

# The smart supply chain management: Huawei's innovative approach

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## Abstract

**Purpose** – This study examines the role of artificial intelligence (AI) in enhancing supply chain performance through a case study of Huawei's ISC + project. It investigates how AI-driven decision-making, self-learning algorithms and digital twin technologies contribute to optimising logistics operations, improving resilience and enabling data-driven risk management in real time.

**Design/methodology/approach** – Adopting a qualitative single-case study approach, the research analyses secondary data from corporate reports, industry publications and peer-reviewed sources. It focuses on Huawei's integration of AI with information and communication technologies (ICT), including the Internet of Things (IoT) and global positioning systems (GPS), to advance transparency, coordination and operational agility.

**Findings** – The findings reveal that Huawei's deployment of AI and supply chain visualisation systems has improved decision-making accuracy, reduced lead times and enhanced resource utilisation. The integration of digital twins and real-time analytics has strengthened Huawei's capacity to predict disruptions, optimise workflows and support continuous business growth.

**Practical implications** – The study offers practical insights for organisations seeking to modernise their supply chains through digital transformation. However, further research involving multi-case and longitudinal designs is needed to validate the generalisability of AI strategies and to address emerging concerns related to data governance and system interoperability.

**Originality/value** – This research provides an integrated analytical perspective on the convergence of AI, digital twins and supply chain management. Unlike prior studies that examine these technologies in isolation, this study highlights their synergistic role in fostering agility, resilience and sustainable competitiveness, using Huawei's ISC + initiative as an empirical reference.

**Keywords** Artificial intelligence (AI), Supply chain management (SCM), Huawei ISC+ project, Digital twins, Self-learning algorithms, Data-driven decision-making

**Paper type** Research article

## 1. Introduction

The global pandemic underscored the critical importance of resilient and adaptive supply chain management (SCM). The disruptions it caused exposed inherent weaknesses in traditional supply chain models, emphasising the need for organisations to rethink their strategies to mitigate risks and sustain performance in volatile environments. In today's interconnected and competitive global marketplace, efficient SCM is increasingly viewed as a key driver of operational excellence and sustainable growth (Merkert and Hoberg, 2023).

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In response to these challenges, the integration of artificial intelligence (AI) into SCM has emerged as a transformative strategy for modern enterprises. AI technologies enable firms to enhance forecasting accuracy, optimise logistics operations, and strengthen decision-making processes across all supply chain stages. Among the companies leading this digital transformation is Huawei, which has successfully embedded AI into its supply chain systems to achieve greater efficiency, agility and sustainability.

Founded in 1987, Huawei is a global leader in information and communication technology (ICT), employing over 207,000 people across 170 countries. Its operations span four key domains: telecommunications networks, computing, connected devices and cloud services. The company's strategic vision is centred on facilitating digital transformation for its clients by translating advanced technologies into competitive products and solutions (Huawei, 2024a, b, c).

In the transport and logistics sector, Huawei has aligned its innovation strategy with the need for intelligent, data-driven mobility solutions. Through the integration of digital infrastructure and AI-based technologies, the company has enhanced operational performance, security, and mobility. Its smart systems are currently deployed in over 210 airports, 300 urban rail lines, and 70 cities worldwide, enabling real-time monitoring, predictive maintenance and optimised passenger and cargo movement (Huawei, 2024a, b, c). Moreover, Huawei collaborates with more than 100 partners globally to develop intelligent navigation and communication solutions that advance digital logistics.

All aspects of Huawei's management system, including quality management, service delivery, cybersecurity and supply chain operations, are certified by leading international organisations (Huawei, 2024a, b, c). This comprehensive approach reflects Huawei's commitment to operational excellence and positions it as a valuable case for examining how AI integration can redefine supply chain performance and resilience.

Accordingly, this study aims to explore how Huawei integrates AI technologies within its SCM framework and assess the resulting impacts on efficiency, risk reduction and sustainability. By examining Huawei's strategic practices, the study contributes to a deeper understanding of AI-driven supply chain transformation in the post-pandemic context.

## 2. Literature review

AI has emerged as one of the most influential technologies in the contemporary business landscape. It has been integrated into multiple industries, driving the evolution of Industry 4.0 and Industry 5.0, which are expected to define the future of digital transformation (Toorajipour *et al.*, 2021). The term "Artificial Intelligence" was introduced by John McCarthy during the celebrated Turing Test in 1950 and later formalised at the Dartmouth Workshop in 1956 (Helo and Hao, 2022). AI is broadly defined as the capability of machines to perform cognitive functions such as learning, reasoning and problem-solving that typically require human intelligence (Stuart and Norvig, 2021). Since its inception, AI has advanced rapidly, driven by increasing customer expectations, global competition, the fast pace of technological innovation, digital transformation and the disruptions caused by the global pandemic.

Building on this historical evolution, recent technological breakthroughs have significantly accelerated the development and application of AI in modern organisations. The progress of AI technologies, enabled by advances in computing power, data availability and algorithmic sophistication, has transformed how organisations operate and compete (Helo and Hao, 2022). In addition to providing financial and business advantages, AI offers numerous organisational benefits, including the development of new competencies, enhanced automation capabilities and the potential to drive innovation, improve decision-making processes and increase operational efficiency. AI algorithms excel at analysing vast amounts of data to uncover trends and insights that may be invisible to human analysts, thereby supporting the formulation of more informed strategic choices. This capability accelerates decision-making and improves the accuracy of forecasts and risk assessments. Moreover, AI can streamline operations by

optimising supply chains, predicting maintenance needs and personalising customer experiences (Bawa, 2023).

The application of AI enables the rapid and precise analysis of extensive datasets, strengthening organisations' capacity for strategic planning and data-driven decision-making. AI encompasses several technological subfields, machine learning (ML), which enables systems to learn patterns from data; deep learning (DL), which processes complex, unstructured information such as images or text through neural networks; and natural language processing (NLP), which allows machines to understand and generate human language (Stuart and Norvig, 2021; Goodfellow *et al.*, 2023). These technologies collectively enhance predictive analytics by examining historical data and generating forecasts that support proactive risk management and opportunity identification (Samuel *et al.*, 2021).

Furthermore, automation supported by AI technologies allows employees to shift from repetitive tasks to more analytical and creative functions, thereby fostering organisational learning and innovation (Arun *et al.*, 2019). This transformation enhances employees' understanding of workflows and their contribution to broader strategic objectives.

