



A Literature Review on Integration of Smart Supply Chain and Green Supply Chain Management: The Mediating Role of Dynamic Capabilities on Green Performance

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Abstract

This study considers the empirical relationships among Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance. A systematic literature review was conducted following PRISMA 2020 guidelines. From an initial pool of 79 documents published between 2019 and 2026, 30 empirical studies were retained for synthesis. The outcomes demonstrate a clear imbalance in research attention. Most prior studies focus on the direct effect of Green Supply Chain Management on Green Performance, while upstream processes linking digital transformation to capability development and operational implementation remain underexplored. Mediation effects are also limited, and no empirical study has tested the full sequential pathway linking Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance within one unified structural model. Based on the results, the study suggests an integrated conceptual framework to guide future empirical investigation and advance understanding of staged digital-enabled sustainability transformation in manufacturing contexts.

Keywords: Smart Supply Chain, Green Supply Chain Management, Dynamic Capabilities, Green Performance

Introduction

In recent years, manufacturing firms have faced increasing pressure to implement digital transformation while addressing environmental sustainability requirements. This dual challenge reflects a broader shift toward digitally enabled sustainability, where firms are expected to enhance operational efficiency while reducing environmental impact (Li et al., 2025; Rehman et al., 2025). Smart Supply Chain technologies, such as the Internet of Things (IoT), Artificial Intelligence (AI), and Big Data Analytics, improve supply chain visibility and enable real-time, data-driven decision-making (Lerman et al., 2022). At the same time, Green Supply Chain Management (GSCM) practices play a critical role in improving environmental accountability, reducing emissions, and increasing resource efficiency (AlSheyadi et al., 2025).



Although extensive research exists on digital transformation and Green Supply Chain Management (GSCM) independently, their integration remains conceptually fragmented, with limited theoretical explanation regarding how digital technologies lead to environmental outcomes. Drawing on Dynamic Capabilities Theory (Teece et al., 1997), it is posited that firms must develop internal capabilities to convert digital resources into sustainable performance. This suggests that the relationship between digital transformation and environmental performance is indirect and mediated by organizational mechanisms.

Most prior studies focus on the direct relationship between GSCM and Green Performance, consistently showing that green practices improve environmental outcomes (Borah et al., 2024; Rehman et al., 2025). However, relatively few studies examine how digital infrastructure supports capability development or facilitates the implementation of green operational practices (Liu et al., 2025). As a result, the literature remains dominated by isolated relationships rather than integrated, multi-stage mechanisms linking digital transformation, capability development, and environmental performance.

This imbalance highlights a structural gap how digital investments are translated into measurable environmental outcomes. While operational-level effects are well established, upstream mechanisms connecting Smart Supply Chain adoption, Green Dynamic Capabilities, and Green Supply Chain Management remain underexplored. Notably, no empirical study has examined the full sequential pathway within a unified structural framework.

Accordingly, this study proposes an integrated conceptual framework that links Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance. By synthesizing recent empirical evidence, the study offers a structured explanation of how digital infrastructure is transformed into environmental outcomes through capability development and operational implementation, providing both theoretical and practical insights for manufacturing contexts.

Objectives

The objectives of this study are:

1. To synthesize empirical evidence on the relationships among Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance
2. To evaluate the distribution of tested pathways in the existing literature and identify structural research imbalances in digital-enabled sustainability mechanisms



3. To develop an integrated conceptual framework that explains how Smart Supply Chain adoption may enhance Green Performance through the mediating roles of Green Dynamic Capabilities and Green Supply Chain Management

Concept theory framework

The proposed framework integrates Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management practices, and Green Performance within a sequential structural model. Smart Supply Chain adoption refers to the use of digital technologies to enhance real-time visibility, coordination, and decision-making across supply chain processes, while Green Dynamic Capabilities represent a firm's ability to sense, seize, and reconfigure resources toward environmental objectives. Green Supply Chain Management practices involve integrating environmental considerations into supply chain activities, and Green Performance reflects measurable environmental outcomes, such as emission reductions and resource efficiency. Rather than treating digital transformation and environmental performance as a direct cause-and-effect relationship, the framework positions organizational capability development and operational implementation as intermediate mechanisms, consistent with the Dynamic Capabilities perspective (Teece et al., 1997).

