**Volume 2, No. 9 September 2023 - (1072-1086)**
p-ISSN 2980-4868 | e-ISSN 2980-4841
https://ajesh.ph/index.php/gp

# IMPACT OF SUPPLY CHAIN TRANSFORMATION ON SUPPLY CHAIN PERFORMANCE: THE EMPIRICAL STUDY THAT BASES ON MEDIATING ROLE OF SUPPLY CHAIN RESILIENCE ON CONSTRUCTION ORGANIZATION ON PAKISTAN

**[1]*Fahad Saddique, [2]Kaushal Rameshbhai Patel, [3]Moazam Niaz, [4]Matthew Uchenna Chukwu, [5]Urenna Nwagwu**

[1]The Institute of Management Sciences, Lahore, Pakistan
[2]North eastern University
[3,5] Wichita State University
[4]Imo State University
Emails: Fahad.Sadique@gmail.Com, kaushalpatel14497@gmail.com, moazam.memon@gmail.com, uchenna1chuckwu@gmail.com, rennychi7@gmail.com,

**ABSTRACT:**
The COVID-19 outbreak and subsequent pandemic have expedited the development of resilient supply chains. Digitization is increasingly acknowledged as a facilitative approach toward achieving that target. Researchers commonly acknowledge the necessity for more empirical studies to explore digitalization's potential to improve supply chain resilience and efficiency in unstable circumstances. This study proposes a theoretical framework that explains the influence of supply chain digitalization on the resilience of supply chains and performance. The proposed relationships were confirmed through a survey conducted with 315 construction companies in Pakistan. The findings provide insights into how digitization and supply chain resilience can enhance the efficiency of supply chain performance. Furthermore, the findings confirm resilience's partial positive mediating role in the relationship between digitalization and supply chain performance. Supply chain digitalization can enhance cost-effectiveness, information, communication efficiency, and supply chain resilience, improving performance during crises. This study contributes to the existing research on supply chain digitalization and resilience by using

dynamic capability to establish their association. The research findings offer valuable insights for companies to enhance supply chain resilience through digitalization.

**Keywords:** Supply Chain Transformation, Supply Chain Performance, Mediating Role, Construction Organization

## INTRODUCTION

Decentralized supply chain operations, complex systems, and volatile market environments can increase the vulnerability of supply chains to problems and hazards (Pettit et al., 2019) (Kamalahmadi & Parast, 2016). The COVID-19 post-pandemic has caused significant uncertainty for enterprises, making it difficult to anticipate the scope of its impact on business. Numerous global supply chains have experienced disruptions that significantly impacted companies' production stream (Ivanov et al., 2020; (Paul et al., 2021); (Zahraee et al., 2022). Various sectors, such as manufacturing (e.g., automobile, food, and pharmaceutical production) and services (e.g., airlines and hotels), have experienced substantial financial hindrances (Rubbio et al., 2020); Belhadi et al., 2021; Soares et al., 2021). For instance, let us consider Kojima Press Sectors, a domestic supplier of Toyota. The company encountered internal system issues due to the COVID-19 pandemic and economic downturn, leading to server shutdown. The sudden supply disruption caused Toyota's ordering system to become inoperable, completely closing all Toyota organisms (Toyota et al., 2022). Companies must adapt their manufacturing systems, trading operations, and processes to effectively manage the disruptions caused by COVID-19 and the economic crisis. Enhancing supply chain resilience is gaining recognition among both business consultants and academics as an effective strategy to mitigate disruptions and minimize weaknesses in supply chains (Ivanov et al., 2017; (Queiroz et al., 2022); Das et al., 2020; Naghshineh et al., 2021). Despite the growing awareness in this area, further research is required to enhance the understanding and implementation of supply chain resilience in risk management. Supply chain resilience includes both the capacity to absorb disruptions and the capability of a supply chain to promptly recover and restore its original or improved performance (Chowdhury et al., 2017) & (Singh & Singh, 2019). Implementing Supply Chain Resilience necessitates firms to integrate and adapt their resources, abilities, and procedures (El Baz & Ruel, 2021). The researcher has limited research that covers all aspects of resilience (Ganly et al., 2009) ; (Alikhani et al., 2021). Therefore, it is imperative to assess the overall resilience capacity of a supply chain. The research findings help leaders understand the effectiveness of various strategies in formulating improved mitigation risk strategies (Rahman et al., 2021). The COVID-19 pandemic has expedited the adoption of

