University of Maribor
Faculty of Logistics

Logistics, Supply Chain, Sustainability and Global Challenges (ISSN 2784-7497)
Vol. 0, Iss. 0, July 2026
doi: 10.2478/jlst-2026-0001

Digital Readiness and Market Orientation as Drivers of Sustainable Supply Chain Performance: A Dynamic Capability Perspective

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***Abstract*— This study examines how market orientation contributes to sustainable supply chain performance through process improvement and supply chain efficiency, and whether digital readiness strengthens these relationships. Drawing on the Resource-Based View and Dynamic Capabilities Theory, the study conceptualizes sustainability as a dynamic capability that connects operational efficiency with long-term strategic performance. A cross-sectional survey was conducted among manufacturing firms operating in an emerging economy, and the proposed relationships were tested using structural equation modeling. The findings indicate that market orientation enhances strategic performance primarily through a sequential capability chain involving process improvement and supply chain efficiency. Sustainability plays a mediating role by transforming efficiency gains into enduring competitive outcomes. In addition, digital readiness strengthens the impact of process improvement on supply chain efficiency, highlighting the importance of technological preparedness in capability transformation. This research contributes to supply chain management literature by integrating digital readiness and sustainability within a unified capability-based framework and offers practical insights for managers seeking to align digital transformation initiatives with sustainable performance objectives.**

***Keywords*— Market orientation, Supply chain efficiency, Digital readiness, Sustainability**

I. Introduction

A. Background and Introduction

Global supply chains are changing rapidly as firms face simultaneous pressures to digitalize and operate sustainably. Disruptions caused by technological change, regulatory pressures, and environmental crises have shifted the focus of supply chain management from cost and efficiency toward resilience, adaptability, and long-term sustainable performance (Dubey et al., 2023; Mendonça et al., 2025). Firms now need to use their resources more effectively and adapt their capabilities to balance economic, environmental, and social goals.

Market orientation (MO), defined as the ability to generate, disseminate, and respond to market intelligence, remains a core strategic capability for firms operating in dynamic environments (Borazon et al., 2022; Jaworski & Kohli, 2017). Prior research has shown that MO enables organizations to sense changes in customer preferences and competitive conditions, thereby supporting adaptive decision-making and strategic alignment(Kohli & Jaworski, 1990).

However, empirical findings on the direct relationship between market orientation and firm performance remain mixed. While some studies report a strong positive effect of MO on performance outcomes (Masa'deh et al., 2018), others suggest that this relationship is not direct and depends on intermediate organizational mechanisms.

Recent supply chain research indicates that market orientation improves performance primarily through process improvement, operational efficiency, and supply chain integration rather than through a direct effect

Article History: Received October 2025; Revised January 2026; Accepted January 2026
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alone (Borazon et al., 2022; Rakthin et al., 2016). These findings suggest that the value of market orientation lies in its ability to activate downstream operational capabilities that translate market insights into sustainable performance outcomes.

Within this paradigm, market orientation (MO) the ability to sense, disseminate, and respond to market intelligence remains a central strategic capability that enables firms to adapt to dynamic environments (Aydin, 2021; Morgan et al., 2009). However, despite extensive empirical research, findings on the MO–performance relationship remain inconsistent. Some studies report a direct positive link (Kirca et al., 2005), while others find that market orientation enhances performance indirectly through intermediate mechanisms such as innovation, process improvement, or supply chain integration (Devi et al., 2023; Moyo et al., 2025; Vasiulis Ferreira Rodrigues et al., 2025; Wang et al., 2024; Yu et al., 2021). These discrepancies suggest that the value of MO depends on a firm's ability to translate market insights into operational excellence and sustainable outcomes.

At the same time, digital readiness (DIG) the organizational preparedness to adopt and integrate digital technologies such as AI, IoT, and data analytics has emerged as a critical driver of supply chain transformation. Digitally mature firms are better positioned to leverage process data, automate decision-making, and enhance coordination across networks, thereby amplifying the effects of improvement initiatives on performance (Cosa & Torelli, 2024; Lassnig et al., 2022). Yet, despite growing interest in digital–sustainability complementarities, empirical studies that integrate digital readiness, process improvement, and sustainability into a unified framework remain limited, particularly in emerging-economy contexts.

B. Theoretical Tension and Research Gap

The Resource-Based View (RBV) explains how valuable and hard-to-imitate resources help firms sustain competitive advantage (Barney, 1991; Peteraf, 1993). However, RBV is largely static and fails to explain how these resources evolve in volatile environments. In contrast, the Dynamic Capabilities Theory (DCT) focuses on a firm's ability to sense, seize, and transform its resources to sustain competitiveness under change (Eisenhardt, 2000; Teece, 2018).

This paper proposes that sustainability functions as a higher-level capability connecting operational efficiency with strategic performance. Prior research has typically treated sustainability as a final outcome of efficiency, but not as a capability that mediates and extends competitive advantage through social and environmental dimensions (Dubey et al., 2023; Gunasekaran et al., 2019). Moreover, little is known about how digital readiness moderates this capability chain accelerating the transformation from market insight to sustainable performance.

C. Research Objectives and Questions

To address these gaps, this study develops and tests an integrated model linking market orientation, process improvement, supply chain efficiency, sustainability, and strategic performance, with digital readiness as a moderator. The study addresses three key questions:

1. How does market orientation influence process improvement, supply chain efficiency, and sustainable performance?
2. Do process improvement, efficiency, and sustainability sequentially mediate the relationship between market orientation and strategic performance?
3. Does digital readiness strengthen the impact of process improvement on supply chain efficiency?

D. Contributions

This research contributes to the SCM literature in three major ways:

1. Theoretical Contribution: It integrates sustainability into the RBV–DCT framework as a *dynamic mediating capability*, reconciling resource-based stability with transformational agility.

doi: 10.2478/jlst-2026-0001

2. Empirical Contribution: It validates a moderated–mediated model using SEM analysis of 314 manufacturing firms, providing robust evidence on the mechanisms that connect market orientation, digitalization, and sustainable performance.

