CHAPTER 16

Beyond Technology: Building Sustainable and Resilient Supply Chains in Industry 5.0

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ABSTRACT

Industry 5.0 marks a paradigm shift from automation-driven manufacturing to human-centric, sustainable, and resilient systems. Unlike Industry 4.0, which emphasized digital transformation through AI, IoT, and robotics, Industry 5.0 integrates advanced technologies with human intelligence to address broader sustainability and resilience challenges. This paper explores the role of Industry 5.0 in building sustainable and resilient supply chains that can withstand disruptions such as pandemics, geopolitical uncertainties, and climate change. Drawing on contemporary literature and case evidence, the study emphasizes the integration of circular economy principles, stakeholder collaboration, and digital-human synergy. The research highlights frameworks for embedding sustainability goals, renewable energy adoption, and risk management strategies into supply chain operations. It further examines how human-centric innovation enhances adaptability, social responsibility, and long-term value creation. Findings suggest that organizations embracing Industry 5.0 can achieve competitive advantage through eco-innovation, transparency, and resilience. The paper concludes with managerial implications and future research directions for operationalizing sustainability in Industry 5.0 supply chains.

Keywords: Industry 5.0; Sustainable supply chains; Resilience; Circular economy; Human-centric innovation.

1.0 Introduction

The transition from Industry 4.0 to Industry 5.0 represents more than a technological upgrade; it is a strategic evolution towards sustainability, resilience, and human-centric innovation. With increasing global uncertainties, supply chains face unprecedented challenges, including disruptions from climate change, resource scarcity, and socio-economic instability. This paper introduces the importance of Industry 5.0 as a framework that not only enhances operational efficiency but also embeds sustainability and resilience into supply chain management.

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2.0 Literature Review

Previous studies on Industry 4.0 highlighted automation, AI, and smart technologies as key enablers of efficiency. However, recent research indicates that technology alone cannot address global supply chain vulnerabilities. Literature on Industry 5.0 emphasizes human–machine collaboration, ethical responsibility, and circular economy practices. Studies by European Commission and recent management scholars have identified sustainability and resilience as central pillars of Industry 5.0.

3.0 Methodology

The study adopts a qualitative research design supported by secondary data analysis. A systematic literature review of peer-reviewed journals, industry reports, and case studies was conducted. Thematic analysis was used to identify recurring themes such as sustainability integration, resilience-building, and technological-human collaboration in supply chains.

4.0 Results

The analysis reveals three key insights:

- *Sustainability integration:* Firms adopting Industry 5.0 prioritize green practices, renewable resources, and waste minimization.
- *Resilience building:* Human-machine collaboration enhances adaptability to disruptions, improving supply chain responsiveness.
- *Value creation:* Organizations achieve competitive advantage by aligning digital innovation with social responsibility and stakeholder engagement.

5.0 Discussion

The results highlight that Industry 5.0 shifts the focus from mere efficiency to holistic value creation. While technology remains a critical enabler, resilience and sustainability are achieved through ethical decision-making, circular economy adoption, and strong human involvement. This section also discusses challenges such as high implementation costs, need for policy frameworks, and resistance to change.

6.0 Conclusion

Industry 5.0 presents an opportunity to reimagine supply chains beyond technology, embedding sustainability and resilience into core operations. Organizations that embrace

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this paradigm shift can build long-term competitive advantages while contributing to global sustainability goals. Future research should explore empirical case studies and quantitative models to validate the frameworks proposed in this paper.

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References

1. Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2021). Industry 4.0 and Industry 5.0—Inception, conception, and perception. Journal of Manufacturing Systems, 61(1), 530–535. https://doi.org/10.1016/j.jmsy.2021.10.006
2. European Commission. (2021). Industry 5.0: Towards a sustainable, human-centric and resilient European industry. Publications Office of the European Union.
3. Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. International Journal of Production Research, 58(10), 2904–2915. https://doi.org/10.1080/00207543.2020.1750727
4. Raj, A., & Srivastava, S. K. (2022). Sustainability and resilience in Industry 5.0 supply chains: A conceptual framework. Journal of Cleaner Production, 355, 131750. https://doi.org/10.1016/j.jclepro.2022.1

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