

Technology-driven operations and strategic management for high-performance global supply chain ecosystems

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Abstract

The accelerating convergence of digital technologies with supply chain operations has fundamentally redefined the parameters of global competitive advantage. This systematic review examines how technology-driven operational frameworks and strategic management paradigms jointly enable high-performance global supply chain ecosystems. Drawing on 87 peer-reviewed studies published between 2015 and 2025, the review synthesises empirical and theoretical literature across five thematic pillars: Industry 4.0 adoption and real-time visibility infrastructure; artificial intelligence and machine learning in demand forecasting and risk management; blockchain-enabled transparency and provenance assurance; sustainable supply chain strategy and circular economy integration; and dynamic capabilities and organisational resilience in turbulent environments. Findings reveal that firms achieving top-quartile supply chain performance consistently combine advanced digital infrastructure with adaptive governance mechanisms and cross-functional strategic alignment. The review proposes an integrative conceptual framework, the Technology-Strategy-Performance (TSP) nexus, that maps the interaction pathways between enabling technologies, strategic management decisions, and ecosystem-level outcomes. Implications are drawn for practitioners managing multi-tier global networks and for scholars advancing supply chain theory in the digital era.

Keywords: Supply chain management; Industry 4.0; Artificial intelligence; Blockchain; Strategic management; Digital transformation; Operational resilience; Circular economy; Global logistics

1. Introduction

Global supply chains have undergone profound structural and operational transformation in the first quarter of the twenty-first century. Heightened demand volatility, geopolitical disruptions, climate-related shocks, and the persistent after-effects of the COVID-19 pandemic have exposed systemic fragilities in traditional supply chain architectures that prioritised cost efficiency over adaptive capacity [1]. Against this backdrop, organisations across sectors have accelerated the adoption of digital technologies not merely as tools of automation but as strategic enablers of ecosystem-level resilience and competitive differentiation.

The literature on supply chain management has correspondingly evolved. Early frameworks emphasised dyadic buyer-supplier relationships and transactional efficiency [2]. Contemporary scholarship, however, conceptualises supply chains as complex adaptive systems embedded in broader socioeconomic and technological ecosystems [3]. This shift

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has elevated the importance of understanding how organisations design, govern, and dynamically reconfigure their operational and strategic capabilities in response to environmental turbulence.

Technology plays a dual role in this context. On the operational front, technologies such as the Internet of Things (IoT), advanced robotics, cloud computing, and autonomous vehicles enable unprecedented levels of visibility, speed, and precision across supply chain nodes [4]. On the strategic front, artificial intelligence (AI), machine learning (ML), and digital twins facilitate anticipatory decision-making, scenario planning, and risk mitigation at scales previously unachievable [5]. The synthesis of operational technology with strategic intelligence constitutes what this review terms the Technology-Strategy-Performance (TSP) nexus.

Despite a burgeoning body of individual studies on discrete technologies and management practices, integrative reviews that span the full breadth of this nexus remain comparatively sparse [6]. Existing reviews have tended to focus narrowly on a single technology or a single performance dimension, without adequately addressing the interactions among multiple technological pillars and the strategic management processes that translate technological investment into performance outcomes.

This review addresses that gap. Specifically, it pursues four objectives: to map the landscape of empirical evidence on technology adoption across the supply chain; to identify the strategic management mechanisms that mediate or moderate the technology-performance relationship; to examine the role of sustainability and circular economy principles in shaping technology strategy; and to propose an integrative conceptual framework that synthesises insights across the reviewed literature.

2. Technology Landscape in Global Supply Chains

The global supply chain technology landscape has undergone a step-change transformation over the past decade, driven by the convergence of connectivity, computing power, and data abundance [7]. Technologies that were once confined to large multinational enterprises have become increasingly accessible to mid-sized and smaller firms, reshaping competitive dynamics across industries and geographies. Understanding the current state of this landscape is essential context for evaluating how individual technologies contribute to supply chain performance and how they interact within broader digital ecosystems.

2.1. The Evolution of Supply Chain Technology

Supply chain technology has progressed through several distinct generations. The first generation, spanning the 1970s through the 1990s, was characterised by the computerisation of transactional processes through enterprise resource planning systems, electronic data interchange, and warehouse management platforms. These systems improved intra-firm efficiency and enabled rudimentary inter-firm data exchange but were largely constrained by proprietary architectures and high implementation costs that limited adoption to large enterprises [8].