supply chain digitalization due to urban lockdowns, logistical disruptions, and shifts in the workplace and market environment. it has gathered significant interest from companies and has emerged as a prominent topic in operations organizations (Ardolino et al., 2022; Sawik et al., 2022; Holmstrom et al., 2019; (Frank et al., 2002). Emerging technologies, including big data analytics, blockchain, and artificial intelligence, have expedited the digitalization of the manufacturing process (Dubey et al., 2020; Gawankar et al., 2019; (Saberi et al., 2019); Song et al., 2021). Digitalization systematically uses data to enhance production and operational activities, facilitate supply chain transformation and improvement, and enhance overall operational effectiveness and product development. Digitalization has disturbed conventional supply chain operations and introduced novel goods and company strategies (Eller et al., 2020). Researchers are investigating how digitalization can enhance companies' supply chain resilience during crises, facilitating rapid recovery from disruptions and restoring earlier performance levels (Hennelly et al., 2020; Stank et al., 2019). The primary focus of recent studies has been examining digital technology's use to enhance resilience (Gu et al., 2021); (Gu et al., 2021); (Weking et al., 2020); (Belhadi, Kamble, Fosso Wamba, et al., 2022). Digital supply chain resilience enhancement involves more than just implementing specific technological innovations to mitigate risk. It also includes incorporating digitized technologies into the resilience mechanism and establishing a framework for managing digital resilience. According to (Belhadi, Kamble, Venkatesh, et al., 2022), implementing a digitalized supply network can enhance visibility into the supply chain and facilitate adaptable modifications to its structure, organization, and capabilities. This, in turn, can lead to improved product quality, enhanced supply chain efficiency, and increased resilience. According to (Ivanov et al., 2022), the structure and processes of a digitally prompted supply chain are dynamic and inherently self-adaptive. This dynamic structure can adapt to the uncertainty of internal and external systems, enhancing resilience in disruptions. Empirical studies are necessary to validate the digital process of enhancing supply chain resilience and generate measurable outcomes that can inform enterprise resilience management practices (Ageron et al., 2020); (Seyedghorban et al., 2020); (Belhadi et al., 2021). Moreover, certain literature suggests that implementing digitalization and supply chain resilience can enhance performance outcomes. Further research is required to empirically investigate the impact of simultaneously implementing supply chain digitalization and supply chain resilience (SCR) on supply chain performance (SCP). This study begins by conducting a literature

review to examine and consolidate existing supply chain resilience research to address the research questions. A model called "SCD→SCR→SCP" is constructed based on dynamic capability theory to depict the influence mechanism of supply chain digitalization (SCD) on supply chain resilience (SCR) and supply chain performance (SCP).

## RESEARCH METHODS

The study applies data from primary sources obtained from building-related businesses in Lahore, Pakistan (Saddique, Nwagwu, et al., 2023). The confidentiality of the survey respondent's responses was confidential (Saddique, Mushtaq, et al., 2023). The questionnaire gathered data on digitalization, supply chain resilience, SC performance, and demographic information. The study's population sample consisted of 315 employees working in construction companies in Lahore, Pakistan.

**Table 1**
**Study's Population**

| Variable Names | Study Items | Sample Questionnaires | Article Reference |
|---|---|---|---|
| **Digitalization** | "3" | "We have adopted digital operational management" | (Hallikas et al, 2021) |
| **Supply chain Resilience** | "5" | "Our firm's supply chain can rapidly plan and execute contingency plans during disruptions" | (yu et al, 2019) |
| **Supply chain Performance** | "4" | "An economic return from the business investments" | (Gu et al, 2021) |

## RESULTS AND DISCUSSION

**Results and Findings:** The study's results and findings encompass various types of analysis that shown below.

**Table 2**
**Explaining Descriptive Analysis**

| "Characteristics Type" | "Frequency" | "Percentage" |
|---|---|---|
| **Male** | 260 | 82.5 |
| **Female** | 55 | 17.4 |
| **Less than 20** | 49 | 15.5 |
| **20-35** | 146 | 46.3 |
| **36-55** | 80 | 25.3 |
| **Above 55** | 40 | 12.6 |
| **Matric** | 52 | 16.5 |
| **Intern** | 79 | 25.0 |
| **Graduate** | 127 | 40.3 |
| **Post-Graduate** | 57 | 18.0 |

The study has samples of 315 employees from building-related businesses in Lahore, Pakistan, as indicated in Table 2. This study has 260 male and 55 female participants. The sample data indicates that most individuals fall within the age group of 20 to 35 (n = 146), while a smaller proportion aged group are above 55 (n = 44). The study included most graduates (n = 127) and a matric minority (n = 52).

