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The transformative power of generative AI for supply chain management: Theoretical framework and agenda

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Abstract The increasing complexity of global supply chains has presented critical challenges for businesses in coordinating resources, forecasting demand, and dynamically optimizing processes. Traditional supply chain management (SCM) methods are often inflexible, reactive, and prone to inefficiencies, which can result in missed opportunities and lost revenue. Technological advancements have played a pivotal role in addressing these challenges, with Generative Artificial Intelligence (GAI) emerging as a transformative force that offers numerous advantages for SCM. Despite the abundance of literature on the role of GAI in enhancing supply chain performance, it remains insufficient in providing a comprehensive theoretical framework for the construction of GAI applications and their empowerment mechanisms within SCM. This study first outlines the core GAI capabilities necessary for

constructing the SCM framework. We then examine the empowerment mechanisms and challenges of GAI in SCM and propose corresponding solutions. Afterward, we discuss notable gaps and propose a comprehensive research agenda, focusing on the SCM framework empowered by GAI.

Keywords generative artificial intelligence, supply chain management, theoretical framework

Received Dec. 18, 2024; revised Feb. 8, 2025; accepted Feb. 17, 2025

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This research was partially supported by the National Natural Science Foundation of China (Grant Nos. 72272013, 72402230, 71971027 and 72321002); the Humanity and Social Science Foundation of Ministry of Education of China (Grant No. 24YJC630232); Beijing Natural Science Foundation (Grant No. 9244035); the China Postdoctoral Science Foundation (No. 2023M743872); the Postdoctoral Fellowship Program (Grade C) of China Postdoctoral Science Foundation (No. GZC20242003); the Fundamental Research Funds for the Central Universities (No. 2023CX01029); the Science Foundation of China University of Petroleum, Beijing (No. 2462023BJRC031).

1 Introduction

In recent years, modern supply chains have been increasingly characterized by uncertainty arising from fluctuating demand, geopolitical instability, and disruptions caused by events such as pandemics and natural disasters (Ning et al., 2023; Li et al., 2024b). These uncertainties, coupled with the growing complexity of supply chain networks, often lead to inefficiencies, higher costs, and delays in decision-making (Xue and Li, 2023; Bednarski et al., 2025). Efficiency challenges, such as inventory mismanagement, transportation delays, and suboptimal resource allocation, remain prevalent (Xue and Li, 2023; Li et al., 2024a). Moreover, data silos between supply chain partners hinder collaboration, reducing transparency and operational coherence (Bednarski et al., 2025). Traditional supply chain management (SCM) struggles to address forecasting uncertainties due to dynamic market conditions and the lack of real-time data integration. These issues have driven the evolution of supply chain strategies, making advanced technologies essential for managing and optimizing supply chain processes (Sharma et al., 2022; Wu et al., 2024; Dolgui and Ivanov, 2025).

Among the transformative technologies shaping modern supply chains, Artificial Intelligence (AI) has gained significant attention (Li and Li, 2022; Hendriksen, 2023; Chen et al., 2024). Within the broader AI landscape, Generative AI (GAI) has recently emerged as a

groundbreaking innovation with the potential to revolutionize SCM (Wamba et al., 2023; Jackson et al., 2024). Powered by advanced algorithms such as transformer models, GAI can synthesize new data, generate human-like responses, and model complex scenarios (Floridi and Chiriatti, 2020; Dubey et al., 2024; Li et al., 2024b). Unlike traditional AI, which primarily focuses on analyzing historical data or performing specific tasks, GAI excels in creating novel solutions, simulating potential outcomes, and offering creative approaches to problem-solving (Budhwar et al., 2023; Fosso Wamba et al., 2024). These capabilities position GAI as a game-changer for addressing the multifaceted challenges faced by supply chain managers (Li et al., 2024a). According to statistical analysis, the global GAI in supply chain market is projected to reach USD 10,284 million by 2032, up from USD 269 million in 2022, growing at a compound annual growth rate of 45.3% during the forecast period from 2023 to 2032, as shown in Fig. 1.