The second generation, spanning roughly the 2000s through the early 2010s, was defined by the rise of internet-enabled collaboration platforms, cloud-based supply chain visibility tools, and the early deployment of RFID for inventory tracking. This era brought significant improvements in supply chain transparency and coordination speed, though data remained largely structured and real-time processing capabilities were limited [9]. The third and current generation, anchored in Industry 4.0, is distinguished by the real-time integration of physical and digital systems through cyber-physical infrastructure, enabling supply chains to sense, analyse, and respond to events at a speed and scale without historical precedent.

2.2. Current Technology Adoption Patterns

Adoption of digital supply chain technologies varies considerably across firm size, sector, and geography. Large multinational firms, particularly those operating in the automotive, electronics, and consumer goods sectors, have made the most substantial investments in advanced technologies including IoT sensor networks, AI-driven demand planning platforms, and blockchain-based traceability systems [10]. Mid-sized firms have shown accelerating adoption of cloud-based supply chain management platforms and predictive analytics tools, driven by falling software costs and the growing availability of software-as-a-service deployment models [11].

Geographic variation in adoption is also pronounced. North American and Northern European firms consistently report the highest rates of advanced technology deployment, underpinned by mature digital infrastructure, deep capital markets, and strong talent pools in data science and engineering [12]. Firms operating in emerging market economies face a more complex adoption environment characterised by infrastructure constraints, regulatory uncertainty, and

skills shortages, though leapfrogging dynamics, whereby firms bypass legacy technology generations entirely, are evident in several high-growth markets across Southeast Asia and Sub-Saharan Africa [13].

2.3. Technology Interdependencies and Ecosystem Effects

A defining characteristic of the current technology landscape is the degree to which individual technologies are interdependent rather than standalone. IoT sensors generate the real-time data streams that feed AI analytics engines; blockchain platforms provide the trusted data substrate on which smart contracts operate; and digital twins derive their predictive power from the continuous data flows generated by connected physical assets. These interdependencies mean that the performance value of any single technology is partly a function of what other technologies are deployed alongside it [14].

The ecosystem effects of technology interdependency have significant strategic implications [15]. Firms that invest in isolated point solutions without a coherent technology architecture strategy frequently find that integration costs erode the anticipated performance gains. Conversely, organisations that approach digital transformation with a platform-oriented mindset, designing for interoperability from the outset and building shared data infrastructure that multiple applications can draw upon, consistently achieve higher returns on their technology investments. The technology landscape is therefore best understood not as a menu of discrete tools but as an interconnected system whose emergent capabilities exceed the sum of its component parts.

3. Industry 4.0 Adoption and Real-Time Visibility Infrastructure

The first and most extensively documented theme concerns the deployment of Industry 4.0 technologies to achieve end-to-end supply chain visibility. Visibility, broadly understood as the ability to access timely and accurate information on inventory positions, shipment statuses, and demand signals across multi-tier networks, has long been recognised as a prerequisite for effective supply chain coordination [16]. What has fundamentally changed in the current period is the granularity, latency, and economic viability of visibility solutions.

3.1. The Internet of Things and RFID

Twenty-two studies reviewed in this analysis document the performance implications of real-time visibility investments. Empirical evidence from the manufacturing sector consistently links IoT deployment with significant reductions in inventory holding costs, improvements in order fulfilment rates, and reductions in supply chain cycle times [17]. In the retail sector, RFID-enabled inventory accuracy improvements have been documented to reduce out-of-stock incidents by up to 30 percent [18]. Studies in the food and pharmaceutical sectors further underscore the value of real-time traceability for regulatory compliance and consumer trust.

The operational advantages of IoT and RFID are not limited to large enterprises. Mid-sized manufacturers that adopted modular IoT platforms reported comparable proportional gains in cycle time reduction and inventory accuracy, suggesting that scalable deployment models are widening access to these technologies across firm-size categories [19].

3.2. Digital Twins and Simulation

Digital twins, which are virtual replicas of physical supply chain assets and processes, represent a particularly consequential development within this theme. Manufacturers employing digital twin simulations achieved higher throughput and lower maintenance costs compared to control groups [20]. Digital twins also enable ripple effect modelling, whereby organisations simulate the downstream consequences of upstream disruptions before they materialise operationally [21].

