Achieving Supply chain Resilience through risk management and mitigation discipline

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Abstract

Global supply networks are growing increasingly complex as a result of the risk and uncertainty underlying supply and demand trends. Environmental and political risks amplify these effects and increase supply chain interruptions; these supply chain interruptions create substantial financial losses and force companies to fail in meeting their strategic expectations. Covid'19's pandemic has emphasized the supply chain's susceptibility to natural disasters, as well as how it might have a global impact on human lives and the economy. The issue of supply chain resilience has gained attention, especially in the aftermath of the pandemic outbreak, as firms and nations aim to avoid and manage these disruptions with the least possible impact on performance and consumers. This study conducted a Systematic Literature Review to identify and assess key themes related to supply chain resilience. This study identifies probable causes of supply chain disruptions by reviewing literature on risk and vulnerability concepts. Finally, this study examines supply chain risk management as a discipline for addressing risk, as well as supply chain capabilities and their contribution to supply chain resilience improvement. This study also looked at emerging digital technologies such as IoT, digital twins, artificial intelligence, and digital supply chain as a way to improve supply chain resilience.

Keywords

Systematic Literature review, Supply Chain Resilience, Supply Chain Risk management, Supply Chain Capabilities, Emerging technologies

1. Introduction

To function efficiently, Supply Chain Management need a high level of resilience (Wieland et al. 2016). Supply Chain Resilience refers to a supply chain's capacity to resist, reset, and resume operations following a disturbance (Ali and Gölgeci 2019). Resilience is a capability that allows operations to continue operating even when there is a large disturbance and swiftly recover to deliver the intended outcomes. In a global market, supply chains are getting increasingly complicated, and their efficiency may provide a competitive edge to a firm (Vlachos et al. 2021). A robust supply chain can quickly recover from and adapt to the negative effects of unanticipated interruptions. In conclusion, supply chain resilience should be considered a component of business continuity, and it need careful attention in order to achieve long-term success (Mangina et al. 2020).

The purpose of this study is to examine existing research on supply chain resilience by recognizing supply chain risks and vulnerabilities as a starting point for improving resilience. Supply chain interruptions can occur without warning, posing a significant risk to operations on both the supply and demand sides of the supply chain. If not foreseen, these interruptions can result in operational losses and have a significant financial and supply effect on businesses and economies. As an example, the recent Covid-19 epidemic has highlighted this reality and exacerbated the danger and

susceptibility that such disruptions might offer to the global overall economy, and to markets and enterprises operating in these areas in particular.

During the pre-pandemic era, supply chain resilience is a little less investigated issue. The majority of study focuses on a single cause and its link to the supply chain resilience, such as the risk to resilience relationship, response and risk management to resilience, or supply chain resilience recovery management competence. This is a gap, particularly for industry practitioners who want to comprehend the entire supply chain resilience framework, from cause to action to result. This study's goal is to provide a comprehensive overview of the whole supply chain resilience, from risk analysis to risk management to risk recovery and resilience sustainability. This study aims to give a holistic conceptual understanding of the supply chain resilience field. To accomplish this aim, this study will conduct a Systematic Literature Review, which will depend on recent research publications.

This study focuses on a thematic analysis of key significant publications and articles linked to supply chain resilience improvement. This is accomplished using the SLR approach, which considers supply chain risk as a cause, disruption as an outcome, and mitigation as a technique of recovery. This study determines the most likely causes of supply chain interruptions and how to handle them by reviewing literature on risk, risk management, and risk recovery. According to Gough, Thomas, and Oliver, SLR is utilized for this study since it is a better approach than traditional review and it helps to learn from prior research and evidence it as knowledge (2012). This study reviewed a total of 125 papers/articles relevant to this topic.

2. Research Method

2.1 Review process

The systematic literature review followed a defined procedure like previous reviews supply chain topics (Ali and Khan 2017; Bhamu and Singh Sangwan 2014; Danese et al. 2018) that includes three major phases, each of which has many outcomes (De Koster et al. 2007; Fayezi et al. 2017; Purssell and Mccrae 2020). The three essential phases have been outlined in depth above, with the purpose and conclusion of each step stated below (Figure 1).

