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Research on Key Influencing Factors of Comprehensive Logistics Service Capabilities in the Smart Logistics Environment

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ABSTRACT

This study investigates the key factors influencing comprehensive logistics service capabilities in the context of smart logistics. The purpose is to illuminate how elements like technology, resources, management, and environment affect service performance amid the Internet of Things, big data, and artificial intelligence integration. A conceptual model is developed and tested using data from 300 Chinese logistics firms. Empirical analysis confirms that factors such as information technology application, logistics infrastructure, human resources, supply chain collaboration, and market demand significantly impact comprehensive logistics service capabilities, with technology and collaboration being most influential. The findings suggest that logistics companies should focus on technological innovation and strategic partnerships to enhance service capabilities. This research provides practical guidance for industry optimization and advances the theoretical understanding of logistics service development in smart logistics environments.

KEYWORDS

Smart Logistics, Comprehensive Logistics Service Capability, Influencing Factors, Research Analysis

INTRODUCTION

In the context of rapid technological advancement and the digital transformation of the logistics industry, understanding the key factors that influence comprehensive logistics service capability (CLSC) has become increasingly vital (Haarstad et al., 2024; Jafari & Rezaee., 2014; Krishnan et al., 2024; Liang, et al., 2025). While prior research has explored isolated aspects such as technological innovation or supply chain collaboration (Jefroy et al., 2022; Liu et al., 2022; Singh et al., 2025), there remains a significant gap in integrating these factors within a holistic framework that reflects the complex, dynamic nature of smart logistics environments (Adesoga et al., 2024; Fernández-Miguel et al., 2025).

This study addresses this gap by developing and empirically testing a comprehensive model that captures the multi-faceted influences—namely information technology (IT) application, logistics infrastructure, human resources, enterprise management, supply chain collaboration, and market demand—on CLSC. By utilizing a rigorous quantitative approach grounded in theoretical frameworks

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such as the resource-based view (RBV), dynamic capabilities theory (DCT), and network theory (NT), this research provides a more nuanced understanding of how these factors interact to enhance logistics capabilities under the emerging paradigm of smart logistics.

Furthermore, this work advances existing knowledge by explicitly examining the synergies among technological, managerial, and environmental factors, moving beyond fragmented studies that consider these elements in isolation. Its multi-dimensional approach not only contributes to the theoretical development of logistics competence in digital contexts but also offers practical insights for logistics practitioners seeking to optimize their strategic investments amidst rapid technological change.

In summary, this study's originality lies in its integrated, theory-driven exploration of the determinants of CLSC within smart logistics, providing both academic contributions and actionable guidance for industry stakeholders. Its significance is underscored by the pressing need for logistics firms to adapt strategically in a highly competitive, technology-driven environment, making this research highly relevant for advancing logistics management and digital transformation strategies.

LITERATURE REVIEW

The rapid evolution of smart logistics—driven by technologies such as Internet of Things (IoT), big data, and Artificial Intelligence (AI)—has transformed how scholars conceptualize CLSC, a key indicator of competitiveness in the logistics sector. While prior research has identified various drivers of CLSC, studies have often focused on isolated factors like technological adoption or supply chain efficiency, failing to integrate their analysis across systemic, contextual, and theoretical dimensions. To address these limitations, this review synthesizes existing work around six core variables—IT, logistics infrastructure, human resources, enterprise management, supply chain collaboration, and market demand—within a unified framework grounded in the RBV, DCT, and NT, thereby establishing a foundation for hypothesis development.

The influence of IT on CLSC is explained primarily through RBV and DCT. RBV suggests that IT resources contribute to sustainable advantage when they are valuable, rare, inimitable, and non-substitutable (Jafari & Rezaee, 2014), while DCT highlights firms' ability to reconfigure such resources in response to environmental shifts (Bhatia et al., 2024). Empirically, technologies like IoT-enabled tracking, AI-driven forecasting, and blockchain enhance operational efficiency through real-time analytics and automation (Paramesha et al., 2024). However, current research faces two main limitations: geographic concentration, particularly in Chinese contexts (Tang et al., 2024; Xu et al., 2024); and narrow operationalizations focusing on single technologies rather than holistic adoption. Regulatory environments, investment patterns, and industrial policies shape technological deployment differently across regions—for instance, general data protection regulation in Europe constrains data usage (Kittur & Agarwal, 2024), U.S. private-sector funding accelerates robotics (Parhi et al., 2022), and Germany's Industry 4.0 strategy fosters deep manufacturing–logistics integration (Khan et al., 2022). To overcome these constraints, this study conceptualizes IT across three dimensions: adoption (deployment of tools like AI and IoT), integration (interoperability with legacy systems such as Enterprise Resource Planning—ERP), and innovation (development of proprietary solutions), offering a more nuanced understanding of IT's role in CLSC.

Similarly, supply chain collaboration is recognized as vital for enhancing CLSC, drawing from NT, which emphasizes value creation through inter-organizational relationships (Xiufan et al., 2024), and transaction cost theory, which underscores efficiency gains via coordinated exchange (Rindfleisch, 2020). Collaboration encompasses information sharing, process synchronization, and strategic alliances, all of which have been shown to reduce transaction costs and improve responsiveness (Sun et al., 2022). Yet existing studies have largely been confined to single-country settings and lack a thorough examination of how institutional and organizational contexts moderate collaborative effectiveness. For example, Japanese firms favor long-term trust-based partnerships (Ohashi et al., 2024), European firms rely on formal digital platforms, and Brazilian operations face coordination