The predictive utility of digital twins has been demonstrated across sectors including automotive, aerospace, and consumer electronics, where the complexity of multi-tier supplier networks amplifies the potential consequences of localised disruptions [22]. By replicating network topology and material flow dynamics in a virtual environment, firms can stress-test their supply chains against hypothetical shock scenarios and refine mitigation strategies accordingly.

3.3. Adoption Barriers and Strategic Enablers

Despite these advances, the literature reveals persistent barriers to adoption, particularly for small and medium-sized enterprises. High initial investment costs, interoperability challenges across heterogeneous technology ecosystems, and shortfalls in digital talent remain significant impediments [23]. Strategic management literature suggests that organisations that treat digital transformation as a whole-of-enterprise change programme, rather than a series of isolated technology purchases, achieve substantially better outcomes [24]. Leadership commitment, dedicated

transformation governance structures, and phased investment roadmaps consistently emerge as differentiating factors between successful and stalled adoption programmes.

4. Artificial Intelligence and Machine Learning

The second thematic cluster encompasses the application of AI and ML across two principal supply chain domains: demand forecasting and supply chain risk management [25]. Twenty-one studies address these applications, reflecting the breadth of scholarly interest and the commercial significance of intelligent decision support. Taken together, these studies establish AI and ML as foundational technologies for supply chain intelligence, with demonstrable performance impacts across firm sizes, sectors, and geographies.

4.1. Demand Sensing and Forecasting

Traditional demand forecasting methods, including exponential smoothing, ARIMA models, and regression-based approaches, have been progressively superseded or at minimum augmented by machine learning models capable of processing high-dimensional, non-linear data inputs. Ensemble methods combining gradient boosting, LSTM networks, and attention mechanisms yield mean absolute percentage errors substantially lower than best-practice statistical baselines on retail demand datasets [26].

Natural language processing has emerged as an important complementary technology, enabling organisations to incorporate unstructured signals such as social media sentiment, news events, weather forecasts, and macroeconomic commentary into demand sensing models. Sentiment-augmented models significantly outperform product attribute-only models during trend inflection points, particularly in the fashion and consumer goods sectors [27].

4.2. Supply Chain Risk Management

AI applications in supply chain risk management span risk identification, risk quantification, and response optimisation. Machine learning has become an increasingly prevalent analytical approach, particularly for supplier risk assessment and disruption prediction. Studies employing graph neural networks to map supply network topologies have demonstrated the ability to identify previously undetected second and third-tier supplier concentration risks that would remain invisible under traditional auditing methods [28].

Reinforcement learning is emerging as a particularly promising avenue for autonomous supply chain optimisation. Unlike supervised learning approaches that learn from historical data, reinforcement learning agents develop adaptive policies that outperform fixed heuristics under novel disruption scenarios [29]. The integration of reinforcement learning with digital twin environments, where agents can be trained and tested without operational risk, represents a significant frontier for future research and practice [30].

4.3. Organisational Readiness for AI Adoption

The performance returns to AI and ML investments are contingent on organisational readiness factors that the literature consistently identifies as preconditions for successful deployment. Data quality and governance infrastructure, cross-functional data literacy, and the availability of skilled analytics professionals each moderate the strength of the AI-performance relationship [31]. Firms that invest systematically in these enabling conditions before deploying advanced algorithms realise significantly greater returns than those that treat algorithm selection as the primary decision variable.

5. Blockchain-Enabled Transparency and Provenance Assurance

Blockchain technology, which is a distributed and immutable ledger system enabling trustless record-keeping across decentralised networks, has attracted considerable scholarly and practitioner attention as a mechanism for addressing supply chain transparency deficits [32]. Eighteen studies in this review address blockchain applications, spanning sectors including food safety, pharmaceuticals, luxury goods, and international trade finance.

5.1. Adoption Drivers and Barriers

Theoretical analysis of blockchain adoption in supply chain management identifies regulatory uncertainty, scalability limitations, and consortium governance challenges as critical impediments to widespread uptake [33]. Empirical studies document positive associations between blockchain adoption and supply chain performance dimensions including transparency, traceability, and trust, though effect sizes vary considerably across sectors and implementation

contextsm [34]. The governance dimension is particularly salient: blockchain platforms that achieve broad multi-firm adoption require agreed protocols, shared infrastructure costs, and mechanisms for resolving disputes about on-chain data, all of which demand collaborative investment that individual firms may be reluctant to commit to unilaterally.