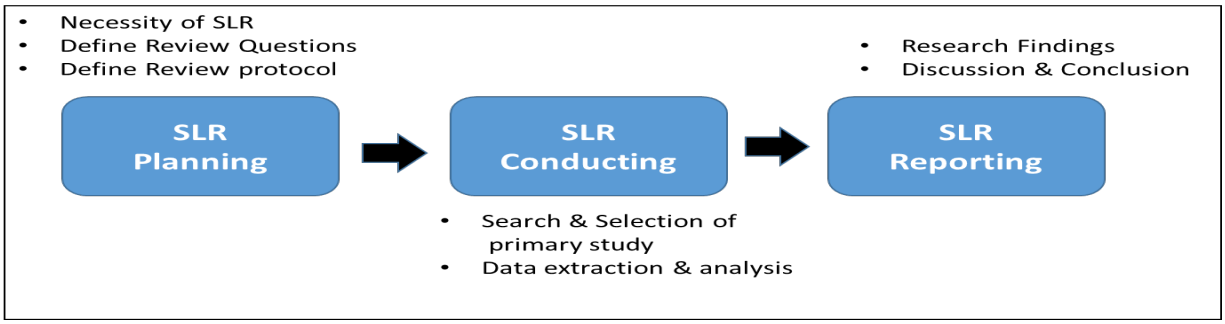


Figure 1 Process map for Systematic Literature Review (SLR)

- **Planning:** This is the first phase in the approach, and the goal is to determine the parameters and technique that will be used by the SLR. To begin, we must explicitly describe the SLR's reasoning in the context of the supply chain concerns we intend to address. We then state the goals that this SLR intends to attain with relation to this subject. This aids in establishing the limitations of this research's scope. Finally, we'll outline the process we'll follow, including the search criteria, literature selection, shortlisting, and review technique.

- **Conducting**: This is the first phase in the approach, and the goal is to determine the parameters and technique that will be used by the SLR. To begin, we must explicitly describe the SLR's reasoning in the context of the supply chain concerns we intend to address. We then state the goals that this SLR intends to attain with relation to this subject. This aids in establishing the limitations of this research's scope. Finally, we'll outline the process we'll follow, including the search criteria, literature selection, shortlisting, and review technique.

- **Reporting**: The goal of the last step of SLR is to transform the understanding of the review process into a well-structured report. This would contain a table of contents, abbreviations list, tables, figures, and other elements that are used in the report. We'll also outline the objective, learnings, and result for each topic per chapter. As we develop this report with the themes we've looked at, we'll wrap it up with a conclusion summary that includes academic and managerial learnings. We also discuss the thesis's limitations and potential future applications. This would bring this SLR to a close.

The process of review to get at the goal of learning how to accomplish supply chain resilience is outlined in the diagram below. The knowledge of risk mitigation complements the study of risk management. This acts as a counterweight to risk, which is defined as a disturbance, and mitigation, which is defined as a reaction to the disruption. We are able to achieve a more comprehensive robust supply chain design using this method.

Figure 2 Systematic literature review approach to supply chain resilience

2.2 Articles search and analysis

The systematic literature reviewed articles span the years 2000 through 2021. Starting in the year 2000, we segmented this across a five-year time criterion. We discovered that 62% of these papers were published after 2010, and 42% were published within 2015 and 2020. Supply chain resilience and its supporters have piqued the interest of authors since 2010, according to these observations. More study has been done on this issue in the last five years, as evidenced by the number of publications published.

When it comes to segmenting this study by topic, we found that 38% of this review is focused on supply chain capability development, 27% on supply chain risk and risk management, 18% on new digital technologies, and 17% on the idea and practise of supply chain resilience (Figure 3). This provides us with a diverse set of papers to help us comprehend supply chain resilience. Authors are contributing their expertise and experience in the field of digital technology, which is still developing. With the current disruption caused by the worldwide pandemic, this is an important problem that will attract more study attention in the supply chain function.

