

From Digital Supply Chains to Intelligent Supply Networks: The Next Frontier of Industrial Management

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Introduction

The landscape of industrial management is currently undergoing a profound and irreversible transformation, driven by an intricate web of global interconnectedness, rapidly escalating customer expectations, and an increasingly volatile and unpredictable global environment. For decades, the traditional, linear conceptualization of supply chains, a sequence of discrete actions from raw material to end consumer served as the bedrock for managing the flow of goods and services. However, in an era defined by constant disruption and rapid technological advancement, this model is proving increasingly insufficient. We are witnessing a fundamental paradigm shift: a movement from merely *digital supply chains* to truly *intelligent supply networks*, a development that undeniably represents the next frontier in the evolution of industrial management. This evolution is far more than a simple technological upgrade; it demands a complete re-imagining of the architecture through which goods, information, and value are conceived, created, and ultimately delivered.

The initial steps in this journey towards intelligence began with the widespread digitization of supply chain operations. As Garay-Rondero et al. (2020) compellingly highlight, the contemporary Digital Supply Chain (DSC) model has been meticulously shaped and significantly accelerated by the advent and pervasive integration of Industry 4.0 concepts. This foundational phase involves the strategic deployment of various digital technologies to enhance and streamline processes across the entire supply chain spectrum, from high-level strategic planning down to granular operational execution. The core objective is to foster unprecedented levels of collaboration, both within an enterprise (across functional units) and between different enterprises (across the supply network)

(Jandhyala, 2021). This foundational digitization is paramount for achieving key strategic imperatives such as enhanced responsiveness, robust sustainability, improved profitability, and critical resilience in the face of frequent disruptions (Jandhyala, 2021). In essence, a truly connected and visible supply chain data infrastructure becomes the indispensable bedrock for informed analysis, proactive sensing of market shifts, and agile, effective responses.

Building upon this digital foundation, the true "intelligence" in these evolving networks emerges from the synergistic convergence of cutting-edge digital technologies. Rozhko and Khalov (2026) articulate this transformation, noting how the powerful integration of Artificial Intelligence (AI), Machine Learning (ML), the Internet of Things (IoT), blockchain, digital twins, and cloud computing is converting what were once simple, linear supply chains into complex, self-organizing, and highly intellectual ecosystems. These advanced technological integrations empower supply networks to transcend their traditional functions, enabling them to become truly autonomous, self-optimizing entities. Such intelligent networks are not only capable of sophisticated demand prediction but can also adapt with an unprecedented level of flexibility and transparency, fundamentally altering the competitive landscape for businesses.

Insights from This Issue

In today's profoundly competitive and inherently risky business environment, characterized by frequent global disruptions ranging from pandemics to geopolitical uncertainties, the strategic imperative of Supply Chain Resilience Management (SCRM) has escalated from a desirable attribute to an absolute necessity. As Wu et al. (2025) astutely observe, effective SCRM is now critical for firms seeking to establish a lasting competitive advantage and build truly sustainable supply chains. This involves meticulously crafting flexible, adaptable networks specifically designed to ensure continuous supply and facilitate rapid, agile responses to market fluctuations and unforeseen events. Within this context, an array of digital intelligence technologies, including sophisticated big data analytics, pervasive Internet of Things (IoT) deployments, advanced artificial intelligence, and secure blockchain solutions emerge as potent enablers. These technologies significantly enhance supply chain visibility, refine forecasting capabilities, and provide robust decision support systems, all of which are vital components of a comprehensive SCRM strategy (Wu et al., 2025). Furthermore, this intelligent development is not merely about surviving disruptions but also about fostering sustainable growth (Ma et al., 2025). The current issue of the *Industrial Management Journal* is particularly timely, as it brings together a collection of articles that directly contribute to this critical discourse. The research presented herein provides valuable insights into various facets of this ongoing transformation, exploring themes such as transparency in food supply chains, the impact of the Metaverse on B2B marketing, the critical

barriers to innovation, and the profound implications of blockchain for supply chain management. These contributions collectively underscore the urgency and complexity of the shift from traditional to intelligent supply networks, highlighting both the immense opportunities and the significant challenges that lie ahead for industrial managers and researchers alike.