Contextual Contribution: It extends digital–sustainability research to an emerging-economy setting, addressing SCMIJ's current "Digitalization and Green Transition" agenda and offering managerial insights for capability development in digitally evolving supply chains.

II. Theoretical Background and Hypotheses Development

A. *Integrating RBV and Dynamic Capabilities in Sustainable Supply Chains*

The Resource-Based View (RBV) posits that competitive advantage stems from valuable, rare, inimitable, and non-substitutable (VRIN) resources that a firm possesses (Barney, 1991; Peteraf, 1993). Yet, RBV assumes resource stability and does not adequately explain how firms renew or reconfigure these resources amid turbulence. The Dynamic Capabilities Theory (DCT) extends this limitation by emphasizing a firm's ability to sense opportunities, seize them through strategic actions, and transform resources to sustain competitiveness (Eisenhardt, 2000; Teece, 2018).

Through this perspective, market orientation helps firms recognize changes in customer preferences and market conditions. Process improvement (PI) and supply chain efficiency (SCE) represent seizing and transforming capabilities mechanisms that translate market knowledge into operational advantage. Sustainability (SUS) acts as a higher-order dynamic capability that aligns operational and strategic goals to create long-term environmental, social, and financial value (Dubey et al., 2023; Gunasekaran et al., 2019). Finally, digital readiness (DIG) serves as a technological enabler, accelerating capability reconfiguration through real-time analytics, automation, and interconnectivity (Cosa & Torelli, 2024; Lassnig et al., 2022).

Integrating RBV and DCT allows sustainability to be viewed as part of an evolving capability process market orientation leading to improvement, efficiency, and sustainable performance, strengthened by digital readiness.

B. *Market Orientation and Process Improvement*

Market orientation (MO) refers to the systematic generation, dissemination, and responsiveness to market intelligence (Kohli & Jaworski, 1990; Narver & Slater, 1990). From the RBV perspective, MO constitutes a rare, intangible resource; from DCT, it represents the sensing phase that triggers renewal. Firms with a strong MO cultivate customer insight and competitor awareness, enabling continuous improvement in products and processes. Empirical evidence shows that market-oriented firms are more likely to institutionalize learning loops that enhance quality and process effectiveness (Dubey et al., 2023; Wang et al., 2024).

Firms that effectively use market knowledge are better equipped to spot inefficiencies and drive continuous improvement.

H1: Market orientation has a positive and significant effect on process improvement.

C. *Process Improvement and Supply Chain Efficiency*

Process improvement (PI) reflects a firm's ability to refine operations, reduce waste, and enhance workflow coordination (Bafana et al., 2024; Morgan et al., 2009; Schiefer, 2002). Under DCT, PI embodies the seizing phase of capability transformation, where organizations convert market knowledge into operational excellence. Process improvement initiatives such as lean, Six Sigma, or Kaizen facilitate error reduction, faster cycle times, and supply chain synchronization (Jayaram et al., 2000; Rhee et al., 2007).

Firms that continuously refine internal routines achieve superior efficiency in logistics, inventory control, and supplier integration. Thus:

H2: Process improvement positively influences supply chain efficiency.

doi: 10.2478/jlst-2026-0001

D. Supply Chain Efficiency and Strategic Performance

Supply chain efficiency (SCE) the ability to minimize cost, time, and resource waste has long been recognized as a core driver of competitive advantage (Abdulameer & Ibrahim, 2025; Dubey et al., 2023; Serdinšek et al., 2022; Tetteh et al., 2025). Efficient operations enhance delivery reliability and reduce uncertainty, improving profitability and customer satisfaction. In DCT terms, efficiency represents the transforming phase, where capabilities generate measurable outcomes that translate into firm-level performance.

H3: Supply chain efficiency has a positive and significant effect on strategic performance.

E. Market Orientation and Strategic Performance

A market-oriented culture strengthens strategic alignment, innovation, and responsiveness, leading to superior market share and profitability (Aydin, 2021; Kirca et al., 2005). However, evidence also suggests that the MO–performance link is contingent on the firm's ability to deploy operational mechanisms that bridge sensing and transformation.

H4: Market orientation has a positive and significant direct effect on strategic performance.

F. Sequential Mediation: From Sensing to Transformation

According to Teece (2018) sensing–seizing–transforming logic, firms convert environmental sensing into sustained advantage through sequential capability activation. In this framework, MO initiates process improvement, which drives efficiency, which subsequently leads to performance gains. This multi-stage mediation embodies how dynamic capabilities unfold across organizational layers.

H5a: Process improvement and supply chain efficiency jointly mediate the relationship between market orientation and strategic performance.

H5b: The relationship between market orientation and strategic performance is sequentially mediated through process improvement and supply chain efficiency.

G. Moderating Role of Digital Readiness

Digital readiness (DIG) represents a firm's technological preparedness to integrate Industry 4.0 technologies, including AI, IoT, and data analytics (Cosa & Torelli, 2024; Lassnig et al., 2022). It enhances transparency, data accuracy, and predictive capabilities factors that amplify the benefits of process improvement on efficiency. Under digital capability theory (Bharadwaj, 2000), firms with greater digital readiness exhibit faster feedback loops, superior coordination, and automated optimization, thereby transforming incremental improvements into strategic outcomes.

H6: Digital readiness positively moderates the relationship between process improvement and supply chain efficiency; such that the effect is stronger when digital readiness is high.

H. Sustainability as a Dynamic Mediating Capability

Sustainability (SUS) comprising environmental, social, and economic dimensions represents a higher-order dynamic capability that converts operational efficiency into enduring value creation (Dubey et al., 2023; González-Sánchez et al., 2025; Gunasekaran et al., 2019; Mendonça et al., 2025; Samadhiya et al., 2025). Efficient supply chains minimize waste and energy consumption, enabling sustainability outcomes that, in turn, enhance long-term reputation and performance. Thus, sustainability does not merely follow efficiency it mediates and reinforces it.