Smart Supply Chain adoption is expected to enhance Green Dynamic Capabilities. Smart technologies such as the Internet of Things, Artificial Intelligence, and Big Data Analytics provide real-time data visibility and analytical support, strengthening firms' ability to monitor resource consumption and identify opportunities for environmental improvement (Lerman et al., 2022; Liu et al., 2025). Empirical studies suggest that digital transformation contributes to capability formation by enabling firms to better coordinate information flows and respond to environmental issues (Li et al., 2025; Mohsin et al., 2025). Accordingly, digital infrastructure functions as a foundational input that facilitates the development of environmentally oriented organizational capabilities.

Green Dynamic Capabilities are expected to encourage Green Supply Chain Management practices. Firms possessing strong environmental capabilities are better able to translate strategic intent into operational practices, including green purchasing, eco-design, waste reduction, and sustainable logistics (AlSheyadi et al., 2025; Borah et al., 2024). These capabilities enable firms to systematically implement environmentally responsible initiatives (Asiedu et al., 2025).

Green Supply Chain Management practices are expected to directly improve Green Performance. Numerous empirical studies report that structured green practices lead to measurable environmental outcomes, including reductions in emissions and improvements in resource efficiency (Rehman et al., 2025; Ngouapegne et al., 2024). Thus,



operational implementation represents the stage at which capability development is translated into observable sustainability results.

This integrated framework connects these relationships into a sequential mechanism that explains how digital adoption influences environmental performance through capability development and operational transformation, thereby addressing the fragmentation identified in prior studies.

Materials and Methods

This study employs a systematic literature review to synthesize empirical research on the relationships among Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance. The review follows the PRISMA 2020 guidelines to ensure transparency in identification, screening, eligibility, and inclusion (Page et al., 2021).

A structured search was conducted in Scopus and Web of Science, focusing on peer-reviewed journal articles published between 2019 and 2026 in English. The search strategy combined keywords using Boolean operators, including (“smart supply chain” OR “digital transformation”) AND (“dynamic capabilities”) AND (“green supply chain management” OR “GSCM”) AND (“green performance” OR “environmental performance”), to capture studies on digital-enabled sustainability in manufacturing contexts.

The search identified 79 records. After removing duplicates and applying inclusion criteria, empirical studies, full-text availability, and relevance to at least two focal constructs, and exclusion criteria, conceptual papers, reviews, and studies lacking empirical testing, 30 studies were retained for synthesis. This sample size is consistent with prior systematic reviews in emerging research domains and is sufficient to identify dominant patterns and structural relationships.

A thematic synthesis was conducted by categorizing studies based on relationship types, mediating mechanisms, and performance outcomes. Most included studies used quantitative survey methods and structural equation modeling.

Results

The systematic search identified 79 documents on Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance. After applying the predefined inclusion criteria and excluding conceptual and review articles, 30 empirical studies were retained for synthesis.

The distribution of tested relationships reveals a clear concentration of research attention on downstream performance effects. The most frequently examined linkage



concerns the impact of Green Supply Chain Management on Green Performance. Fourteen studies, representing 46.67 percent of the empirical sample, report a significant direct effect of green operational practices on environmental or sustainability outcomes. This strong emphasis indicates that prior research has predominantly conceptualized environmental performance as the outcome of operational implementation, positioning green practices as the principal driver of measurable sustainability results.

In comparison, capability-based explanations receive moderate attention. Eight studies, accounting for 26.67 percent of the sample, examine the direct relationship between Green Dynamic Capabilities and Green Performance. These findings suggest growing recognition that organizational capabilities contribute to sustainability outcomes beyond operational routines. However, capability-driven perspectives remain secondary to practice-oriented approaches, reflecting a tendency in the literature to prioritize observable operational outcomes over underlying capability development.