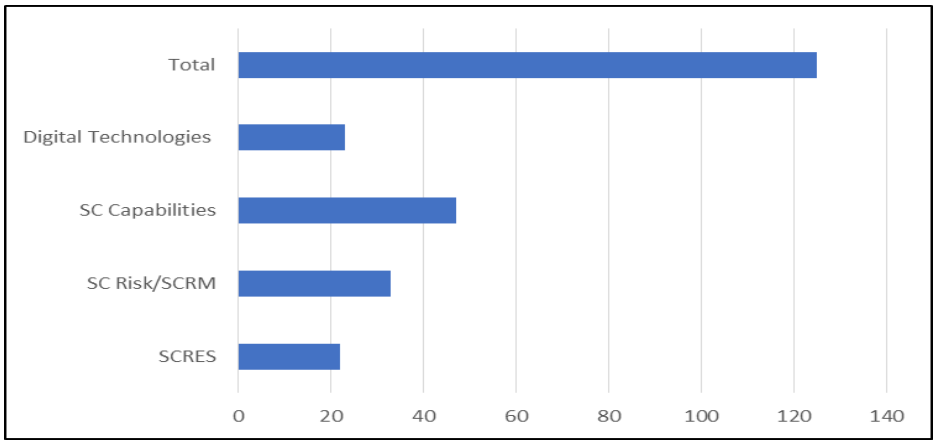
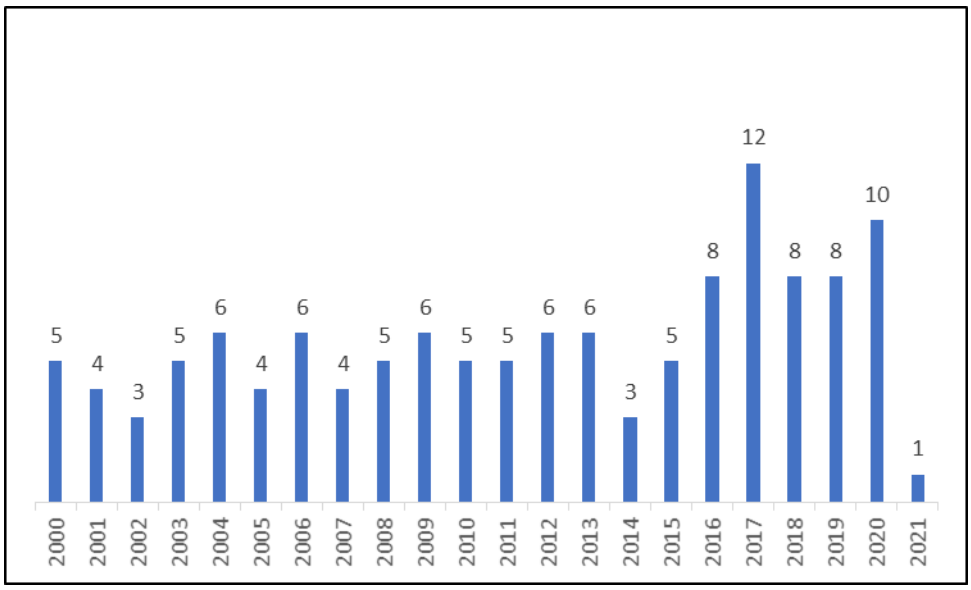


Figure 3. Key themes in the reviewed articles



2000 to 2004	23
2005 to 2009	25
2010 to 2014	25
2015 to 2020	52

Figure 4. Reviewed articles by year of publication

3. Findings

3.1 Supply chain risk

The ability of an organization's supply chain to manage risk is critical to its success. When supply chain risk is not controlled, firms are more likely to fail to meet their client promises. Altay and Ramirez (2010) and Zsidisin and Wagner (2010) argue that in order to manage their requirements and avoid risk, organisations should adopt relational structures that promote justice and devotion, as well as search for accessible, dependable, and aligned suppliers in order to reduce demand risk and minimise expensive business effect, depreciation, and inefficient capacity utilisation by reducing the variation between expected and actual demand and enhancing coordination throughout the enterprise (Wagner and Walton 2016). According to Bhattacharyya et al. (2010), operational risk is caused by poor processes and a lack of supply-demand coordination, resulting in interruptions that may be easily prevented. Risk analysis is recommended as a management technique by Sinha et al. (2004). Companies that analyse risk on a regular basis are more aware of actions and circumstances that might create disruptions and are better prepared to deal with the consequences.