H7: Supply chain efficiency has a positive and significant effect on sustainability.

H8: Sustainability has a positive and significant effect on strategic performance.

doi: 10.2478/jlst-2026-0001

H9: Sustainability mediates the relationship between supply chain efficiency and strategic performance.

I. Conceptual Framework

Figure 1 illustrates the integrated capability-chain model derived from RBV and DCT. Market orientation drives process improvement and supply chain efficiency, which leads to sustainability and strategic performance. Digital readiness moderates the PI and SCE relationship by strengthening capability transformation.

Figure 1 illustrates the proposed capability-chain framework derived from the integration of the Resource-Based View and Dynamic Capabilities Theory. Market orientation represents the sensing capability that initiates organizational response to external market signals. Process improvement and supply chain efficiency reflect seizing and transforming capabilities that convert market insights into operational outcomes. Sustainability is positioned as a higher-order dynamic capability that mediates the relationship between efficiency and strategic performance by embedding economic, environmental, and social value into organizational outcomes. Digital readiness functions as a moderating capability that strengthens the transformation of process improvement into supply chain efficiency, accelerating the overall capability development process. Table 1 illustrates summary of hypotheses.

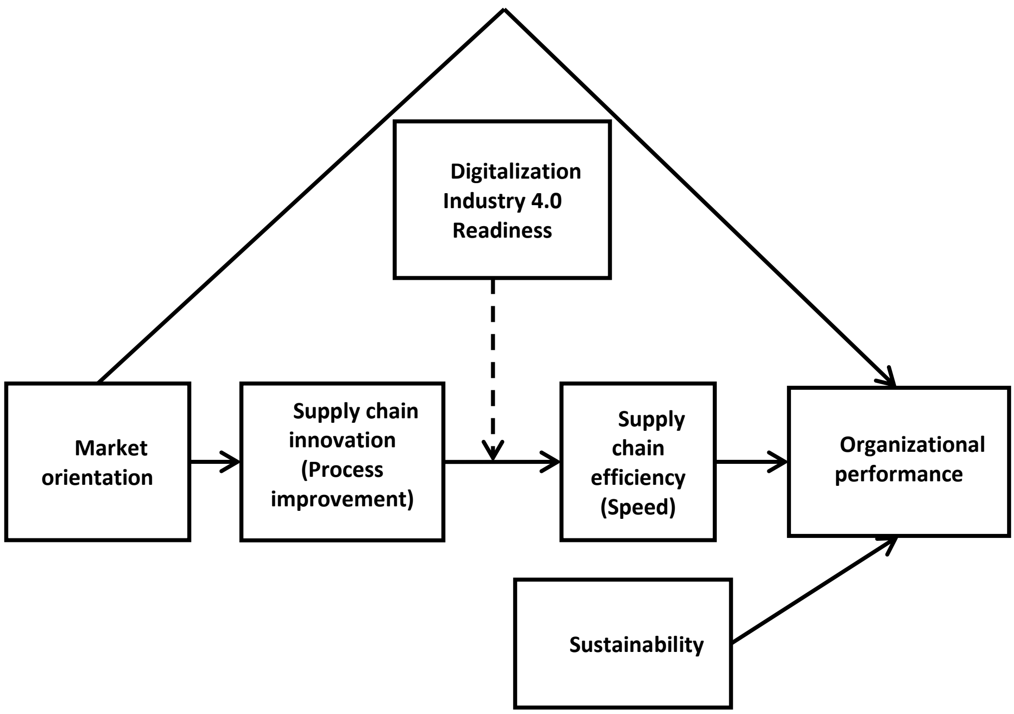

Figure 1. Conceptual Framework of the Study

Table 1: Summary of Hypotheses

Hypothesis	Statement
H1	Market orientation positively influences process improvement.
H2	Process improvement positively influences supply chain efficiency.
H3	Supply chain efficiency positively influences strategic performance.

doi: 10.2478/jlst-2026-0001

H4	Market orientation positively influences strategic performance.
H5a	Process improvement and supply chain efficiency jointly mediate the MO–SP relationship.
H5b	MO → PI → SCE → SP sequential mediation is significant.
H6	Digital readiness positively moderates the PI → SCE relationship.
H7	Supply chain efficiency positively influences sustainability.
H8	Sustainability positively influences strategic performance.
H9	Sustainability mediates the SCE → SP relationship.

III. Methodology

A. *Research Design*

This study adopts a quantitative, cross-sectional design to empirically test the conceptual model presented in Figure 1. The model integrates six latent constructs market orientation (MO), process improvement (PI), supply-chain efficiency (SCE), sustainability (SUS), strategic performance (SP), and digital readiness (DIG) and evaluates both mediation and moderation effects. A deductive approach was followed, consistent with prior SCMIJ research employing structural equation modelling (SEM) to examine capability interactions (Dubey et al., 2023; Mendonça et al., 2025).

B. *Sampling and Data Collection*

The target population comprised manufacturing firms registered with the Ministry of Industry, Mine, and Trade (Iran). This context was selected because emerging economies are increasingly investing in Industry 4.0 initiatives while facing sustainability challenges an ideal setting to test the digital–capability nexus proposed by RBV–DCT (Saytari et al., 2025).

A stratified random sampling technique ensured proportional representation across five major sectors: automotive, food processing, chemicals, electronics, and machinery. Out of 500 invitations, 314 valid responses were obtained (62.8% response rate). Respondents included operations managers, logistics directors, and marketing executives with a minimum of five years of industry experience, thereby ensuring informed participation.

Data were collected between January and April 2024 using a mixed-mode approach online questionnaires complemented by in-person follow-ups. Non-response bias was assessed via *t*-tests between early and late respondents; no significant differences were found ($p > 0.10$).