5.2. Smart Contracts and Process Automation

Smart contracts, which are self-executing code inscribed on blockchain platforms that automatically enforce contractual terms when predefined conditions are met, hold particular promise for automating payment, customs clearance, and quality assurance processes across international supply chains. Smart contract enabled payment automation has been shown to reduce invoice processing times by 67 percent and dispute resolution times by 54 percent, generating measurable improvements in working capital efficiency for both buyers and suppliers [35].

Beyond payment automation, smart contracts are being deployed to enforce quality thresholds at goods receipt, trigger automatic replenishment orders when inventory levels breach predefined parameters, and release escrow payments upon verified delivery confirmation [36]. Each of these applications reduces the administrative overhead associated with manual verification and dispute resolution, while simultaneously creating an auditable record of contractual performance.

5.3. The Oracle Problem and IoT Integration

A persistent challenge in the blockchain supply chain literature concerns the oracle problem, which refers to the difficulty of reliably connecting on-chain records to off-chain physical realities. Counterfeit or fraudulent data entered into blockchain systems propagate with the same immutability as legitimate records, undermining the technology's transparency value proposition [37]. Research integrating IoT sensors with blockchain platforms, creating trusted hardware pipelines that automate data ingestion, represents a promising response to this challenge. By minimising human intervention in the data entry process, sensor-to-chain architectures significantly reduce the surface area for fraud and transcription error.

6. Sustainable Supply Chain Strategy and Circular Economy Integration

The integration of sustainability imperatives into supply chain strategy constitutes the fourth thematic pillar of this review. Fifteen studies address this theme, reflecting growing recognition that environmental and social sustainability considerations are no longer peripheral to supply chain management but are increasingly central to licence-to-operate, brand equity, and long-term financial performance [38].

6.1. Green Supply Chain Management

Green supply chain management has evolved from an environmental compliance-oriented practice towards a strategic capability that simultaneously generates cost savings, reduces regulatory risk, and creates differentiated value propositions. Positive relationships between green supply chain practices, including green procurement, eco-design, and reverse logistics, and financial performance metrics including return on assets and market capitalisation are well-documented in the literature [39]. Organisations in highly regulated industries exhibit stronger sustainability and performance associations than those in less-regulated sectors, suggesting that regulatory pressure functions as a critical boundary condition [40].

6.2. Circular Economy Integration

The circular economy paradigm, which conceptualises products and materials as nutrients circulating indefinitely within closed-loop systems, has further enriched the sustainability and supply chain nexus [41]. Technology plays a central enabling role in circular economy supply chains. IoT-enabled product end-of-life tracking facilitates recovery and remanufacturing decisions; AI-driven reverse logistics optimisation reduces the cost of material recapture; and blockchain platforms provide the provenance records essential for secondary markets [42].

Firms that have successfully integrated circular economy principles into their supply chain strategies report not only environmental performance improvements but also meaningful reductions in raw material costs, as recovered and reprocessed materials substitute for virgin inputs [43]. The economic case for circularity is therefore strongest in sectors where material costs constitute a high proportion of total cost of goods sold and where secondary material markets are sufficiently developed to absorb recovered volumes.

6.3. Moderating Factors in Sustainability Performance

Critically, the reviewed studies indicate that sustainability and performance relationships are not unconditional. Moderating factors including regulatory environment stringency, industry structure, consumer demand characteristics, and top management commitment significantly shape the strength and direction of sustainability-performance linkages [44]. Sustainability initiatives that are visibly championed by senior leadership, embedded in executive performance metrics, and supported by dedicated investment budgets consistently outperform those managed as peripheral corporate responsibility functions.

7. Dynamic Capabilities and Organisational Resilience

The fifth thematic cluster addresses the organisational and strategic management side of the TSP nexus, specifically the dynamic capabilities that enable firms to configure, reconfigure, and leverage their supply chain assets in response to turbulent environments [45]. Eleven studies engage directly with dynamic capabilities theory in a supply chain context, with a further subset addressing the related construct of supply chain resilience.

7.1. Supply Chain Agility

Supply chain agility, which is a dynamic capability enabling rapid adjustment to demand and supply volatility, positively and significantly impacts customer satisfaction, market performance, and financial performance [46]. Technology infrastructure emerged as both a direct enabler and a moderator of agility, amplifying the performance returns to agile strategic postures [47]. Organisations that have invested in real-time data infrastructure and cross-functional decision-making processes demonstrate markedly faster response times to demand signals and supply disruptions than those operating through sequential, function-specific information flows.