In a coordinated technique by supply chain partners, Jüttner and Maklan (2011) propose risk rectification by pinpointing the risk locus with the goal of reducing vulnerability. Supply chain resilience, supply chain vulnerability, and supply chain risk management are all important aspects to consider when designing a supply chain that is both efficient and risk-aware. Tang (2006) emphasises the significance of risk management by demonstrating the relationship between it and company continuity and revenue.

Avoidance, deferral, speculation, hedging, control, and sharing are some of the most common risk-reduction methods (Jüttner et al. 2003). Managing a strategic contingency stock is one approach of risk management (Bhattacharyya et

al. 2010; Ellegaard 2008; Wagner and Bode 2008). Though an appealing technique, it should be employed with caution due to the increased costs involved as well as the cash needed to develop a buffer stock (Zsidisin and Wagner 2010). Flexibility as an alternate option improves organisational and cross-organizational abilities in detecting and reacting quickly to supply-chain hazards, preventing interruptions, and is a popular approach of risk mitigation (Zsidisin and Wagner, 2010). When it comes to forecasting which risk management technique would succeed, Chopra and Sodhi (2004) claim that there is no magic wand. Corporations will have to experiment with redundancy (stock buffer), flexibility, or both to find what works best in a given circumstance and matches the working culture of the company while controlling risk.

To mitigate supply chain risk, several businesses are developing strategic partnerships with other businesses (Vlachos and Dyra 2020). Lack of trust is a cause of higher risk, and organizations should actively work to develop mutual understanding with suppliers (Vlachos and Bourlakis 2006). Organizations with a high-performance supply chain discipline, display significant involvement with their partnerships while sharing the results for both rewards and risk (Mangina et al. 2020; Tortorella et al. 2021).

3.2 The supply chain capabilities and mitigation perspective

Based on an empirical research by Pettit et al. (2010), when supply chain capabilities improve, supply chain vulnerabilities decrease, and overall supply chain resilience improves. Vulnerability and capability are inversely proportional. Supply chain resilience is fathomably affected by core supply chain skills including cooperation, flexibility, visibility, and velocity, according to Jüttner and Maklan (2011), which increase the capacity to respond to disturbances. To assess their impact on supply chain resilience , we looked at these characteristics in particular: supply chain agility, procurement competency, logistics, and Industry 4.0.

According to Brusset (2016), supply chain agility is the greatest strategy to respond quickly to market demand. Companies may use supply chain agility for strategic edge to decrease instabilities and boost reaction capabilities in a dynamic environment (Fayezi et al. 2017). The integration of best practises and industry standards, according to Swafford et al. (2006), is an important aspect of agile supply chains. This will enable the organisation to offer more customer-focused goods and services, giving it a competitive advantage.

There is a consensus among scholars that procurement today encompasses the purchase process as well as supply management (Danese et al. 2018; Koenigsberg and Mckay 2010; Wieland et al. 2016). According to Yi et al. (2011), procurement frequently employs flexibility to preserve supplier availability, hence assisting in the provision of high-quality items to the business in the case of a requirement or an emergency. Ironically, lack of flexibility has been one of the most major barriers among buyer and supplier interactions in procurement. Lago Da Silva et al. (2014) propose introducing alternative structural interfaces between customers and providers to overcome this problem. This guarantees that both parties are committed to a common set of goals, resulting in better deliverables and increased supply chain resilience capacity.

A stronger performance of logistics capability, according to Lynch et al. (2000); Zhao et al. (2001) argue that the logistics capability provides the organization a competitive edge in the marketplaces it works in, and so increases its resilience capability during disruptions. As an example, logistics integration is a crucial lever for establishing a more integrated process that can be readily copied to scale up and change the business. Integration of specific logistical skills such as supply and demand management, as well as information management, and, according to Ponomarov and Holcomb (2009), will lead to productivity improvement, giving organizations a competitive edge and improving their resilience capability. Because of the interface and simplicity of information interchange, using digital technologies for diverse logistical operations greatly increases reaction time and allows self-calibrate system performance (Liu et al. 2020).

Industry 4.0 is a critical lever for performance improvement since traditional supply chain methods and technology are incapable of managing the complex risk exposure in today's supply chain environment (Pettit et al. 2010). Companies that apply Industry 4.0 gain the ability to react to change relatively fast, according to Ambulkar et al. (2015) while Krause et al. (2009) support that a fundamental element of supply chain resilience is the capacity to respond to abrupt or unexpected change, which may be accomplished through Industry 4.0.