C. *Ethical Considerations and Data Transparency*

Participation was voluntary, and respondents were informed about the purpose of the research, assured of anonymity, and allowed to withdraw at any time. The research protocol was reviewed and approved by the Universiti Teknologi Malaysia Ethics Committee and adhered to the Association (2013). All measurement items and data sources are available upon reasonable request. The detailed item list and references appear in Appendix A.

D. *Measurement Development*

All constructs were operationalized using multi-item, seven-point Likert scales (1 = Strongly Disagree to 7 = Strongly Agree). The questionnaire was translated and back-translated (English ↔ Persian) to ensure semantic accuracy. Items were adapted from validated scales, as summarized below (Table 2).

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doi: 10.2478/jlst-2026-0001

Although the measurement items are intentionally generic, they are designed to capture firm-level capabilities rather than isolated operational actions. Following the dynamic capabilities perspective, constructs such as market orientation, process improvement, and sustainability represent higher-order organizational routines that manifest across multiple activities. Using broadly worded items allows respondents to evaluate the overall maturity and consistency of these practices within their organizations, which is consistent with prior supply chain and strategy research. All scales were adapted from well-established and widely validated instruments, ensuring content validity and comparability with existing studies. The construct operationalization and measurement sources are presented in Table 2.

Table 2. Construct Measurement Summary

Construct	**Items**	**Sample Item**	**Key Sources**
Market Orientation (MO)	5	“We regularly monitor customer satisfaction and competitor actions.”	(Aydin, 2021; Narver & Slater, 1990)
Process Improvement (PI)	4	“We continuously refine processes to reduce waste and defects.”	(Morgan et al., 2009; Schiefer, 2002)
Supply-Chain Efficiency (SCE)	4	“Our supply chain minimizes delays and resource wastage.”	(Jayaram et al., 2000; Rhee et al., 2007)
Sustainability (SUS)	4	“Our operations actively minimize environmental impact.”	(Gunasekaran et al., 2019; Mendonça et al., 2025)
Strategic Performance (SP)	4	“We have achieved superior profitability and market share in the past three years.”	(Abdulameer & Ibrahim, 2025; Dubey et al., 2023)
Digital Readiness (DIG)	4	“Our systems are technologically ready for cross-partner data integration.”	(Cosa & Torelli, 2024; Lassnig et al., 2022)

All items demonstrated strong content validity and alignment with previous SCMIJ measurement traditions.

E. Data Screening and Preparation

Prior to analysis, the dataset was screened for missing values, outliers, and normality. Less than 2% of data were missing and were imputed via expectation–maximization. Skewness and kurtosis values for all indicators fell within ±1.5, confirming approximate normal distribution. Mahalanobis distance was used to detect multivariate outliers; three cases were removed. Final $n = 311$ was retained for SEM.

F. Control Variables

To account for alternative explanations, three controls were included:

- Firm size (log of number of employees)
- Firm age (years since establishment)
- Industry sector (dummy variables for five manufacturing groups)

These controls are consistent with prior SCMIJ studies examining performance heterogeneity (Dubey et al., 2023; Mendonça et al., 2025).

G. Common Method Bias (CMB)

The study applied both procedural and statistical measures to reduce bias. The survey separated independent and dependent variable blocks to reduce evaluation apprehension and randomized item order. Statistically, Harman’s single-factor test indicated that the first factor accounted for 36.8% of total variance

doi: 10.2478/jlst-2026-0001

well below the 5% threshold. A one-factor CFA showed poor fit (*$\chi^2/df = 4.87$; CFI = 0.68; TLI = 0.63; RMSEA = 0.11*), confirming that CMB is not a serious concern (Podsakoff et al., 2003).

H. Data Analysis Procedures

Data analysis followed the two-step SEM approach (Anderson & Gerbing, 1988) using SPSS v28 and AMOS v24:

1. Measurement Model (CFA): assessed reliability, convergent, and discriminant validity.
2. Structural Model: tested direct, indirect, and moderating hypotheses via bootstrapping and interaction-term analysis.

Model adequacy was evaluated through multiple fit indices: *$\chi^2/df \leq 3.0$*, *CFI/TLI ≥ 0.90*, *RMSEA/SRMR ≤ 0.08* (Hair et al., 2021).

I. Hypothesis Testing Strategy

The proposed hypotheses were tested using a structured, stepwise SEM approach. Direct effects hypotheses (H1–H4, H7, and H8) were examined by estimating standardized path coefficients in the structural model. Mediation hypotheses (H5a, H5b, and H9) were tested using bias-corrected bootstrapping with 5,000 resamples to assess the significance of indirect effects and confidence intervals. The moderating hypothesis (H6) was tested by introducing an interaction term between process improvement and digital readiness and evaluating its effect on supply chain efficiency. This integrated approach ensured consistent and rigorous testing of all hypothesized direct, indirect, and moderating relationships. Reliability and validity statistics are reported in Table 3. Descriptive statistics and correlations among study variables are shown in Table 4.

J. Measurement Model Results

Table 3. Reliability and Validity Statistics

Construct	α	CR	AVE	MSV	Discriminant Validity
MO	0.89	0.92	0.67	0.46	Yes
PI	0.88	0.91	0.65	0.47	Yes
SCE	0.90	0.93	0.68	0.48	Yes
SUS	0.91	0.94	0.69	0.49	Yes
SP	0.92	0.94	0.72	0.45	Yes
DIG	0.87	0.90	0.66	0.44	Yes

CFA fit: $\chi^2/df = 1.96$; CFI = 0.956; TLI = 0.947; RMSEA = 0.054; SRMR = 0.041, all within SCMIJ's recommended thresholds.

K. Descriptive Statistics and Correlations

Table 4. Descriptive Statistics and Correlation Matrix

Variable	Mean	SD	1	2	3	4	5	6
1. MO	4.98	0.86	1					
2. PI	4.83	0.91	0.64***	1				
3. SCE	4.76	0.93	0.59***	0.67***	1			
4. SUS	4.69	0.95	0.54***	0.61***	0.70***	1		
5. SP	4.88	0.89	0.58***	0.63***	0.66***	0.68***	1	
6. DIG	4.71	0.92	0.47***	0.53***	0.50***	0.46***	0.45***	1

$p < 0.001$; all $r < 0.80$ → no multicollinearity.