Moreover, AI-driven tools improve customer engagement and satisfaction by enabling personalised interactions, adaptive recommendations and predictive service delivery (Singh and Singh, 2024). Such responsiveness to customer preferences strengthens brand loyalty and competitiveness. Finally, cultivating an innovation-oriented culture supported by AI insights enables firms to continuously adapt to market fluctuations and sustain long-term relevance in a dynamic global environment (Singh and Singh, 2024).

To demonstrate the significance of AI implementation within businesses, and according to a study conducted on a sample of 2,342 IT companies with more than 1,000 employees that adopted AI solutions between 2019 and 2023 (IBM, 2022), the results shown in Figure 1 were found:

As illustrated in Figure 1, over the 2019–2023 period, 44% of companies maintained their levels of AI adoption. Meanwhile, as of November 2023, 42% of companies utilising AI and 40% of companies exploring AI were in operation. The prior study indicated that, in November 2023, the uptake of AI in business operations differed across various industries. The breakdown below shows adoption percentages by industry.

As shown in Figure 2, AI adoption varies significantly across industries. The highest deployment rates are observed in financial services (49%), the industrial sector (42%) and government (37%), reflecting the strategic importance of AI in data-intensive and decision-driven fields. In contrast, sectors such as telecommunications and global enterprise display notably lower adoption levels, at 9% and 3% respectively. Moreover, the substantial share of organisations still in the exploratory stage – particularly in travel and transportation (53%), energy and utilities (51%) and healthcare (47%) – suggests a widespread recognition of AI's

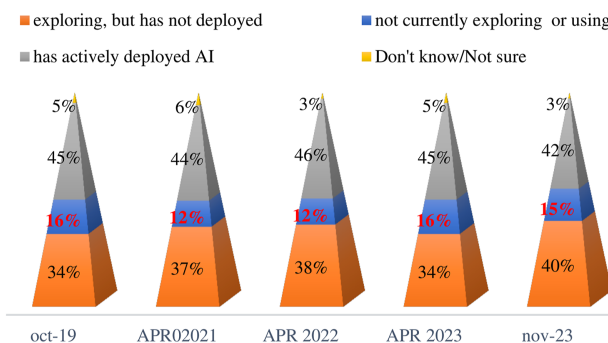


Figure 1. Evolution of AI Usage in businesses from 2019 to 2023

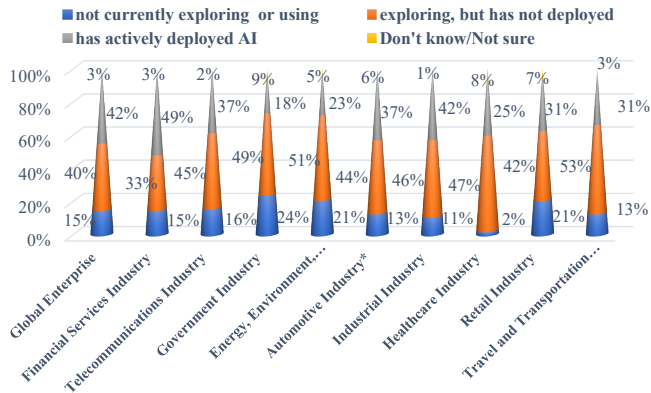


Figure 2. AI adoption in various Industries: Exploration and deployment

potential, even among industries facing technical or regulatory barriers to implementation. These findings emphasise the uneven yet accelerating nature of AI diffusion across sectors, supporting the argument that organisational readiness and contextual factors strongly influence adoption rates (IBM, 2022).

SCM is broadly defined as the coordination and integration of all activities involved in sourcing, production and distribution to ensure that goods and services reach end users efficiently and effectively (Mentzer *et al.*, 2001). It encompasses several functional domains, including procurement, manufacturing, logistics and customer service. In the context of digital transformation, AI has emerged as a catalyst for reshaping these processes by enabling systems to perform complex analytical tasks such as model training, feature engineering, parameter optimisation and continuous model updating (Mussomeli *et al.*, 2023).

AI's integration into SCM allows firms to transition from reactive to predictive and prescriptive decision-making. Through tools such as predictive analytics, organisations can forecast demand fluctuations, optimise inventory levels and mitigate supply-demand imbalances (Ivanov and Dolgui, 2021). This shift not only enhances operational efficiency but also strengthens resilience in the face of market volatility. However, the successful implementation of AI-driven SCM depends on data quality, technological readiness and managerial alignment, suggesting that the benefits of AI adoption are uneven across sectors and organisational contexts (Wamba, 2024).

AI also strengthens quality management within supply chain processes by allowing managers to anticipate potential defects and operational inefficiencies before they escalate into costly problems (Mussomeli *et al.*, 2023). Through continuous data monitoring and process optimisation, AI supports proactive interventions that safeguard product reliability and profitability. Furthermore, AI-based supply chain systems enhance decision reliability by incorporating self-learning mechanisms that refine insights over time. These systems typically operate through four integrated capabilities: optimisation, predictive analysis, modelling and simulation, and decision-support functions, all of which enable organisations to move from reactive to predictive management approaches (Mussomeli *et al.*, 2023). From a critical standpoint, however, the effectiveness of these applications depends heavily on data quality, cross-departmental collaboration, and the organisation's digital maturity, without which the potential of AI may remain underexploited.

Leveraging these operational capabilities, many companies have integrated AI across their supply chains, achieving measurable improvements in efficiency, forecasting and decision-making. The following Table 1 presents a selection of companies that have benefited from the integration of AI in diverse aspects of their supply chains:

**Table 1.** The benefits of implementing AI in supply chain in some industries

Industry	Organization	Benefits of AI application in supply chain
The Industries Organisations Benefiting from AI Application in Supply Chain	<i>Global transportation leader</i>	Predictive maintenance by \$110M + annual benefits across 160+ location
	<i>Global Automotive OEM</i>	Avoidance of \$46M in penalties in investigation of issues
	<i>Global Appliances Leader</i>	Benefits across 97M\$ –150M\$ by optimises manufacturing, logistics services, and inventory
	<i>Food and Beverage Company</i>	Benefits from finding sources and savings across 75M\$
	<i>Major Airline</i>	Cost reduction and Performance Management Enabled 1B\$ inventory reduction opportunity
	<i>Global Automotive OEM</i>	Scenario simulations for inventory +200M\$ cost-saving opportunity
	<i>Aerospace Manufacturer</i>	Tracking resources in real time by planning Enabled 228M\$ benefits in production and 12% improvement in throughput
	<i>Global Medical Devices Leader</i>	Inventory reduction Unlocked +550M\$ reduction opportunity

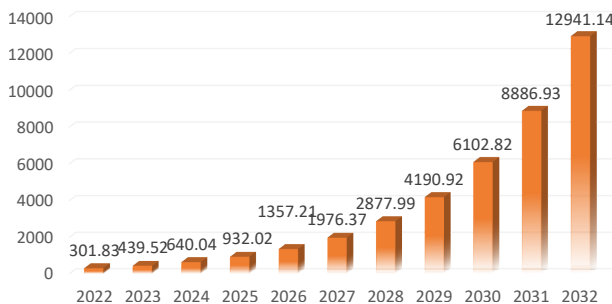
Forecasts from 2023 to 2032 project significant growth in the generative AI supply chain market (Precedence Research, 2023), as illustrated in Figure 3.