To date, despite the promising potential of GAI, its application within SCM remains in its early stages. Existing research in AI for SCM has primarily concentrated on predictive and prescriptive analytics, while the creative and generative capabilities of AI remain largely unexplored. Most studies have focused on incremental improvements rather than the transformative changes that GAI could introduce (Wamba et al., 2023; Li et al., 2024a and 2024b). For example, although traditional AI models have effectively optimized inventory levels and forecasted demand fluctuations, they often lack the capacity to generate innovative strategies for mitigating disruptions or redesigning supply chain networks. This gap underscores the limited theoretical integration of GAI within SCM. The existing literature lacks a unified theoretical framework that systematically explores the integration of GAI into key supply chain functions such as demand forecasting, inventory optimization, and risk management. Furthermore, the literature has not sufficiently examined how GAI can be leveraged to optimize decision-making processes in real-time, considering the

dynamic nature of supply chains. To address this gap, the research will focus on the following key questions: (i) What are the core GAI capabilities necessary for building the SCM framework? (ii) What are the potential benefits and limitations of integrating GAI into supply chain processes? (iii) What knowledge gaps exist in the current literature?

To examine the above questions, our study employs a conceptual integration method. By synthesizing relevant theories of GAI and SCM with practical cases, a comprehensive theoretical framework is developed. Specifically, we first introduce the background and significance of GAI, and focus on the core capabilities and outlines their applications in SCM. Then, we illustrate the empowerment mechanisms and challenges of GAI in SCM and propose corresponding solutions. Afterward, we establish a research agenda that identifies key questions and avenues for future exploration. By addressing these aspects, this study seeks to contribute to the growing body of knowledge on Generative AI and its transformative role in SCM, while providing a roadmap for its effective implementation in practice.

2 Core capabilities of GAI

The increasing complexity of global supply chains has presented critical challenges for businesses in coordinating resources, forecasting demand, and dynamically optimizing processes. GAI's unique capabilities provide innovative solutions to these challenges. This section seeks to investigate the core GAI capabilities necessary for building a comprehensive SCM framework. The analysis presented in this study builds upon the capabilities described in previous literature, extending their proposals (Floridi and Chiriatti, 2020; Budhwar et al., 2023; Wamba et al., 2023; Dubey et al., 2024; Feuerriegel et al., 2024; Fosso Wamba et al., 2024; Jackson et al., 2024; Li et al., 2024a and 2024b; Modgil et al., 2025). The core capabilities of GAI can be classified into five categories:

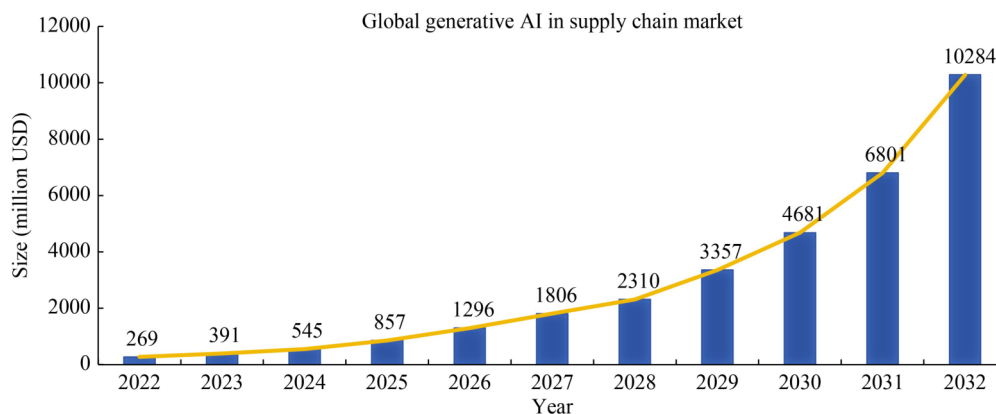


Fig. 1 The global GAI in supply chain market (Based on MarketResearch.biz).

learning and creativity, perception and prediction, expression and communication, collaboration and interaction, and adjustment and adaptation. **Table 1** defines these core capabilities and outlines their applications within SCM.

2.1 Learning and creativity

GAI can extract underlying patterns and features from large-scale, multimodal data, including text, images, and audio. Through semi-supervised or unsupervised learning, GAI can uncover the intrinsic structure and distribution of data, even in the absence of explicit labels, thereby facilitating more efficient decision-making processes. Furthermore, GAI exhibits considerable creative potential. By learning patterns from training data, GAI can generate novel and innovative content. This creative capacity holds significant promise for applications in SCM. Specifically, GAI can predict demand based on real-time data and dynamically optimize solutions for inventory management and logistics, thereby enhancing both the responsiveness and efficiency of the supply chain.

2.2 Perception and prediction

In comparison to traditional AI, GAI offers superior processing and analytical capabilities for images and videos, enabling the extraction of valuable insights from these data sources, thereby enhancing prediction accuracy. Furthermore, advancements in natural language processing, particularly through models such as GPT, have significantly broadened AI's perceptual capabilities. Once trained, GAI models can understand a broad range of text with near-human accuracy, both in terms of semantic and syntactic comprehension. In the context of SCM, these enhanced perceptual and predictive capabilities support more accurate demand forecasting, fostering more responsive and data-driven decision-making.