Upstream relationships linking digital transformation to capability development and operational delivery are considerably less explored. Only two studies (6.67 percent) examine the direct effect of Smart Supply Chain adoption on Green Dynamic Capabilities, while five studies (16.67 percent) test its influence on Green Supply Chain Management practices. Similarly, only three studies (10.00 percent) investigate the relationship between Green Dynamic Capabilities and Green Supply Chain Management. This limited attention suggests that the mechanisms through which digital infrastructure is translated into organizational capabilities and subsequently embedded into green operational routines remain insufficiently examined.

Evidence of mediation is also relatively scarce. The mediating role of Green Dynamic Capabilities between Smart Supply Chain adoption and Green Performance appears in three studies (10.00 percent), while Green Supply Chain Management as a mediator is examined in four studies (13.33 percent). Importantly, none of the reviewed empirical studies evaluate the full sequential mechanism linking Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance within a unified structural model, highlighting a critical gap in the literature. The empirical distribution demonstrates a pronounced emphasis on direct operational effects and a relative neglect of integrated multi-stage mechanisms. While the performance implications of green operational practices are well established, the staged process through which digital adoption enables capability development and operational transformation remains underexplored. This structural imbalance provides a clear empirical basis for the integrated framework proposed in this study.



Table 1: Synthesized Relationships among variables

Empirical Relationship	Studies (%)	Representative Studies
Impact of Smart Supply Chain adoption on Green Dynamic Capabilities	2 studies (6.67%)	Liu et al. (2025); Mohsin et al. (2025)
Impact of Smart Supply Chain adoption on Green Supply Chain Management	5 studies (16.67%)	Lerman et al. (2022); Rehman et al. (2025); Rajabion et al. (2019); Alzubi et al. (2024)
Influence of Green Dynamic Capabilities on Green Supply Chain Management	3 studies (10.00%)	Borah et al. (2024); Amaranti et al. (2024); Widyantoro et al. (2025)
Effect of Green Supply Chain Management on Green Performance	14 studies (46.67%)	Borah et al. (2024); Lerman et al. (2022); Rehman et al. (2025); AlSheyadi et al. (2025); Bag et al. (2020); Ngouapegne et al. (2024); Mahar et al. (2025); Niu et al. (2025)
Effect of Green Dynamic Capabilities on Green Performance	8 studies (26.67%)	Borah et al. (2024); Asiedu et al. (2025); AlSheyadi et al. (2025); Liu et al. (2025); Zhu et al. (2023); Widyantoro et al. (2025); Amaranti et al. (2024)
Mediating role of Green Dynamic Capabilities between Smart Supply Chain and Green Performance	3 studies (10.00%)	Liu et al. (2025); Mohsin et al. (2025); Amaranti et al. (2024)
Mediating role of Green Supply Chain Management between Smart Supply Chain and Green Performance	4 studies (13.33%)	Lerman et al. (2022); Rehman et al. (2025); Niu et al. (2025)
Full sequential mechanism linking Smart Supply Chain, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance	0 studies (0.00%)	Not empirically tested

Based on the empirical distribution presented in Table 1, a unified structural framework is proposed to address the identified research gap. The particularly GSCM → GP and GDC → GP are integrated as mechanisms linking digital adoption, capability

development, operational implementation, and environmental performance remain empirically untested. This gap highlights the absence of a coherent, multi-stage explanation of how digital transformation translates into environmental outcomes