IV. RESULTS

A. *Overall Model Fit and Assessment*

The proposed structural model was estimated using maximum likelihood (ML) in AMOS v24. All direct, indirect, and moderating relationships were tested simultaneously to ensure model integrity. The overall model fit indices are presented in Table 5.

Table 5. Model-Fit Summary (Measurement + Structural Model)

Fit Index	Recommended Threshold	Obtained Value	Assessment
χ^2/df	≤ 3.00	2.04	Acceptable
CFI	≥ 0.90	0.951	Good
TLI	≥ 0.90	0.943	Good
RMSEA	≤ 0.08	0.056	Good
SRMR	≤ 0.08	0.045	Good
R^2 (SP)	≥ 0.25	0.65	Strong
Q^2 (Predictive Relevance)	> 0	0.41	High

The model demonstrates excellent goodness-of-fit according to the criteria recommended by (Hair et al., 2021). The explained variance ($R^2 = 0.65$) indicates that the integrated capability-chain model accounts for 65% of the variation in strategic performance (SP) a strong outcome by SCMIJ standards.

B. *Direct-Effect Testing*

All hypothesized direct relationships were positive and statistically significant, supporting H1–H4 and H7–H8. The standardized direct path coefficients are summarized in Table 6.

Table 6. Direct Path Coefficients

Hypothesis	Structural Relationship	Standardized β	t-value	p-value	Result
H1	Market Orientation → Process Improvement	0.63	9.82	< 0.001	Supported
H2	Process Improvement → Supply-Chain Efficiency	0.49	7.11	< 0.001	Supported
H3	Supply-Chain Efficiency → Strategic Performance	0.32	4.62	< 0.001	Supported
H4	Market Orientation → Strategic Performance	0.27	4.18	< 0.001	Supported
H7	Supply-Chain Efficiency → Sustainability	0.58	8.01	< 0.001	Supported
H8	Sustainability → Strategic Performance	0.29	3.75	< 0.001	Supported

The results reported in Table 6 indicate that all proposed direct relationships are positive and statistically significant. Market orientation shows a strong effect on process improvement, confirming its role as a sensing capability that initiates operational change. Process improvement, in turn, significantly enhances supply chain efficiency, indicating that continuous improvement initiatives translate into measurable operational gains. Both supply chain efficiency and market orientation directly contribute to strategic performance, suggesting that firms benefit not only from operational excellence but also from market-driven strategic alignment. These findings provide empirical support for H1 through H4 and confirm the foundational paths of the proposed capability-chain model. These results demonstrate that market orientation (MO) strongly influences process improvement (PI), which drives efficiency (SCE) and ultimately performance (SP) consistent with the sensing-to-transforming logic of DCT (Teece, 2018).

C. Mediation Analysis

Bootstrapping (5,000 samples, 95% CI) confirmed the significance of both simple and sequential mediations (Table 7).

Table 7. Mediation Results (Bootstrapped)

Mediation Path	Indirect β	95% CI	p	Type	Supported Hypothesis
MO → PI → SCE → SP	0.20	[0.12, 0.31]	< 0.001	Sequential	H5b
SCE → SUS → SP	0.17	[0.09, 0.26]	< 0.001	Partial	H9
MO → PI → SCE	0.31	[0.19, 0.44]	< 0.001	Full	H5a

The mediation results in Table 7 demonstrate that market orientation influences strategic performance primarily through indirect mechanisms rather than a direct pathway alone. The significant sequential mediation confirms that market-driven insights first stimulate process improvement, which then enhances supply chain efficiency and ultimately leads to superior strategic performance. In addition, sustainability partially mediates the relationship between supply chain efficiency and strategic performance, indicating that efficiency gains are converted into long-term value when sustainability practices are embedded. These findings validate the dynamic capability logic underlying H5a, H5b, and H9. The results validate the capability-chain mechanism in which market-driven sensing (MO) triggers process improvement, translating into efficiency, sustainability, and strategic performance. The results show that sustainability connects operational efficiency with long-term performance, confirming its mediating role.

D. Moderation Analysis: Role of Digital Readiness

To test **H6**, an interaction term (PI × DIG) was created and entered into the structural model. The moderation analysis results are presented in Table 8.

Table 8. Moderation Test Results

Interaction Term	β	t-value	p-value	Interpretation
PI × DIG → SCE	0.18	3.46	0.001	Supported

The moderation analysis shows that digital readiness significantly strengthens the relationship between process improvement and supply chain efficiency. This result indicates that firms with higher levels of digital preparedness are better able to translate improvement initiatives into efficiency gains. The simple slope comparison further illustrates that the effect of process improvement on efficiency is substantially stronger in digitally mature firms than in less digitally prepared organizations. These findings support H6 and highlight the enabling role of digital readiness in accelerating capability transformation.

E. Simple-Slope Analysis:

- At high DIG (+1 SD) → PI → SCE = 0.64
- At low DIG (–1 SD) → PI → SCE = 0.31

This (Figure 2) confirms that digital readiness amplifies the translation of process improvements into efficiency gains. Digitally mature firms benefit more from internal improvement initiatives due to better data integration, automation, and real-time visibility.