2.3 Expression and communication

GAI can mimic human thought processes and logic to engage in dialogs, and it also has access to extensive

professional knowledge, enabling real-time communication with users. Moreover, GAI supports multiple output formats, including text, images, audio, and video, making it a versatile tool for facilitating expression and communication in diverse contexts. Leveraging these capabilities, GAI enhances the efficiency of interactions between individuals and AI. In the context of SCM, GAI's expressive and communicative abilities can strengthen communication and collaboration between organizations. Specifically, in supplier relationship management, GAI can assist companies in negotiations, contract formulation, and even optimize contract terms while improving communication efficiency, thereby enhancing both coordination and flexibility within the supply chain.

2.4 Collaboration and interaction

GAI models, such as ChatGPT, demonstrate advanced collaborative and interactive capabilities. These models facilitate real-time dialogs with users, enabling human-machine interaction, and efficiently process large volumes of repetitive tasks, thereby saving valuable team time. For instance, GAI can function as a customer service agent, responding to customer inquiries. GAI can also collaborate with robots in environments like manufacturing, where it handles design and planning, while robots execute specific tasks, thus completing the production process. Additionally, multiple GAI models can operate in tandem, coordinating seamlessly across systems. By leveraging the collaborative and interactive capabilities of GAI, these models can optimize coordination across various stages of the supply chain, thereby enhancing overall efficiency in complex environments.

2.5 Adjustment and adaptation

GAI's adaptability is primarily evident in its capacity to analyze large data sets, swiftly detect changes in both internal and external environments, simulate risk scenarios, and promptly adjust strategies for dynamic planning. This capability helps mitigate the likelihood of risks and minimize the potential damage they may cause. GAI can

Table 1 The core capabilities of GAI

Capacity	Definition	Empowerment mechanism
Learning and creativity	GAI possesses the capability to discern patterns and underlying principles through extensive data training, thereby enabling it to generate novel, logical, and contextually appropriate content based on pre-existing knowledge.	Assisted decision making Accurate demand forecasting Dynamic programming
Perception and prediction	GAI can perceive complex situations and predict future trends or user needs by analyzing the environment, user behavior, and historical data.	Accurate demand forecasting
Expression and communication	GAI possesses the ability to transform input information into multimodal outputs—such as text, images, and audio—that are tailored to specific contexts and applications.	Strengthening organizational relationships Enhancing supplier relationship management
Collaboration and interaction	GAI facilitates efficient collaboration and information exchange with human users or other AI systems through data-driven algorithms.	Optimization of logistics routes Adjustment of warehouse layouts
Adjustment and adaptation	GAI can dynamically adjust its behavior or output content to better achieve its objectives in response to environmental changes or user feedback.	Increased resilience against risks

iterate on its algorithms, continuously refining its processes as it accumulates usage data and experience, thereby enhancing its adaptability. Furthermore, GAI can adjust the content it generates in response to evolving use cases, thus meeting users’ personalized needs. This adaptability allows GAI to dynamically adjust strategies based on external environmental changes and real-time feedback. By leveraging this capability, firms can enhance the flexibility and resilience of their supply chains, optimizing key processes such as inventory management, production, and logistics.

optimization results, and simulating various “what-if” scenarios. It further optimizes human-system interaction by integrating data sources and decision models, thus facilitating complex analyses and promoting agile, responsive operations. The combination of these capabilities enhances supply chain members’ visibility, accelerates decision-making, and fosters collaboration, ultimately strengthening the resilience and adaptability of supply chains. With ongoing advancements in GAI, its potential in SCM remains boundless. This subsection discusses how GAI drives improvements in SCM.

3 Framework based on GAI capabilities in SCM

In this section, we explore how GAI empowers SCM, addresses the challenges associated with its implementation, and presents potential solutions. The conceptual framework for SCM empowered by GAI is shown in Fig. 2.