The graph demonstrates a substantial increase from 301.83 USD million in 2022 to approximately 12,941.14 USD million by 2032, reflecting robust market demand for generative AI solutions to optimise and enhance supply chain operations.

Extending the impact of generative AI adoption, these technologies not only support market growth but also enhance operational adaptability and efficiency across logistics processes. AI strengthens supply chain performance by enabling dynamic, adaptive operations. This is achieved through AI-driven warehouse automation, optimised order fulfilment and improved transportation management, which collectively boost logistics efficiency. Additionally, AI facilitates supplier data assessment and precision quality control via AI-based vision systems (Madancian et al., 2024). However, despite these advantages, challenges remain, such as the need for high-quality data, integration complexity and potential resistance from employees adapting to AI-driven workflows.

Prior research has investigated various aspects of AI in SCM. The following table (Table 2) synthesises the main studies, highlighting their focus, findings and critical observations.

The literature reveals a strong focus on AI’s capacity to improve predictive analytics. It also highlights its potential to enhance operational efficiency. Furthermore, it shows how AI can



**Figure 3.** Generative AI in logistics markets in the next decade from 2023 to 2032 -Base Year: 2023 (In USD million)

improve decision-making in supply chains. Generative AI and digital twins are emerging as transformative tools, particularly with regard to resilience and adaptive operations. However, several studies omit integration with the Internet of Things (IoT), self-learning algorithms or real-time tracking, and there is uneven coverage of dynamic, adaptive supply chain processes across industries. Furthermore, many studies concentrate on particular sectors or regional contexts, which restricts the generalisability of their findings. These gaps highlight the necessity for more extensive, integrated research into AI applications that combine generative AI, digital twins, the IoT and adaptive decision-making processes in various supply chains.

### 3. Methodology

This study employs a qualitative single-case study design to investigate Huawei's AI-driven supply chain transformation through its ISC + project. The rationale behind this approach is that it facilitates the study of a genuine phenomenon within its authentic context, a prerequisite for comprehending the practical implementation of AI in logistics and decision-making (Yin, 2018).

#### 3.1 Case selection

Huawei was selected as a case study due to its status as a leading example of digital transformation in the realm of SCM. The company's ISC + project, incorporating the Lingfeng Intelligent Logistics Center and digital twin applications, provides a comprehensive and well-documented model of AI integration. The selection was also based on the availability of rich secondary data, which allowed for a deep and reliable analysis.

#### 3.2 Data sources

The study relies only on reliable secondary sources such as:

- (1) Huawei's corporate and sustainability reports (2022–2024);
- (2) Industry reports from IBM, and Precedence Research (2023–2025);
- (3) About 35 peer-reviewed articles on AI in SCM, identified through keyword searches on Scopus and Web of Science (using terms such as AI in SCM, digital transformation and digital twins).

#### 3.3 Data analysis

Data were analysed using qualitative content analysis following (Dubé and Paré, 2003). The process involved three main steps:

- (1) Coding key information related to AI applications, logistics processes and performance outcomes;
- (2) Identifying themes to show how AI supports efficiency and decision-making;
- (3) Comparing findings with existing studies to highlight new insights and differences.

#### 3.4 Reliability and limitations

To ensure the reliability of the results, data were cross-checked across multiple independent sources (corporate, academic and industry). However, because this research is based on secondary data, some internal operational details were not available. Nevertheless, the

**Table 2.** Summary of key studies on AI in supply chain management

Author(s), Year	Study focus	Key findings	Limitations
<a href="#">Mashayekhy et al. (2022)</a>	Internet of Things (IoT) in inventory management	Demonstrates how IoT integration improves visibility, control and automation in inventory systems; highlights transition toward Supply Chain 4.0	Relies on traditional inventory models that may not adapt to rapid technological shifts or real-time data integration
<a href="#">Zakaria et al. (2024)</a>	Smart warehousing and intelligent logistics	Provides a comparative assessment of traditional vs. smart warehousing; reveals efficiency gains, cost reduction and improved sustainability through automation	Limited exploration of AI and self-learning systems; focus remains on infrastructure rather than cognitive technologies
<a href="#">Roman et al. (2025)</a>	AI and digital twins for resilience under climate disruptions	Explores how AI-driven digital twins enable real-time monitoring and adaptive responses to environmental risks, enhancing manufacturing continuity	Focuses primarily on digital-twin applications, offering minimal discussion of IoT or generative AI integration
<a href="#">Culot et al. (2024)</a>	Experimental AI techniques in supply-chain operations	Reviews technological applications, organisational integration and performance impacts of AI across industries	Broad theoretical review; lacks emphasis on specific AI forms such as generative AI or IoT-enabled analytics
<a href="#">Boone et al. (2025)</a>	Generative AI for supply-chain resilience	Shows that generative AI improves decision-making, automation, and adaptability; highlights real-time scenario simulation	Focused on generative models; limited comparison with traditional AI or physical logistics systems
<a href="#">Wu et al. (2025)</a>	Capabilities and challenges of Generative AI in SCM	Identifies empowerment mechanisms and organisational enablers for GAI adoption; proposes a conceptual roadmap for integration	Does not address IoT, digital twins or cross-system synchronisation
<a href="#">Kurrahman et al. (2025)</a>	AI for green supply-chain management in the automotive sector	Integrates AI with dynamic-capabilities theory to enhance environmental responsiveness and innovation in GSCM.	Empirical evidence limited to Indonesia's automotive industry, reducing global generalisability
<a href="#">Beta et al. (2025)</a>	AI's impact on supply-chain resilience	Confirms AI's role in improving demand forecasting, operational efficiency, and customer satisfaction; supports data-driven adaptability	Focuses broadly on AI benefits; lacks discussion of IoT, self-learning algorithms or predictive maintenance
<a href="#">Riad et al. (2024)</a>	AI for risk management and collaborative networks	Proposes an AI-based framework that enhances risk control, efficiency and partner collaboration through data sharing	Theoretical orientation; omits integration with IoT and digital-twin technologies
<a href="#">Li et al. (2024)</a>	Artificial General Intelligence (AGI) in supply-chain coordination	Finds that AGI usage depth and supplier-buyer coordination significantly influence performance; highlights importance of adaptive decision-making	Focus limited to relational coordination mechanisms; lacks wider SCM applicability
<a href="#">Vandana et al. (2024)</a>	AI and machine learning for real-time monitoring	Demonstrates AI's potential to improve control and monitoring in global logistics; supports faster response to disruptions	Concentrates on monitoring; minimal discussion of strategic decision-making or integration with predictive systems

reliability and validity of the results are enhanced by the presence of consistent information from multiple credible sources.

