities and capabilities. Their framework emphasizes that resilience is not simply the absence of risk; rather, it is supported by capabilities that can counter or absorb vulnerabilities.

The risk-management literature similarly identifies a cycle of risk identification,

assessment, treatment and monitoring. Ho et al. (2015) and later reviews distinguish risk-management activities from broader resilience capabilities, while Oliveira et al. (2019) and SME-focused studies show that resource limitations influence how smaller firms implement risk practices. The distinction is important because an SME may recognize a risk but still lack the resources required to mitigate it.

The SME context received focused attention in the systematic review by Bak, Shaw, Colicchia and Kumar (2020), which analyzed 101 journal articles on SME supply chain resilience. The review identified collaboration and culture, SME capabilities, information systems, and cost and financing as important areas for resilience research. During the COVID-19 period, El Baz and Ruel (2021) further reported empirical evidence that supply chain risk-management practices can support resilience and robustness.

Against this background, the present paper aims to organize the pre-2022 literature into a practical methodology for studying SME supply chain resilience. The objectives are: (i) to identify major supply chain risks affecting SMEs; (ii) to synthesize commonly reported risk-management practices; (iii) to identify resilience capabilities; and (iv) to propose a concise conceptual framework for future empirical research.

Research Questions

RQ1: What supply chain risks are most frequently discussed in SME-focused literature?

RQ2: Which risk-management practices are associated with improved supply chain resilience?

RQ3: Which organizational and supply-chain capabilities help SMEs absorb and recover from disruptions?

Literature Review

The literature can be grouped into four related streams. The first stream concerns the conceptual meaning of resilience. Ponomarov and Holcomb (2009) view resilience as a

dynamic capacity involving preparedness, response and recovery, whereas Pettit et al. (2010) emphasize the interaction between vulnerabilities and capabilities. Pettit, Croxton and Fiksel (2013) subsequently developed an assessment approach linking vulnerability factors and controllable capability factors.

The second stream focuses on supply chain risk management. Ho et al. (2015) reviewed the field and described supply chain risk management in terms of identifying, assessing, mitigating and monitoring risks. Fan and Stevenson (2018) similarly reviewed risk management research and highlighted the importance of risk identification, assessment, treatment and monitoring. These activities provide a process foundation for resilience because they create mechanisms for recognizing vulnerabilities before and during disruption.

The third-stream addresses performance and resilience capabilities. Singh, Soni and Badhotiya (2019) reviewed resilience performance indicators and linked resilience to measures such as flexibility, recovery, responsiveness and operational continuity. Pettit et al. (2019) argued that resilience research has evolved toward a more integrated understanding of vulnerabilities, capabilities and business continuity.

The fourth stream is SME-specific. Bak et al. (2020) found that SME resilience research remains less developed than research on large firms and identified collaboration and culture, capabilities, information systems, and cost and financing as major focal areas. A systematic review of SME risk management by Oliveira et al. (2020) also indicates that SME risk-management approaches are shaped by limited resources and firm-specific characteristics. Al-Hakimi, Saleh and Borade (2021) further examined manufacturing SMEs and connected entrepreneurial orientation, absorptive capacity and innovation with supply chain resilience. El Baz and Ruel (2021) provided survey evidence that supply chain risk-management practices can contribute to resilience and robustness during disruption.

Table 1. Selected Literature and Main Contributions

Study	Context	Key focus	Relevance to SMEs
Ponomarov & Holcomb (2009)	General SC	Resilience, adaptation, recovery	Conceptual foundation
Pettit et al. (2010)	General SC	Vulnerabilities and capabilities	Framework for assessment
Pettit et al. (2013)	General SC	Resilience assessment tool	Capability benchmarking
Ho et al. (2015)	General SC	SCRM review	Risk-process foundation

Fan & Stevenson (2018)	General SC	Risk identification/treatment	Structured risk cycle
Bak et al. (2020)	SMEs	Systematic review of 101 papers	SME-specific resilience gaps
Oliveira et al. (2020)	SMEs	Risk-management review	Resource constraints
El Baz & Ruel (2021)	Firms	SCRM and resilience	Empirical disruption evidence

Methodology

This paper adopts a structured literature-review methodology rather than collecting primary survey data. The approach is suitable because the objective is to synthesize established evidence on SME supply chain resilience and risk-management practices and to identify themes for future empirical research.

1. Research Design

The review followed four stages: literature identification, screening and eligibility, thematic coding, and synthesis. Searches were designed around combinations of the terms “SME,” “small and medium enterprise,” “supply chain resilience,” “supply chain risk management,” “disruption,” “risk mitigation,” and “business continuity.” Priority was given to peer-reviewed journal articles and scholarly proceedings with identifiable DOI information.

2. Inclusion and Exclusion Criteria

Studies were included when they (a) addressed supply chain risk, resilience or closely related

disruption-management practices; (b) considered SMEs directly or provided concepts applicable to SME supply chains; (c) were published from 2009 through 2021; and (d) provided sufficient bibliographic information for traceability. Studies published after 2021 were excluded from the reference base to satisfy the requested cutoff. Purely technical articles unrelated to organizational supply-chain risk were excluded.