3.1 GAI enables SCM

GAI’s core capabilities offers significant advantages in data processing, decision support, and human-computer interaction within SCM. For instance, it efficiently extracts critical information, standardizes data formats, and summarizes large volumes of textual data, such as contracts and invoices. Moreover, GAI enhances decision-making by providing contextual insights, interpreting

3.1.1 Empowering Forecasting: GAI Drives Precise Demand Insights

By leveraging deep learning and analyzing historical data, market trends, and external factors, GAI can develop more efficient and accurate forecasting models. The GAI’s ability to recognize complex demand patterns and provide data-driven insights enables enterprises to predict future demand with greater precision. In specific, GAI, with its learning, creativity, and perception and prediction capabilities, can integrate and analyze multi-modal data, including historical sales data, natural language data, images, and videos. Furthermore, GAI can extract consumer sentiment and market feedback from social media, news, and other channels, thereby enabling accurate forecasting of potential demand fluctuations, as depicted in Fig. 3. In practice, Cainiao introduces the GAI-powered big data model *Tianji π*, which leverages historical data, market trends, and potential disruptions to

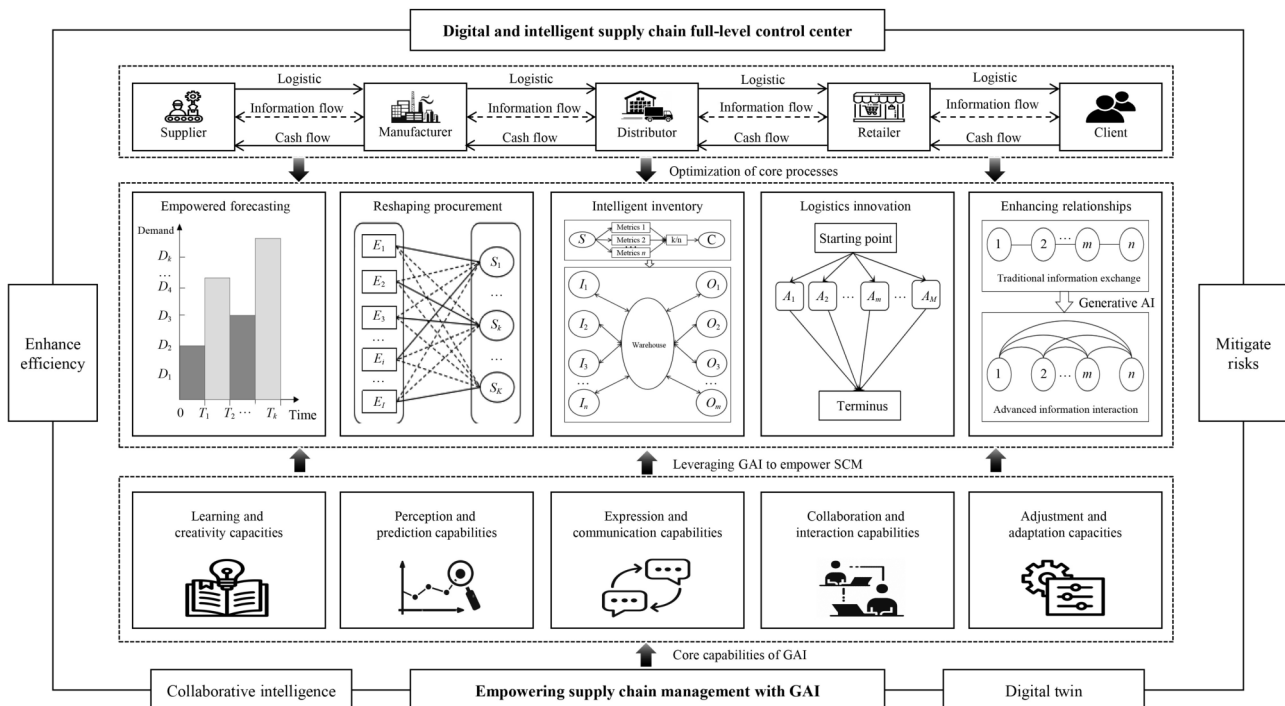


Fig. 2 Conceptual framework of SCM empowered by GAI.

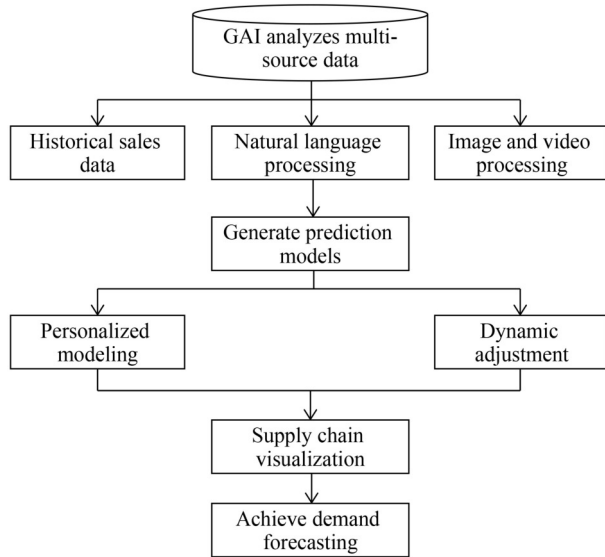


Fig. 3 Demand forecasting diagram.

generate precise demand forecasts, thereby aiding businesses in optimizing inventory management and logistics resource allocation. By incorporating multidimensional data sources, such as consumer behavior, weather variations, and socio-economic indicators, *Tianji π* enhances the accuracy of demand forecasts, particularly under market volatility and supply chain uncertainties, thereby exhibiting superior adaptability.