**Table 3**
**Explaining Inferential Analysis**

| Variable | Mean | Standard Deviation |
|---|---|---|
| **Digitalization** | 3.79 | 0.84 |
| **Supply Chain Resilience** | 3.91 | 0.88 |
| **Supply chain Performance** | 3.90 | 0.87 |

**Explanation:** Table 3. represents the mean and standard deviations for various appreciation characteristics. Digitalization has a mean value of 3.79 with a standard deviation of 0.84. The supply chain resilience value has a mean of 3.91 with a standard deviation of 0.88. Lastly, the supply chain performance has a mean of 3.90 with a standard deviation of 0.87.

**Table 4**
**Reliability Analysis**

| Variable | No of Items | Cronbach's Alpha |
|---|---|---|
| **Digitalization** | "3" | 0.810 |
| **Supply chain Resilience** | "5" | 0.830 |
| **Supply chain Performance** | "4" | 0.821 |

**Explanation:** As shown in Table 4, all scale reliability was checked using Cronbach's alpha test, and all scales show that the measured reliability is more significant than 0.70, which is sufficient for further analysis.

**Table 5**
**Correlation Analysis**

| Sr. No | Items | Values | Values |
|---|---|---|---|
| **1** | **Digitalization** | | |
| **2** | **Supply Chain Resilience** | 0.147** | |
| **3** | **Supply chain Performance** | 0.149** | .345** |

**Explanation:** Table 5 presents the results of the correlation analysis. There is a positive correlation between digitalization and supply chain performance (r = 0.147, P < 0.05). Digitalization is significantly related to resilience (r = 0.149, p < 0.05). resilience and performance are positively correlated (r = 0.345, p < 0.05). The findings indicate that digital technology among employees leads to improved performance in the supply chain, even if it has resilience.

**Table 6**

**Regression**

| Variable | R2 | β | F | F- sign |
|---|---|---|---|---|
| **Digitalization** | 0.019 | 0.148 | 6.89 | 0.000 |
| **SC Resilience** | 0.265 | 0.345 | 122.0 | 0.000 |

**Dependent variable: Supply chain performance.**

**Table 7**

**Mediating Analysis**

| Variable | R2 | β | F | F-Sign |
|---|---|---|---|---|
| **Digitalization ⟶ SC Performance** | 0.019 | 0.148 | 6.89 | 0.000 |
| **Digitalization ⟶ SC Resilience** | 0.021 | 0.345 | 122.0 | 0.000 |
| **Digitalization ⟶ SC Resilience ⟶ SC Performance** | 0.235 | 0.235 | 131.0 | 0.000 |

**Note ***p<0.01, **p<0.05**

**Explanation:** The regression analysis has been conducted, as indicated in Table#7. The study reveals a significant positive relationship between digitalization and SC performance (β = 0.148, p = 0.00). Hypothesis H1 is accepted. The impact of digitalization on SC Resilience is statistically significant and positive (β = 0.345, p = 0.000). Hypothesis H2 is accepted. The statistical analysis indicates a significant relationship between SC Resilience and SC performance (β = 0.235, p = 0.000). Hypothesis H3 has been accepted. SC Resilience plays a partial mediating role in the relationship between digitalization and SC performance.