3. Data Extraction and Thematic Coding

For each selected study, the review recorded publication year, research context, risk categories, management practices, resilience capabilities and reported outcomes. The studies were then coded into four thematic categories: risk exposure, risk-management practices, resilience capabilities, and SME outcomes. Cross-study comparison was used to identify recurring themes rather than to calculate a statistical effect size.

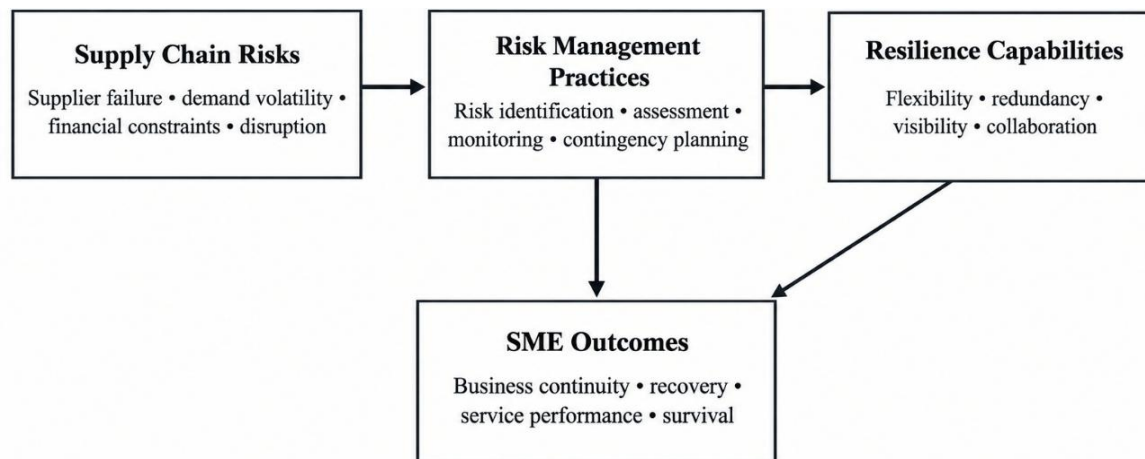


Figure 1. Conceptual framework linking supply chain risk management and SME resilience.

4. Analytical Logic

The analytical logic assumes that exposure to supply chain risks creates vulnerability, while risk-management practices and organizational capabilities can reduce disruption impact. Resilience is therefore treated as an outcome of interacting capabilities rather than as a single

practice. This logic is consistent with the vulnerability-capability perspective of Pettit et al. (2010, 2013) and with the SME-focused themes identified by Bak et al. (2020).

Results

The literature synthesis indicates four broad findings. First, SMEs face interconnected rather than isolated risks. Supplier dependence, demand fluctuations, transportation problems, cash-flow pressure, technology limitations and information gaps can reinforce one another. This is consistent with the broader supply chain risk literature, which treats risk as a network-level phenomenon rather than only a firm-level event (Ho et al., 2015; Fan & Stevenson, 2018).

Second, supplier-related practices are repeatedly associated with resilience. Supplier diversification, alternative sourcing, stronger supplier relationships, information sharing and collaborative planning can reduce dependence on a single source and improve visibility. However, SME resource limitations mean that diversification may involve additional costs. Consequently, the literature suggests that resilience requires a balance between

redundancy and affordability rather than unlimited buffers.

Third, internal capabilities matter. Flexibility, employee knowledge, rapid decision making, information visibility, contingency planning and the ability to reconfigure operations are repeatedly linked with resilience. Bak et al. (2020) specifically highlighted SME capabilities and information systems as important research areas. Al-Hakimi et al. (2021) also linked absorptive capacity and innovation with resilience among manufacturing SMEs.

Fourth, risk-management practices appear to have a direct role in reducing disruption effects. El Baz and Ruel (2021), using survey evidence from 470 French firms, reported that supply chain risk-management practices fostered resilience and robustness. Although that study is not restricted to SMEs, its findings support the proposition that structured risk management is an important mechanism through which firms respond to uncertainty.

Table 2. Synthesized SME Risk–Practice–Resilience Matrix

Risk area	Typical SME exposure	Management practice	Expected resilience capability
Supplier disruption	High dependence on few suppliers	Dual sourcing; supplier assessment	Redundancy and flexibility
Demand volatility	Forecasting and market uncertainty	Demand monitoring; flexible production	Agility and responsiveness
Financial risk	Limited cash reserves	Cash-flow planning; supply-chain finance	Absorption capacity
Information gaps	Limited digital visibility	Information sharing; basic digital tools	Visibility and coordination
Transport disruption	Dependence on routes/carriers	Alternative logistics options	Adaptability
Crisis events	Limited formal contingency plans	BCP; emergency roles and drills	Recovery capability

Overall, the synthesis supports a staged view of resilience for SMEs: identify vulnerabilities; prioritize critical risks; establish affordable mitigation practices; build information and collaboration capabilities; and periodically test business-continuity arrangements. The literature does not imply that every SME should adopt the same practices. Rather, practice selection should reflect the firm's supply-chain position, risk profile, resource availability and operating environment.