3.3 Perspective of digital technologies to sustain risk mitigation

Digital technologies are advancing, companies can now apply a number of verified use cases of applications that may be broadly deployed in the supply chain industry right away (Ivanov, Dolgui, and Sokolov 2019; Lin and Vlachos 2018; Vlachos et al. 2021). In the context of resilience support, we looked at applications of Digital supply chain (DSC), Internet of Things (IoT), Digital twin, and Artificial Intelligence (AI) (Vlachos 2021).

Digital supply chain helps to increase visibility, responsiveness, cycle time reduction, and analytical capabilities (Mangina et al. 2020; Mangina and Vlachos 2005; Stank et al. 2019). Digital supply chain can improve resilience by leveraging data analysis prospectively to anticipate predictions and maintain contingency plans on hand (Ivanov, Dolgui, Das, et al. 2019). Organizations may achieve supply chain excellence by incorporating technology into their operations plans and leveraging this for efficiency and strategic advantage (Al-Talib et al. 2020).

The cost, complexity, and mistakes of operations will be decreased by adding IOT into the supply chain. IoT offers real-time traceability and enhances the speed with which mistakes or faults are handled, hence enhancing supply chain resilience (Miorandi et al. 2012). IoT allows for quick and precise data-driven supply chain choices, enhancing the ability to respond efficiently in the event of a disruption (Da Xu et al. 2014). This also leads to a faster response time (Velocity), which is an important supply chain resilience feature (Whitmore et al. 2015).

Digital twins, according to Ivanov, Dolgui, Das, et al. (2019), may be used to assess contingency planning since they can display end-to-end supply chain network modification and hence test resilience capabilities even before a disruption occurs. We can follow the change using the digital twin risk monitoring module by changing inputs from both internal and external supply chain variables, which improves simulation capabilities and reliability (Geels 2004). The use of a digital twin enables for rapid testing of recovery techniques as well as the adaption of contingency plans, allowing businesses to use design as a foundation for enhanced supply chain management (Boehmer et al. 2020; Buer et al. 2018).

According to Riahi et al. (2021), the two most common AI use cases in supply chain are AI for supplier evaluation and AI for inventory control. Artificial Intelligence approaches are quickly increasing and enriching decision aid using data analysis, data trends recognition, forecasting, and anticipation, therefore responding efficiently under disruptions and enhancing the supply chain resilience. According to (Poon and Lau 2000), there is a lack of certainty on supply chain resilience performance measurement, which is most relevant to today's interconnected supply chains. According to Jüttner and Maklan (2011), firms must use performance management as an operational discipline to manage and maintain supply chain performance.

4. Discussion and conclusions

With an emphasis on value chain analysis and global footprint reassessment, supply chain resilience post-pandemic is beginning to attract a lot of attention. Supply chain resistance is a multi-step operational journey that commences before the disturbance, persists through it, and concludes once the crisis has passed. The degree of resilience is determined by the supply chain's ability to anticipate risk, respond appropriately, and quickly restore productivity to pre-disruption levels. The diagram below depicts the supply chain resilience journey evolution and the characteristics that are necessary to guide the organisation through it.

When constructing a supply chain network, companies should consider supply chain resilience as a critical performance indicator. The current worldwide pandemic has exposed supply networks to a degree of risk that had not been expected or envisioned for quite some time. Supply and demand situations continue to fluctuate throughout sectors, putting significant pressure on sales and production performance. Companies that analyse risk proactively are better positioned to deal with interruptions. This is supported by the supply chain resilience framework, which was addressed in earlier chapters, and it should be a top management priority. Even in normal settings, businesses might confront unpredictable conditions, thus management should develop a set of operational strategies that can be implemented swiftly to react and adjust to the disruption. Risk assessment and mitigation are used to accomplish this. Because risk may come from both within the business and from outside the supply network, the company should establish a collaborative culture and trust among its supply chain partners. According to the supply chain resilience evaluation, the organization's two most critical operating competencies for responding to and maintaining performance during interruptions are flexibility and cooperation.