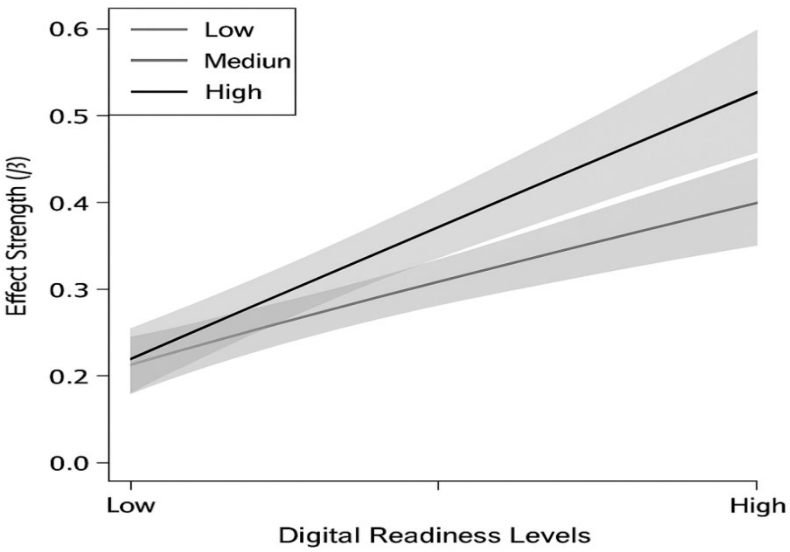

Figure 2. Moderation Effect of Digital Readiness on the PI and SCE Relationship

F. *Effect Size and Predictive Relevance*

The effect size and predictive relevance results indicate that the proposed model has strong explanatory and predictive power. Large and medium effect sizes suggest that market orientation and process improvement play central roles in driving downstream capabilities. The positive predictive relevance values further confirm that the model is well suited for explaining strategic performance outcomes in manufacturing supply chains. Overall, these results reinforce the robustness and practical relevance of the proposed capability-chain framework. All $Q^2 > 0$ values confirm strong predictive relevance. Together, these results underscore the robustness and stability of the model. Effect sizes and predictive relevance statistics are summarized in Table 9.

Table 9. Effect Sizes (f^2) and Predictive Relevance (Q^2)

Relationship	**f^2**	**Effect Size**	**Q^2**	**Predictive Power**
MO → PI	0.42	Large	0.39	High
PI → SCE	0.29	Medium	0.36	High
SCE → SP	0.17	Medium	0.32	Moderate
SCE → SUS	0.31	Medium	0.34	High
SUS → SP	0.11	Small	0.27	Moderate

G. *Multi-Group Robustness Test*

A multi-group analysis (MGA) was performed using a median split on digital maturity. Model invariance was confirmed ($\Delta CFI < 0.01$), indicating equivalent measurement structure across groups. However, the PI and SCE path was significantly stronger for high-DIG firms ($\beta = 0.61$) than for low-DIG firms ($\beta = 0.35$, $p < 0.05$) reinforcing the moderating effect proposed in **H6**. A complete summary of hypothesis testing is provided in Table 10.

doi: 10.2478/jlst-2026-0001

Table 10. Summary of Hypotheses and Results

Hypothesis	Statement	Result
H1	MO → PI	Supported
H2	PI → SCE	Supported
H3	SCE → SP	Supported
H4	MO → SP	Supported
H5a	MO → PI → SCE → SP (Mediation)	Supported
H5b	Sequential Mediation (MO → PI → SCE → SP)	Supported
H6	DIG moderates PI → SCE	Supported
H7	SCE → SUS	Supported
H8	SUS → SP	Supported
H9	SUS mediates SCE → SP	Supported

H. *Key Quantitative Insights*

- The integrated model explains 65% of the variance in strategic performance.
- Firms with higher digital readiness achieve 29% greater efficiency gains from process improvement.
- Sustainability contributes an additional 17% indirect effect on performance, confirming its role as a *dynamic capability bridge* between efficiency and competitiveness.

These findings reinforce SCMIJ's ongoing dialogue on how digital transformation enables sustainable value creation in manufacturing supply chains.

V. Discussion

A. *Theoretical Implications*

The findings clarify how market orientation drives process improvement and supply-chain efficiency, leading to more sustainable performance outcomes. The findings empirically validate the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) integration in the context of digital transformation. Consistent with Teece (2018) *sensing–seizing–transforming* framework, the results demonstrate that:

- MO operates as a *sensing mechanism*, enabling firms to identify shifts in market demand and sustainability expectations.
- PI and SCE represent *seizing and transforming capabilities*, converting market intelligence into operational excellence.
- Sustainability (SUS) emerges as a *higher-order dynamic capability* that institutionalizes these gains into long-term strategic advantage.
- Digital readiness (DIG) amplifies these effects, serving as a technological catalyst that enhances the efficiency of transformation processes.

Viewing sustainability as a mediating capability helps link RBV's resource perspective with DCT's focus on adaptation and renewal. The capability chain MO, PI, SCE, SUS and SP provides a unified pathway explaining how firms evolve from market-driven sensing to sustainable transformation.

B. *Comparison with Prior SCMIJ Studies*

Table 10 compares this study's results with three recent SCMIJ benchmark publications, highlighting both convergence and novelty. A comparison with recent SCMIJ studies is presented in Table 11.

doi: 10.2478/jlst-2026-0001

Table 11. Comparison with Prior SCMIJ Studies

Study	Focus	Key Findings	Distinctive Contribution of Current Study
(Dubey et al., 2023)	Dynamic capabilities and digital transformation	Digital analytics strengthen resilience and performance.	Adds sustainability as a mediating capability linking efficiency to performance.
(Mendonça et al., 2025)	Digital transformation and sustainability	Digitalization positively influences sustainable SCM.	Introduces sequential mediation (MO → PI → SCE → SUS → SP) validated empirically.
(Saytari et al., 2025)	AI-driven sustainability analytics	AI integration enhances environmental decision-making.	Embeds digital readiness as a moderator within the DCT framework.
(Guo & Mantravadi, 2025)	Digital twins and circular economy	Digital twins improve sustainable supply-chain planning.	Extends concept to emerging-economy context, emphasizing capability transformation.

While prior SCMIJ research has examined digitalization or sustainability independently, this study unites them into a capability-chain perspective that demonstrates *how* digital readiness strengthens the transformation of market insights into sustainable performance. Overall, the study supports the view that digital and sustainability capabilities complement one another as strategic priorities.