3.1.2 Reshaping Procurement: GAI Leads Decision Optimization

GAI significantly enhances the accuracy of demand forecasting and optimizes the supplier selection process through its learning, creativity, and communication capabilities. As illustrated in Fig. 4, GAI can leverage its perception and prediction abilities to integrate historical procurement data, inventory levels, and market trends to generate precise procurement demand forecasts. Based on these predictions, GAI helps formulate more scientific and effective purchasing plans. In supplier management, GAI can facilitate supplier negotiations and generate

customized contract texts that align with procurement needs and legal regulations, thereby improving the efficiency of contract signing. Additionally, GAI can automatically generate comparative analysis reports by analyzing vast amounts of supplier data, enabling decision-makers to make prompt, accurate, and informed choices. In practice, Walmart implements the Pactum AI platform, which harnesses GAI to facilitate supplier interactions, automating negotiations and contract modifications. This approach not only generates substantial cost savings and optimized contract terms but also enhances supply chain efficiency by fostering more dynamic and data-driven decision-making. By leveraging GAI’s analytical capabilities to process vast data sets, Walmart can better synchronize its procurement strategies with market dynamics, thereby strengthening supplier relationships and optimizing operational performance.

3.1.3 Smart Inventory: GAI Optimizes Storage and Regulation

With its powerful capabilities in learning, creativity, collaboration, and interaction, GAI can more accurately predict inventory demand, identify market demand trends, and dynamically optimize replenishment and distribution strategies. This ensures that companies can meet production requirements and deliver products to customers in the shortest possible time. GAI intelligently optimizes inventory management processes by collecting and analyzing various financial and order data, as shown in Fig. 5. Based on order dynamics, GAI efficiently schedules inbound and outbound operations of goods while optimizing warehouse layout based on the frequency of goods movements, ensuring optimal resource allocation and operational efficiency. Additionally, GAI can automatically generate accurate statistical reports based on goods movements, providing real-time support for decision-making and offering data-driven insights. In practice, ZARA develops its proprietary AI model to facilitate demand forecasting, sales analysis, and real-time inventory adjustments, resulting in improved inventory control, reduced surplus, and

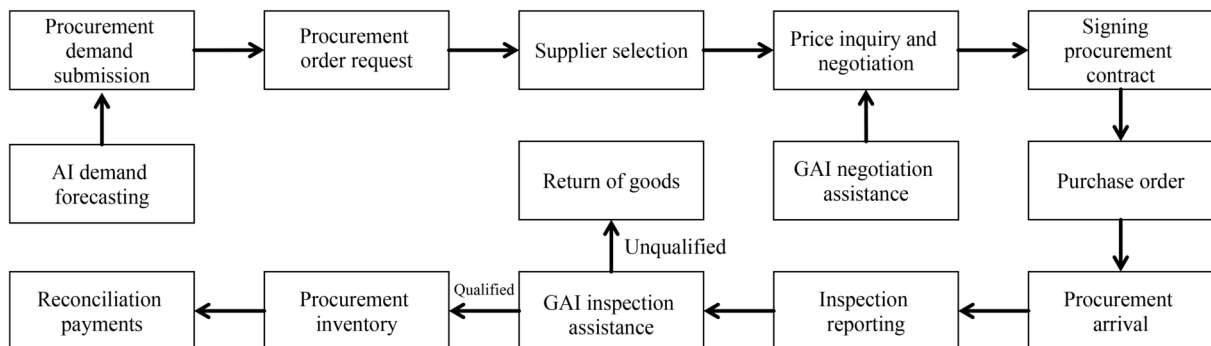


Fig. 4 Procurement management flowchart (Based on <https://s.fanruan.com/a80xf>).