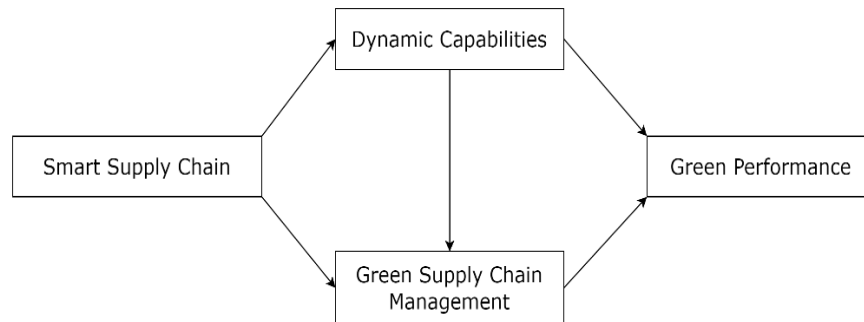


Figure 1: Proposed Research Framework

The framework positions Green Dynamic Capabilities and Green Supply Chain Management as complementary mediating mechanisms as which digital transformation translates into environmental performance outcomes. By assembling these constructs into a single sequential model, the study confronts the absence of empirical testing of the full pathway identified in the literature synthesis.

Conclusions and Discussion

This study provides a structured synthesis of recent empirical research examining the relationships among Smart Supply Chain adoption, Green Dynamic Capabilities, Green Supply Chain Management, and Green Performance. Drawing on systematic review studies published between 2019 and 2026, the analysis demonstrates that digital transformation, capability development, and green operational practices have largely been examined in fragmented ways rather than as components of an integrated process. While environmental performance outcomes are well documented, the mechanisms linking digital infrastructure to capability formation and operational implementation remain insufficiently integrated in empirical research.

This study addressed three objectives. First, it synthesized empirical evidence on the relationships among the four focal constructs. The analysis of 30 empirical studies indicates that prior research predominantly focuses on the direct effect of Green Supply Chain Management on environmental performance outcomes.

Second, the review evaluated the distribution of tested pathways and identified a structural imbalance in research attention. While operational practices receive substantial empirical support, upstream mechanisms relating digital transformation to capability



formation and operational implementation remain comparatively underexamined. Mediation analyses are limited, and the integration of digital, capability, and operational mechanisms has not been empirically tested within a single structural framework.

Third, based on the identified imbalance, this study proposes an integrated conceptual framework that positions Green Dynamic Capabilities and Green Supply Chain Management as complementary mechanisms through which digital adoption may translate into environmental performance. The absence of empirical testing of the full sequential mechanism represents a substantive research gap and offers a clear direction for future empirical investigation.

This study contributes by extending the application of the Dynamic Capabilities framework to digital-enabled sustainability contexts, providing a structured explanation of how digital transformation can be translated into environmental performance outcomes through sequential organizational mechanisms. Moreover, firms should not rely solely on digital technology adoption, but must also invest in capability development and the systematic implementation of green practices to achieve measurable sustainability outcomes.

Future research should empirically examine the proposed framework using longitudinal designs and explore contextual boundary conditions, such as regulatory pressure, industry characteristics, and supply chain complexity, to better understand the applicability.

References

- AlSheyadi, A., Abbas, H., Baawain, A., & Saeed, A. (2025). Linking zero-waste management and green innovative supply chains to sustainable performance: The mediating role of green dynamic capabilities in manufacturing firms. *Sustainability*, 17(22), 10348.
- Alzubi, A., Al-Zoubi, M., Alshurideh, M., Al Kurdi, B., & Salloum, S. (2024). The path from green innovation to supply chain resilience: Do structural and dynamic supply chain complexity matter? *Sustainability*, 16, 3762.
- Amaranti, R., Govindaraju, R., & Irianto, D. (2024). Do green dynamic capabilities and absorptive capacity affect green innovation performance? A study on companies in Indonesia. *Journal of Industrial Engineering and Management*, 17(2), 424–444.
- Asiedu, E., Alhassan, S., Mohammed, M., & Malcalm, E. (2025). Green dynamic capability and sustainability performance: The roles of green innovation and green sustainability of manufacturing firms. *Discover Sustainability*, 6(1), 961.