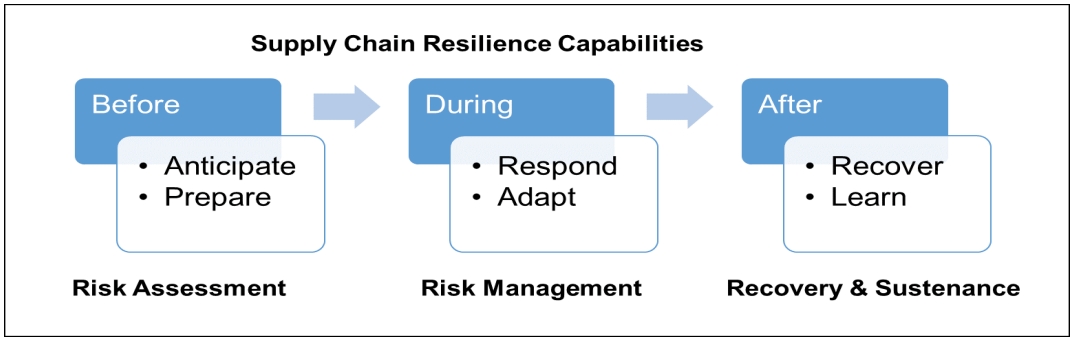


Figure 4 Supply chain resilience - key performance expectations across the operations cycle

Organizations must concentrate on improving their supply chain process' functional capabilities. Traditional supply chain services such as logistics, procurement, and manufacturing may be revolutionised by leveraging digital technology to increase inter-network integration and give continuous insight into supply chain network performance. This visibility is crucial not just for tracking a disruption early, or even before it occurs, but also for tracking how the correlation and causation matrix reacts during the reaction phase. Data analytics and techniques such digital twin for model performance and AI for analysis and processing of vast amounts of data may also be used by management. As a result, businesses' decision-making becomes more data-driven, improving their productivity and supply chain resilience capabilities. Lastly, if you can measure it, you can manage it, therefore performance management is a critical organisational discipline that should take the lead during regular business this to guarantee supply chain resilience is achieved and maintained.

References

Al-Talib, M., Melhem, W. Y., Anosike, A. I., Reyes, J. A. G., and Nadeem, S. P., Achieving resilience in the supply chain by applying IoT technology, *Procedia CIRP*, vol. 91, pp. 752-7, 2020.

Ali, I., and Gölgeci, I., Where is supply chain resilience research heading? A systematic and co-occurrence analysis, *International Journal of Physical Distribution & Logistics Management*, 2019.

Ali, M., and Khan, W. U., Implementation Issues of AGVs in Flexible Manufacturing System : A Review, *Global Journal of Flexible Systems Management*, vol. 11, no. 1-2, pp. 55-61, 2017.

Altay, N., and Ramirez, A., Impact of disasters on firms in different sectors: implications for supply chains, *Journal of Supply Chain Management*, vol. 46, no. 4, pp. 59-80, 2010.

Ambulkar, S., Blackhurst, J., and Grawe, S., Firm's resilience to supply chain disruptions: Scale development and empirical examination, *Journal of Operations Management*, vol. 33, pp. 111-22, 2015.

Bhamu, J., and Singh Sangwan, K., Lean manufacturing: literature review and research issues, *International Journal of Operations & Production Management*, vol. 34, no. 7, pp. 876-940, 2014.

Bhattacharyya, K., Datta, P., and Offodile, O. F., The contribution of third-party indices in assessing global operational risks, *Journal of Supply Chain Management*, vol. 46, no. 4, pp. 25-43, 2010.

Boehmer, J. H., Shukla, M., Kapletia, D., and Tiwari, M. K., The impact of the Internet of Things (IoT) on servitization: an exploration of changing supply relationships, *Production Planning & Control*, vol. 31, no. 2-3, pp. 203-19, 2020.

Brusset, X., Does supply chain visibility enhance agility?, *International Journal of Production Economics*, vol. 171, pp. 46-59, 2016.

Buer, S.-V., Strandhagen, J. O., and Chan, F. T. S., The link between Industry 4.0 and lean manufacturing: mapping current research and establishing a research agenda, *International Journal of Production Research*, vol. 56, no. 8, pp. 2924-40, 2018.

Chopra, S., and Sodhi, M., Supply-chain breakdown, *MIT Sloan management review*, vol. 46, no. 1, pp. 53-61, 2004.