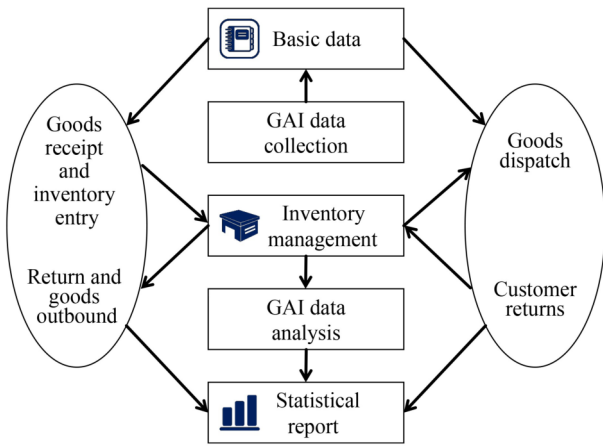


Fig. 5 Inventory management diagram (Based on SOHU.com).

enhanced sales efficiency.

3.1.4 Revolutionizing Logistics: GAI Fuels Intelligent Operations

GAI in logistics management encompasses four key areas: intelligent scheduling and resource allocation, cross-department collaboration, logistics route optimization, and predictive maintenance, all of which significantly enhance management efficiency and flexibility, as illustrated in Fig. 6. First, GAI integrates real-time data, such as orders, inventory, traffic, and weather, to enable intelligent scheduling and automatic resource allocation, optimizing the match between goods and vehicles, thereby reducing logistics costs and improving delivery efficiency. Second, GAI facilitates real-time cross-department collaboration by integrating supply chain information, such as shipper, warehouse, and receiver details, and leveraging automation systems to swiftly respond to unexpected changes, ensuring the efficient operation of logistics. Third, GAI analyzes multi-dimensional transportation network factors, thereby reducing delays and

minimizing resource waste. Finally, GAI identifies potential equipment failures, such as those involving trucks or data storage devices, proactively schedules maintenance tasks, and reduces failure rates, ultimately enhancing the reliability and continuity of logistics systems. In practice, Baidu Maps introduces its GAI-powered *Logistics Big Model Beta*, which is utilized for logistics address parsing and dispatch decision-making. By employing advanced AI algorithms, this model enhances both the accuracy and speed of address identification while optimizing route planning and dispatch decision-making, thereby substantially improving logistics efficiency.

3.1.5 Forward-Looking Risk Management: GAI Builds Resilience

Through intelligent analysis and predictive modeling, GAI not only assists companies in identifying potential risks and optimizing decision-making processes but also offers flexible countermeasures. As depicted in Fig. 7, GAI analyzes historical data, market trends, and external environmental changes to predict potential supply chain disruptions, enabling companies to take proactive measures in advance. In the event that risks have already materialized, GAI can rapidly identify and assess their severity, coordinating all systems to respond swiftly and ensuring that the supply chain returns to normal operations. Furthermore, GAI enhances supply chain resilience and responsiveness by automating responses and dynamically adjusting strategies, effectively addressing sudden risk events and ensuring stable supply chain operations. In practice, IBM utilizes GAI models to predict and respond to supplier disruptions, natural disasters, and geopolitical events, thereby ensuring operational stability and continuity.

In short, compared to traditional SCM, the GAI-enabled SCM has made notable advancements in key areas, including demand forecasting, procurement



Fig. 6 Logistics management diagram.

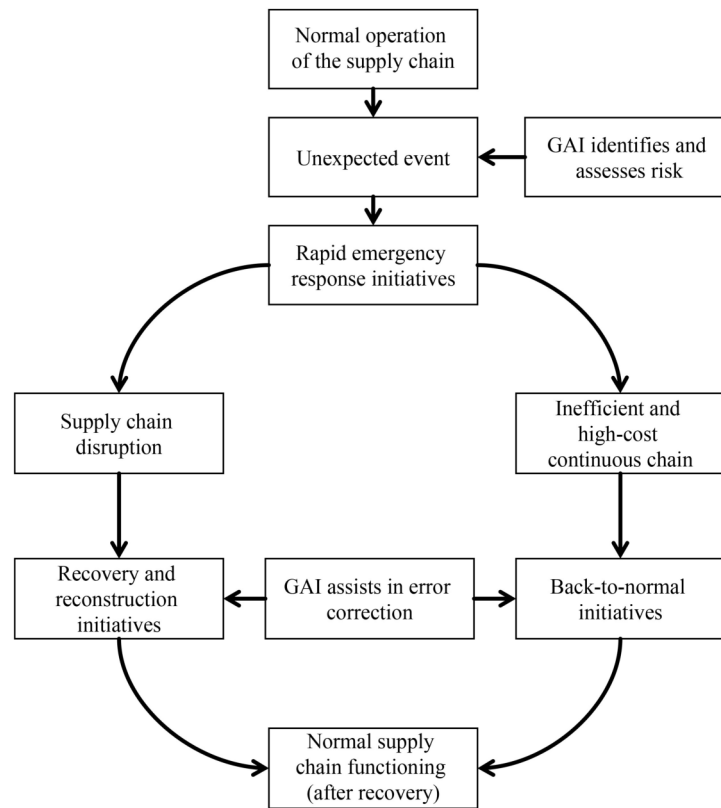


Fig. 7 Risk management diagram (Based on We Chat official account: Nantong Supply Chain Management).

management, inventory management, logistics management and risk response. Table 2 presents a comparison of these two types of SCM across these key aspects.