#### 4. Results

Huawei Technologies Co., Ltd., a leading global provider of information and communications technology (ICT) solutions, operates extensive supply chains across manufacturing, logistics, and services. Its adoption of AI-driven solutions in SCM makes it a relevant case study for examining the impact of advanced technologies on operational efficiency and resilience. The following subsections present Huawei's initiatives and results in implementing intelligent supply chain practices:

##### 4.1 *Integrated supply chain plus (ISC+) project*

Initiated in 2015, the ISC + project focuses on developing intelligent logistics solutions that provide comprehensive visualisation of the logistics process. Dedicated zones for high-frequency material picking and consolidation have enabled Huawei to optimise storage and retrieval operations. The centralised warehouse integrates the management of perishable and moisture-sensitive items with automatic stock replenishment, ensuring reliable handling of complex logistics scenarios (Ping, 2017).

##### 4.2 *Intelligent logistics solutions*

The ISC + project incorporates automated systems that enable seamless communication between warehouses and production lines. Automated trolleys efficiently move materials, improving operational efficiency and enabling rapid responses to changing demands (Ping, 2017).

##### 4.3 *Algorithmic Modelling*

Huawei employs algorithmic modelling to optimise logistics operations and decision-making processes. This approach improves resource allocation and forecasting, strengthening supply chain resilience (Ping, 2017).

##### 4.4 *Collaboration in transport systems*

Huawei has developed a framework aligning innovation with client services in the transport industry. By leveraging intelligent components and a numeric base for transport systems, Huawei enhances security and performance across its extensive network of airports and urban rail lines (Ping, 2017).

##### 4.5 *Certification and quality management*

Huawei's management systems are certified by leading industry organisations, reflecting adherence to high standards in quality management, service delivery, SCM and cybersecurity. This ensures reliability and trustworthiness of operations (Ping, 2017).

The results indicate measurable improvements in inventory turnover, delivery times, and forecast accuracy. Huawei observed a reduction in manual labour, enhanced resource visibility and improved responsiveness to fluctuations in supply and demand. To implement the ISC + project, the company leveraged algorithmic modelling in conjunction with the Lingfeng Intelligent Logistics Centre, creating an integrated framework for intelligent SCM. This approach allowed Huawei to optimise operations, enhance decision-making and strengthen overall supply chain resilience.

#### 4.6 Algorithmic modelling for the intelligent supply chain

To implement the ISC + project, Huawei employed algorithmic modelling as a core component of its intelligent SCM strategy, supported by the Lingfeng Intelligent Logistics Centre. The company treats data as a strategic asset, focusing on three key areas: business objects, business processes and business rules. Prioritising these elements allows Huawei to create an integrated framework that streamlines operations, fosters innovation and enhances adaptability in a rapidly evolving technological environment (Huawei, 2024a, b, c).

A key aspect of this strategy is the development of advanced analytical models, such as the multi-objective combinatorial optimisation (MOCO) algorithm illustrated in Figure 4, which is designed to match supply and demand effectively. This approach supports Huawei's broader shift toward digital transformation, leveraging big data to improve forecasting accuracy, reduce costs and enhance operational agility (Huawei, 2024a, b, c).

The optimisation framework balances multiple objectives, including cost minimisation and service-level maximisation, by selecting solutions from discrete decision spaces. This extends classical optimisation problems, such as the Vehicle Routing Problem and Supply Chain Scheduling, allowing the simultaneous management of millions of decision variables – including inventory levels, transportation routes and supplier capacities (Huawei, 2024a, b, c).

Hybrid algorithms are used to solve these large-scale problems efficiently. Linear Programming (LP) addresses linear relationships and constraints, while Mixed-Integer Programming (MIP) models discrete decisions, such as shipment quantities and facility operations. By considering real-world constraints – such as resource capacities, lead times and logistical limitations – this framework provides practical and feasible solutions. Overall, Huawei's approach aligns with modern operations research practices that emphasise robust, adaptive models for dynamic and stochastic supply chain environments.

#### 4.7 The Lingfeng intelligent logistics centre

The Lingfeng Intelligent Logistics Centre, situated within Huawei's logistics campus, is designed to optimise automated material distribution, warehousing, scheduling and production operations based on wave picking principles. Automated measurement and scanning systems are applied to finished products to ensure accuracy. When a shipping order is generated, drivers can select pickup times through a digital platform, which calculates optimal routes and estimated travel times. The tallying process is coordinated with driver arrival schedules, ensuring that goods are ready for immediate dispatch.

The system employs a digital engine to manage resources efficiently, including personnel, vehicles, goods, storage and orders, while integrating scheduling across reception, storage, picking, tallying and delivery. This facilitates the transformation of Huawei's supply chain into a two-tier intelligent business system (Lening, 2022).

At the core of this transformation is the Intelligent Operation Centre (IOC), which enhances operational efficiency through automated anomaly detection using over 300 deployed probes,

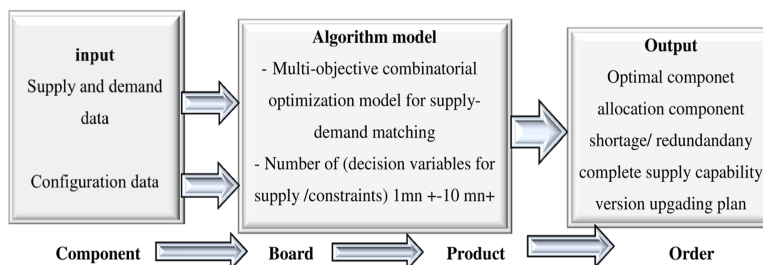


Figure 4. Scenario design and algorithm modelling for Huawei's intelligent supply chain

exception management automation and rapid analysis of risk events. The IOC provides real-time visibility of resources and supply status, evaluates material shortages, performs automated risk assessments and generates recommendations for process adjustments with minimal human intervention. Updates are automatically relayed to relevant managers, improving responsiveness and supporting the development of supply chain digital twins (Lening, 2022).