**Discussion:** This study examines the quantitative association between Digitization, SC Resilience, and SC

Performance. The study's findings reveal the paths and effects of digitization on SC Resilience and SC Performance in a crisis like economic and political stability. SC Digitalization has positively affected SC Performance. This result corresponds to the findings of several researchers (Al- Mulhim et al, 2021; (Frank et al., 2002).. Integrating Digitalization with supply chain processes in the digital economy enables companies to establish digital operational processes, enhance the effectiveness of supply chain operations, and reduce operational costs (Cavalcante et al., 2019). Integrating digital innovations and elements in products and services facilitates the collection of data and information from suppliers and consumers. Analyzing this data can help companies enhance their product development and promotion strategies, customize customers' needs, and enhance supply chain performance (Li et al., 2022). Currently, companies utilize the digital business model to establish online and offline delivery channels, which allows the creation of diverse revenue streams. Moreover, the digital supply chain utilizes open interfaces to seamlessly interact with suppliers, fostering an open ecosystem and enhancing the company's long-term profitability. Additionally, Digitalization has a favorable impact on SC Resilience (Ye et al., 2022). Applying of digital business development model can improve the supply chain visibility of products and supply chain management from offline to online. It facilitates information sharing between different supply chain stages and enhances risk awareness (Ivanov et al., 2021; Li et al., 2022). Digitalization has the potential to capture risk signals, enhance situational awareness, minimize supply chain disruptions, and enhance absorptive ability (Liu et al., 2020); (Holmström et al., 2019). Digitalization robust data analysis to develop effective inventory management strategies that optimize inventory utilization and ability to absorb risks (Cavalcante et al., 2019). Blockchain technology can integrate smart contracts into (Arunmozhi et al., 2022). Smart contracts offer several benefits in supply chain management, including increased speed, transparency, and reliability. These advantages help foster cooperative relationships among supply chain partners, strengthen the resilience of supply chain networks, and improve risk management (Lohmer et al., 2020; (Saberi et al., 2019). Response capability refers to the capacity to promptly make risk response decisions, efficiently allocate resources, connect with collaborators in a timely way, and optimize the allocation of supply chain resources (Negri et al., 2021). Digital platforms facilitate online communication between internal divisions and supply chain partners, even during urban lockdowns (Frank et al., 2002). Digital technologies, such as analytics for big data and artificial intelligence, enable the supply chain to integrate working and environmental information. This integration allows for rapidly generating effectively represented decisions in response to delays (Ivanov et al., 2019). (Singh & Singh, 2019) argue that this approach is more reliable and unbiased than

conventional risk response plans. Digitalization offers benefits for operational procedures and enhanced collaboration, resulting in increased efficiency for employees and managers. It improves the efficiency of asset cooperation during times of risk (Ganbold et al., 2021). Digitalization enables effective data sharing among companies in the supply chain regarding assets, operations, surroundings, and risk indices (Ivanov et al., 2022). (Shukor et al., 2021) suggest that collaborative decision-making among supply chain companies regarding new technologies, production lineup, and products in the face of risks can enhance supply chain flexibility. Integrating digital technology in management can enhance the development of operational strategies and resource integration in supply chains, thereby reducing the cost and inefficiency associated with traditional supply chains (Carlucci et al., 2004). Digital supply chains are supported to emphasize the importance of win-win collaboration and reasonable distribution of benefits. This approach effectively encourages suppliers to reach risk mitigation and collaborative planning. As (Belhadi et al. 2021) say that including risk information in the decision database using digital technology can assist managers in making more informed and logical choices regarding management and business plans. Furthermore, exchanging chain of custody information and knowledge contributes to enhanced acquisition within the supply chain. (Rui et al. 2008) suggest that businesses in the digital supply chain, upstream and downstream, can acquire, share, and gain insights from disruptions. This process facilitates innovation within the supply chain and leads to improved business performance. This study offers empirical evidence supporting the positive influence of Digitalization. A responsive and resilient supply chain is less inclined to disruption loss, positively impacting supply chain performance (Bown-Wilson, 2011)vv. The empirical findings of this study support the impact of resilience on supply chain performance (Chen et al., 2019). This study suggests that enhancing supply chain visibility and situational awareness accuracy can be achieved through the mediation path of SC resilience, specifically by improving supply chain redundancy and mobilizing inventory. The development of absorptive capability involves various elements, including visibility and redundancy. However, these elements necessitate more infrastructure support, such as costs for digital development, inventory management, and constructing a visual network for the supply chain (Govindan et al., 2013)

**Theoretical implications:** This study examines 315 manufacturing companies and develops an internal influence mechanism, "SCD→SCR→SCP," based on the dynamic capability perspective. It analyses the digitalization process to enhance SC