3.2 Challenges and solutions

Despite the significant potential applications of GAI in SCM, its widespread deployment and practical implementation face numerous challenges. These challenges not only involve technical complexities but also encompass multidimensional constraints related to data, ethics, society, and cost. Therefore, this section provides an in-depth analysis of the potential risks and practical issues associated with the use of GAI in SCM, along with proposed solutions to address these challenges, as illustrated in Table 3.

4 Frontier research agenda

As the body of literature on GAI's applications in SCM continues to grow, our understanding of its transformative potential remains limited. To address the pressing questions surrounding this emerging field, this study identifies four frontier research directions, categorized into technology-driven approaches and management innovation practices, as shown in Table 4.

In the domain of technology-driven directions, the

application of GAI in smart supply chain design and risk prediction offers significant opportunities. Research in this area focuses on leveraging GAI to design supply chain networks that can adapt to complex environments and high-risk scenarios. The key challenges include utilizing GAI to predict potential supply chain risks, developing adaptive response strategies, and optimizing supply chain structures to enhance resilience and risk mitigation. Furthermore, the intersection of GAI with emerging technologies holds the potential to further enhance predictive accuracy and decision-making processes. By integrating advanced GAI techniques with innovative technologies, this field can create more robust, adaptive, and risk-aware supply chains, better equipped to address future challenges.

In the realm of management innovation practices, the ethical and social implications of GAI in supply chain decision-making represent crucial research areas. These challenges encompass issues such as data bias, decision transparency, and the potential risk of job displacement. Central to these discussions are the design of interpretable AI systems to improve transparency and strategies for mitigating the impact of GAI on workforce transformations within supply chains. Moreover, GAI's role in sustainable supply chain design is gaining attention, particularly in optimizing carbon emissions, resource recycling, and low-carbon logistics. Research in this area aims to balance economic efficiency with environmental sustainability,

Table 2 The comparison of these two types of SCM

	GAI-Driven	Traditional
Demand Forecasting	Multi-Source Data Forecasting—By leveraging historical sales data, natural language processing, and multimedia data (e.g., images and videos), GAI can generate more accurate and dynamic demand forecasts.	Single-Source Data Forecasting—Relying primarily on historical sales data and basic statistical models for predictions, which presents challenges in accurately forecasting market demand.
Procurement Management	Dynamic Procurement—Real-time data analysis can optimize procurement decisions, thereby enhancing the flexibility and responsiveness of the supply chain.	Static Procurement—Relying on historical data for decision-making, making it difficult to adapt to market fluctuations and sudden demand changes.
Inventory Management	Automated Adjustment—GAI can automatically generate intelligent replenishment and allocation strategies to dynamically optimize inventory levels, thereby reducing stockpiling and stockouts.	Manual Adjustment—Based on fixed replenishment cycles and experience-based rules, with slower response times, often leading to overstocking or stock shortages.
Logistics Planning	Smart Logistics—GAI can leverage multi-dimensional data, such as traffic and weather conditions, to analyze and generate optimal transportation routes in real time, thereby supporting dynamic adjustments.	Traditional Logistics—Based on fixed routes with limited adjustment capabilities, offering limited flexibility in responding to real-time changes and lacking support for dynamic adjustments.
Risk Mitigation	Preemptive Forecasting—GAI can analyze equipment and financial data to predict potential risks in advance, thereby reducing the likelihood of such occurrences.	Post-Incident Response—Making timely adjustments after a risk event occurs to minimize the resulting losses.