Digital twins enable the replication of physical supply chain operations in a digital environment, creating a closed loop between digital simulations and real-world processes. Based on predefined scenarios, the system guides operational decisions through intelligent service instructions, allowing for proactive risk management and optimisation of supply chain activities (Lening, 2022). Figure 5 illustrates the structure and main components of Huawei's intelligent supply chain system.

The principal elements of the "cloud brain" include data management, simulation, contingency planning and decision-making. This digitalisation framework interacts with service-oriented processes and information systems, connecting suppliers, factories, distribution centres (DCs), customs, warehouses and customers. The use of predefined scenarios and algorithmic rules optimises the planning and execution of supply chain operations. At the foundation of this system is the Lingfeng Intelligent Engine, comprising several entities (Lingfeng A, B, C, etc.), which integrates digital logistics solutions with physical operations.

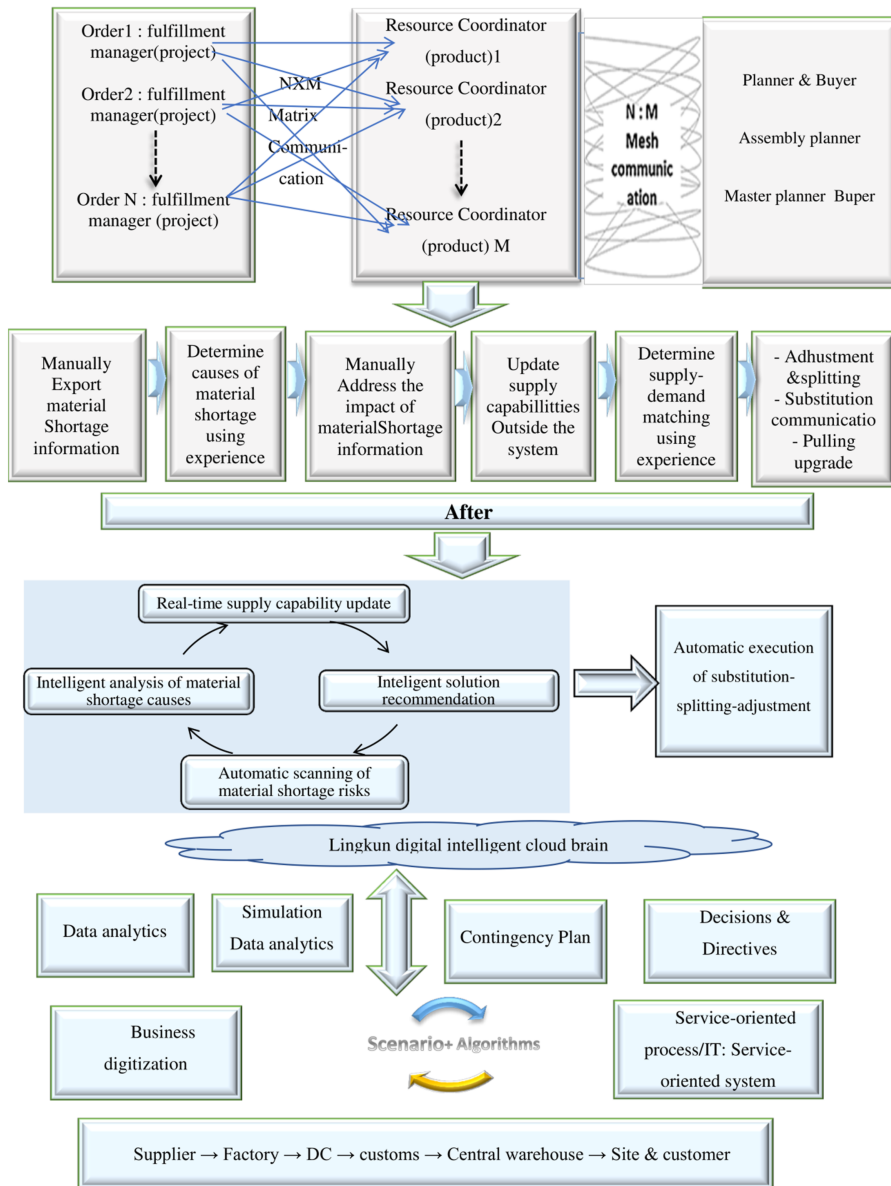
## 5. Discussion

Integrating AI into Huawei's supply chain marks a transition from traditional reactive models to more proactive and predictive strategies. Techniques such as generative algorithms, ML and self-learning models support demand forecasting, risk mitigation and inventory optimisation. Compared to traditional SCM practices, these applications improve responsiveness and adaptability in dynamic market environments (Ivanov, 2023). However, the effectiveness of these advancements depends on the quality of input data, system integration and workforce adaptation, all of which can present challenges during implementation.

Huawei's implementation can be analysed using the Technology-Organisation-Environment (TOE) framework, which emphasises technological readiness and organisational support. The ISC + project and the Lingfeng Intelligent Logistics Centre demonstrate how digital maturity and unified data models can enhance supply chain visibility and coordination (Wu *et al.*, 2025). These examples support the theoretical view that digital transformation in SCM involves technological and organisational dimensions. However, achieving such integration may require significant investment in IT infrastructure and staff training.

Huawei emphasises the use of a unified data model to support AI-driven analytics, aiming to improve supply chain visibility, agility and resilience. The ISC + project incorporates self-learning algorithms to enhance decision-making within logistics operations, enabling real-time adjustments based on simulated or observed data. This approach promotes data-driven decision-making and can improve operational efficiency and cost management. However, reliance on these algorithms requires continuous monitoring to ensure accuracy and relevance of the generated recommendations.

Huawei's supply chain leaders acknowledge the strategic role of a unified data model in enabling AI and analytics to enhance visibility, agility, resilience, cost efficiency and sustainability (Samuel *et al.*, 2021). The company's ISC + project leverages self-learning algorithms to support more adaptive and data-informed logistics management. These algorithms continuously refine operational decision-making by processing real-time information, thereby enabling timely responses to fluctuations in demand or disruptions. More importantly, the initiative promotes a culture of data-driven decision-making, where insights extracted from extensive datasets inform strategic and operational choices, ultimately contributing to process optimisation and cost reduction.



**Figure 5.** Building Huawei's intelligent supply chain system

The “cloud brain” concept developed by Huawei exemplifies the integration of generative AI into SCM. Its contribution can be discussed through several key mechanisms:

### 5.1 Enhanced demand forecasting

Generative AI models can improve demand prediction accuracy by analysing large, diverse data sources such as historical sales, market trends and promotional activities. This

comprehensive data processing enables firms to align production and inventory levels with market realities, reducing overstocking and shortages (Okeleke2024). Nevertheless, the reliability of such forecasts still depends on the quality and representativeness of the input data.