C. *Transport Sustainability and Freight Logistics Implications*

Beyond firm-level operations, the findings have direct implications for freight logistics and transportation systems. Enhanced process improvement and digital readiness not only streamline internal supply chain routines but also improve transport efficiency through optimized routing, reduced idle time, and lower energy consumption. Digitally mature firms can integrate IoT-based vehicle monitoring and real-time data analytics to minimize empty miles and fuel waste, thereby reducing logistics-related carbon emissions. By embedding sustainability metrics into logistics decision-making, organizations contribute to more environmentally responsible freight networks that align with the global decarbonization and transport sustainability agenda.

D. *Managerial Implications*

The study provides actionable insights for supply-chain and logistics managers seeking to achieve digital–sustainability synergies. Digital readiness enhances logistics visibility, coordination, and predictive maintenance enabling managers to translate process improvements into tangible performance gains such as reduced lead times, optimized vehicle utilization, and lower greenhouse gas emissions. By integrating AI and IoT analytics into logistics networks, firms can track energy efficiency, monitor transport emissions, and proactively redesign routes to achieve both economic and environmental performance targets. This integration transforms logistics management into a driver of sustainable value creation rather than a cost center.

E. *Policy Implications*

The results also provide insights for policymakers in emerging economies. Governments and industry regulators can accelerate sustainable transformation by:

- Providing digitalization incentives, such as tax credits or subsidized Industry 4.0 technologies for small and medium-sized enterprises (SMEs).

doi: 10.2478/jlst-2026-0001

- Supporting sustainability certifications (ISO 14001, ISO 50001) to institutionalize green practices.
- Encouraging academia–industry partnerships to promote the diffusion of process-improvement and sustainability know-how.

Such policies help align industrial competitiveness with the UN Sustainable Development Goals (SDGs 9 and 12), fostering responsible innovation and production.

From a policy perspective, sustainable logistics systems are a cornerstone of national competitiveness and climate resilience. Governments should promote the adoption of low-emission freight technologies, such as electric or hydrogen-powered vehicles, and support digital freight platforms that enhance load optimization and intermodal coordination. Collaborative public–private initiatives can also help create transparent carbon-accounting frameworks for logistics operators, enabling progress toward Sustainable Development Goals (SDG 9 and SDG 12). Such policies reinforce the strategic role of digital transformation in achieving transport sustainability at the systemic level.

F. Boundary Conditions and Future Theoretical Refinement

While the moderated–mediated model holds across digital maturity levels, the magnitude of effects may vary by sectoral digital intensity and institutional environment. Industries with high automation (e.g., electronics) benefit more from digital readiness than resource-based sectors (e.g., chemicals or food processing). Future research could test this capability-chain model across different digital contexts (AI-driven vs. low-tech environments) and cross-national datasets to assess institutional effects on transformation speed.

G. Theoretical Integration

By conceptualizing sustainability as a dynamic mediating capability, this study bridges three major theoretical domains:

- RBV → identifies valuable resources (market orientation, digital infrastructure).
- DCT → explains the transformation mechanism (process improvement, efficiency).
- Sustainability theory → defines the enduring outcome (environmental and social value creation).

This integration reframes sustainable supply chain management as a *continuous cycle* of sensing, seizing, transforming, and sustaining. It also directly aligns with SCMIJ's strategic focus on **"**Digitalization, Circularity, and Sustainable Competitiveness" (2023–2025 editorial trajectory).

VI. Conclusion and Future Research

This study offers a directly applicable framework for managers and policymakers. By linking market orientation, process improvement, and digital readiness, the results demonstrate how firms can simultaneously enhance logistics efficiency and sustainability performance. The capability-chain model provides a practical roadmap for integrating digital tools into sustainable freight and supply-chain operations. The insights are particularly valuable for emerging-economy manufacturers and logistics providers seeking to align operational excellence with environmental stewardship and global transport-sustainability targets.

This study develops and empirically validates an integrated model linking market orientation (MO), process improvement (PI), supply-chain efficiency (SCE), sustainability (SUS), and strategic performance (SP), with digital readiness (DIG) as a moderating factor. Grounded in the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT), the results demonstrate how firms transform market insights into sustainable competitive advantage through a sequential capability chain.

This study relies on self-reported survey data, which may introduce perceptual bias despite the procedural and statistical remedies applied. While senior managers were selected to ensure informed responses, future research could complement perceptual measures with objective indicators such as digital investment levels, process automation rates, or carbon emission metrics. Longitudinal designs and multi-respondent data collection would further strengthen causal inference and reduce common method concerns.

A. *Summary of Findings*

The empirical evidence from 314 manufacturing firms confirms that:

- MO functions as a *sensing capability* that initiates organizational learning and process innovation.
- PI and SCE act as *seizing and transforming capabilities* that convert market-driven insights into operational excellence.
- SUS serves as a *higher-order dynamic capability* linking efficiency to strategic and social value.
- DIG strengthens the PI and SCE pathway, accelerating the transformation process.

Together, these factors account for most of the differences in firms' strategic performance, highlighting the combined importance of digital readiness and sustainability.

B. *Theoretical Contributions*

1. Reconceptualizing Sustainability as a Dynamic Capability: This study advances SCM theory by framing sustainability not as a static outcome, but as a *mediating capability* that enables the renewal and extension of competitive advantage.
2. Integrating RBV and DCT under Digital Transformation: By incorporating digital readiness as a moderator, the model demonstrates *how* technological infrastructure enhances the speed and quality of capability transformation.
3. Unifying the Sensing–Seizing–Transforming–Sustaining Cycle: The model provides a complete theoretical loop where firms sense opportunities (MO), seize them through improvement (PI), transform them into efficiency (SCE), and sustain them via sustainability (SUS).

C. *Managerial Implications*

Managers should view market orientation, process improvement, and sustainability as interconnected pillars of competitive strategy rather than isolated practices. To operationalize this framework:

- Integrate digital systems (e.g., IoT, AI analytics) into continuous improvement processes.
- Measure sustainability KPIs such as energy efficiency, carbon intensity, and supplier ESG compliance as part of performance dashboards.
- Develop cross-functional collaboration between marketing, operations, and IT teams to translate customer insights into green process innovations.

