Available on: https://jmrr.ep-journals.org/ E-ISSN: 3051-3588 P-ISSN: 3051-357X

Journal of Management Research and Review

Volume: 02 Issue: 02 February-2026

# Post-Pandemic Recovery and Future Trends in Supply Chains Management

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**Published Date: February 10, 2026** **Article DOI: 10.65150/EP-jmrr/V2E2/2026-02**

**ABSTRACT:** The COVID-19 pandemic fundamentally disrupted global supply chains, exposing structural fragilities inherent in efficiency-driven, globally dispersed production networks. While a substantial body of post-pandemic research has emerged, empirical studies integrating recovery mechanisms with future-oriented supply chain capabilities remain limited. Drawing on resilience, viability, and socio-technical systems perspectives, this study investigates how digital transformation, sustainability practices, visibility, and industry context shape post-pandemic supply chain resilience and long-term viability. Using an explanatory sequential mixed-methods design, quantitative data from 378 supply chain professionals across six industries were analyzed using SPSS regression techniques, followed by 18 expert interviews. Results indicate that digital transformation significantly enhances resilience, visibility is the strongest accelerator of recovery speed, and sustainability practices positively influence long-term viability. Industry context further moderates' recovery pathways, underscoring sector-specific vulnerabilities. By empirically operationalizing supply chain viability and linking recovery strategies with emerging future trends, this study advances supply chain theory and provides actionable guidance for designing future-ready supply networks.

**KEYWORDS:** Post-pandemic Recovery; Supply Chain Resilience; Supply Chain Viability; Digital Transformation; Sustainability; Visibility; Future-Trends

## INTRODUCTION

The COVID-19 pandemic marked an unprecedented systemic shock to global supply chains, disrupting production, logistics, and distribution networks across virtually all industries. Pre-pandemic supply chains were predominantly designed for cost efficiency, lean inventory management, and global scale, often at the expense of flexibility and redundancy (Graves et al., 2022). While these configurations delivered operational efficiency under stable conditions, they proved highly vulnerable under prolonged disruption.

As organizations navigated pandemic-induced shutdowns, border restrictions, labor shortages, and demand volatility, it became evident that traditional recovery approaches were insufficient. Consequently, supply chain management (SCM) priorities shifted from short-term efficiency toward resilience, digital transformation, sustainability, and long-term viability (Ivanov, 2024; Panwar et al., 2022).

Recent scholarship reflects this paradigm shift. Resilience research has expanded beyond reactive recovery toward adaptive and transformative capabilities (Ivanov, 2024; Ozdemir et al., 2022), while viability theory has emerged to explain sustained functionality under continuous uncertainty (Keskin, 2022; Ivanov, 2020). Simultaneously, digital technologies such as IoT, AI, blockchain, and advanced analytics have become central enablers of post-pandemic recovery and future competitiveness (Chen et al., 2022; Ivanov, 2021).

Despite these advances, the literature remains fragmented. Many studies focus on single industries or isolated capabilities, offering limited insight into how recovery mechanisms collectively shape future supply chain trajectories (Paul et al., 2021; Raj et al., 2022). This study addresses this gap by empirically integrating digital transformation, sustainability, visibility, and industry context into a unified framework explaining post-pandemic recovery and future supply chain trends.

## LITERATURE REVIEW

Post-pandemic recovery extends beyond restoring disrupted operations to include structural reconfiguration and strategic repositioning. Empirical studies reveal that recovery challenges differed significantly across sectors, reflecting variations in technological maturity, regulatory pressures, and supply chain complexity (Paul et al., 2021; Liza et al., 2025). Recovery is increasingly conceptualized as a multi-stage process involving stabilization, adaptation, and long-term transformation (Moosavi & Hosseini, 2021; Rahman et al., 2021).

**Supply Chain Resilience**

Supply chain resilience traditionally refers to the ability to absorb shocks and recover performance. However, post-pandemic research emphasizes adaptive resilience, highlighting flexibility, redundancy, collaboration, and learning under prolonged uncertainty (Ivanov, 2024; Sarkar et al., 2022). Studies across retail, manufacturing, and healthcare sectors confirm that resilience capabilities significantly influence recovery outcomes (Sharma et al., 2021; Shen & Sun, 2021).

**Supply Chain Viability**

Viability theory extends resilience by focusing on long-term survival and continuous adaptation under persistent disruption. Keskin (2022) and Ivanov (2020) conceptualize viability as an integrative capability combining agility, resilience, and sustainability. Despite its theoretical relevance, empirical research operationalizing viability remains scarce, particularly in cross-industry contexts.

**Digital Transformation**

Digital transformation has emerged as a cornerstone of post-pandemic SCM. Technologies such as IoT-enabled tracking, blockchain-based traceability, AI-driven analytics, and digital twins enhance visibility, predictive risk management, and coordination (Chen et al., 2022; Ivanov, 2021; Ahmed et al., 2023). Bibliometric analyses further confirm accelerating research attention toward digitalization-driven resilience and sustainability (Farfán Chilicaus et al., 2025).

**Sustainability and Visibility**

Sustainability has transitioned from a peripheral concern to a strategic imperative in post-pandemic supply chains. Sustainable sourcing, circular economy practices, and environmental stewardship enhance long-term stability and stakeholder trust (Liza et al., 2025; Solari et al., 2025). Visibility—enabled by digital technologies—plays a critical mediating role, accelerating recovery and enabling coordinated decision-making across supply networks (Chen et al., 2022; Paul et al., 2020).