### 5.2 Optimised inventory management

AI-driven inventory systems employ ML and predictive analytics to optimise stock levels and replenishment processes (Choi *et al.*, 2022). When integrated with the IoT, they enable real-time monitoring of inventory conditions and locations, thereby increasing operational transparency. Yet, successful deployment requires robust data governance and employee training to interpret automated recommendations.

### 5.3 Rapid decision-making and resilience

Access to real-time data enhances responsiveness in the face of disruptions such as natural disasters or logistics delays. The ability to act swiftly ensures operational continuity and strengthens resilience, though it also demands advanced data-processing infrastructure and skilled human oversight to avoid overreliance on automation.

### 5.4 Advanced risk management

Generative AI assists in supplier evaluation, procurement automation and contract monitoring, improving overall compliance and risk mitigation. However, these benefits can only be realised when AI outputs are validated through human judgment, ensuring accountability and accuracy in decision-making.

### 5.5 Integration with IoT and blockchain

Combining AI, IoT, and blockchain enhances transparency and traceability across supply chain ecosystems (Soori *et al.*, 2024). IoT devices capture real-time performance data, while blockchain ensures secure and immutable transaction records. This integration reduces fraud risks and strengthens sustainability reporting, although scalability and interoperability remain major challenges for global operations.

### 5.6 Modular logistics centres and automation

Huawei's introduction of modular logistics centres, supported by technologies such as eLTE wireless systems, NB-IoT, AGVs and automatic code scanners, reflects a shift towards flexible and automated logistics networks. These systems enhance tracking accuracy, reduce waste and increase service quality, though they require significant capital investment and technical expertise.

### 5.7 Real-time management systems

The integration of mobile applications and IoT platforms allows Huawei to issue early risk alerts and monitor material flows dynamically. Such systems promote proactive risk control and scheduling optimisation. Nevertheless, the reliability of these mechanisms depends on continuous system maintenance and cybersecurity safeguards.

### 5.8 Big data and AI in cargo optimisation

The combination of Big Data analytics and AI facilitates improved distribution, asset utilisation and cost efficiency. By detecting emerging market trends, Huawei can align logistics strategies with demand variability, resulting in a more agile supply chain. This finding supports broader literature on digital transformation in logistics.

### 5.9 Improved coordination and communication

Advanced communication platforms enable real-time interaction among all supply chain actors, including personnel, vehicles and warehouses. Integrating external risk data further strengthens coordination and allows for rapid adaptation to unexpected events. However, overdependence on interconnected systems increases exposure to data privacy and network vulnerability issues.

Although Huawei's ISC + shows advanced coordination and real-time adaptability across the supply chain, it is important to consider these capabilities in the wider academic and industrial context. The existing studies reviewed in this research offer various insights into the integration of AI, the IoT, digital twins and other emerging technologies in supply chains. However, few of these studies achieve the same level of integration and operational coherence as Huawei's ISC+.

For instance, [Wu et al. \(2025\)](#), [Mashayekhy et al. \(2022\)](#) discuss IoT-enabled logistics and inventory management models; however, their frameworks fall short of providing real-time synchronisation between manufacturing and distribution. Similarly, [Culot et al. \(2024\)](#), provide a theoretical overview of AI applications in supply chains, yet they overlook the dynamic, data-driven decision-making that underpins ISC+ ([Riad et al., 2024](#)). [Riad et al., 2024](#) propose conceptual frameworks for AI-driven resilience, though their studies remain at the design level and lack evidence of practical implementation.

Furthermore, the research conducted by [Zhao et al. \(2025\)](#) focuses on narrow logistical contexts, such as the transportation of food at low altitudes. This limits the generalisability of their findings to large-scale industrial systems. In a similar vein, [Zakaria et al., 2024](#), have examined smart warehousing, yet the predictive maintenance component derived from IoT-AI integration, a key differentiator of ISC+, has been overlooked. In their seminal work, [Booneet al., 2025](#) explored the application of AI in the realm of resilience management, yet their discourse remained confined to the realm of theoretical considerations, neglecting to incorporate the critical dimension of physical logistics. In contrast, [Beta et al., 2025](#) placed significant emphasis on data-driven decision-making methodologies; however, their theoretical framework eschewed consideration of adaptive, real-time control mechanisms. Finally, [Li et al. \(2024\)](#) highlight coordination mechanisms in AI-driven supply chains, but do not address self-learning algorithms and real-time responsiveness, which are core features that enhance ISC+'s agility and precision.

In light of the extant literature, there is a tendency to prioritise the focus on fragmented technological components as opposed to the consideration of a holistic, self-learning ecosystem. It is therefore the case that Huawei's ISC + represents a significant advancement, since it serves to bridge the gap between conceptual frameworks and fully operational, adaptive supply chain systems. This paradigm illustrates the convergence of AI, IoT, and digital twins into a cohesive platform that fosters resilience, transparency and intelligent automation.

While preceding studies have investigated the theoretical integration of AI, IoT and digital twins, Huawei's ISC + initiative provides concrete evidence of the successful implementation of these technologies in real-world operations. The ensuing performance indicators illustrate the measurable outcomes achieved through this transformation.

Huawei's smart supply chain transformation, driven by the ISC + project and the Lingfeng Intelligent System, has led to notable operational improvements. AI-enabled demand forecasting and real-time monitoring through Digital Twin and IoT integration enhanced on-time delivery (OTD) performance from 85% to 95%, representing a 30% improvement ([Huawei, 2024a, b, c](#)). Inventory turnover increased by 40%, largely due to the application of big data analytics and automated storage systems. Furthermore, self-learning algorithms improved demand forecasting accuracy by 25%, reaching a precision level of 90%. Smart routing and automated inventory control also contributed to a 20% reduction in operational costs. Collectively, these results demonstrate the transformative impact of AI, big data and IoT technologies on supply chain performance.

Notwithstanding these significant achievements, Huawei's smart supply chain transformation is not without challenges. The success of the ISC + system is contingent upon data accuracy, cybersecurity and seamless system integration across all operational layers. Furthermore, the implementation of AI-driven systems necessitates ongoing employee training and cultural adaptation to ensure effective human-machine collaboration. These challenges underscore the notion that while technological advancement can significantly enhance supply chain resilience and efficiency, achieving sustainable performance still requires a balanced focus on human, technological and organisational dimensions.