Resilience and SC Performance. This study provides a comprehensive examination of the development process and performance. The argument suggests that achieving Supply Chain Resilience (SCR) necessitates companies adapt their infrastructure, eliminate information barriers among departments and partners, and attain risk prediction and planning, response, and rapid recovery through process optimization and resource reorganization. Digitalization encompasses utilizing digital technology and transforming business processes, products, services, and models through technological application. Digitalization allows businesses to restructure their value-creation process, increasing adaptability, quickness, and effectiveness. The digitalization of the supply chain aligns with the strategic goals and implementation process of supply chain resilience (SCR). Digital technology can enhance the development of various aspects of supply chain resilience (SCR) capabilities. This study expands the scope of research on digitalization by encompassing the entire digital management process rather than focusing exclusively on a single digital technology. The research perspective emphasizes digital supply chain activities, with the adoption of digital technology as the underlying rationale and the integrated use of digital technologies as the approach. This study expands the research on digitalization by including crisis scenarios, thereby enhancing the research context in digitalization. This study contributes to the existing research by examining the mediating role of supply chain resilience in the relationship between digitization and SC performance. The findings indicate that introducing new assets, abilities, and models through digitalization has significantly shaped SC Resilience. SC Resilience is a complex capability essential for ensuring the continuity of operations in a market characterized by high levels of uncertainty. This process enhances the performance outcomes of the supply chain. This study effectively addresses the need for research on developing dynamic supply chain skills during crises (Ambulkar et al., 2015).

**Managerial Implications:** This study's findings offer valuable managerial knowledge for companies and their contributions to theory. The findings indicate that digitalization allows for restructuring current products, services, business processes, and models to enhance supply chain Performance. It is achieved through the flexible nature of supply chain resilience, which effectively attaches the digital driving force during times of crisis. The management implications for leaders and employees are as follows. Our study examines the collective impact of resilience capability on mitigating supply chain disruption. External environmental factors, such as natural disasters, political intervention, and supply network complexity, can result in unforeseen disruptions to the supply chain. Our research indicates that enhancing (Supply Chain Performance) in highly volatile marketplaces is contingent upon developing resilience capabilities. Firms are expected to improve

their forecasting capabilities for internal and external factors and effectively manage insufficient funds (Namdar et al., 2018; Pettit et al., 2013). This study's findings align with (Ivanov et al., 2022) perspective that redundant possessions can serve as unused resources during crises. Restricting their usage solely for emergencies is inefficient and insignificant enhancements in performance levels. Small and medium-sized enterprises (SMEs) with limited resources and capabilities face significant costs associated with stocking redundant inventory and arranging diversified purchases. As supply chain resilience increasingly determines company continuity, enterprises should enhance collaboration with partners to accelerate the development of joint plans for risk mitigation and promptly adapt to market changes. Enterprises should expedite the development of a diverse supply chain system. Promoting win-win cooperation and equitable sharing of benefits can influence the resources and abilities of individual businesses to foster sustainable development across the entire supply chain. Our findings demonstrate that supply chain digitalization plays distinct roles in developing sustainable supply chain resilience (SCR) at various stages. Supply chain digitalization can enhance absorptive capability by improving supply chain risk preparedness. Intelligent operational processes and digital business models can enhance response and recovery capabilities by facilitating the reconstruction of internal and external resources. (Cohen et al., 2022) maintain that variations in the industry sector, risk stage, and the present state of building resilience can influence the prioritization of developing distinct capabilities for Supply Chain Resilience (SCR). Managers can utilize our supply chain resilience framework to assess existing weaknesses in their supply chain and establish the necessary resilience. There is a need to reassess resilience and digital resources to align digital strategies with resilience capabilities at various stages. Flexible utilizing digital tools is crucial for re-planning enterprise organization, procedures, and business models. Managers can enhance the resilience capability of their companies by focusing on the areas that require the most improvement, thereby increasing the SCR levels. Managers should enhance the potential of digitalization by integrating digital asset management with the enterprise's dynamic capability, taking into account the mediating role of SC resilience. Companies must acknowledge the characteristic mechanisms of strategic chain digitalization, formulate a digital strategy that aligns with their growth during times of crisis and engage in a more extensive digital transformation. They should purposefully and strategically advance their digitization process. Companies must engage in the recruitment

of digital capacities, enhance the digital skills of their workforce, and proactively adapt the structure of their digital supply chain to facilitate the process of supply chain digitalization effectively.