Discussion and Conclusion

The findings show that supply chain resilience and risk management should be considered complementary constructs. Risk management provides the structured process for recognizing and treating threats, while resilience reflects the broader capability to withstand and recover from disruption. The distinction is especially useful for

SMEs because resource constraints can make some conventional risk controls impractical. The literature instead points toward selective, capability-oriented practices such as supplier collaboration, visibility, flexibility, contingency planning and targeted redundancy. From a methodological perspective, future empirical research can operationalize the framework through a questionnaire administered to SME owners, supply-chain managers or procurement professionals. Potential constructs include supplier diversification, information sharing, risk identification, contingency planning, flexibility, collaboration, recovery speed and perceived supply chain performance. Researchers may test direct and mediated relationships using regression, structural equation modelling or partial least squares structural equation modelling, depending on sample size and

measurement design. For managers, the review suggests beginning with a simple risk register that records critical suppliers, single points of failure, cash-flow dependencies, transport alternatives and recovery priorities. The next step is to match each high-priority vulnerability with a feasible response. For example, an SME with high supplier concentration may prioritize alternative suppliers and supplier communication, while an SME with low information visibility may prioritize basic digital tracking and structured information sharing before investing in more advanced technologies. The main limitation of this paper is that it is a literature-based methodology paper and does not report a new primary dataset. The results therefore summarize patterns reported by previous studies and should not be interpreted as statistical estimates for all SMEs. In addition, SME definitions, industries and national contexts vary across studies. Future research should use sector-specific and country-specific samples, particularly in emerging economies, to examine how financial constraints, digital maturity and supplier concentration shape resilience outcomes. In conclusion, SME supply chain resilience is best understood as an interaction between exposure to disruption, risk-management practices and organizational capabilities. The pre-2022 literature consistently emphasizes the value of structured risk identification, collaboration, information visibility, flexibility and contingency planning. A practical SME resilience program should therefore combine risk monitoring with capability development rather than treating risk management as a one-time compliance exercise.

Key Practical Recommendations

- Map critical suppliers, materials, customers and logistics dependencies.
- Use a simple risk register with likelihood, impact and response ownership.
- Develop alternative sourcing and logistics options for critical inputs.
- Improve information sharing with suppliers and customers.
- Maintain proportionate inventory or capacity buffers where disruption costs are high.
- Create and periodically test a business-continuity and crisis-response plan.

References

Al-Hakimi, M. A., Saleh, M. H., & Borade, D. B. (2021). Entrepreneurial orientation and supply chain resilience of manufacturing SMEs in Yemen: The mediating effects of absorptive

capacity and innovation. *Heliyon*, 7(10), e08145. <https://doi.org/10.1016/j.heliyon.2021.e08145>

Bak, O., Shaw, S., Colicchia, C., & Kumar, V. (2020). A systematic literature review of supply chain resilience in small-medium enterprises (SMEs): A call for further research. *IEEE Transactions on Engineering Management*. <https://doi.org/10.1109/TEM.2020.3016988>

El Baz, J., & Ruel, S. (2021). Can supply chain risk management practices mitigate the disruption impacts on supply chains' resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era. *International Journal of Production Economics*, 233, 107972. <https://doi.org/10.1016/j.ijpe.2020.107972>

Fan, Y., & Stevenson, M. (2018). A review of supply chain risk management: Definition, theory, and research agenda. *International Journal of Physical Distribution & Logistics Management*, 48(3), 205–230. <https://doi.org/10.1108/IJPDLM-01-2017-0043>

Ho, W., Zheng, T., Yildiz, H., & Talluri, S. (2015). Supply chain risk management: A literature review. *International Journal of Production Research*, 53(16), 5031–5069. <https://doi.org/10.1080/00207543.2015.1047735>

Oliveira, T. C., et al. (2020). Risk management in SMEs: A systematic literature review and future directions. *European Management Journal*, 38(1), 78–94. <https://doi.org/10.1016/j.emj.2019.06.005>

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>

Pettit, T. J., Croxton, K. L., & Fiksel, J. (2013). Ensuring supply chain resilience: Development and implementation of an assessment tool. *Journal of Business Logistics*, 34(1), 46–76. <https://doi.org/10.1111/jbl.12009>

Pettit, T. J., Croxton, K. L., & Fiksel, J. (2019). The evolution of resilience in supply chain management: A retrospective on ensuring supply chain resilience. *Journal of Business Logistics*, 40(1), 56–65. <https://doi.org/10.1111/jbl.12202>

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

Singh, C. S., Soni, G., & Badhotiya, G. K. (2019). Performance indicators for supply chain resilience: Review and conceptual framework. *Journal of Industrial Engineering International*, 15, 105–117. <https://doi.org/10.1007/s40092-019-00322-2>

Tang, Y. Y., Wong, K. Y., & Syed Hassan, S. A. H. B. (2020). Supply chain resilience among SMEs manufacturer in Malaysia: A survey. *European Proceedings of Social and Behavioural Sciences*, 89, 323–338. <https://doi.org/10.15405/epsbs.2020.10.02.30>