## 6. Conclusion

The digital transformation of supply chains represents a multifaceted process that requires the restructuring of managerial, operational, and organisational systems. Through the optimisation of logistics and procurement, Huawei's supply chain demonstrates enhanced responsiveness to market fluctuations and improved capacity for continuous innovation. This transformation ensures business continuity, strengthens customer experience and fosters sustainable growth in uncertain environments. Quantitatively, these initiatives have resulted in a 50% improvement in key performance indicators, including customer service levels, delivery times, end-to-end (E2E) IT operations and supply cost rates.

### 6.1 Analytical insights on Huawei's ISC + innovation

The case study highlights Huawei's ISC + as a distinctive model of technological convergence, combining AI, the IoT and digital twins to enable real-time adaptive decision-making – an integration not thoroughly examined in prior literature. While previous research often focuses on isolated technological components, Huawei's approach emphasises operational integration through:

- (1) Self-learning algorithms that refine decision-making processes by analysing real-time operational data.
- (2) Real-time tracking and analytics systems that facilitate proactive disruption management and inventory optimisation.
- (3) Advanced technologies – such as eLTE, NB-IoT, automated guided vehicles (AGVs) and digital scanners – that enhance automation and visibility across logistics operations.
- (4) Big data-driven warehousing and logistics optimisation that reduces costs and improves responsiveness to dynamic market conditions.
- (5) Collectively, these mechanisms contribute to operational efficiency and competitive advantage, offering a practical illustration of how technological integration can translate theoretical models into measurable performance outcomes.

### 6.2 Implications for practice

The study provides actionable insights for organisations aiming to modernise their supply chains through digital transformation:

- (1) **AI-Driven Analytics:** Firms should implement AI-based forecasting and optimisation systems to enhance service levels and reduce delivery times, drawing on Huawei's experience with self-learning algorithms and IoT integration.
- (2) **Unified Data Infrastructure:** Developing a centralised data framework that integrates ERP, IoT and blockchain can enhance visibility, coordination and responsiveness.

- (3) **Automation and Advanced Technologies:** The use of AGVs, automated scanning systems and digital twins should be prioritised in high-volume logistics centres to evaluate efficiency and return on investment.
- (4) **Proactive Risk Management:** Predictive analytics should be embedded into supply chain monitoring systems to anticipate disruptions and improve resilience.

### 6.3 Directions for future research

This study also opens several avenues for future investigation:

- (1) **Empirical Validation:** Comparative studies are needed to quantitatively assess the impact of AI-enabled systems across different industries.
- (2) **Sustainability and Generative AI:** Future research should explore how generative AI can contribute to reducing operational waste and emissions.
- (3) **Longitudinal Assessment of Digital Twins:** Evaluating the long-term economic and strategic impact of digital twins on supply chain performance.
- (4) **Collaborative Supply Chain Models:** Investigating how blockchain and IoT can facilitate scalable, collaborative ecosystems.
- (5) **Human–AI Interaction:** Examining workforce transformation and skill adaptation in AI-integrated supply chain contexts.

### Author contributions

All authors worked together on this article. They wrote the manuscript together and each author wrote a section. All authors approved the final version.

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### References

- Arun, R., Panos, C. and Saonee, S. (2019), “Next-Generation Digital Platforms: Toward Human–AI Hybrids”, *Management Information Systems Quarterly*, Vol. 43 No. 01, pp. iii-ix.
- Bawa, S.S. (2023), “How business can use ERP and AI to become intelligent enterprise”, *International Journal of Innovative Science and Research Technology*, Vol. 6 No. 2.
- Beta, K., Nagaraj, S.S. and Weerasingh, T.D. (2025), “The role of artificial intelligence on supply chain resilience”, *Journal of Enterprise Information Management*, Vol. 38 No. 3, pp. 950-973, doi: [10.1108/JEIM-12-2023-0674](https://doi.org/10.1108/JEIM-12-2023-0674).
- Boone, T., Fahimnia, B., Ganeshan, R., Herold, D.M. and Sanders, N.R. (2025), “Generative AI: opportunities, challenges, and research directions for supply chain resilience”, *Transportation Research Part E: Logistics and Transportation Review*, Vol. 191, 104135, doi: [10.1016/j.tre.2025.104135](https://doi.org/10.1016/j.tre.2025.104135).
- Choi, T., Wallace, S. and Wang, Y. (2022), “Big data analytics in operations management”, *Production and Operations Management*, Vol. 27 No. 10, pp. 1868-1883, doi: [10.1111/poms.12838](https://doi.org/10.1111/poms.12838).
- Culot, G., Podrecca, M. and Nassimbeni, G. (2024), “Artificial intelligence in supply chain management: a systematic literature review of empirical studies and research directions”, *Computers in Industry*, Vol. 162, 104132, doi: [10.1016/j.compind.2024.104132](https://doi.org/10.1016/j.compind.2024.104132).