Da Xu, L., He, W., and Li, S., Internet of things in industries: A survey, *IEEE Transactions on industrial informatics*, vol. 10, no. 4, pp. 2233-43, 2014.

Danese, P., Manfè, V., and Romano, P., A Systematic Literature Review on Recent Lean Research: State-of-the-art and Future Directions, *International Journal of Management Reviews*, vol. 20, no. 2, pp. 579-605, 2018.

de Koster, R., Le-Duc, T., and Roodbergen, K. J., Design and control of warehouse order picking: A literature review, *European Journal of Operational Research*, vol. 182, no. 2, pp. 481-501, 2007.

Ellegaard, C., Supply risk management in a small company perspective, *Supply Chain Management: An International Journal*, 2008.

Fayezi, S., Zutshi, A., and O'Loughlin, A., Understanding and development of supply chain agility and flexibility: a structured literature review, *International Journal of Management Reviews*, vol. 19, no. 4, pp. 379-407, 2017.

Geels, F. W., From sectoral systems of innovation to socio-technical systems, *Research Policy*, vol. 33, no. 6-7, pp. 897-920, 2004.

Ivanov, D., Dolgui, A., Das, A., and Sokolov, B. Digital supply chain twins: Managing the ripple effect, resilience, and disruption risks by data-driven optimization, simulation, and visibility. In *Handbook of ripple effects in the supply chain*, edited by Dmitry Ivanov, Alexandre Dolgui, Ajay Das and Boris Sokolov, 309-32. Springer,2019.

Ivanov, D., Dolgui, A., and Sokolov, B., The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics, *International Journal of Production Research*, vol. 57, no. 3, pp. 829-46, 2019.

Jüttner, U., and Maklan, S., Supply chain resilience in the global financial crisis: an empirical study, *Supply Chain Management: An International Journal*, vol. 16, no. 4, pp. 246-59, 2011.

Jüttner, U., Peck, H., and Christopher, M., Supply chain risk management: outlining an agenda for future research, *International Journal of Logistics: Research and Applications*, vol. 6, no. 4, pp. 197-210, 2003.

Koenigsberg, E., and McKay, K. N., A taxonomy for understanding the origins of production control, *Production Planning & Control*, vol. 21, no. 5, pp. 437-51, 2010.

Krause, D. R., Vachon, S., and Klassen, R. D., Special topic forum on sustainable supply chain management: introduction and reflections on the role of purchasing management, *Journal of Supply Chain Management*, vol. 45, no. 4, pp. 18-25, 2009.

Lago Da Silva, A., Christopher, M., and Roberta Pereira, C., Achieving supply chain resilience: the role of procurement, *Supply Chain Management: An International Journal*, vol. 19, no. 5/6, pp. 626-42, 2014.

Lin, Z., and Vlachos, I., An advanced analytical framework for improving customer satisfaction: A case of air passengers, *Transportation research. Part E, Logistics and Transportation Review*, vol. 114, pp. 185-95, 2018.

Liu, W., Wang, S., Lin, Y., Xie, D., and Zhang, J., Effect of intelligent logistics policy on shareholder value: evidence from Chinese logistics companies, *Transportation Research Part E: Logistics and Transportation Review*, vol. 137, pp. 101928, 2020.

Lynch, D. F., Keller, S. B., and Ozment, J., The effects of logistics capabilities and strategy on firm performance, *Journal of Business Logistics*, vol. 21, no. 2, pp. 47, 2000.

Mangina, E., Narasimhan, P. K., Saffari, M., and Vlachos, I., Data analytics for sustainable global supply chains, *Journal of Cleaner Production*, vol. 255, pp. 120300, 2020.

Mangina, E., and Vlachos, I. P., The changing role of information technology in food and beverage logistics management : beverage network optimisation using intelligent agent technology: Operational research and food logistics, *Journal of Food Engineering*, vol. 70, no. 3, pp. 403-20, 2005.

Miorandi, D., Sicari, S., De Pellegrini, F., and Chlamtac, I., Internet of things: Vision, applications and research challenges, *Ad hoc Networks*, vol. 10, no. 7, pp. 1497-516, 2012.