Table 3 Challenges and solutions

Challenge	Description	Mitigation Strategies
Data Quality and Availability	Data quality issues and poor accessibility among multiple stakeholders create information silos and inconsistencies in standards, negatively affecting model training and forecasting accuracy.	<ul style="list-style-type: none"> ◇ Automated Data Cleaning Pipelines: Implement machine learning-based anomaly detection and outlier correction to enhance data integrity; ◇ Federated Learning for Data Sharing: Adopt privacy-preserving federated learning models to facilitate cross-enterprise data sharing without exposing raw data; ◇ Blockchain for Data Traceability: Utilize blockchain-based ledgers to ensure data authenticity, reduce inconsistencies, and maintain tamper-proof records.
Ethical and Social Implications	Extensive use of GAI may lead to ethical and social concerns, including privacy breaches, lack of decision transparency, and increased unemployment within the supply chain.	<ul style="list-style-type: none"> ◇ Explainable AI Models: Integrate interpretable GAI models that provide human-readable explanations of decisions, ensuring accountability; ◇ Regulatory Compliance Monitoring: Deploy AI-powered compliance tools that track regulatory changes in real time and ensure adherence to evolving data protection laws; ◇ Reskilling Initiatives: Develop AI-driven adaptive learning platforms for workers to upskill in AI-augmented supply chain roles, ensuring job transition support.
Integration Challenges	The complexity of GAI makes it difficult for supply chain managers and employees to comprehend underlying algorithms, hindering their acceptance and utilization.	<ul style="list-style-type: none"> ◇ Low-Code/No-Code AI Platforms: Utilize user-friendly interfaces that enable non-technical users to leverage GAI without deep technical expertise; ◇ Custom AI Assistants: Implement domain-specific AI assistants to provide real-time, interactive guidance on AI-driven decision-making; ◇ Simulation-Based Training: Introduce digital twins and AI-driven simulations to train employees in a risk-free environment.
Computational Costs	GAI requires the processing of large data sets, demanding substantial computing power. The associated high computational requirements lead to increased costs, necessitating a careful balance between benefits and financial implications.	<ul style="list-style-type: none"> ◇ Edge AI for Decentralized Processing: Shift computational loads to edge devices to reduce reliance on centralized, high-cost cloud resources; ◇ Adaptive Model Compression: Apply quantization and pruning techniques to reduce model size and computational burden without compromising accuracy; ◇ Joint AI Infrastructures: Establish AI infrastructure-sharing consortiums among supply chain stakeholders to distribute computing costs and resources efficiently.
Accuracy and Consistency	GAI responses, while in natural language, often suffer from a lack of precision and consistency. Additionally, GAI systems are susceptible to hallucination, producing false or misleading information.	<ul style="list-style-type: none"> ◇ Hybrid AI Verification Systems: Implement a human-in-the-loop approach to validate AI-generated outputs, reducing errors; ◇ Reinforcement Learning with Human Feedback: Continuously refine AI models by incorporating real-time feedback from supply chain experts; ◇ Knowledge Graph Integration: Enhance AI reasoning capabilities by linking responses to structured industry-specific knowledge graphs, improving factual accuracy.

supporting businesses in achieving carbon neutrality and long-term sustainable development.

5 Conclusions

Supply chain operations have become increasingly complex over the years, with businesses facing growing pressure to deliver goods more rapidly and efficiently while simultaneously reducing costs. GAI offers numerous

advantages for SCM. Despite the abundance of literature on the role of GAI in enhancing supply chain performance, a comprehensive theoretical framework for the construction of GAI applications and their empowerment mechanisms within SCM remains underdeveloped. This study presents a critical analysis and a theoretical framework for SCM enabled by GAI. In specific, we first identify the core GAI capabilities necessary for constructing the SCM framework. We then examine the empowerment mechanisms and challenges associated with GAI in SCM,

Table 4 Frontier research agenda

Theme	Frontier Research Agenda	Critical Questions	Methods
Technology-driven	Intelligent supply chain design and risk prediction	How can GAI be utilized to predict risks and proactively propose mitigation strategies? What frameworks are required to optimize supply chain networks for improved resilience and stability?	Experimental Mathematical Simulation Conceptual Empirical Analysis Machine Learning Case Study Multi-method
	Intersections of GAI with emerging technologies	How can GAI be integrated with blockchain and edge computing to enhance data security and privacy in decentralized systems? What are the potential synergies between GAI and quantum computing in accelerating optimization processes and solving complex SCM problems?	
Management innovation	Ethical and societal implications of GAI	How can GAI systems be designed to ensure explainability and accountability? What strategies can mitigate the adverse impacts of GAI-driven automation on workforce roles and employment?	
	Sustainable supply chain design and low-carbon transition	How can GAI generate supply chain solutions that balance economic profitability with environmental sustainability? What methods can ensure effective application of GAI to manage green supply chains across their lifecycle?	

offering corresponding solutions. Subsequently, we identify key gaps and propose a comprehensive research agenda, emphasizing the SCM framework empowered by GAI. The insights and recommendations provided in this study aim to assist firms in building flexible, robust, and sustainable supply chains in the era of GAI.

Competing Interests The authors declare that they have no competing interests.

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