Such alignment enables firms to achieve "digital–sustainability synergy", driving long-term performance and resilience.

D. *Policy Implications*

Policymakers can facilitate sustainable digital transformation by:

- Incentivizing SME digitalization through grants and tax credits for Industry 4.0 technologies.
- Embedding sustainability standards into national procurement and manufacturing policies.
- Encouraging knowledge-sharing platforms between academia and industry to accelerate capability diffusion.

These initiatives align industrial development with the UN Sustainable Development Goals (SDGs 9 and 12) on innovation and responsible production.

E. *Limitations and Future Research Directions*

Although robust, this study has several limitations that suggest avenues for future exploration:

1. Cross-sectional design: Limits causal inference. Longitudinal data could trace the evolution of digital and sustainability capabilities over time.
2. Single-country context: Future research should compare results across different institutional and technological environments (e.g., Asia, North America, and Europe).
3. Self-reported data: Combining perceptual data with objective indicators (e.g., carbon footprint, process automation rates) would improve validity.

Emerging research frontiers include exploring the role of AI-driven decision systems, digital twins, and circular economy mechanisms as next-generation enablers of sustainable supply-chain transformation (Saytari et al., 2025).

F. *Concluding Statement*

In conclusion, the evidence shows that market-oriented firms perform better and achieve stronger sustainability outcomes when they are digitally prepared to support transformation. By integrating RBV, DCT, and sustainability theory, the research contributes to SCMIJ's ongoing discourse on how digitalization and green transition reshape global supply-chain competitiveness. The framework provides practical guidance for developing digitally enabled and sustainable supply chains suited to today's competitive environment.

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Manuscript received by 9 October 2025.

The authors alone are responsible for the content and writing of this article.

Digitalna pripravljenost in tržna usmerjenost kot gonilni sili trajnostne uspešnosti oskrbovalne verige: perspektiva dinamičnih zmogljivosti

Izvleček – Ta študija preučuje, kako tržna usmerjenost prispeva k trajnostni uspešnosti oskrbovalne verige prek izboljšanja procesov in učinkovitosti oskrbovalne verige ter ali digitalna pripravljenost krepi te odnose. Na podlagi teorije virov in dinamičnih zmogljivosti študija pojmuje trajnost kot dinamično zmogljivost, ki povezuje operativno učinkovitost z dolgoročno strateško uspešnostjo. Med proizvodnimi podjetji, ki delujejo v nastajajočem gospodarstvu, je bila izvedena presečna raziskava, predlagane odnose pa so preverili s pomočjo strukturne enačbe. Rezultati kažejo, da tržna usmerjenost izboljšuje strateško uspešnost predvsem prek zaporedne verige sposobnosti, ki vključuje izboljšanje procesov in učinkovitost oskrbovalne verige. Trajnost ima posredniško vlogo, saj učinkovitost pretvarja v trajne konkurenčne rezultate. Poleg tega digitalna pripravljenost krepi vpliv izboljšanja procesov na učinkovitost oskrbovalne verige, kar poudarja pomen tehnološke pripravljenosti pri preoblikovanju zmogljivosti. Ta raziskava prispeva k literaturi o upravljanju oskrbovalne verige z vključitvijo digitalne pripravljenosti in trajnosti v enoten okvir, ki temelji na zmogljivostih ter ponuja praktične vpoglede za upravljavce, ki želijo uskladiti pobude za digitalno preoblikovanje s cilji trajnostne uspešnosti.

Ključne besede – Market orientation, Supply chain efficiency, Digital readiness, Sustainability

APPENDIX 1: MEASUREMENT ITEMS AND SOURCES

Market Orientation (MO)

- MO1: We regularly monitor customer satisfaction and competitor actions.
- MO2: Our decisions are driven by customer feedback and market intelligence.
- MO3: We respond quickly to competitor innovations.
- MO4: Our marketing and production units share market insights regularly.
- MO5: We prioritize long-term customer relationships.
- *Adapted from (Kohli & Jaworski, 1990; Narver & Slater, 1990)*

Process Improvement (PI)

- PI1: We continuously refine processes to reduce waste and defects.
- PI2: Our teams frequently evaluate process effectiveness.
- PI3: Continuous improvement initiatives are supported by top management.
- PI4: We benchmark against industry best practices.
- *Adapted from (Morgan et al., 2009; Schiefer, 2002)*

Supply-Chain Efficiency (SCE)

- SCE1: Our supply chain minimizes delays and bottlenecks.
- SCE2: We achieve optimal utilization of materials and resources.
- SCE3: We effectively synchronize production and logistics.
- SCE4: Our delivery lead times are among the shortest in the industry.
- *Adapted from (Jayaram et al., 2000; Rhee et al., 2007)*

Sustainability (SUS)

- SUS1: We actively minimize the environmental impact of our operations.
- SUS2: Sustainability is a key performance objective.
- SUS3: We collaborate with suppliers for eco-friendly sourcing.
- SUS4: Our firm has programs to reduce carbon emissions.
- *Adapted from (Gunasekaran et al., 2019; Mendonça et al., 2025)*

Strategic Performance (SP)

- SP1: We have achieved superior profitability compared to competitors.
- SP2: Our market share has increased during the past three years.

- SP3: We have improved customer satisfaction levels.
- SP4: Our firm’s overall performance meets or exceeds expectations.
- *Adapted from (Abdulameer & Ibrahim, 2025; Dubey et al., 2023)*

Digital Readiness (DIG)

- DIG1: Our systems are technologically ready for cross-partner data integration.
- DIG2: Our firm has strong IT infrastructure supporting process automation.
- DIG3: Employees are skilled in digital tools and analytics.
- DIG4: Our organization invests regularly in emerging digital technologies.
- *Adapted from (Cosa & Torelli, 2024; Lassnig et al., 2022)*