7.2. Resilience and Disruption Recovery

Supply chain resilience, defined as the ability to prepare for, respond to, and recover from disruptions to return to the original or a superior state of operation, received heightened academic and practitioner attention in the aftermath of the COVID-19 pandemic. Organisations with pre-existing visibility infrastructure, diversified supplier bases, and digital collaboration platforms recovered supply operations significantly faster than peers relying on traditional architectures [48]. The pandemic thus served as a natural experiment validating the performance value of prior resilience investments and exposing the vulnerability of cost-optimised, single-source supply configurations [49].

7.3. Absorptive Capacity as a Mediating Construct

Absorptive capacity, which is the organisational ability to recognise, assimilate, and apply external knowledge, emerges as a crucial mediating construct in the technology-performance relationship. Firms with higher absorptive capacity are better positioned to extract value from technology investments because they can integrate new technological capabilities with existing operational knowledge and routines [50]. This finding has significant implications for the sequencing and governance of digital transformation programmes. Investments in organisational learning infrastructure, including knowledge management systems, cross-functional training programmes, and communities of practice, may therefore be as strategically consequential as the technology investments they are designed to support.

8. The Technology-Strategy-Performance Nexus: An Integrative Framework

Synthesising findings across the five thematic clusters, this review proposes the Technology-Strategy-Performance (TSP) Nexus as an integrative conceptual framework. The TSP Nexus posits three interacting layers of analysis: the Technology Layer, comprising the enabling digital infrastructure and intelligence platforms discussed in the preceding sections; the Strategy Layer, comprising the dynamic capabilities, governance mechanisms, and sustainability orientations; and the Performance Layer, comprising the ecosystem-level outcomes of efficiency, resilience, sustainability, and customer value that constitute the ultimate objectives of supply chain management.

8.1. Framework Propositions

The framework advances three principal propositions. The first proposition holds that technology adoption generates performance benefits only when mediated by appropriate strategic management capabilities, including absorptive capacity, digital leadership, and cross-functional integration. Firms that invest in technology without developing corresponding strategic capabilities consistently underperform relative to technology investment benchmarks [51]. The second proposition holds that the strategic value of individual technologies is amplified when they are deployed as an integrated system rather than as isolated applications. Specifically, the combination of IoT visibility, AI analytics, and

blockchain transparency creates synergistic performance effects that exceed the sum of individual technology contributions.

The third proposition holds that sustainability orientation functions both as a performance objective and as a strategic boundary condition that shapes the design and governance of the technology-strategy interface. Sustainability-integrated technology strategies demonstrate superior long-term financial performance compared to those focused narrowly on operational efficiency or cost reduction [52]. This proposition implies that sustainability considerations should inform technology selection, deployment sequencing, and performance measurement from the outset of digital transformation initiatives rather than being retrofitted as reporting requirements.

8.2. Practical Application of the Framework

The TSP Nexus is intended as both a diagnostic and a prescriptive tool [53]. As a diagnostic, it enables organisations to assess the alignment between their technology investments, strategic management capabilities, and performance objectives, identifying gaps that may explain underperformance relative to industry benchmarks. As a prescriptive tool, it guides investment sequencing by highlighting the enabling conditions, particularly in the Strategy Layer, that must be in place before specific technology deployments are likely to yield their expected returns. Practitioners are encouraged to use the framework as the basis for structured supply chain strategy reviews conducted at regular intervals to account for the pace of technological change.

9. Performance Measurement in Technology-Driven Supply Chains

Performance measurement in technology-driven supply chains has evolved considerably alongside the digital transformation of supply chain operations [54]. Traditional measurement frameworks, which were oriented primarily around cost, quality, delivery, and flexibility metrics, are increasingly inadequate for capturing the full value created by digital investments. A more expansive and nuanced performance measurement architecture is required, one that accounts for resilience, sustainability, innovation capacity, and ecosystem-level value creation alongside conventional operational and financial indicators.

9.1. Frameworks and Metrics for Digital Supply Chain Performance

The Supply Chain Operations Reference (SCOR) model, long regarded as the dominant framework for supply chain performance measurement, has undergone successive revisions to incorporate digital performance dimensions. The most recent iterations of the framework include metrics related to digital responsiveness, data quality, and technology-enabled flexibility, reflecting growing recognition that digital capabilities are performance dimensions in their own right rather than merely enablers of traditional operational metrics[55].¹ Beyond SCOR, researchers have proposed bespoke frameworks tailored to specific technology contexts. Metrics for evaluating IoT-driven visibility programmes include data latency, sensor coverage density, and alert accuracy rates [56]. Frameworks for assessing AI forecasting performance typically employ statistical accuracy measures such as mean absolute percentage error and forecast bias, complemented by financial metrics that translate forecast accuracy improvements into inventory cost savings and revenue protection.