This editorial note aims to comprehensively explore this pivotal shift, examining the key trends driving the evolution from digital supply chains to intelligent networks. We will delve into the transformative role of advanced technologies, the imperative for resilience and sustainability, and the profound implications for operational paradigms and strategic decision-making. By synthesizing the current research landscape and drawing specific insights from the valuable contributions within this very issue, we intend to illuminate the emerging challenges that accompany this revolution and, crucially, to outline a compelling future research agenda that will guide scholarly inquiry in this dynamic field. Our goal is to provide a holistic overview that not only contextualizes the present but also charts a course for the future of industrial management in an increasingly interconnected and intelligent world.

Future Research Agenda

As the global industrial landscape rapidly transitions from fragmented digital operations to integrated intelligent networks, a plethora of compelling opportunities and critical challenges emerge, demanding rigorous scholarly attention. While significant progress has been made in understanding the digital transformation of supply chains, substantial gaps remain in the literature regarding the comprehensive mechanisms, practical implications, and ethical considerations of fully intelligent supply networks. Filling these voids is paramount for researchers, as highlighted by calls for more holistic frameworks and deeper empirical insights (Wu et al., 2025; Garay-Rondero et al., 2020; Zhao et al., 2020). The complexity inherent in these evolving systems necessitates a forward-looking research agenda that not only addresses present dilemmas but also anticipates future trends and their potential impact. A primary avenue for future research lies in the development of more comprehensive and robust theoretical frameworks capable of fully articulating the intricate complexities of intelligent supply networks. Current models often struggle to capture the dynamic interplay between diverse technological components, human factors, and organizational structures within these interconnected ecosystems. Researchers are encouraged to integrate insights from various theoretical lenses, including network theory, complex adaptive systems theory, and institutional theory, to construct nuanced models that reflect the multi-faceted nature of these networks. Furthermore, the burgeoning field of generative AI presents a fascinating frontier. Future studies should critically examine the transformative impact of generative AI on decision-making optimization within supply chains, exploring how these advanced algorithms can foster proactive, adaptive, and even self-evolving supply chain intelligence (Shen & Lin, 2026).

Beyond theoretical advancements, an urgent need exists for deeper, more granular investigations into specific intelligent technologies and their practical applications. The metaverse, for instance, remains largely unexplored in its potential to revolutionize supply chain interactions, B2B marketing, and collaborative planning; therefore, research should delve into its economic benefits and operational feasibility. Similarly, the role of Intelligent Autonomous Vehicles (IAVs) and other advanced automation technologies warrants further scrutiny, particularly concerning their contributions to enhanced sustainability, reduced energy consumption, and optimized last-mile logistics (Bechtsis et al., 2018). Moreover, the development and application of sophisticated mathematical models and optimization techniques will be crucial for solving the intricate scheduling, routing, and resource allocation problems that characterize complex intelligent networks, ensuring efficiency and resilience in diverse operational contexts (Norozi et al., 2026; Saffarinia et al., 2026).

Conclusion

The journey from traditional, linear supply chains to highly integrated digital systems, and now to the truly intelligent supply networks, represents a defining evolutionary leap in industrial management. This fundamental transformation, propelled by the relentless pace of technological innovation, is reshaping how organizations conceptualize, operate, and derive value from their interconnected processes. We have seen how the convergence of digital intelligence technologies from AI and IoT to blockchain and the metaverse is not merely optimizing existing functions but is fundamentally redesigning supply chain architecture. This shift is critical for fostering unparalleled efficiency, ensuring robust resilience against unpredictable disruptions, and championing the imperative of sustainable growth in an increasingly complex and demanding global marketplace. The insights garnered from both foundational literature and the timely contributions within this journal issue underscore the urgency and strategic importance of embracing this new paradigm. As we stand at this frontier, it is clear that the path ahead, while promising, is also fraught with challenges, be they technical complexities, organizational inertia, or ethical considerations. Overcoming these hurdles will require sustained interdisciplinary research, innovative policy development, and a collaborative spirit across industry, academia, and governmental bodies. The call for a comprehensive future research agenda, focusing on theoretical advancements, technological specificities, and socio-ethical dimensions, is not merely academic; it is an essential guide for navigating the complexities and harnessing the full potential of intelligent supply networks. Ultimately, the successful transition to these smarter, more adaptive ecosystems will define the competitive landscape and sustainable viability of enterprises in the decades to come, solidifying the position of industrial management at the forefront of global innovation.

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