## CONCLUSION

Recent research on supply chain resilience has emphasized the importance of digitalization in improving resilience in various aspects. However, empirical analysis is required to confirm the actual impact of digitalization on SC Resilience. Further investigation is needed to explore the role of SC Resilience as a dynamic capability in mediating the relationship between digitalization and Supply chain performance during crises. The study proposes Supply chain resilience that integrates dynamic capability theory and the interruption stages (before, during, and after). This study integrates dynamic capability theory to examine the impact of combining digitalization and Supply Chain Resilience on Supply chain performance, establishing the framework of "SCD→SCR→SCP." The study demonstrates that digitalization has a direct effect on supply chain performance. Additionally, supply chain resilience has a partial positive mediating association between digitalization and supply chain performance. The findings expand the scope of dynamic capability theory study from firms to the entire supply chain and contribute to current empirical research on the factors influencing supply chain resilience. This study examines the effects of digitalization on crisis scenarios, explicitly focusing on changes in information, resources, structure, and processes. It also explores the various ways in which digitalization can enhance capabilities in these scenarios. The findings offer both theoretical and practical backing for businesses to strategically and gradually enhance their resilience capabilities through digital tools, enabling them to bounce back from potential risks efficiently. The study's limitations may serve as potential areas for future research. This study develops a theoretical framework to analyze the relationship between digitalization, resilience, and performance. It then conducts an empirical test using structural equation modeling. Future research can do as case studies to further investigate. Furthermore, a limitation of our study is the reliance on data collected from construction companies in Pakistan. Various environmental. Moreover, cultural factors can limit the generalizability and applicability of the results.

## BIBLIOGRAFI

Ageron, B., Bentahar, O., & Gunasekaran, A. (2020). Digital supply chain: challenges and future directions. *Supply Chain Forum: An International Journal*, *21*(3), 133–138.

Alikhani, S., Nummi, P., & Ojala, A. (2021). Urban wetlands: A review on ecological and cultural values. *Water*, *13*(22), 3301.

Arunmozhi, M., Venkatesh, V. G., Arisian, S., Shi, Y., & Sreedharan, V. R. (2022). Application of blockchain and smart

contracts in autonomous vehicle supply chains: An experimental design. *Transportation Research Part E: Logistics and Transportation Review*, *165*, 102864.

Belhadi, A., Kamble, S., Fosso Wamba, S., & Queiroz, M. M. (2022). Building supply-chain resilience: an artificial intelligence-based technique and decision-making framework. *International Journal of Production Research*, *60*(14), 4487–4507.

Belhadi, A., Kamble, S. S., Venkatesh, M., Jabbour, C. J. C., & Benkhati, I. (2022). Building supply chain resilience and efficiency through additive manufacturing: An ambidextrous perspective on the dynamic capability view. *International Journal of Production Economics*, *249*, 108516.

Belhadi, A., Mani, V., Kamble, S. S., Khan, S. A. R., & Verma, S. (2021). Artificial intelligence-driven innovation for enhancing supply chain resilience and performance under the effect of supply chain dynamism: an empirical investigation. *Annals of Operations Research*, 1–26.

Bown-Wilson, D. (2011). The role of age in career progression: Motivation and barriers to fulfilment in older employees. *Managing an Age-Diverse Workforce*, 129–149. https://doi.org/10.1057/9780230299115

Carlucci, D., Marr, B., & Schiuma, G. (2004). The knowledge value chain: how intellectual capital impacts on business performance. *International Journal of Technology Management*, *27*(6–7), 575–590.

Cavalcante, I. M., Frazzon, E. M., Forcellini, F. A., & Ivanov, D. (2019). A supervised machine learning approach to data-driven simulation of resilient supplier selection in digital manufacturing. *International Journal of Information Management*, *49*, 86–97.

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.

Frank, J., King, A., & Raine, D. (2002). *Accretion power in astrophysics*. Cambridge university press.

Ganbold, O., Matsui, Y., & Rotaru, K. (2021). Effect of information technology-enabled supply chain integration on firm's operational performance. *Journal of Enterprise Information Management*, *34*(3), 948–989.

Ganly, I., Agrawal, N., Tuttle, R. M., Patel, S. G., & Shah, J. P. (2009). Management of Thyroid Cancer. *Principles and Practice of Head and Neck Surgery and Oncology. London*, 413–443.

Gu, M., Yang, L., & Huo, B. (2021). The impact of information technology usage on supply chain resilience and performance: An ambidexterous view. *International Journal of Production Economics*, *232*, 107956.