Balanced scorecard approaches adapted for digital supply chains typically organise performance indicators across four perspectives: financial outcomes, customer experience, internal operational processes, and learning and innovation capacity [57]. The learning and innovation perspective is particularly valuable for technology-driven supply chains, as it captures the degree to which digital investments are building the organisational capabilities needed to sustain performance improvements over time rather than merely delivering one-off efficiency gains. Organisations that report against this perspective consistently demonstrate greater long-term performance stability than those focused exclusively on short-term operational and financial metrics.

9.2. Challenges in Attributing Performance to Technology Investments

A persistent challenge in performance measurement for technology-driven supply chains is the attribution of performance outcomes to specific technology investments. Supply chain performance is shaped by multiple simultaneous factors, including market conditions, competitive dynamics, supplier relationships, and macroeconomic variables, that interact with technology investments in complex ways. Isolating the marginal performance contribution of a specific technology deployment from this broader causal landscape is methodologically demanding and practically difficult in operational settings where controlled experimentation is rarely feasible [58].

The attribution challenge is compounded by the interdependent character of modern supply chain technology ecosystems. When IoT sensors, AI analytics, and blockchain traceability are deployed as an integrated platform, attributing performance improvements to any single component of the stack is analytically problematic [59]. Practitioners are consequently encouraged to evaluate technology portfolios holistically rather than seeking to justify individual investments in isolation. Return on investment calculations that account for the synergistic value created by technology integration, rather than appraising each technology independently, provide a more accurate and strategically useful basis for investment decision-making.

9.3. Emerging Dimensions of Supply Chain Performance

The scope of supply chain performance measurement is expanding in response to stakeholder expectations and regulatory requirements that extend well beyond traditional operational and financial metrics. Environmental performance, measured through indicators such as supply chain carbon intensity, waste generation rates, and water consumption per unit of output, is now a standard reporting requirement for publicly listed companies in many jurisdictions and is increasingly demanded by institutional investors as part of broader environmental, social, and governance assessment frameworks [60].

Social performance dimensions, including supplier labour standards compliance, community impact, and supply chain transparency with respect to human rights risks, are also gaining prominence as performance measurement priorities. Technology plays an enabling role in both environmental and social performance measurement: IoT sensors facilitate real-time energy and emissions monitoring; blockchain platforms enable end-to-end supply chain transparency that supports social compliance auditing; and AI-powered analytics tools are being deployed to identify anomalies in supplier behaviour that may indicate labour or environmental standard violations. The integration of these emerging dimensions into mainstream supply chain performance measurement frameworks represents one of the most significant ongoing developments in the field [61].

10. Conclusion

This systematic review has examined the intersection of technology-driven operations and strategic management as the defining architecture of high-performance global supply chain ecosystems in the contemporary era. Synthesising 87 peer-reviewed studies across five thematic clusters, namely Industry 4.0 visibility, AI and machine learning analytics, blockchain transparency, sustainability strategy, and dynamic capabilities, the review has documented a consistent empirical pattern. Organisations that combine advanced digital infrastructure with adaptive strategic management capabilities and sustainability-integrated governance systematically outperform peers on efficiency, resilience, and long-term value creation dimensions.

The Technology-Strategy-Performance Nexus framework proposed herein offers a unifying analytical lens for understanding these relationships. It emphasises that technology is necessary but not sufficient for supply chain performance excellence; the translation of technological investment into performance outcomes requires deliberate strategic choices, organisational capabilities, and governance mechanisms that remain under the control of management. In a period of rapid technological change and persistent environmental uncertainty, this distinction between technology as tool and strategy as intent may be the most consequential insight that supply chain scholarship can offer to practice.

Future research should prioritise longitudinal empirical validation of the TSP Nexus propositions, extend geographical coverage to underrepresented regions, and pursue interdisciplinary collaborations that bridge supply chain management, information systems, and sustainability science. The supply chain challenges of the coming decade, encompassing climate adaptation, geopolitical fragmentation, and circular economy transition, will require theory and evidence commensurate with their complexity.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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