- Dubé, L. and Paré, G. (2003), "Rigor in information systems positivist case research: current practices, trends, and recommendations", *MIS Quarterly*, Vol. 27 No. 4, pp. 597-635, doi: [10.2307/30036550](https://doi.org/10.2307/30036550).
- Goodfellow, I., Yoshua, B. and Courville, A. (2023), *Deep Learning*, The MIT Press, United States of America.
- Helo, P. and Hao, Y. (2022), "Artificial intelligence in operations management and supply chain management: an exploratory case study", *Production Planning*, Vol. 33 No. 16, pp. 1573-1590, doi: [10.1080/09537287.2021.1882690](https://doi.org/10.1080/09537287.2021.1882690).
- Huawei (2024a), *2023 Annual Report*, Huawei, available at: [https://www-file.huawei.com/minisite/media/annual\\_report/annual\\_report\\_2023\\_en.pdf](https://www-file.huawei.com/minisite/media/annual_report/annual_report_2023_en.pdf) (accessed 3 December 2025).
- Huawei (2024b), *Making Connections with Smart Logistics*, available at: <https://e.huawei.com/sa/case-studies/global/2018/201807051051>
- Huawei (2024c), *Recherche et développement*, available at: <https://www.huawei.com/fr/corporate-information/research-development>
- IBM (2022), *IBM Global AI Adoption Index 2022*.
- Ivanov, D. (2023), "Conceptualisation of a 7-element digital twin framework in supply chain and operations management", *International Journal of Production Research*, Vol. 62 No. 6, pp. 2220-2232, doi: [10.1080/00207543.2023.2217291](https://doi.org/10.1080/00207543.2023.2217291).
- Ivanov, D. and Dolgui, A. (2021), "A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0", *Production Planning and Control*, Vol. 32 No. 9, pp. 775-788, doi: [10.1080/09537287.2020.1768450](https://doi.org/10.1080/09537287.2020.1768450).
- Kurrahman, T., Tsai, F.M., Lim, M.K., Sethanan, K. and Tseng, M.-L. (2025), "Generative AI capabilities for green supply chain management improvement: extended dynamic capabilities view", *International Journal of Logistics Research and Applications*, Vol. 28, pp. 1-28, doi: [10.1080/13675567.2025.2479006](https://doi.org/10.1080/13675567.2025.2479006).
- Lening, X. (2022), *How Huawei Transformed its Supply Chain in the Digital Era*, available at: <https://www.huawei.com/en/huaweitech/publication/202203/huawei-reshape-supply-chain-digital-era>
- Li, L., Liu, Y., Jin, Y., Cheng, E.T. and Zhang, Q. (2024), "Generative AI-enabled supply chain management: the critical role of coordination and dynamism", *International Journal of Production Economics*, Vol. 2077.
- Madancian, M., Taherdoost, H., Javadi, M., Khan, I., Kalantar, A. and Kumar, D. (2024), "The impact of artificial intelligence on supply chain management in modern business", in *Artificial Intelligence, Data Science and Applications (ICAISE 2023)*, Springer.
- Mashayekhy, Y., Babaei, A., Yuan, X.-M. and Xue, A. (2022), "Impact of Internet of Things (IoT) on inventory management", *Logistics*, Vol. 6 No. 33.
- Mentzer, J.T., Keebler, J.S.W., Soonhong Nix Nancy W, M., Carlo D, S., Zach G, Z., Smith, C.D. and Zacharia, Z.G. (2001), "Defining supply chain management", *Journal of Business Logistics*, Vol. 22 No. 2, pp. 1-25, doi: [10.1002/j.2158-1592.2001.tb00001.x](https://doi.org/10.1002/j.2158-1592.2001.tb00001.x).
- Merkert, R. and Hoberg, K. (2023), *Global Logistics and Supply Chain Strategies for the 2020s*, Springer, Switzerland.
- Mussomeli, A., Patil, S. and Noyes, C. (2023), *Artificial Intelligence (AI) in Supply Chain Management: Combatting Complexity in Modern Supply Chain Management*, Deloitte, United Kingdom.
- Okeleke, P.A., Ajiga, D., Folorunsho, S.O. and Ezeigweneme, C. (2024), "Predictive analytics for market trends using AI: a study in consumer behavior", *International Journal of Engineering Research Updates*, Vol. 7 No. 1, pp. 036-049, doi: [10.53430/ijeru.2024.7.1.0032](https://doi.org/10.53430/ijeru.2024.7.1.0032).
- Ping, G. (2017), *Making Connections with Smart Logistics - Huawei Industry Insights*, available at: <https://www.huawei.com/en/huaweitech/cases/smart-logistics>
- Precedence Research (2023), *Generative AI in Supply Chain Market*, precedenceresearch, available at: <https://www.precedenceresearch.com/generative-ai-in-supply-chain-market> (accessed 23 May 2024).

- Riad, M., Naimi, M. and Okar, C. (2024), "Enhancing supply chain resilience through artificial intelligence: developing a comprehensive conceptual framework for AI implementation and supply chain optimization", *Logistics*, Vol. 8 No. 111, p. 111, doi: [10.3390/logistics8040111](https://doi.org/10.3390/logistics8040111).
- Roman, E.-A., Stere, A.-S., Eugen, R., Radu, A.-V., Codroiu, D. and Ilie, A. (2025), "State of the art of digital twins in improving supply chain resilience", *Logistics*, Vol. 22 No. 1.
- Samuel, F., Maciel, M., Q., Cameron, G. and Ashley, B. (2021), "Industry experiences of artificial intelligence (AI): benefits and challenges in operations and supply", *Journal of Production Planning and Control*, Vol. 33 No. 16, doi: [10.1080/09537287.2021.1882695](https://doi.org/10.1080/09537287.2021.1882695).
- Singh, P. and Singh, V. (2024), "The power of AI: enhancing customer loyalty through satisfaction and efficiency", *Cogent Business and Management*, Vol. 11 No. 01, pp. 01-14, doi: [10.1080/23311975.2024.2326107](https://doi.org/10.1080/23311975.2024.2326107).
- Soori, M., Jough, F.K., Dastres, R. and Arezoo, B. (2024), "Blockchains for industrial Internet of Things in sustainable supply chain management of industry 4.0, a review", *Sustainable Manufacturing and Service Economics*, Vol. 3, 100026, doi: [10.1016/j.smse.2024.100026](https://doi.org/10.1016/j.smse.2024.100026).
- Stuart, J., R. and Norvig, P. (2021), *Artificial Intelligence: A Modern Approach*, Pearson.
- Toorajipour, R., Sohrabpour, V., Nazarpour, A., Oghazi, P. and Maria Fischl, M. (2021), "Artificial intelligence in supply chain management: a systematic", *Journal of Business Research*, Vol. 122.
- Vandana, M., Naveena, M., Ellaturu, N., Kumari, L.T., Bambuwala, S. and Rajalakshmi, M. (2024), "AI-driven solutions for supply chain management", *Journal of Informatics Education and Research*, Vol. 4 No. 2.
- Wamba, S., Maciel, M. and Trinchera, L. (2024), "The role of artificial intelligence-enabled dynamic capability on environmental performance: the mediation effect of a data-driven culture in France and the USA", *International Journal of Production Economics*, Vol. 268, 109131, doi: [10.1016/j.ijpe.2023.109131](https://doi.org/10.1016/j.ijpe.2023.109131).
- Wu, H., Li, G. and Ivanov, D. (2025), "The transformative power of generative AI for supply chain management: theoretical framework and agenda", *Frontiers of Engineering Management*, Vol. 12 No. 2, pp. 425-433, doi: [10.1007/s42524-025-4240-x](https://doi.org/10.1007/s42524-025-4240-x).
- Yin, R. (2018), *Case Study Research and Applications: Design and Methods*, SAGE Publications, CA.
- Zakaria, H.I., Lyn, J., Azizul, P.M., Anis, F. and bakri, A.h. (2024), "Smart warehousing solutions: enhancing efficiency and sustainability in logistics and transportation", *Journal of Vocational Education Research*, Vol. 9 No. 2.
- Zhao, Y., Zhang, M., Mujumdar, A.S., Benu, A. and Rui, L. (2025), "AI-based low-altitude delivery fresh food supply Chain: research progress and trends" Vol. 161, 105056, doi: [10.1016/j.tifs.2025.105056](https://doi.org/10.1016/j.tifs.2025.105056).

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