Holmström, J., Holweg, M., Lawson, B., Pil, F. K., & Wagner, S. M. (2019). *The digitalization of operations and supply chain management*.

Kamalahmadi, M., & Parast, M. M. (2016). A review of the literature on the principles of enterprise and supply chain resilience: Major findings and directions for future research. *International Journal of Production Economics*, *171*, 116–133.

Li, G., Xue, J., Li, N., & Ivanov, D. (2022). Blockchain-supported business model design, supply chain resilience, and firm performance. *Transportation Research Part E: Logistics and Transportation Review*, *163*, 102773.

Liu, Y., Mao, B., Liang, S., Yang, J.-W., Lu, H.-W., Chai, Y.-H., Wang, L., Zhang, L., Li, Q.-H., & Zhao, L. (2020). Association between age and clinical characteristics and outcomes of COVID-19. *European Respiratory Journal*, *55*(5). https://doi.org/10.1183/13993003.01112-2020

Negri, M., Cagno, E., Colicchia, C., & Sarkis, J. (2021). Integrating sustainability and resilience in the supply chain: A systematic literature review and a research agenda. *Business Strategy and the Environment*, *30*(7), 2858–2886.

Paul, S. K., Chowdhury, P., Moktadir, M. A., & Lau, K. H. (2021). Supply chain recovery challenges in the wake of COVID-19 pandemic. *Journal of Business Research*, *136*, 316–329.

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.

Queiroz, M. M., Wamba, S. F., Jabbour, C. J. C., & Machado, M. C. (2022). Supply chain resilience in the UK during the coronavirus pandemic: a resource orchestration perspective. *International Journal of Production Economics*, *245*, 108405.

Rahman, T., Taghikhah, F., Paul, S. K., Shukla, N., & Agarwal, R. (2021). An agent-based model for supply chain recovery in the wake of the COVID-19 pandemic. *Computers & Industrial Engineering*, *158*, 107401.

Rubbio, I., Bruccoleri, M., Pietrosi, A., & Ragonese, B. (2020). Digital health technology enhances resilient behaviour: evidence from the ward. *International Journal of Operations & Production Management*, *40*(1), 34–67.

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

Saddique, F., Mushtaq, N., Abbas, Z., & Nawaz, M. (2023). Creative Performance of Healthcare Professionals (Nurses) in Hospitals Lahore, Pakistan. *Traditional Journal of Law And Social Sciences*, *2*(01), 60–72.

Saddique, F., Nwagwu, U., Mushtaq, N., Lamiaa, B., & Ali, A. (2023). Implementation Of Digitalization Supply Chain Helps in Gaining of Competitive Advantages as Mediating Role in the Supply Chain Performance in Construction Organization in Pakistan.

*TRADITIONAL JOURNAL OF HUMANITIES, MANAGEMENT AND LINGUISTICS*, *1*(01), 14–27.

Seyedghorban, Z., Tahernejad, H., Meriton, R., & Graham, G. (2020). Supply chain digitalization: past, present and future. *Production Planning & Control*, *31*(2–3), 96–114.

Shukor, A. A. A., Newaz, M. S., Rahman, M. K., & Taha, A. Z. (2021). Supply chain integration and its impact on supply chain agility and organizational flexibility in manufacturing firms. *International Journal of Emerging Markets*, *16*(8), 1721–1744.

Singh, N. P., & Singh, S. (2019). Building supply chain risk resilience: Role of big data analytics in supply chain disruption mitigation. *Benchmarking: An International Journal*, *26*(7), 2318–2342.

Weking, J., Stöcker, M., Kowalkiewicz, M., Böhm, M., & Krcmar, H. (2020). Leveraging industry 4.0–A business model pattern framework. *International Journal of Production Economics*, *225*, 107588.

Ye, F., Liu, K., Li, L., Lai, K.-H., Zhan, Y., & Kumar, A. (2022). Digital supply chain management in the COVID-19 crisis: An asset orchestration perspective. *International Journal of Production Economics*, *245*, 108396.

Zahraee, S. M., Shiwakoti, N., & Stasinopoulos, P. (2022). Agricultural biomass supply chain resilience: COVID-19 outbreak vs. sustainability compliance, technological change, uncertainties, and policies. *Cleaner Logistics and Supply Chain*, *4*, 100049.