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Artificial Intelligence, Cyber-Physical Systems, and Decision Making in Operations and Supply Chain Management

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The confluence of artificial intelligence (AI), autonomous cyber-physical systems (CPS), and sophisticated decision-making technologies represents more than incremental advancement in operations and supply chain management (OSCM)—it signals a fundamental paradigm shift that redefines how organizations create, deliver, and capture value in interconnected global networks. This transformation occurs at a pivotal moment when supply chain vulnerabilities exposed by recent global disruptions intersect with unprecedented technological capabilities. This special issue advances the OSCM research frontier through methodologically diverse investigations that collectively reveal three critical insights regarding the complex interplay within technology-enabled supply chain transformation.

First, the democratization of sensing and connectivity technologies creates a paradox where accessibility does not guarantee capability. Mirzaei et al. (2025) demonstrates through technology affordance theory how GPS trackers, RFID tags, and IoT devices enable powerful monitoring capabilities in New Zealand's fishing industry, yet implementation success depends more on user knowledge, contextual conditions, and organizational readiness than on technological sophistication. Pramudika et al. (2025) reinforces this finding through AI-IoT integration in cold storage systems and achieves notable efficiency gains while revealing that sustainable retail transformation requires not just technological deployment but careful attention to organizational readiness and energy-conscious decision-making frameworks. Tong (2025) extends this insight by showing how intelligent barcode systems outperform traditional approaches but require deployment expertise that organizations often lack despite their reduced complexity compared to RFID alternatives. These findings challenge the technology adoption literature's focus on features and functionality by directing more attention toward organizational capability development.

Second, the research reveals organizational culture and human factors as critical moderating variables that determine whether AI and CPS investments amplify or diminish operational performance. Es-satty et al. (2025) provides compelling empirical evidence through the supply chain operations reference model and dynamic capabilities theory that organizational culture significantly moderates the relationship between AI technologies and supply chain reliability. Lasse et al. (2025) deepens this understanding through their investigation of AI-driven collaboration platforms in Indonesian ports and uncovers socio-technical challenges that can derail digital initiatives despite technological readiness. Dowling and Haddud (2025) demonstrates this pattern's persistence across maritime freight forwarding, where substantial employee support coexists with fundamental management and workforce development challenges. These contributions extend socio-technical systems theory by identifying specific mechanisms through which human factors mediate technological effectiveness in supply chain contexts.

Third, the research demonstrates that sophisticated optimization models achieve remarkable results when they integrate algorithmic innovation with contextual problem understanding. To and Phan (2025) exemplifies this through multi-objective optimization frameworks that integrate diverse forecasting methodologies with mixed integer linear programming and achieves substantial cost reductions in supplier selection and order allocation tasks. Vu et al. (2025) advances time-sensitive logistics through robust algorithms for frozen distribution and effectively manages delivery variations through simulated annealing approaches. Farahani et al. (2025) showcases stochastic programming frameworks that integrate scenario-based demand modeling with progressive hedging algorithms for fleet management during pharmaceutical distribution crises. A repeated theme demonstrated across these studies is how implementation pragmatism integrated directly within algorithmic sophistication, including both AI-driven and direct model-based approaches, can deliver impressive success in modern operations.

Broader theoretical implications emerge through bibliometric research synthesis. Elghomri et al. (2025) contextualizes these findings through their analysis of recent schol-

arly studies and reveals growth in AI research alongside persistent implementation gaps. Mahmah et al. (2025) provides empirical validation through systematic evaluation of Industry 4.0 adoption across emerging markets and highlights selective adoption patterns where organizations pursue pragmatic rather than purely technical transformation paths. Pham and Bris (2025) synthesizes AI implementations across diverse organizations, from multinational corporations to startups, while emphasizing the organizational transformation required for effective adoption.

These findings add nuance to OSCM and AI convergence, which is often neglected when approached separately. OSCM literature often emphasizes the need for technological adoption, while emerging technology literature often focuses on early prototypical and siloed deployment when quantifying adoption metrics. By bridging discussions from both fields, this special issue establishes that successful integration of AI, cyber-physical systems, and advanced decision-making in supply chains at scale transcends technological adoption and requires organizational transformation. The research challenges traditional technology acceptance models by demonstrating that implementation success depends on complex interactions between technological capabilities, organizational culture, human factors, and contextual conditions. For practitioners, these findings suggest that sustainable competitive advantage lies not only in choosing which advanced technologies to adopt, but also in developing human-centered organizational capabilities.

The research agenda emerging from this collection points toward several critical directions. First, future research should investigate the dynamic capabilities required for organizations to effectively integrate AI and CPS technologies across diverse operational contexts. Second, substantial methodological innovation is needed to capture the complex socio-technical interactions that determine implementation success in supply chain contexts, beyond accuracy or other technical metrics often emphasized during development. Finally, longitudinal studies are essential to understand how organizations build technology orchestration capabilities that focus on human-centric acceptance over time.

As guest editors, we believe this collection establishes new foundations and provides actionable guidance for the OSCM community. The research demonstrates that the future of supply chain management lies in orchestrating intelligent systems that amplify human capabilities while remaining grounded in organizational realities. We extend our gratitude to the authors, reviewers, and editorial team whose contributions made this collection possible.

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