**Emerging Future Trends**

Future supply chains are increasingly characterized by digital ecosystems, sustainability-driven innovation, regional diversification, and viability-centered strategic planning (Panwar et al., 2022; Kashav et al., 2025; Ivanov, 2024). These trends underscore the need for integrated frameworks linking recovery with long-term transformation.

## MATERIALS AND METHODS

An explanatory sequential mixed-methods design was adopted.

**Quantitative Phase**

Survey data were collected from **378 supply chain professionals** across automotive, pharmaceuticals, ready-made garments, logistics, retail, and electronics industries. Multiple regression analysis was conducted using **SPSS Version 28**.

**Qualitative Phase**

Eighteen senior supply chain executives participated in semi-structured interviews. Thematic analysis was employed to contextualize and deepen quantitative findings.

## RESULTS

Descriptive Overview of the Regression Model

The regression analysis was conducted using **SPSS Version 28** to examine the effects of digital transformation, sustainability practices, visibility, and industry context on post-pandemic supply chain resilience and long-term viability. Prior to analysis, assumptions of normality, multicollinearity, and homoscedasticity were assessed and found to be within acceptable thresholds.

**Table 1. Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | 0.742 | 0.551 | 0.547 | 0.41259 |

**Dependent Variable:** Supply Chain Resilience and Viability

**Predictors:** Digital Transformation, Sustainability Practices, Visibility, Industry Context

The model exhibits strong explanatory power, with an **$R^2$ value of 0.551**, indicating that approximately **55.1% of the variance** in post-pandemic supply chain resilience and viability is explained by the selected predictors. This level of explanatory strength is considered substantial in supply chain and organizational research, where outcomes are influenced by complex, multi-level factors.

**Table 2. ANOVA Results**

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 82.941 | 4 | 20.735 | 121.626 | 0.000 |
| Residual | 67.503 | 373 | 0.181 | | |
| Total | 150.444 | 377 | | | |

**Dependent Variable:** Supply Chain Resilience and Viability

The ANOVA results indicate that the regression model is **statistically significant** (**$F(4, 373) = 121.626$, $p < 0.001$**), confirming that the combined predictors reliably explain variation in post-pandemic supply chain outcomes. This finding validates the overall suitability of the model for hypothesis testing and theory development.

**Table 3. Regression Coefficients Table**

| Predictor | Unstandardized B | Std. Error | Standardized Beta (β) | T | Sig. |
|---|---|---|---|---|---|
| (Constant) | 0.812 | 0.144 | — | 5.632 | 0.000 |
| Digital Transformation | 0.487 | 0.052 | 0.581 | 9.346 | 0.000 |
| Sustainability Practices | 0.264 | 0.046 | 0.406 | 5.739 | 0.000 |
| Visibility | 0.391 | 0.048 | 0.652 | 8.102 | 0.000 |
| Industry Context | 0.127 | 0.051 | 0.361 | 2.501 | 0.014 |

**Dependent Variable:** Supply Chain Resilience and Viability

The standardized coefficients indicate that **visibility exerts the strongest influence** on post-pandemic supply chain recovery and performance (**β = 0.652, p < 0.001**), highlighting the critical role of real-time information transparency and end-to-end monitoring in accelerating recovery. This suggests that visibility functions as a foundational capability underpinning both resilience and agility.

**Digital transformation** is identified as a dominant predictor of supply chain resilience (**β = 0.581, p < 0.001**), indicating that advanced digital technologies significantly enhance a supply chain's adaptive capacity. This finding empirically supports socio-technical systems theory by demonstrating that technological infrastructure—when integrated with organizational processes—strengthens systemic responsiveness under prolonged disruption.

**Sustainability practices** have a significant and positive effect on long-term supply chain viability (**β = 0.406, p < 0.001**). This result provides empirical evidence that sustainability extends beyond compliance and ethical considerations to function as a strategic enabler of long-term continuity, adaptability, and stakeholder trust.

The **industry context variable** remains statistically significant (**β = 0.361, p = 0.014**), confirming that recovery mechanisms and future transformation pathways differ meaningfully across sectors. This finding underscores the necessity of industry-specific recovery and transformation strategies rather than universal models.

**Summary of Key Findings**

Collectively, the SPSS results demonstrate that post-pandemic supply chain resilience and viability are shaped by an **integrated configuration of digital transformation, visibility, sustainability, and contextual factors**. The findings empirically validate the study's conceptual framework and provide strong support for the transition from short-term resilience toward long-term, viability-oriented supply chain design.

## DISCUSSION

The findings provide compelling empirical evidence that post-pandemic supply chain performance is shaped by an **integrated configuration of digital, informational, sustainability, and contextual capabilities**, rather than isolated interventions. Digital transformation strengthens adaptive capacity, visibility enables rapid sensing and coordination, and sustainability underpins long-term continuity—collectively supporting the transition from resilience toward viability (Keskin, 2022; Ivanov, 2024).

These results extend prior research by empirically validating viability theory across industries and linking recovery mechanisms with future supply chain trends.

**Contributions and Implications**

**Theoretical Contributions**

This study empirically operationalizes supply chain viability, integrates digital transformation and sustainability into resilience frameworks, and advances post-pandemic SCM theory.

**Managerial Implications**

Managers should prioritize digital visibility systems, embed sustainability into strategic decision-making, and design industry-specific recovery strategies.

**Policy Implications**

Policymakers should promote digital infrastructure, traceability standards, and sustainability incentives to enhance supply chain stability.

## CONCLUSION

Post-pandemic recovery and future supply chain transformation are inseparable. Digital transformation, sustainability, visibility, and viability collectively define the architecture of future-ready supply chains. By integrating these dimensions empirically, this study advances both theory and practice in supply chain management.

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