Pettit, T. J., Fiksel, J., and Croxton, K. L., Ensuring supply chain resilience: development of a conceptual framework, *Journal of Business Logistics*, vol. 31, no. 1, pp. 1-21, 2010.

Ponomarov, S. Y., and Holcomb, M. C., Understanding the concept of supply chain resilience, *The international Journal of Logistics Management*, 2009.

Poon, W., and Lau, K., Value challenges in supply chain management, *Logistics Information Management*, 2000.

Purssell, E., and McCrae, N. *How to perform a systematic literature review: a guide for healthcare researchers, practitioners and students*. Cham, Switzerland: Springer,2020.

Riahi, Y., Saikouk, T., Gunasekaran, A., and Badraoui, I., Artificial intelligence applications in supply chain: A descriptive bibliometric analysis and future research directions, *Expert Systems with Applications*, vol. 173, pp. 114702, 2021.

Sinha, P. R., Whitman, L. E., and Malzahn, D., Methodology to mitigate supplier risk in an aerospace supply chain, *Supply Chain Management: An International Journal*, 2004.

Stank, T., Esper, T., Goldsby, T. J., Zinn, W., and Autry, C., Toward a digitally dominant paradigm for twenty-first century supply chain scholarship, *International Journal of Physical Distribution & Logistics Management*, 2019.

Swafford, P. M., Ghosh, S., and Murthy, N., The antecedents of supply chain agility of a firm: scale development and model testing, *Journal of Operations Management*, vol. 24, no. 2, pp. 170-88, 2006.

Tang, C. S., Robust strategies for mitigating supply chain disruptions, *International Journal of Logistics: Research and Applications*, vol. 9, no. 1, pp. 33-45, 2006.

Tortorella, G. L., Narayanamurthy, G., and Thurer, M., Identifying pathways to a high-performing lean automation implementation: An empirical study in the manufacturing industry, *International Journal of Production Economics*, vol. 231, pp. 107918, 2021.

Vlachos, I., Implementation of an intelligent supply chain control tower: a socio-technical systems case study, *Production Planning & Control*, pp. 1-17, 2021.

Vlachos, I., and Dyra, S. C., Theorizing coordination, collaboration and integration in multi-sourcing triads (B3B triads), *Supply chain management*, vol. 25, no. 3, pp. 285-300, 2020.

Vlachos, I. P., and Bourlakis, M., Supply Chain Collaboration Between Retailers and Manufacturers: Do They Trust Each Other?, *Supply Chain Forum*, vol. 7, no. 1, pp. 70-80, 2006.

Vlachos, I. P., Pascazzi, R. M., Zobolas, G., Repoussis, P., and Giannakis, M., Lean manufacturing systems in the area of Industry 4.0: a lean automation plan of AGVs/IoT integration, *Production Planning & Control*, pp. 1-14, 2021.

Wagner, S. M., and Bode, C., An empirical examination of supply chain performance along several dimensions of risk, *Journal of Business Logistics*, vol. 29, no. 1, pp. 307-25, 2008.

Wagner, S. M., and Walton, R. O., Additive manufacturing's impact and future in the aviation industry, *Production Planning & Control*, vol. 27, no. 13, pp. 1124-30, 2016.

Whitmore, A., Agarwal, A., and Da Xu, L., The Internet of Things—A survey of topics and trends, *Information Systems Frontiers*, vol. 17, no. 2, pp. 261-74, 2015.

Wieland, A., Handfield, R. B., and Durach, C. F., Mapping the Landscape of Future Research Themes in Supply Chain Management, *Journal of Business Logistics*, vol. 37, no. 3, pp. 205-12, 2016.

Yi, C. Y., Ngai, E. W. T., and Moon, K., Supply chain flexibility in an uncertain environment: exploratory findings from five case studies, *Supply Chain Management: An International Journal*, vol. 16, no. 4, pp. 271-83, 2011.

Zhao, X., Xie, J., and Lau, R. S. M., Improving the supply chain performance: use of forecasting models versus early order commitments, *International Journal of Production Research*, vol. 39, no. 17, pp. 3923-39, 2001.

Zsidisin, G. A., and Wagner, S. M., Do perceptions become reality? The moderating role of supply chain resiliency on disruption occurrence, *Journal of Business Logistics*, vol. 31, no. 2, pp. 1-20, 2010.

Biographies

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