- Bag, S., Gupta, S., Kumar, S., & Sivarajah, U. (2020). Role of green supply chain management in enhancing organizational performance: Evidence from emerging markets. *International Journal of Production Research*, 58(6), 1839–1863.
- Borah, P. S., Dogbe, C. S. K., & Marwa, N. (2024). Green dynamic capability and green product innovation for sustainable development. *Corporate Social Responsibility and Environmental Management*, 32(1), 911–926.
- Dubey, R., Gunasekaran, A., Childe, S. J., Blome, C., & Papadopoulos, T. (2019). Big data and predictive analytics and manufacturing performance. *International Journal of Production Economics*, 211, 65–74.
- Green, K. W., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green supply chain management practices: Impact on performance. *Supply Chain Management: An International Journal*, 17(3), 290–305.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24.
- Kamble, S. S., Gunasekaran, A., & Gawankar, S. A. (2020). Achieving sustainable performance through smart manufacturing technologies. *Technological Forecasting and Social Change*, 157, 120–137.
- Khan, S. A. R., Yu, Z., & Golpıra, H. (2022). The role of green supply chain management in environmental performance. *Journal of Cleaner Production*, 278, 123–141.
- Lerman, L. V., Benitez, G. B., Müller, J. M., de Sousa, P. R., & Frank, A. G. (2022). Smart green supply chain management: A configurational approach to enhance green performance through digital transformation. *Supply Chain Management: An International Journal*, 27(7), 147–176.
- Li, Q., Tian, W., & Zhang, H. (2025). Digital transformation for sustainability in Industry 4.0. *Systems*, 13(2), 123.
- Liu, R., Xie, M., & Li, Y. (2025). How does digital transformation drive green innovation? *Sustainability*, 17(19), 8885.
- Mahar, A. S., Zhang, Y., Sadiq, B., & Gul, R. F. (2025). Sustainability transformation through green supply chain management practices. *Sustainability*, 17(5), 2204.
- Mohsin, A. K. M., Rashed, M., Gerschberger, M., Plasch, M., Ahmed, S. F., Dritan, O., & Islam, M. F. (2025). Smart supply chains: How do resilience and dynamic capabilities drive corporate performance? *The International Journal of Logistics Management*, 36(7), 330–363.
- Ngouapegne, C. N. M., Chinomona, E., & Okoumba, W. V. L. (2024). Green supply chain management and green economic performance. *Journal of Transport and Supply Chain Management*, 18, a1087.



- Niu, L., Mansab, M., Malik, A., Sadiq, S., & Ali, W. (2025). The mediating impact of green management on the relationship between green supply chains and firm performance. *International Journal of Business and Economics Research*, 14(6), 225–239.
- Rajabion, L., Khorraminia, M., Andjomshoaa, A., Ghafouri-Azar, M., & Molavi, H. (2019). A new model for assessing the impact of urban intelligent transportation systems. *Journal of Retailing and Consumer Services*, 50, 154–162.
- Rehman, S. U., Mahmood, R., & Abidi, N. (2025). Integrating smart supply chain with green practices to enhance sustainable supply chain performance. *Operations and Supply Chain Management*, 18(1), 1–18.
- Sarkis, J., Zhu, Q., & Lai, K.-H. (2011). An organizational theoretic review of green supply chain management literature. *International Journal of Production Economics*, 130(1), 1–15.
- Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16(15), 1699–1710.
- Shibin, K. T., Gunasekaran, A., Papadopoulos, T., Dubey, R., Singh, M., & Wamba, S. F. (2020). Environmental sustainability and supply chain innovation. *International Journal of Production Economics*, 229, 107–118.
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.
- Widyantoro, T., Rusmanto, T., Warganegara, D. L., & Furinto, A. (2025). Enhancing green innovation and financial performance. *Frontiers in Climate*, 7, 1599894.
- Wu, K. J., Tseng, M. L., Chiu, A. S., & Lim, M. K. (2017). Achieving competitive advantage through supply chain agility. *Journal of Cleaner Production*, 142, 639–649.
- Zhu, Q., Sarkis, J., & Lai, K. H. (2013). Institutional-based antecedents and performance outcomes of green supply chain management practices. *Journal of Cleaner Production*, 45, 1–9.
- Zhu, Y., Zhang, H., Siddik, A. B., Zheng, Y., & Sobhani, F. A. (2023). Understanding corporate green competitive advantage through green technology adoption and green dynamic capabilities. *Systems*, 11(9), 461.